quote at length from a copyrighted work in material you intend to publish, you usually also need written permission from the owner of the copyright. Requirements for obtaining permission to quote copyrighted material vary from one copyright owner to another; for example, APA policy permits use of up to 500 words of APA-copyrighted journal text without explicit permission. It is the author's responsibility to determine whether permission is required from the copyright owner and to obtain it for both print and electronic reuse when required. APA cannot publish previously copyrighted material that exceeds the copyright holder's determination of "fair use" without permission.

If you must obtain written permission from the copyright owner, append a footnote to the quoted material with a superscript number, and in the footnote, acknowledge permission from the owner of the copyright. Format the footnote like the permission footnotes used for tables and figures (see section 3.73), but substitute the indented superscript number for the word *Note.* Place the footnote number at the end of the quotation, after any punctuation. Enclose a copy of the letter of permission with the final version of the manuscript.

Numbers

The general rule governing APA style on the use of numbers is to use figures to express numbers 10 and above and words to express numbers below 10. Sections 3.42–3.44 expand on this rule and state exceptions and special usages.

3.42 *Numbers Expressed in Figures*

Use figures to express

a. all numbers 10 and above. (*Exceptions:* See sections 3.43–3.44.)

12 cm wide

the remaining 10%

25 years old

10th-grade students

the 15th trial

13 lists

105 stimulus words

b. all numbers below 10 that are grouped for comparison with numbers 10 and above (and that appear in the same paragraph). (*Exceptions*: See sections 3.43–3.44.)

3 of 21 analyses

of 10 conditions . . . the 5th condition

5 and 13 lines

in the 2nd and 11th grades . . . the 2nd-grade students

on 2 trials . . . on the remaining 18 trials

4 of the 40 stimulus words

in 7 blocks . . . in 12 blocks

the 6th group . . . 12 groups

the 1st and 12th items of all 15 lists

2 of the 20 responses

toys included 14 balloons, 3 stuffed animals, and 5 balls

25 words . . . 8 verbs, 12 nouns, and 5 adjectives

but

15 traits on each of four checklists [Traits and checklists are not being compared; they are different categories of items.]

c. numbers that immediately precede a unit of measurement.

a 5-mg dose

with 10.54 cm of

d. numbers that represent statistical or mathematical functions, fractional or decimal quantities, percentages, ratios, and percentiles and quartiles.

multiplied by 5

3 times as many [proportion; cf. 3.43a]

0.33 of the

more than 5% of the sample

a ratio of 16:1

the 1st quartile

the 5th percentile

e. numbers that represent time; dates; ages; sample, subsample, or population size; specific numbers of subjects or participants in an experiment; scores and points on a scale; exact sums of money; and numerals as numerals.

in about 3 years

2 weeks ago

1 hr 34 min

at 12:30 a.m.

March 30, 1994

2-year-olds

3 participants [*but* two raters, seven observers]

9 rats

scored 4 on a 7-point scale

were paid $5 each

the numerals on the scorecard were 0–6

f. numbers that denote a specific place in a numbered series, parts of books and tables, and each number in a list of four or more numbers.

Grade 8 [*but* the eighth grade; see section 3.45]

Trial 3

Table 3

page 71

chapter 5

row 5

1, 3, 4, and 7 words, respectively

g. all numbers in the abstract of a paper.

3.43 *Numbers Expressed in Words*

Use words to express

a. numbers below 10 that do not represent precise measurements and that are grouped for comparison with numbers below 10.

repeated the task three times [cf. 3.42d]

the only one who

two words that mean

five trials . . . the remaining seven trials

three conditions

seven lists

one-tailed *t* test

nine words each

three-dimensional blocklike figures

eight items

four responses

six sessions

nine pages

three-way interaction

the third of five taste stimuli

b. the numbers *zero* and *one* when the words would be easier to comprehend than the figures or when the words do not appear in context with numbers 10 and above.

zero-base budgeting

one-line sentence

However, one response was valid. [*but* However, 1 of 15 responses was valid.]

c. any number that begins a sentence, title, or text heading. (Whenever possible, reword the sentence to avoid beginning with a number.)

Ten participants answered the questionnaire

Forty-eight percent of the sample showed an increase; 2% showed no change.

Four patients improved, and 4 patients did not improve.

d. common fractions

one fifth of the class

two-thirds majority

reduced by three fourths

e. universally accepted usage

the Twelve Apostles

the Fourth of July

the Ten Commandments

3.44 *Combining Figures and Words to Express Numbers*

Use a combination of figures and words to express

a. rounded large numbers (starting with millions).

almost 3 million people

a budget of $2.5 billion

b. back-to-back modifiers.

2 two-way interactions

ten 7-point scales

twenty 6-year-olds

the first 10 items

A combination of figures and words in these situations increases the clarity and readability of the construction. In some situations, however, readability may suffer instead of benefit. In such a case, spelling out both numbers is preferred.

Poor:

1st two items

first 2 items

Better:

first two items

3.45 *Ordinal Numbers*

Treat ordinal numbers as you would cardinal numbers (see sections 3.42–3.44).

Ordinal	**Cardinal base**
second-order factor	two orders (3.43a)
the fourth graders	four grades (3.43a)
the fifth list for the 12th-grade students	five lists, 12 grades (3.42b)
the first item of the 75th trial	one item, 75 trials (3.42b)
the 2nd and 11th rows	2 rows, 11 rows (3.42b)
the first and third groups	one group, three groups (3.43a)
the third column	three columns (3.43a)
of 3rd-year students	3 years (3.42e)
4th and 5th years	4 years, 5 years (3.42e)

3.46 *Decimal Fractions*

Use a zero before the decimal point when numbers are less than 1.

0.23 cm, 0.48 s

Do not use a zero before a decimal fraction when the number cannot be greater than 1 (e.g., correlations, proportions, and levels of statistical significance).

$r(24) = -.43, p < .05$

The number of decimal places to use in reporting the results of experiments and data analytic manipulations of the data should be gov-

erned by three general principles: (a) a fundamental attitude to round as much as possible while keeping (b) prospective use and (c) statistical precision in mind. As a general rule, fewer decimal digits are easier to comprehend than more digits; therefore, in general, it is better to round to two decimal places or to rescale the measurement (in which case effect sizes should be presented in the same metric). For instance, a difference in distances that must be carried to four decimals to be seen when scaled in meters can be more effectively illustrated by conversion to millimeters, which would require only a few decimal digits to illustrate the same difference. As a rule, when properly scaled, most data can be effectively presented with two decimal digits of accuracy. Report correlations, proportions, and inferential statistics such as *t*, *F*, and chi-square to two decimals. In general, significance probabilities will be reported to two decimal places (i.e., the lowest reported significance probability being $p < .01$). There are, however, circumstances under which more decimals may be reported (e.g., Bonferroni tests, exact randomization probabilities).

3.47 *Roman Numerals*

If roman numerals are part of an established terminology, do not change to arabic numerals; for example, use Type II error. Use arabic, not roman, numerals for routine seriation (e.g., Step 1).

3.48 *Commas in Numbers*

Use commas between groups of three digits in most figures of 1,000 or more.

Exceptions:

page numbers	page 1029
binary digits	00110010
serial numbers	290466960
degrees of temperature	3071 °F
acoustic frequency designations	2000 Hz

degrees of freedom	$F(24, 1000)$
numbers to the right of a decimal point	4,900.0744

3.49 *Plurals of Numbers*

To form the plurals of numbers, whether expressed as figures or as words, add s or es alone, without an apostrophe.

fours and sixes 1950s 10s and 20s

Metrication

3.50 *Policy on Metrication*

APA uses the metric system in its journals. All references to physical measurements, where feasible, should be expressed in metric units. The metric system outlined in this section is based, with some exceptions, on the International System of Units (SI), which is an extension and refinement of the traditional metric system and is supported by the national standardizing bodies in many countries, including the United States.

In preparing manuscripts, authors should use metric units if possible. Experimenters who use instruments that record measurements in nonmetric units may report the nonmetric units but also must report the established SI equivalents in parentheses immediately after the nonmetric units.

> The rods were spaced 19 mm apart. [Measurement was made in metric units.]
>
> The rod was 3 ft (0.91 m) long. [Measurement was made in nonmetric units and converted to the rounded SI equivalent.]

Journal editors reserve the right to return manuscripts if measurements are not expressed properly. Tables 3.4–3.8 provide guidelines on the use of metric expressions.

3.51 *Style for Metric Units*

Abbreviation. Use the metric symbol (see Tables 3.4–3.8) to express a metric unit when it appears with a numeric value (e.g., 4 m). When a metric unit does not appear with a numeric value, spell out the unit in text (e.g., measured in meters), and use the metric symbol in column and stub headings of tables to conserve space (e.g., lag in ms).

Capitalization. Use lowercase letters when writing out full names of units (e.g., meter, nanometer), unless the name appears in capitalized material or at the beginning of a sentence.

For the most part, use lowercase letters for symbols (e.g., cd), even in capitalized material. Symbols derived from the name of a person usually include uppercase letters (e.g., Gy), as do symbols for some prefixes that represent powers of 10: exa (E), peta (P), tera (T), giga (G), and mega (M). (See the list in section 3.25 for more examples.)

Use the symbol L for liter when it stands alone (e.g., 5 L, 0.3 mg/L) because a lowercase *l* may be misread as the numeral one (use lowercase *l* for fractions of a liter: 5 ml, 9 ng/dl).

Plurals. Make full names of units plural when appropriate. Example: meters

Do not make symbols of units plural. Example: 3 cm, *not* 3 cms

Periods. Do not use a period after a symbol, except at the end of a sentence.

Spacing. Never use a space between a prefix and a base unit. Examples: kg, kilogram

Use a space between a symbol and the number to which it refers, except for measures of angles (e.g., degrees, minutes, and seconds). Examples: 4.5 m, 12 °C, but 45° angle

Compound units. Use a centered dot between the symbols of a compound term formed by the multiplication of units. Example: Pa·s

Use a space between full names of units of a compound unit formed by the multiplication of units; do not use a centered dot. Example: pascal second

Table 3.4. International System (SI) Base and Supplementary Units

Quantity	*Name*	*Symbol*
Base units		
amount of substance	mole	mol
electrical current	ampere	A
length	meter	m
luminous intensity	candela	cd
mass	kilogram	kg
thermodynamic temperature[a]	kelvin	K
time	second	s
Supplementary units		
plane angle	radian	rad
solid angle	steradian	sr

[a]Celsius temperature is generally expressed in degrees Celsius (symbol: °C).

Table 3.5. International System (SI) Prefixes

Factor	*Prefix*	*Symbol*	*Factor*	*Prefix*	*Symbol*
10^{18}	exa	E	10^{-1}	deci	d
10^{15}	peta	P	10^{-2}	centi	c
10^{12}	tera	T	10^{-3}	milli	m
10^{9}	giga	G	10^{-6}	micro	μ
10^{6}	mega	M	10^{-9}	nano	n
10^{3}	kilo	k	10^{-12}	pico	p
10^{2}	hecto	h	10^{-15}	femto	f
10^{1}	deka	da	10^{-18}	atto	a

Table 3.6. International System (SI) Derived Units With Special Names

Quantity	*Name*	*Symbol*	*Expression in terms of other units*
absorbed dose, specific energy imparted, kerma, absorbed dose index	gray	Gy	J/kg
activity (of a radionuclide)	becquerel	Bq	s^{-1}
capacitance	farad	F	C/V
conductance	siemens	S	A/V
dose equivalent, dose equivalent index	sievert	Sv	J/kg
electric charge, quantity of electricity	coulomb	C	A·s
electric potential, potential difference, electromotive force, voltage	volt	V	W/A
electric resistance	ohm	Ω	V/A
energy work, quantity of heat	joule	J	N·m
force	newton	N	$(kg \cdot m)/s^2$
frequency	hertz	Hz	s^{-1}
illuminance	lux	lx	lm/m^2
inductance	henry	H	Wb/A
luminous flux	lumen	lm	cd·sr
magnetic flux	weber	Wb	V·s
magnetic flux density	tesla	T	Wb/m^2
pressure, stress	pascal	Pa	N/m^2
radiant flux, power	watt	W	J/s
volume (capacity)	liter	L	dm^3

Table 3.7. Other International System (SI) Derived Units

Quantity	*Name*	*Symbol*
absorbed dose rate	gray per second	Gy/s
acceleration	meter per second squared	m/s^2
angular acceleration	radian per second squared	rad/s^2
angular velocity	radian per second	rad/s
area	square meter	m^2
concentration (amount of substance)	mole per cubic meter	mol/m^3
current density	ampere per square meter	A/m^2
density, mass density	kilogram per cubic meter	kg/m^3
electric charge density	coulomb per cubic meter	kg/m^3
electric field strength	volt per meter	V/m
electric flux density	coulomb per square meter	C/m^2
energy density	joule per cubic meter	J/m^3
exposure (X and γ rays)	coulomb per kilogram	C/kg
heat capacity, entropy	joule per kelvin	J/K
luminance	candela per square meter	cd/m^2
magnetic field strength	ampere per meter	A/m
molar energy	joule per mole	J/mol
molar entropy, molar heat capacity	joule per mole kelvin	$J/(mol \cdot K)$
moment of force	newton meter	$N \cdot m$
permeability	henry per meter	H/m
permittivity	farad per meter	F/m
power density, heat flux density, irradiance	watt per square meter	W/m^2
radiance	watt per square meter steradian	$W/(m^2 \cdot sr)$
radiant intensity	watt per steradian	W/sr
specific energy	joule per kilogram	J/kg
specific heat capacity, specific entropy	joule per kilogram kelvin	$J/(kg \cdot K)$
specific volume	cubic meter per kilogram	m^3/kg
surface tension	newton per meter	N/m
thermal conductivity	watt per meter kelvin	$W/(m \cdot k)$
velocity, speed	meter per second	m/s
viscosity (dynamic)	pascal second	$Pa \cdot s$
viscosity (kinematic)	square meter per second	m^2/s
volume	cubic meter	m^3
wave number	one per meter	m^{-1}

Table 3.8. Examples of Conversions to International System (SI) Equivalents

Physical quantity	*Traditional U.S. unit*	*SI equivalent*
Area	acre	4,046.873 m^2
	square foot[a]	0.09290304 m^2
	square inch[a]	645.16 mm^2
	square mile (statute)	2.589998 km^2
	square yard	0.8361274 m^2
Energy	British thermal unit (IT)	1,055.056 J
	calorie (IT), thermochemical[a]	4.186800 J
	erg	10^{-7} J
	kilowatt hour[a]	3.6×10^6 J
Force	dyne	10^{-5} N
	kilogram force[a]	9.80665 N
	poundal	0.138255 N
Length	angstrom (Å)[a]	0.1 nm
	foot (international)[a]	0.3048 m
	inch[a]	2.54 cm
	micrometer[a]	1.0 μm
	mile (U.S. statute)	1.609347 km
	nautical mile (international; nmi)[a]	1,852.0 m
	yard[a]	0.9144 m
Light	footcandle	10.76391 lx
	footlambert	3.426359 cd/m^2
Mass	grain[a]	64.79891 mg
	ounce	28.34952 g
	pound (U.S.)[a]	0.45359237 kg
Power	horsepower (electric)[a]	0.746 kW
Pressure	atmosphere (normal)[a]	101,325.0 Pa
	pound per square inch (psi)	6.894757 kPa
	torr[a]	(101,325/760) Pa
	sound pressure level (SPL; 0.0002 dynes/cm^2)[b]	20 $\mu N/m^2$

(*table continues*)

Table 3.8. (continued)

Physical quantity	*Traditional U.S. unit*	*SI equivalent*
Volume	cubic foot	0.02831685 m^3
	cubic inch	16.38706 cm^3
	fluid ounce	29.57353 ml
	quart (liquid)	0.9463529 L

Note. IT = International Table.

[a]Conversion factors for these units are exact. (For conversion factors that are not exact, the precision with which the quantity was measured determines the number of decimal places.)

[b]A decibel value is a measure of the power of sound relative to a specific reference level. The most common reference level on which decibel values are based is at 20 $\mu N/m^2$. If decibel values are based on another reference level, specify the level. Also, always indicate how frequencies were weighted: If frequencies were equally weighted, write SPL (i.e., sound pressure level) in parentheses after the decibel value; if frequencies were unequally weighted, specify the standard weighting used (e.g., A, B, or C) in parentheses after the decibel value.

3.52 *Metric Tables*

Tables 3.4–3.8 are intended to assist authors in the conversion to the metric system. They are based on tables that appeared in the National Bureau of Standards' (1979) "Guidelines for Use of the Modernized Metric System." For more detailed information, consult the sources on metrication referenced in section 9.03.

Statistical and Mathematical Copy

APA style for presenting statistical and mathematical copy reflects both standards of content and form agreed on in the field and the requirements of the printing process.

3.53 *Selecting the Method of Analysis and Retaining Data*

Authors are responsible for the statistical method selected and for all supporting data. Access to computer analyses of data does not relieve the author of responsibility for selecting the appropriate data analytic techniques. To permit interested readers to verify the statistical analysis, an author should retain the raw data after publication of the research. Authors of manuscripts accepted for publication in APA journals are required to have available their raw data throughout the editorial review process and for at least 5 years after the date of publication (section 8.05 includes a discussion about sharing data in the subsection on data verification).

3.54 *Selecting Effective Presentation*

Statistical and mathematical copy can be presented in text, in tables, and in figures. Read sections 3.57, 3.62, and 3.75 to compare methods of presentation and to decide how best to present your data. A general rule that might prove useful is

- if you have 3 or fewer numbers, use a sentence;
- if you have from 4 to 20 numbers, use a table; and
- if you have more than 20 numbers, consider using a graph or figure instead of a table.

When you are in doubt about the clearest and most effective method of presentation, prepare tables or figures with the understanding that if the manuscript is accepted, they are to be published at the editor's discretion. In any case, be prepared to submit tables and figures of complex statistical and mathematical material if an editor requests them.

3.55 *References for Statistics*

Do not give a reference for statistics in common use; this convention applies to most statistics used in journal articles. Do give a reference for (a) less common statistics, especially those that have appeared in journals but that are not yet incorporated in textbooks, or (b) a statistic used in

a controversial way (e.g., to justify a test of significance when the data do not meet the assumptions of the test). When the statistic itself is the focus of the article, give supporting references.

3.56 *Formulas*

Do not give a formula for a statistic in common use; do give a formula when the statistic or mathematical expression is new, rare, or essential to the paper. Presentation of equations is described in sections 3.60–3.61.

3.57 *Statistics in Text*

When reporting inferential statistics (e.g., *t* tests, *F* tests, chi-square tests), include sufficient information to allow the reader to fully understand the analyses conducted and possible alternative explanations for the results of these analyses. What constitutes sufficient information depends on the analytic approach selected. Examples of presentations follow (see section 5.14 on typing statistical and mathematical copy):

> For immediate recognition, the omnibus test of the main effect of sentence format was statistically significant, $F(2, 177) = 4.37$, $p = .03$. Regarding the 2 one-degree-of-freedom contrasts of interest (C1 and C2 above), both reached the specified .05 significance level, $F(1, 117) = 4.03$, $p = .05$, and $F(1, 117) = 4.71$, $p = .03$, respectively. In terms of effect sizes . . .

> For the autokinetic movement illusion, as predicted, people highly hypnotizable ($M = 8.19$, $SD = 7.12$) reported perceiving the stationary light as moving significantly more often than did the other participants ($M = 5.26$, $SD = 4.25$), $t(60) = 1.99$, $p = .03$ (one-tailed), $d = .50$. The high-hypnotizability group ($M = 21.41$, $SD = 10.35$) reported statistically greater occurrences of extreme, focused attention than did the low group ($M = 16.24$, $SD = 11.09$), $t(75) = 2.11$, $p = .02$ (one-tailed), $d = .48$.

If you present descriptive statistics in a table or figure, you do not need to repeat them in text, although highlighting particular data in the narrative may be helpful.

With chi-square, report degrees of freedom and sample size (i.e., the number of independent entries in the chi-square table) in parentheses:

$\chi^2(4, N = 90) = 10.51, p = .03$

When enumerating a series of similar statistics, be certain that the relation between the statistics and their referents is clear. Words such as *respectively* and *in order* can clarify this relationship.

> Means (with standard deviations in parentheses) for Trials 1 through 4 were 2.43 (0.50), 2.59 (1.21), 2.68 (0.39), and 2.86 (0.12), respectively.

> In order, means for Trials 1 through 4 were 2.43, 2.59, 2.68, and 2.86 (*SD*s = 0.50, 1.21, 0.39, and 0.12, respectively). The *n*s for each trial were 17.

3.58 *Statistical Symbols*

When using a statistical term in the narrative, use the term, not the symbol. For example, use The means were, *not* The *M*s were.

Symbols for population versus sample statistics. Population (i.e., theoretical) statistics, properly called *parameters*, are usually represented by lowercase Greek letters. A few sample (i.e., observed) statistics are also expressed by Greek letters (e.g., χ^2), but most sample statistics are expressed by italicized Latin letters (e.g., *SD*).

Symbols for number of subjects. Use an uppercase, italicized *N* to designate the number of members in a total sample (e.g., $N = 135$) and a lowercase, italicized *n* to designate the number of members in a limited portion of the total sample (e.g., $n = 30$).

Symbol for percent (%). Use the symbol for percent only when it is preceded by a numeral. Use the word *percentage* when a number is not given.

found that 18% of the rats

determined the percentage of rats

Exception: In table headings and figure legends, use the symbol % to conserve space.

Standard, boldface, and italic type. Statistical symbols and mathematical copy are typeset in three different typefaces: standard, **boldface,** and *italic.* The same typeface is used for a symbol whether the symbol appears in text, tables, or figures.

Greek letters, subscripts, and superscripts that function as identifiers (i.e., that are not variables) and abbreviations that are not variables (e.g., sin, log) are typeset in a standard typeface. On the manuscript, do not italicize them.

μ_{girls}, α, ε, β

Symbols for vectors are bold. Use the word processor boldface function (or a handwritten wavy underline).

v

All other statistical symbols are typeset in italic type.

N, M_X, df, p, SS_b, SE, MSE, t, F, a, b

A list of common statistical abbreviations is provided in Table 3.9.

Table 3.9. Statistical Abbreviations and Symbols

Abbreviation/ Symbol	*Definition*
ANCOVA	Analysis of covariance
ANOVA	Analysis of variance (univariate)
d	Cohen's measure of effect size
d'	(d prime) measure of sensitivity
D	Used in Kolmogorov–Smirnov test
df	degree of freedom
f	Frequency
f_e	Expected frequency
F	Fisher's F ratio
F_{max}	Hartley's test of variance homogeneity
g	Hedge's measure of effect size
H	Used in Kruskal–Wallis test; also used to mean *hypothesis*
H_0	Null hypothesis under test
H_1	Alternative hypothesis
HSD	Tukey's honestly significant difference (also referred to as the Tukey a procedure)
k	Coefficient of alienation
k^2	Coefficient of nondetermination
K-R 20	Kuder–Richardson formula
LR	Likelihood ratio (used with some chi-squares)
LSD	Fisher's least significant difference
M	Mean (arithmetic average)
MANOVA	Multivariate analysis of variance

(*table continues*)

Table 3.9. (*continued*)

Abbreviation/ Symbol	*Definition*
Mdn	Median
mle	Maximum likelihood estimate (used with programs such as LISREL)
MS	Mean square
MSE	Mean square error
n	Number in a subsample
N	Total number in a sample
ns	Nonsignificant
p	Probability; also the success probability of a binomial variable
P	Percentage, percentile
pr	Partial correlation
q	$1 - p$ for a binomial variable
Q	Quartile (also used in Cochran's test)
r	Pearson product–moment correlation
r^2	Pearson product–moment correlation squared; coefficient of determination
r_b	Biserial correlation
r_k	Reliability of mean *k* judges' ratings
r_1	Estimate reliability of the typical judge
r_{pb}	Point-biserial correlation
r_s	Spearman rank correlation coefficient (formerly rho [ρ])
R	Multiple correlation; also composite rank, a significance test
R^2	Multiple correlation squared; measure of strength of relationship

Table 3.9. (*continued*)

Abbreviation/ Symbol	*Definition*
SD	Standard deviation
SE	Standard error (of measurement)
SEM	Standard error of measurement
SEM	Structural equation modeling
sr	Semipartial correlation
SS	Sum of squares
t	Computed value of *t* test
T	Computed value of Wilcoxon's or McCall's test
T^2	Computed value of Hotelling's test
Tukey *a*	Tukey's HSD procedure
U	Computed value of Mann–Whitney test
V	Cramér's statistic for contingency tables; Pillai–Bartlett multivariate criterion
W	Kendall's coefficient of concordance
x	Abscissa (horizontal axis in graph)
y	Ordinate (vertical axis in graph)
z	A standard score; difference between one value in a distribution and the mean of the distribution divided by the *SD*
$\|a\|$	Absolute value of *a*
α	Alpha; probability of a Type I error; Cronbach's index of internal consistency
β	Beta; probability of a Type II error; ($1 - \beta$ is statistical power); standardized multiple regression coefficient

(*table continues*)

Table 3.9. (continued)

Abbreviation/ Symbol	*Definition*
γ	Gamma; Goodman–Kruskal's index of relationship
Δ	Delta (cap); increment of change
κ	Cohen's estimate of effect size
η^2	Eta squared; measure of strength of relationship
Θ	Theta (cap); Roy's multivariate criterion
λ	Lambda; Goodman–Kruskal's measure of predictability
Λ	Lambda (cap); Wilks's multivariate criterion
ν	Nu; degrees of freedom
ρ_I	Rho (with subscript); intraclass correlation coefficient
Σ	Sigma (cap); sum or summation
τ	Tau; Kendall's rank correlation coefficient; also Hotelling's multivariate trace criterion
ϕ	Phi; measure of association for a contingency table; also a parameter used in determining sample size or statistical power
ϕ^2	Phi squared; proportion of variance accounted for in a 2×2 contingency table
χ^2	Computed value of a chi-square tset
ψ	Psi; a statistical contrast
ω^2	Omega squared; measure of strength of relationship
$\hat{}$	(caret) when above a Greek letter (or parameter), indicates an estimate (or statistic)

Note. Greek symbols are lowercase unless noted otherwise.

Identifying letters and symbols. Some letters, numerals, and other characters may be ambiguous to the typesetter and should be clarified with notations made by hand (see Equation 1 in section 3.61). The following characters, for example, may be misread in typewritten and handwritten copy: 1 (the numeral one or the letter *l*), 0 (the numeral zero or the letter *o*), × (multiplication sign or the letter *x*), Greek letters (the letter *B* or beta), and letters that have the same shape in capital and lowercase forms, which can be especially confusing in subscripts and superscripts (e.g., *c*, *s*, and *x*). Identify ambiguous characters with a notation in the margin on their first appearance in the manuscript (e.g., "lowercase *l* throughout").

In general, remember that production staff usually do not have mathematical backgrounds and will reproduce what they see, not what a mathematician knows. If errors appear in the typeset proofs because of ambiguity in a manuscript, the author may be charged for correcting them. Avoid misunderstandings and corrections by preparing mathematical copy carefully and by reviewing the copyedited manuscript thoroughly before returning it to the production office for typesetting.

3.59 *Spacing, Alignment, and Punctuation*

Space mathematical copy as you would space words: $a+b=c$ is as difficult to read as wordswithoutspacing; $a + b = c$ is much better. Align mathematical copy carefully. Subscripts usually precede superscripts (x_{α}^{2}), but a prime is placed next to a letter or symbol (x'_{α}). Superscripts will be typeset directly above subscripts in APA journals unless the author gives specific instructions to the contrary when transmitting the accepted manuscript for production (see section 5.24).

Punctuate all equations, whether they are in the line of text or displayed (i.e., typed on a new line), to conform to their place in the syntax of the sentence (see the period following Equation 1 in section 3.61). If an equation exceeds the column width of a typeset page (approximately

55 characters, including spaces, will fit on one line in most APA journals), the typesetter will break it. For long equations, indicate on the final version of the accepted manuscript where breaks would be acceptable.

3.60 *Equations in Text*

Place short and simple equations, such as $\alpha = [(1 + b)/x]^{1/2}$, in the line of text. Equations in the line of text should not project above or below the line; for example, the equation above would be difficult to set in the line of text if it were in this form:

$$\alpha = \sqrt{\frac{1 + b}{x}}.$$

To present fractions in the line of text, use a slanted line (/) and appropriate parentheses and brackets: Use ( ) first, then [( )], and finally {[( )]}. Use parentheses and brackets to avoid ambiguity: Does $a/b + c$ mean $(a/b) + c$ or $a/(b + c)$?

3.61 *Displayed Equations*

To display equations, start them on a new line, and double-space twice above and twice below the equation. Simple equations should be displayed if they must be numbered for later reference. Display all complex equations.

Number displayed equations consecutively, with the number in parentheses near the right margin of the page:

$$\chi = -2 \sum a_x^{\,2} + a_0 + \frac{\cos x - 5ab}{1/n + a_x}. \qquad (1)$$

(chi) (summation) (lc ex) (zero) (one)

When referring to numbered equations, spell out the reference; for example, write Equation 1 (do not abbreviate as Eq. 1), or write the first equation.

Tables

3.62 *Tabular Versus Textual Presentation*

Tables are efficient, enabling the researcher to present a large amount of data in a small amount of space. Tables usually show exact numerical values, and the data are arranged in an orderly display of columns and rows, which aids comparison. For several reasons, it is worthwhile to be selective in choosing how many tables to include in your paper. First, a reader may have difficulty sorting through a large number of tables and may lose track of your message (Scientific Illustration Committee, 1988). Second, a disproportionately large number of tables compared with a small amount of text can cause problems with the layout of typeset pages; text that is constantly broken up with tables will be hard for the reader to follow. Third, tables are complicated to set in type and are therefore more expensive to publish than text. For these reasons, reserve tables for crucial data that are directly related to the content of your article and for simplifying text that otherwise would be dense with numbers.

Dense:

> The mean final errors (with standard deviations in parentheses) for the Age × Level of Difficulty interaction were .05 (.08), .05 (.07), and .11 (.10) for the younger participants and .14 (.15), .17 (.15), and .26 (.21) for the older participants at low, moderate, and high levels of difficulty, respectively.

The reader can more easily comprehend and compare these data when they are presented in tabular form, as in Table Example 1. However, the data in unusually short and simple tables (e.g., a table with two or fewer columns and rows) are more efficiently presented in text.

Determine the amount of data the reader needs to understand the discussion, and then decide whether those data are best presented in text or as a table or figure. Peripherally related or extremely detailed data should be omitted or, depending on their nature, presented in an appendix (see sections 3.90–3.93).

Tables usually present quantitative data. Occasionally, however, a table that consists of words is used to present qualitative comparisons. For additional information on word tables, see section 3.69.

Tables that communicate quantitative data are effective only when the data are arranged so that their meaning is obvious at a glance (Ehrenberg, 1977; Wainer, 1997). A table should be organized so that entries that are to be compared are next to one another. Following this principle, it is generally the case that different indices (e.g., means, standard deviations, sample sizes) should be segregated into different parts of tables. Table Example 1 illustrates these principles. An author's thoughtful preparation can result in tables that very effectively communicate the essential results of an empirical inquiry.

Table Example 2 shows the basic elements of a table and illustrates the advantage of including derivative values in a table—in this case, the differences between the *With* and *Without Pretraining* subsamples that are the focus of the discussion. Detailed information on the preparation of tables is presented in sections 3.63–3.74. Table Examples 3 and 4 are examples of different kinds of tables as they would appear in a manuscript, that is, as prepared with a personal computer or a typewriter. These tables show the proper form and arrangement of titles, headings, data in the body of the table, footnotes, and rules.

Many data tables have certain canonical forms. The advantage of using the canonical form is that the reader generally knows where to look in the table for certain kinds of information. Table Example 5 presents the canonical form for reporting correlations in two groups. There are situations, however, where presentation in noncanonical form can enhance the reader's understanding of the point being made. Consider, for ex-

ample, the same data recast into Table Example 6. In this case a number of changes have been made in the form of the table; most noticeably, the order of the variables in the rows and columns is not the same. The column order has been rearranged to bring the high positive correlations together, thereby making the structure of the relationships clearer. In addition, the nonmeaningful correlations of the variable with itself have been eliminated, and the number of decimals has been reduced so that the essential features of the data are stressed (but at the cost of some detail and precision). The judicious use of noncanonical forms can be effective but must always be motivated by the special circumstances of the data array.

Additional information on ways to present data in specific kinds of tables is presented in section 3.69.

Table Example 1.

Table X

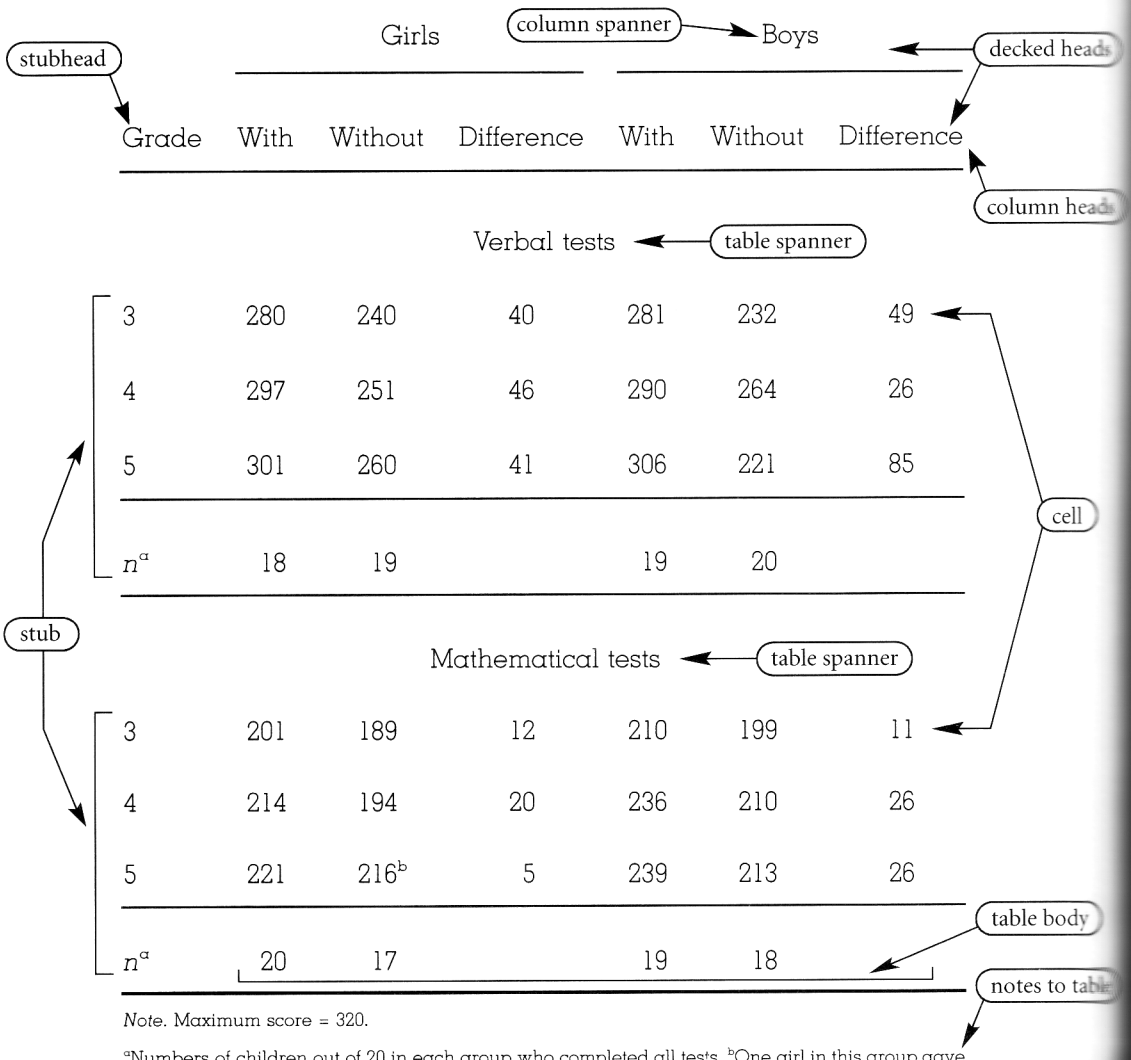
Error Rates of Older and Younger Groups

Level of difficulty	Mean error rate		Standard deviation		Sample size	
	Younger	Older	Younger	Older	Younger	Older
Low	.05	.14	.08	.15	12	18
Moderate	.05	.17	.07	.15	15	12
High	.11	.26	.10	.21	16	14

Table Example 2.

Table X

Mean Numbers of Correct Responses by Children With and Without Pretraining



Note. Maximum score = 320.

[a]Numbers of children out of 20 in each group who completed all tests. [b]One girl in this group gave only two correct responses.

Table Example 3.

Table X

Mean Causality and Responsibility Attribution Scores

Personal similarity	Situational similarity: Low	Situational similarity: High
	Causality	
High	16	15
Low	32	20
	Responsibility	
High	16	9
Low	38	19

Note. The higher the score, the greater the attribution. Actual scores have been multiplied by 10.

Table Example 4.

Table X

Recognition Memory for Words and Nonwords as a Function of Age and Viewing Condition

Viewing condition	Adults[a]	Children[b]	Difference
		Words	
Dim	91	73	18
Moderate	88	63	25
Bright	61	45	16
		Nonwords	
Dim	78	58	20
Moderate	65	62	3
Bright	80	51	29

Note. The values represent mean percentages of correctly recognized words or nonwords.

[a]Adults were 18–21 years old. [b]Children were 12–14 years old.

Table Example 5. Sample correlation table

Table X

Intercorrelations Between Subscales for Students and Older Adults

Subscale	1	2	3	4
		Students (n = 200)		
1. Tranquillity	—	.93	–.09	.73
2. Goodwill		—	–.34	.62
3. Happiness			—	.14
4. Elation				—
		Older adults (n = 189)		
1. Tranquillity	—	.42	–.07	.52
2. Goodwill		—	–.43	.62
3. Happiness			—	.47
4. Elation				—

Table Example 6.

Table X

Intercorrelations Between Subscales for Students and Older Adults

Subscale	Goodwill	Elation	Happiness
	Students (n = 200)		
Tranquillity	.9	.7	–.1
Goodwill		.6	–.3
Elation			.1
	Older adults (n = 189)		
Tranquillity	.4	.5	–.1
Goodwill		.6	–.4
Elation			.5

3.63 *Relation of Tables and Text*

Discussing tables in text. An informative table supplements—instead of duplicates—the text. In the text, refer to every table and tell the reader what to look for. Discuss only the table's highlights; if you discuss every item of the table in text, the table is unnecessary.

Ensuring that each table can be understood on its own. Each table should be an integral part of the text but also should be intelligible without reference to the text. Explain all abbreviations (except such standard statistical abbreviations as *M*, *SD*, and *df*) and special use of underlining, dashes, and parentheses. Always identify units of measurement.

Citing tables. In the text, refer to tables by their numbers:

> as shown in Table 8, the responses were . . .
>
> children with pretraining (see Table 5) . . .

Do not write "the table above" (or below) or "the table on page 32," because the position and page number of a table cannot be determined until the typesetter sets the pages. (Students preparing theses or dissertations in which tables and figures are integrated into the text may disregard this requirement; see chapter 6.)

3.64 *Relation Between Tables*

Consider combining tables that repeat data. Ordinarily, identical columns or rows of data should not appear in two or more tables. Be consistent in the presentations of all tables within a paper to facilitate comparisons. Use similar formats, titles, and headings, and use the same terminology throughout (e.g., *response time* or *reaction time*, not both).

3.65 *Table Numbers*

Number all tables with arabic numerals in the order in which the tables are first mentioned in text, regardless of whether a more detailed discussion of the tables occurs later in the paper (the typesetter lays out tables and figures closest to where they are first mentioned). Do not use suffix letters to number tables; that is, label tables as Tables 5, 6, and 7 instead of 5, 5a, and 5b, or combine the related tables into one table. If the manuscript includes an appendix with tables, identify the tables of the appendix with capital letters and arabic numerals (e.g., Table A1 is the first table of Appendix A or of a sole appendix, which is not labeled with a letter; Table C2 is the second table of Appendix C).

3.66 *Table Titles*

Give every table a brief but clear and explanatory title.

Too telegraphic:

Relation Between College Majors and Performance [It is unclear what data are presented in the table.]

Too detailed:

Mean Performance Scores on Test A, Test B, and Test C of Students With Psychology, Physics, English, and Engineering Majors [This duplicates information in the headings of the table.]

Good title:

Mean Performance Scores of Students With Different College Majors

Abbreviations that appear in the headings or the body of a table sometimes can be parenthetically explained in the table title. For example,

Hit and False-Alarm (FA) Proportions in Experiment 2

Abbreviations that require longer explanations or that do not relate to the table title are explained in a general note to the table (see section 3.70). Do not use a specific footnote to clarify an element of the title.

3.67 *Headings*

A table classifies related items and enables the reader to compare them. Data form the body of the table. Headings establish the logic of your organization of the data and identify the columns of data beneath them. Like a table title, a heading should be telegraphic and should not be

many more characters in length than the widest entry of the column it spans. For example,

Poor:

Grade level
3
4
5

Better:

Grade
3
4
5

You may use standard abbreviations and symbols for nontechnical terms (e.g., *no.* for *number*, *%* for *percent*) and for statistics (e.g., *M*, *SD*, χ^2) in table headings without explanation. Abbreviations of technical terms, group names, and the like must be explained in a note to the table (see section 3.70).

Each column of a table must have a heading, including the *stub column*, or leftmost column of the table (its heading is called the *stub head*). The stub column usually lists the major independent variables. In Table Example 2, for example, the stub lists the grades. Number elements only when they appear in a correlation matrix (see Table Example 5) or if the text refers to them by number.

Subordination within the stub is easier to comprehend by indenting stub items instead of by creating an additional column. This also simplifies the typesetting by keeping the number of columns to a minimum.

Poor:

Sex	Pretraining
Girls	With
	Without
Boys	With
	Without

Better:

Group
Girls
With
Without
Boys
With
Without

All headings identify items below them, not across from them. The headings just above the body of the table (called *column heads* and *column spanners*) identify the entries in the vertical columns in the body of the table. A column head covers just one column; a column spanner covers two or more columns, each with its own column head. Headings stacked in this way are called *decked heads.* Often decked heads can be used to avoid repetition of words in column headings (see Table Example 2). If possible, do not use more than two levels of decked heads.

Incorrect:

Temporal lobe:	Left	Right

Wordy:

Left temporal lobe	Right temporal lobe

Correct:

Temporal lobe	
Left	Right

A few tables may require *table spanners* in the body of the table. These table spanners cover the entire width of the body of the table, allowing for further divisions within the table (see Table Example 2). Also, table spanners can be used to combine two tables into one, provided they have similar column heads.

Any item within a column should be syntactically as well as concep-

tually comparable with the other items in that column, and all items should be described by the heading:

Nonparallel:

Condition
Functional psychotic
Drinks to excess
Character disorder

Parallel:

Condition
Functional psychosis
Alcoholism
Character disorder

Stubheads, column heads, and column spanners should be singular unless they refer to groups (e.g., *Children*), but table spanners may be plural. Use sentence style for capitalization: Capitalize only the first letter of the first word of all headings (column headings, column spanners, stub heads, and table spanners) and word entries. (All proper nouns should be in caps and lowercase.)

3.68 *Body of a Table*

Decimal values. The body of a table contains the data. Express numerical values in the number of decimal places that the precision of measurement justifies (see section 3.46), and, if possible, carry all comparable values to the same number of decimal places. Do not change the unit of measurement or the number of decimal places within a column.

Empty cells. If the point of intersection between a row and a column (called a *cell*) cannot be filled because data are not applicable, leave the cell blank. If a cell cannot be filled because data were not obtained or are not reported, insert a dash in that cell and explain the use of the dash in the general note to the table. By convention, a dash in a correlation matrix (see Table Example 5) usually indicates that the correlation of an item with itself was not computed. No explanation of this use of

the dash in a correlation matrix is needed. If you need to explain that data in a correlation matrix are unavailable, unreported, or inapplicable, use a specific note (see section 3.70) rather than a dash.

Conciseness. Be selective in your presentation. Do not include columns of data that can be calculated easily from other columns:

Not concise:

	No. responses			
Participant	First trial	Second trial	Total	*M*
1	5	7	12	6

The example could be improved by (a) giving either the number of responses per trial or the total number of responses, whichever is more important to the discussion, and (b) not including the column of averages because their calculation is simple.

3.69 *Presenting Data in Specific Types of Tables*

Analysis of variance (ANOVA) tables. To avoid statistics-laden text that is difficult to read, you may want to present ANOVA statistics in a table. To do so, list the source in the stub column; report degrees of freedom in the first column after the stub column and the *F* ratios next. Stub entries should first show between-subjects variables and the error and then within-subject variables and any error. Enclose mean square errors in parentheses, and explain what the values in parentheses mean in a general note to the table. Identify statistically significant *F* ratios with asterisks, and provide the probability values in a column within the table or in a probability footnote (see section 3.70); avoid columns of probability values. (See Table Example 7.)

Regression tables. List both raw or unstandardized (*B*) and standardized beta (β) coefficients unless the study is purely applied (in which case,

list only *B*s) or purely theoretical (in which case, list only βs). Specify in the table what type of analysis (hierarchical or simultaneous) you used. For hierarchical regressions, be sure to provide the increments of change (see Table Example 8).

Path and LISREL (linear structural relations) tables. Present the means, standard deviations, and intercorrelations of the entire set of variables you use as input to path and LISREL analyses. These data are essential for the reader to replicate or confirm your analyses and are necessary for archival purposes, for example, if your study is included in meta-analyses. To help the reader interpret your table, give short descriptions instead of just a list of symbols of the *x* and *y* variables used in the models (see Table Example 9). If you need to use acronyms, be sure to define each one.

Occasionally, multiple models are compared in LISREL analyses. In cases like these, it may be useful to summarize the fit of these models and tests of model comparisons (see Table Example 10). (Results of analyses of structural models are often presented in a figure; see section 3.77.)

Word tables. Unlike most tables, which present quantitative data, some tables consist mainly of words. Word tables present qualitative comparisons or descriptive information. For example, a word table can enable the reader to compare characteristics of studies in an article that reviews many studies, or it can present questions and responses from a survey or show an outline of the elements of a theory. Word tables illustrate the discussion in the text; they should not repeat the discussion. (See Table Example 11.)

Word tables include the same elements of format as do other types of tables—table number and title, headings, rules, and possibly notes. Keep column entries brief and simple. Indent any runover lines in entries. *Double-space all parts of a word table.*

Table Example 7. Sample ANOVA table

Table X

Analysis of Variance for Classical Conditioning

Source	*df*	*F*	η	*p*
		Between subjects		
Anxiety (A)	2	0.76	.22	.48
Shock (S)	1	0.01	.02	.92
A × S	2	0.18	.11	.84
S within-group error	30	(16.48)		
		Within subjects		
Blocks (B)	4	3.27**	.31	.01
B × A	8	0.93	.24	.49
B × S	4	2.64*	.28	.04
B × A × S	8	0.58	.19	.79
B × *S* within-group error	120	(1.31)		

Note. Values enclosed in parentheses represent mean square errors. *S* = subjects. Adapted from "The Relation of Drive to Finger-Withdrawal Conditioning," by M. F. Elias, 1965, *Journal of Experimental Psychology, 70,* p. 114.

*$p < .05$. **$p < .01$.

Table Example 8. Sample regression table

Table X

Summary of Hierarchical Regression Analysis for Variables Predicting Adult Daughters' Belief in Paternalism (N = 46)

Variable	*B*	*SE B*	β
Step 1			
Daughter's education	–5.89	1.93	–.41*
Mother's age	0.67	0.31	.21*
Step 2			
Daughter's education	–3.19	1.81	–.22
Mother's age	0.31	0.28	.14
Attitude toward elders	1.06	0.28	.54*
Affective feelings	1.53	0.60	.31*
Dogmatism	–0.03	0.10	–.04

Note. R^2 = .26 for Step 1; ΔR^2 = .25 for Step 2 (*ps* < .05). From "Relationship of Personal–Social Variables to Belief in Paternalism in Parent Caregiving Situations," by V. G. Cicirelli, 1990, *Psychology and Aging*, 5, 436. Copyright 1990 by the American Psychological Association. Adapted with permission of the author.

*p < .05.

Table Example 9. Sample LISREL table

Table X

Factor Loadings and Uniqueness for Confirmatory Factor Model of Type A Behavior Pattern Variables

Measure and variable	Unstandardized factor loading	*SE*	Uniqueness
SI—Speech Characteristics			
Loud and explosive	.60	—	.32
Rapid and accelerating	.63	.04	.29
Response latency	.71	.04	.16
Verbal competitiveness	.82	.05	.25
SI—Answer Content			
Competitiveness	.60	—	.34
Speed	.59	.04	.27
Impatience	.67	.05	.28
SI—Hostility			
Stylistic rating	.60	—	.22
Content rating	.60	.05	.17

Table Example 9 (continued). **Sample LISREL table**

Measure and variable	Unstandardized factor loading	*SE*	Uniqueness
Thurstone Activity Scale			
Variable 1	.60	—	.73
Variable 2	.88	.08	.39
Variable 3	.71	.07	.54
Variable 4	.69	.07	.74
Variable 5	.74	.07	.31

Note. Dashes indicate the standard error was not estimated. SI = Structured Interview. From "The Nomological Validity of the Type A Personality Among Employed Adults," by D. C. Ganster, J. Schaubroeck, W. E. Sime, and B. T. Mayes, 1991, *Journal of Applied Psychology, 76*, p. 154. Copyright 1991 by the American Psychological Association. Reprinted with permission of the author.

Table Example 10. Sample model comparison table

Table X

Fit Indices for Nested Sequence of Cross-Sectional Models

Model	χ^2	NFI	PFI	χ^2_{diff}	ΔNFI
1. Mobley's (1977) measurement model	443.18*	.92	.67		
2. Quit & search intentions	529.80*	.89	.69		
Difference between Model 2 & Model 1				86.61*	.03
3. Search intentions & thoughts of quitting	519.75*	.90	.69		
Difference between Model 3 & Model 1				76.57*	.02
4. Intentions to quit & thoughts of quitting	546.97*	.89	.69		
Difference between Model 4 & Model 1				103.78*	.03
5. One withdrawal cognition	616.97*	.87	.70		
Difference between Model 5 & Model 1				173.79*	.05

Table Example 10 (continued). **Sample model comparison table**

Model	χ^2	NFI	PFI	χ^2_{diff}	ΔNFI
6. Hom et al.'s (1984)					
structural model	754.37*	.84	.71		
Difference between					
Model 6 & Model 5				137.39*	.03
7. Structural null model	2,741.49*	.23	.27		
Difference between					
Model 7 & Model 6				1,987.13*	.61
8. Null model	3,849.07*				

Note. NFI = normed fit index; PFI = parsimonious fit index. From "Structural Equations Modeling Test of a Turnover Theory: Cross-Sectional and Longitudinal Analyses," by P. W. Hom and R. W. Griffeth, 1991, *Journal of Applied Psychology, 76*, p. 356. Copyright 1991 by the American Psychological Association. Reprinted with permission of the author.

*$p < .05$.

Table Example 11. **Sample word table**

Table X

Some Memorial and Processing Advantages of the Fuzzy-Processing Preference

Advantage	Description
Trace availability	Gist has a memorial stability advantage over verbatim detail; therefore, reasoning is engineered to operate on the types of information that tend to be available in memory.
Trace accessibility	Gist has a retrieval advantage over verbatim traces because it can be accessed by a broader range of retrieval cues.
Trace malleability	The schematic, patternlike nature of gist makes it easier to manipulate than verbatim traces during the course of reasoning.

Table Example 11 (continued). **Sample word table**

Advantage	Description
Processing simplicity	Less elaborate representations call for less complicated processing operations, and gist is less elaborate than verbatim traces.
Processing accuracy	Processing verbatim details typically produces no accuracy gains, especially with respect to the functional goals that reasoning serves, and the reverse is often true.
Processing effort	The fuzzy-processing preference comports with the law of least effort in that reasoning gravitates toward processing activities that are easier to execute.

Note. From "Memory Independence and Memory Interference in Cognitive Development," by C. J. Brainerd and V. F. Reyna, 1993, *Psychological Review, 100,* p. 48. Copyright 1993 by the American Psychological Association. Adapted with permission of the author.

3.70 *Notes to a Table*

Tables have three kinds of notes, which are placed below the table: general notes, specific notes, and probability notes.

A general note qualifies, explains, or provides information relating to the table as a whole and ends with an explanation of abbreviations, symbols, and the like.

General notes are designated by the word *Note* (italicized) followed by a period. (See section 3.73 and Table Examples 7–11 for examples of general notes indicating that a table is from another source.)

> *Note.* All nonsignificant three-way interactions were omitted. M = match process; N = nonmatch process.

A specific note refers to a particular column, row, or individual entry. Specific notes are indicated by superscript lowercase letters (e.g., [a, b, c]). Within the headings and table body, order the superscripts from left to right and from top to bottom, starting at the top left. Specific notes to a table do not apply to any other table, and each table's first footnote begins with a superscript lowercase *a*. (See Table Examples 2 and 4 for examples of this kind of note.)

> [a]n = 25. [b]This participant did not complete the trials.

A probability note indicates the results of tests of significance. Asterisks indicate those values for which the null hypothesis is rejected, with the probability (p value) specified in the probability note. Include a probability note only when relevant to specific data within the table. Assign a given alpha level the same number of asterisks from table to table within your paper, such as $^{*}p < .05$ and $^{**}p < .01$; the largest probability receives the fewest asterisks.

$F(1, 52)$
6.95*
12.38**

*$p < .05$. **$p < .01$.

Ordinarily, you will use asterisks to identify probability values; occasionally, however, you may need to distinguish between one-tailed and two-tailed tests in the same table. To do so, use asterisks for the two-tailed p values and an alternate symbol (e.g., daggers) for the one-tailed p values.

*$p < .05$, two-tailed. **$p < .01$, two-tailed. $^{\dagger}p < .05$, one-tailed. $^{\dagger\dagger}p < .01$, one-tailed.

Asterisks attached to the obtained value of a statistical test in a table indicate probability. To indicate significant differences between two or more table entries—for example, means that are compared with procedures such as a Tukey test—use lowercase *sub*scripts (see Table Example 12). Explain the use of the subscripts in the table note (see the following sample table notes).

Note. Means having the same subscript are not significantly different at $p < .01$ in the Tukey honestly significant difference comparison.

or

Note. Means with different subscripts differ significantly at $p < .01$ by the Fisher least significant difference test.

Table Example 12. Sample of data comparison

Table X

Judgments of Agency of Life Events by Condition

	Anger		Sadness	
Target judgment	Hot	Cold	Hot	Cold
Future problems	4.10_a	4.35_a	5.46_b	3.81_a
Future successes	4.31_a	4.55_a	4.55_a	3.85_a
Life circumstances	3.80_a	4.50_b	5.40_c	3.46_a

Note. Judgments were made on 9-point scales (1 = *completely due to people's actions*, 9 = *completely due to impersonal forces*). Means in the same row that do not share subscripts differ at $p < .05$ in the Tukey honestly significant difference comparison. From "Beyond Simple Pessimism: Effects of Sadness and Anger on Social Perception," by D. Keltner, P. C. Ellsworth, and K. Edwards, 1993, *Journal of Personality and Social Psychology, 64*, p. 751. Copyright 1993 by the American Psychological Association. Adapted with permission of the author.

Order the notes to a table in the following sequence: *general* note, *specific* note, *probability* note.

Note. The participants . . . responses.

$^{a}n = 25$. $^{b}n = 42$.

$^{*}p < .05$. $^{**}p < .01$.

Each type of note begins flush left (i.e., no paragraph indentation) on a new line below the table and is double-spaced. The first *specific* note

begins flush left on a new line under the *general* note; subsequent specific notes follow one after the other on the same line (lengthy specific notes may be set on separate lines when typeset). The first *probability* note begins flush left on a new line; subsequent probability notes are run in.

Notes are useful for eliminating repetition from the body of a table. Certain types of information may be appropriate either in the table or in a note. To determine the placement of such material, remember that clearly and efficiently organized data enable the reader to focus on the significance of the data. Thus, if probability values or subsample sizes are numerous, use a column rather than many notes. Conversely, if a row or column contains few entries (or the same entry), eliminate the column by adding a note to the table:

Poor:

Group	*n*
Anxious	15
Depressed	15
Control	15

Better:

Group[a]
Anxious
Depressed
Control

[a]*n* = 15 for each group.

3.71 *Ruling of Tables*

Typesetting requirements restrict the use of rules (i.e., lines) in a table. Limit the rules to those that are necessary for clarity, and use horizontal rather than vertical rules. (Vertical rules are rarely used in APA journals.) Appropriately positioned white space can be an effective substitute for rules; for example, long, uninterrupted columns of numbers or words are more readable if a horizontal line of space is inserted after every fourth or fifth entry.

In the manuscript, use generous spacing between columns and rows and strict alignment to clarify relationships within a table.

3.72 *Size of Tables*

Turning a journal sideways to read a table is an inconvenience to readers. You can design a table to fit the width of a journal page or column if you count characters (i.e., letters, numbers, and spaces). Count characters in the widest entry in each column (whether in the table body or in a heading), and allow 3 characters for spaces between columns. If the count exceeds 60, the table will not fit across the width of most APA journal columns. If the count exceeds 125, the table will not fit across the width of most APA journal pages. To determine the exact fit, count the characters that fit across a column or page in the journal for which you are writing, and adjust your table if necessary. When typing tables, it is acceptable to turn them sideways (landscape orientation for setting up a laser printer) on the page or run them over several pages, but do not single-space or reduce the type size.

3.73 *Tables From Another Source*

Authors must obtain permission to reproduce or adapt all or part of a table (or figure) from a copyrighted source. It is not necessary to obtain permission from APA to reproduce one table (or figure) from an APA article provided you obtain the author's permission and give full credit to APA as copyright holder and to the author through a complete and accurate citation. When you wish to reproduce material from sources not copyrighted by APA, contact the copyright holders to determine their requirements for both print and electronic reuse. If you have any doubt about the policy of the copyright holder, you should request permission. Always enclose the letter of permission when transmitting the final version of the accepted manuscript for production (see section 7.01).

Any reproduced table (or figure) must be accompanied by a note at the bottom of the reprinted table (or in the figure caption) giving credit to the original author and to the copyright holder. If the table (or figure) contains test items, see the cautionary note in section 3.93. Use the following form for tables or figures. (For copyright permission footnotes in text [see section 3.41 for permission to quote], use the following form,

but substitute the indented superscript footnote number for the word *Note.*)

Material reprinted from a journal article:

> *Note.* From [*or* The data in column 1 are from] "Title of Article," by A. N. Author and C. O. Author, 2000, *Title of Journal, 50,* p. 22. Copyright 2000 by the Name of Copyright Holder. Reprinted [*or* Adapted] with permission.

Material reprinted from a book:

> *Note.* From [*or* The data in column 1 are from] *Title of Book* (p. 103), by A. N. Author and C. O. Author, 1999, Place of Publication: Publisher. Copyright 1999 by the Name of Copyright Holder. Reprinted [*or* Adapted] with permission.

3.74 *Table Checklist*

- Is the table necessary?
- Is the entire table—including the title, headings, and notes—double-spaced?
- Are all comparable tables in the manuscript consistent in presentation?
- Is the title brief but explanatory?
- Does every column have a column heading?
- Are all abbreviations; special use of italics, parentheses, and dashes; and special symbols explained?
- Are all probability level values correctly identified, and are asterisks attached to the appropriate table entries? Is a probability level assigned the same number of asterisks in all tables in the same article?
- Are the notes in the following order: general note, specific note, probability note?

- Are all vertical rules eliminated?
- Will the table fit across the width of a journal column or page?
- If all or part of a copyrighted table is reproduced, do the table notes give full credit to the copyright owner? Have you received written permission for reuse (in print and electronic form) from the copyright holder and sent a copy with the final version of your paper?
- Is the table referred to in text?

Figures

3.75 *Deciding to Use Figures*

In APA journals, any type of illustration other than a table is called a *figure.* (Because tables are typeset, rather than photographed from artwork supplied by the author, they are not considered figures.) A figure may be a chart, graph, photograph, drawing, or other depiction.

Consider carefully whether to use a figure. Tables are often preferred for the presentation of quantitative data in archival journals because they provide exact information; figures typically require the reader to estimate values. On the other hand, figures convey at a quick glance an overall pattern of results. They are especially useful in describing an interaction —or lack thereof—and nonlinear relations. A well-prepared figure can also convey structural or pictorial concepts more efficiently than can text.

During the process of drafting a manuscript, and in deciding whether to use a figure, ask yourself these questions:

- What idea do you need to convey?
- Is the figure necessary? If it duplicates text, it is not necessary. If it complements text or eliminates lengthy discussion, it may be the most efficient way to present the information.
- What type of figure (e.g., graph, chart, diagram, drawing, map, or photograph) is most suited to your purpose? Will a simple, relatively inexpensive figure (e.g., line art) convey the point as well as an elaborate, expensive figure (e.g., photographs combined with line art, figures that are in color instead of in black and white)?

3.76 *Standards for Figures*

The standards for good figures are simplicity, clarity, and continuity. A good figure

- augments rather than duplicates the text;
- conveys only essential facts;
- omits visually distracting detail;
- is easy to read—its elements (type, lines, labels, symbols, etc.) are large enough to be read with ease in the printed form;
- is easy to understand—its purpose is readily apparent;
- is consistent with and is prepared in the same style as similar figures in the same article; that is, the lettering is of the same size and typeface, lines are of the same weight, and so forth; and
- is carefully planned and prepared.

Types of figures and guidelines for preparing them are described in sections 3.77–3.82 so that you can select the figure most appropriate to the information being presented and ensure the preparation of a figure of professional quality. If you engage a professional artist, supply the artist with the guidelines in this section. (See the references in section 9.03 for more on the preparation of figures.)

3.77 *Types of Figures*

Several types of figures can be used to present data to the reader. Sometimes the choice of which type to use will be obvious, but at other times it will not. Figure Examples 1 and 2 and Figure Examples 3 and 4 illustrate this point by showing that there are different methods for depicting the same data in a figure. Well-designed figures can convey a memorable image of the overall pattern of results. They also can be the best way to reveal what the reader is not expecting. (See the references in section 9.03 for additional source materials on graphing and visualizing data.)

Graphs show relations—comparisons and distributions—in a set of data and may show, for example, absolute values, percentages, or index

numbers. Keep the lines clean and simple, and eliminate extraneous detail. The presentation of information on the horizontal (or *x*) and vertical (or *y*) axes should be orderly (e.g., small to large) and consistent (e.g., in comparable units of measurement).

- **Scatter plots** consist of single dots plotted to represent the values of single events on the two variables scaled on the abscissa and ordinates (see Figure Example 5). Meaningful clusters of dots imply correlations. For example, a cluster of dots along a diagonal implies a linear relationship, and if all the dots fall on a diagonal line, the coefficient of correlation is 1.00.
- **Line graphs** are used to show the relation between two quantitative variables. The independent variable is plotted on the horizontal axis, and the dependent variable is plotted on the vertical axis (see Figure Examples 1, 2, and 4). Grid marks on the axes demarcate units of measurement; scales on the axes can be linear (with equal numerical and visual increments, e.g., 25, 30, 35), logarithmic, or log-linear.
- **Bar graphs** are used when the independent variable is categorical (e.g., as with different experimental conditions; see Figure Example 3). Solid horizontal or vertical bars each represent one kind of datum. In a subdivided bar graph, each bar shows two or more divisions of data (note that comparison across bars is difficult for all but the first layer because they do not have a common baseline). Other bar graphs include multiple bar graphs (in which whole bars represent different single variables in one set of data) and sliding bar graphs (in which bars are split by a horizontal line that serves as the reference for each bar, such as to show less-than-zero and greater-than-zero relations).
- **Pictorial graphs** are used to represent simple quantitative differences between groups. All symbols representing equal values should be the same size. Keep in mind that if you double the height of a symbol, you quadruple its area.

- **Circle (or pie) graphs,** or 100% graphs, are used to show percentages and proportions. The number of items compared should be kept to five or fewer. Order the segments from large to small, beginning the largest segment at 12 o'clock. A good way to highlight differences is to shade the segments from light to dark, making the smallest segment the darkest. Use patterns of lines and dots to shade the segments.

Charts can describe the relations between parts of a group or object or the sequence of operations in a process; charts are usually boxes connected with lines. For example, organizational charts show the hierarchy in a group, flowcharts show the sequence of steps in a process, and schematics show components in a system. Figure Example 6 shows the elements of a theoretical model in a path analysis.

Dot maps can show population density, and **shaded maps** can show averages or percentages. In these cases, plotted data are superimposed on a map. Maps should always be prepared by a professional artist, who should clearly indicate the compass orientation (e.g., north–south) of the map, fully identify the map's location, and provide the scale to which the map is drawn. Use arrows to help readers focus on reference points.

Drawings are selective and give the author the flexibility to emphasize any aspect of an image or idea (see Figure Example 7). They can be done from any of several views, for instance, a two-dimensional view of one side of an object or a view of an object rotated and tipped forward to show several sides at once. Drawings should be prepared by a professional artist and should use the least amount of detail necessary to convey the point.

Photographs have excellent eye appeal. They should be of professional quality and should be prepared with a background that produces the greatest amount of contrast. A photographer can highlight a particular aspect of the photograph by manipulating the camera angle or by choosing a particular type of lighting or film. (For more on photographs, see section 3.82.)

Figure Example 1. Sample line graph.[1]

- Lines are smooth and sharp.
- Typeface is simple (sans serif) and legible.
- Unit of measure is indicated in axis label.
- Axis labels are shared by both panels to decrease clutter.
- Legends are contained within the borders of the graph.
- Symbols are easy to differentiate.
- Caption explains error bars.

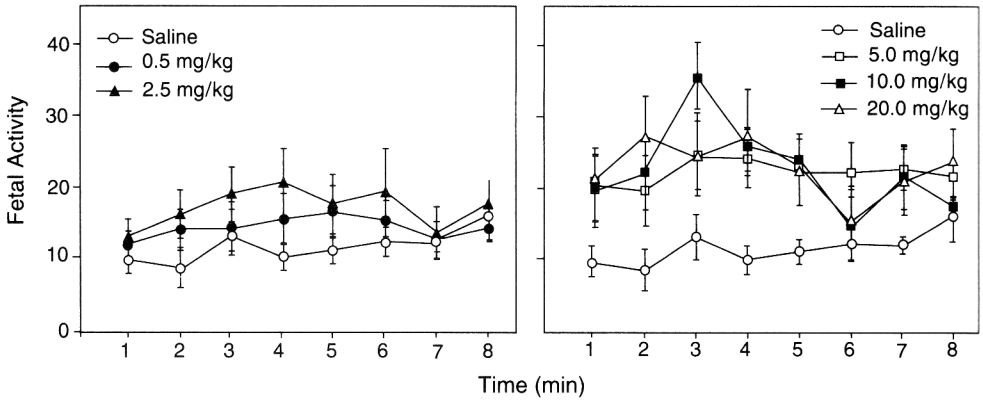


Figure X. Overall motor activity during the first 8 min of the observation session of E21 (Embryonic Day 21) rat fetuses treated with isotonic saline or varying dosages of cocaine. Cocaine groups in the left panel did not differ significantly from the saline-treated control group; cocaine groups in the right panel exhibited significantly elevated activity compared with the control group. Points represent the mean number of movements per minute; vertical lines depict standard errors of the means.

[List captions together on a separate page.]

[1] From "Cocaine Alters Behavior in the Rat Fetus," by D. K. Simonik, S. R. Robinson, and W. P. Smotherman, 1993, *Behavioral Neuroscience, 107*, p. 870. Copyright 1993 by the American Psychological Association. Adapted with permission of the author.

Figure Example 2. Alternative line graph to left panel of previous figure.

- Expanding the scale makes differences within the data more visible.
- A single error bar shows the only significant difference.

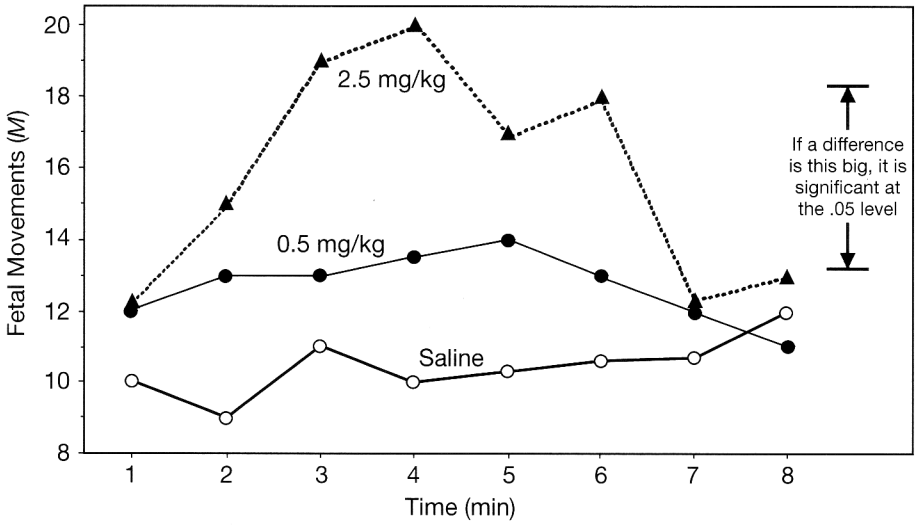


Figure Example 3. Sample bar graph.[2]

- Bars are easy to differentiate by fill pattern.
- Zero point is indicated on ordinate axis.
- Axes are labeled with legible type; ordinate axis indicates unit of measure.
- Legend appears within dimensions of the graph.
- Axes are just long enough to accommodate bar length.
- Caption explains error bars and sample sizes.

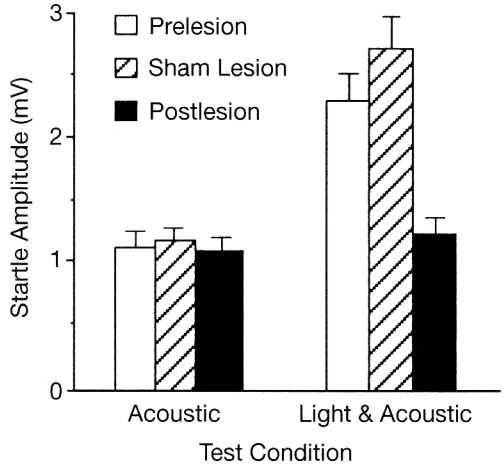


Figure X. Mean amplitude startle response (+*SE*) for prelesion (n = 4), sham lesion (n = 2), and postlesion (n = 2) groups in acoustic and light-and-acoustic test conditions.

[List captions together on a separate page.]

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[2] From "Amygdala Efferents Mediating Electrically Evoked Startle-Like Responses and Fear Potentiation of Acoustic Startle," by J. S. Yeomans and B. A. Pollard, 1993, *Behavioral Neuroscience, 107*, p. 606. Copyright 1993 by the American Psychological Association. Adapted with permission of the author.

Figure Example 4. A line graph as an alternative to a bar graph.

- *Figure is simpler.*
- More than one comparison at a time can be perceived.

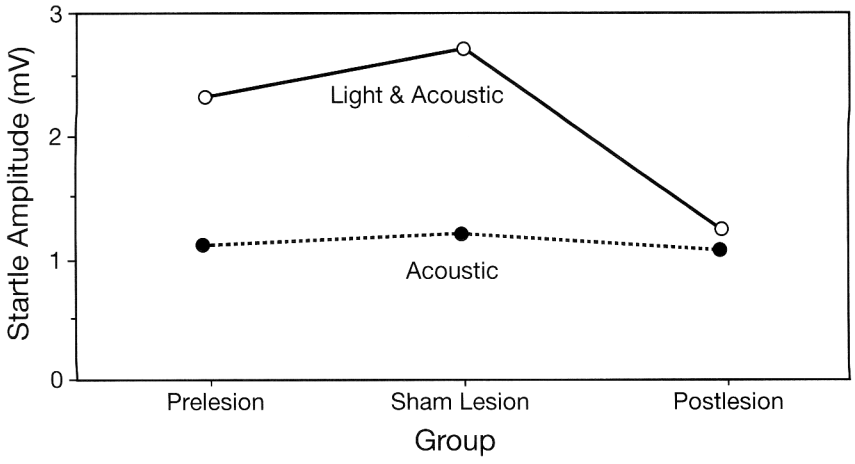


Figure Example 5. Sample scatter plot.[3]

- Solid circles represent data points.
- Zero point indicated on axes.
- Axis labels are in a legible typeface.

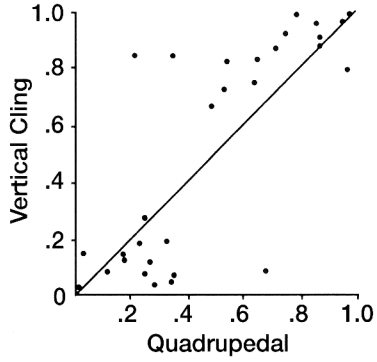


Figure X. Proportion of left-hand reaches by squirrel monkeys from horizontal quadrupedal and vertical cling postures in Experiment 1. [List captions together on a separate page.]

[3] From "Postural Effects on Manual Reaching Laterality in Squirrel Monkeys (*Saimiri sciureus*) and Cotton-Top Tamarins (*Saguinus oedipus*)," by L. S. Roney and J. E. King, 1993, *Journal of Comparative Psychology, 107*, p. 382. Copyright 1993 by the American Psychological Association. Adapted with permission of the author.

Figure Example 6. Sample chart (path model).[4]

- Names of variables are indicated with the variable symbols.
- Size of numbers is proportional to lettering, enabling complex figure to be placed in a small space on page.

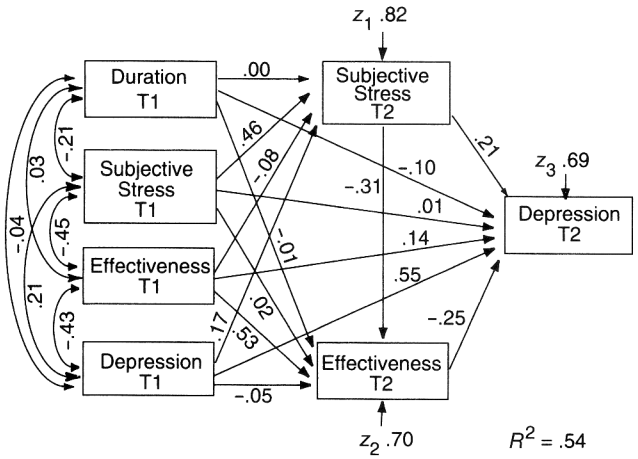


Figure X. Initial path-analytic model: Influence of caregiving duration, subjective caregiving stress, and subjective caregiving effectiveness on changes in depression.

[List captions together on a separate page.]

[4] From "Longitudinal Impact of Interhousehold Caregiving on Adult Children's Mental Health," by A. Townsend, L. Noelker, G. Deimling, and D. Bass, 1989, *Psychology and Aging, 4*, p. 395. Copyright 1989 by the American Psychological Association. Reprinted with permission of the author.

Figure Example 7. Sample line drawing.[5]

- Lines are simple; no extraneous detail.
- Type is legible.
- Arrangement of components of figure is compact.

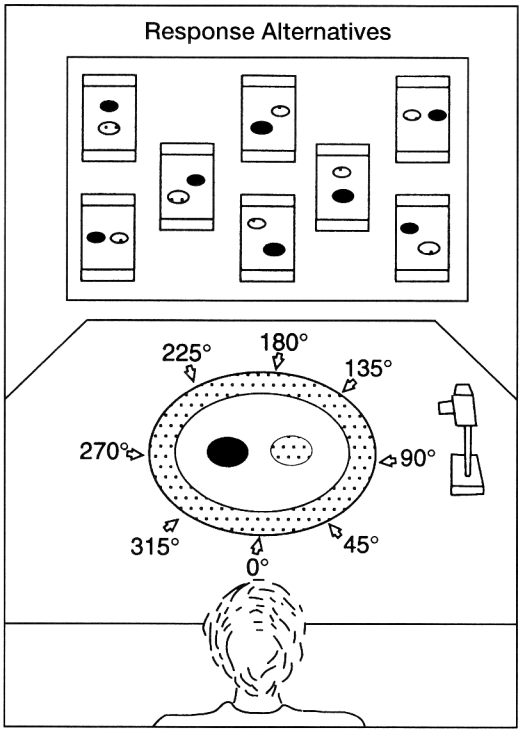


Figure X. The perspective-taking task. In the item depicted, the disks are in the horizontal orientation, the camera is at 90°, and the correct response is shown in the upper left corner of the response alternatives.

[List captions together on a separate page.]

[5] From "Understanding Person–Space–Map Relations: Cartographic and Developmental Perspectives," by L. S. Liben and R. M. Downs, 1993, *Developmental Psychology, 29*, p. 744. Copyright 1993 by the American Psychological Association. Reprinted with permission of the author.

3.78 *Line Art Versus Halftone*

Although there are many types of figures, usually only two printing processes are involved in reproducing them: line art processing and halftone processing. Line art is any material that will reproduce only in black and white, for example, type, lines, boxes, and dots; such material includes line graphs, charts, and bar graphs. Halftones are figures that have shades of gray—photographs and photomicrographs, for example (see Figure Example 8). Halftones require a special printing process, which makes them more expensive than line drawings to reproduce.

Figure Example 8. Sample photograph (halftone).[6]

- Cropped to omit extraneous detail and to fit in one column.
- Good contrast for reproduction.
- Panel label has good contrast to background.
- Scale bar included and labeled in 14-pt sans serif font.

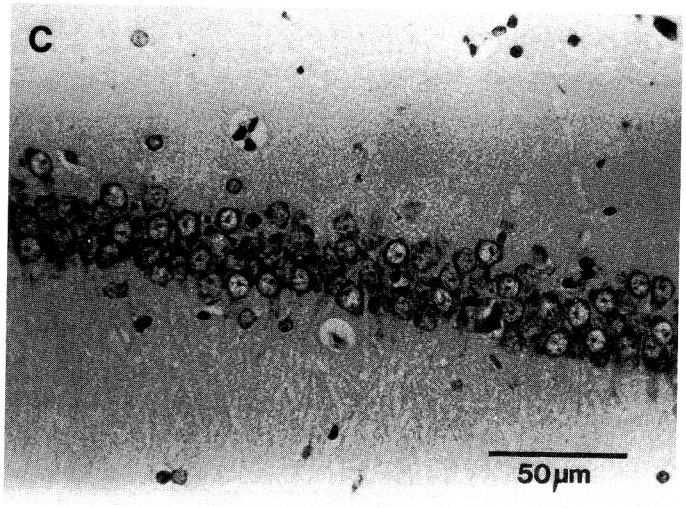


Figure X. Photomicrograph of part of the CA1 cell field from the control rat.

[List captions together on a separate page.]

[6] Panel from "Impaired Object Recognition Memory in Rats Following Ischemia-Induced Damage to the Hippocampus," by E. R. Wood, D. G. Mumby, J. P. J. Pinel, and A. G. Phillips, 1993, *Behavioral Neuroscience, 107,* p. 55. Copyright 1993 by the American Psychological Association. Reprinted with permission of the author.

3.79 *Overall Size and Proportion*

When planning a figure, consider that

- All published figures must fit the dimensions of the journal in which your article will be published. Size your figures to fit within a single journal column unless multiple panels or fine detail require them to be the width of the journal page (see Table 3.10).
- Parallel figures or figures of equal importance should be of equal size; that is, they should be prepared according to the same scale.
- Combining like figures (e.g., two line graphs with identical axes) facilitates comparisons between them. For example, if each of two figures can be reduced to fit in a single column, place one above the other and treat them as one figure. Two line graphs with identical axes might be combined horizontally and treated as one figure (see Figure Example 1).
- All elements of a figure, including plot points and subscripts, must be large enough to be legible (as a general rule, type should be no smaller than 8 point and no larger than 14 point).
- A figure legend, which is a key to symbols used in the figure, should be positioned within the borders of the figure (see Figure Examples 1 and 3). Place labels for parts of a figure as close as possible to the components being indentified.

3.80 *Preparation of Figures*

Figures may be mechanically produced or computer generated. Mechanical figure preparation usually should be done by graphic arts professionals because they have the technical skill to produce a figure that meets printing requirements. A graphic arts professional also may produce a figure with sophisticated computer software and hardware that typically are unavailable to authors. A glossy or high-quality laser print of any professional-quality figure is acceptable, however, whether created by a graphics specialist or generated by computer. If you generate figures by computer, resist the temptation to use special effects (e.g., three-dimensional effects in bar graphs and line graphs); although special ef-

Table 3.10. Sizing and Type Specifications for Figures for APA Journals

A. *Standard Figure Sizes*

APA journal dimension	*Standard figure width*			
	1 column		*2 columns*	
	Minimum	*Maximum*	*Minimum*	*Maximum*
Inches				
8¼ × 11	2	3¼	4¼	6⅞
6¾ × 10	2	2⅝	3⅝	5½
Centimeters				
21 × 28	5.0	8.45	10.60	17.50
17 × 25.4	5.0	6.70	9.30	14.00
Picas				
49.5 × 66	13	20	25	41.5
40.5 × 60	12	16	22	33

Note. Figures are sized to fit within the ranges shown. Simple line graphs and bar graphs will be reduced to fit into one column.

B. *Minimum and Maximum Type Sizes*

Minimum

8 point

8 POINT

● ○ ▲ □

Maximum

14 point

14 POINT

● ○ ▲ □

Note. For legibility, a sans serif typeface, such as Helvetica used above, is recommended. Other common sans serif typefaces are Futura, Univers, Geneva, and Optima. A combination of circles and triangles is recommended to distinguish curves on line graphs; the shapes remain distinctive after reduction, whereas circles and squares can look similar when reduced.

fects may have eye-catching appeal and are popular in newsletters and magazines, they can distort data and distract the reader.

Whether prepared by graphic artist or author, drawn by hand or generated by a graphics software or statistical package, all figures must adhere to the following mechanical specifications to be acceptable for reproduction (camera ready).

Size and proportion of elements. Each element must be large enough and sharp enough to be legible (see Figure Example 9 for examples of good and poor proportions). The size of lettering should be no smaller than 8-point type and no larger than 14-point type (see Table 3.10 for examples of each). As a general guideline, plot symbols should be about the size of a lowercase letter of an average label within the figure. Also consider the weight (i.e., size, density) of each element in a figure in relation to that of every other element, making the most important elements the most prominent. For example, curves on line graphs and outlines of bars on bar graphs should be bolder than axis labels, which should be bolder than the axes and tick marks (Scientific Illustration Committee, 1988).

Materials. For mechanical figure preparation, use black india ink and a good grade of bright white drawing paper. The higher the contrast, the sharper the detail. If you draw a graph on tracing paper over a dark grid, use high-quality tracing paper. Professional artists also use pencil, scratchboard (white lines on a black field), carbon dust (to show shades of gray), and ink wash. If you are creating your own figures and need to show shaded areas, you may use patterns of lines or dots on pressure-sensitive adhesive paper (e.g., Zipatone, Letraset, Formatt), which are available from art supply stores. Keep in mind that pen-and-ink figures, which can almost always be reproduced as line art, often will be less expensive to prepare and reproduce than, for example, halftone pencil drawings.

For computer-generated figures, use high-quality, bright white paper or other paper stock that is designed to produce high-quality output from your equipment. The output must have a minimum resolution of

300 dots per inch (600 to 1200 dots per inch is preferable). In addition, the software and hardware used must produce smooth curves and crisp lines showing no jagged areas. See Figure Example 10 for examples of acceptable and unacceptable computer-generated art.

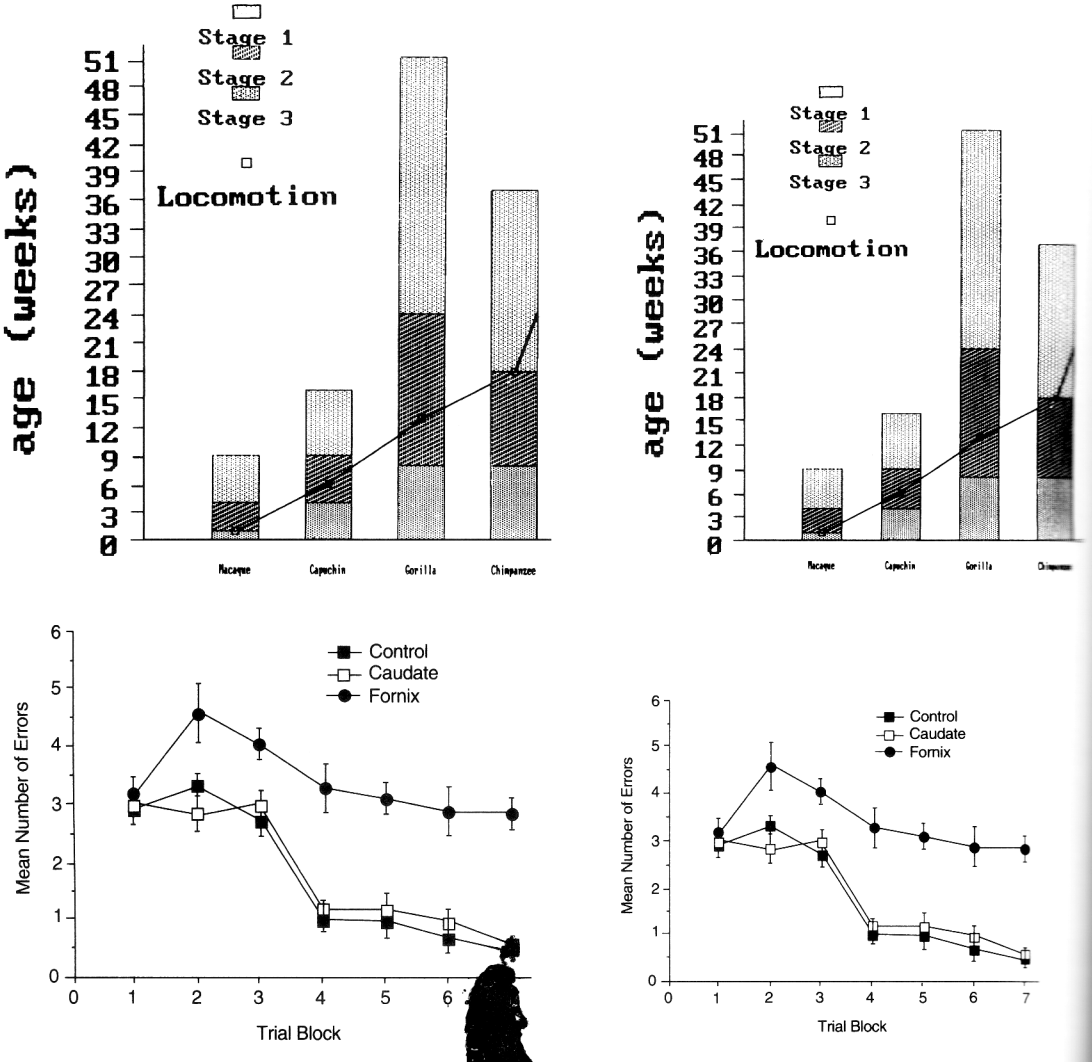
Shading. Drawings and graphs should be shaded in such a way that they can be reproduced as line art rather than as more expensive halftones. If different shadings are used to distinguish bars or segments of a graph, choose shadings that are distinct (e.g., the best option to distinguish two sets of bars is no shading [open] and black [solid]). Limit the number of different shadings used in one bar graph to two or three. If more are required, a table may be a better presentation of the data. Instead of using fine dot screens to create shades of gray in a bar graph, use a pattern of diagonal lines (hatching) or heavier dots (stippling). Diagonal lines produce the best effect; fine stippling and shading can "drop out," or disappear, when reproduced. If you use fine dot screens, be sure that different bars contrast with each other by at least 30% of gray tone (Scientific Illustration Committee, 1988). Computer-generated art will typically be produced as line art, as long as the image has been created through a digital process that places dots on the page.

Lettering. For either mechanical or computer-generated type, use a simple, sans serif typeface (such as Arial, Futura, or Helvetica) with enough space between letters to avoid crowding. Letters should be clear, sharp, and uniformly dark and should be as consistent a size as possible throughout the figure. Point size should vary by no more than 4 points; for example, if axis labels are 12 points, legend labels should be no smaller than 8 points, the minimum acceptable size of lettering.

Style of type also affects legibility: For example, type in boldface tends to thicken and become less legible when reproduced. Initial capitals and lowercase letters generally are easier to read than all capital letters, but if the figure requires several distinctions (i.e., levels) of lettering, occasional use of capitals is acceptable. If the figure consists of several panels, label each panel with a capital letter in the top left corner (the letter should be 14 point: A).

Figure Example 9. Proportion examples.

Examples of poor (top) and good (bottom) proportions on originals (left) and their reductions at 80% (right). In the poor original, the type size varies from 4 to 16 points and is in an illegible "jagged," condensed style, which worsens with reduction; the shading, symbols, and lines improve slightly but are still too difficult to distinguish. The professional sans serif type in the good original holds up on reduction, as do the symbols and lines.[7]



[7] Top panel used with permission from P. [redacted] G. Spinozzi, whose revised art appeared in "Early Sensorimotor Development in Chimpanzees (*Pan trogl[redacted]*," 1994, *Journal of Comparative Psychology, 108*, p. 100. Bottom panel from "Double Dissociation of Fornix and Caudate Nucleus Lesions on Acquisition of Two Water Maze Tasks: Further Evidence for Multiple Memory Systems," by M. G. Packard and J. L. McGaugh, 1992, *Behavioral Neuroscience, 106*, p. 442. Copyright 1992 by the American Psychological Association. Adapted with permission of the author.

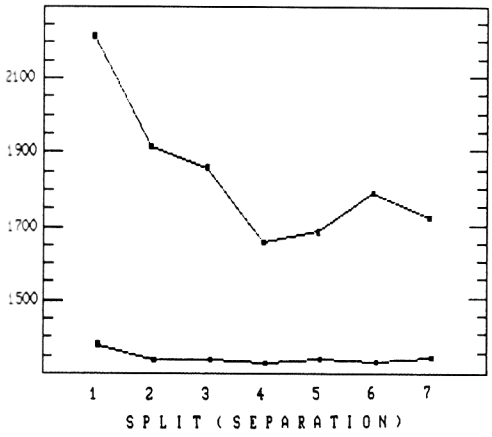
Figure Example 10. Examples of unacceptable computer-generated art (left) and the revision (right).

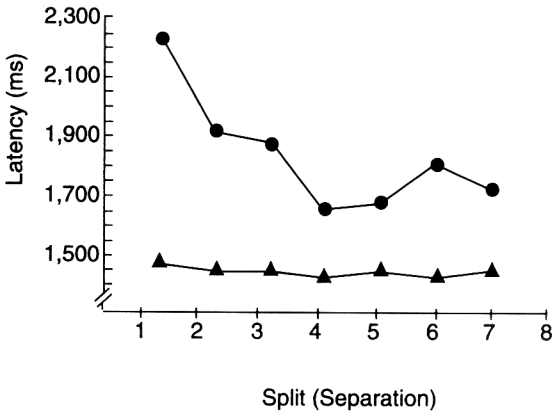
Unacceptable

- Type is jagged and illegible.
- Curves are jagged.
- Axes labels are in all caps, and ordinate label reads vertically.
- Units of measure are not specified.

Acceptable

- Lettering is professional.
- Curves are smooth.
- Lettering is in caps and lowercase and runs parallel to axes.
- Units of measure are specified.
- Top border and right axis were removed.





Typewritten or nonprofessional freehand lettering is not acceptable for publication. Computer-generated lettering that has a resolution of less than 300 dots per inch (such as dot-matrix printer output) or that has jagged edges, regardless of the resolution, is unacceptable.

Three methods of mechanical lettering are acceptable: professional lettering, stencil, and dry-transfer sheets. Professional lettering includes typeset or hand lettering. A stencil (e.g., Chartpak, Leroy, Wrico, or Ames lettering devices) provides a guide to the size and proportion of all lettering on the figure. Align letters from dry-transfer or pressure-sensitive sheets carefully, and press the letters securely onto the original figure so that they do not rub off. You can apply a light coat of spray fixative to protect the lettering until you photograph the figure to make a glossy print or photostat.

Preparing the final print. The final print that you supply for publication must have high contrast and be reasonably sturdy. For mechanically prepared figures, and for the best results with computer-generated figures, have a photographic proof or photostat of the figure made on gloss-coated photographic paper. Check that the glossy print is in sharp focus and that the background is bright white, not grainy or gray. For computer-generated figures, the output from your computer equipment is often acceptable for reproduction. Use bright white, high-quality paper or other high-quality materials (such as transparencies) that are designed to get the best possible quality of output from your equipment. Check that the final print is sharp and free from smudges. If your computer-generated art includes shading, check the printout to make sure that all shading has an even tone so that "bald spots" do not occur in reproduction. (For additional information on submitting final prints, see section 3.85.)

Submitting an electronic version of a figure. APA is open to receiving digital art files, if you are interested in providing them. Printers are not at this time fully successful in using author-supplied digital art, so you

will still need to provide a high-quality print as well (see previous section).

The graphic files with which we are the most successful are TIFF files generated from a professional-level graphics program (such as Adobe Photoshop or Illustrator) in accordance with the following guidelines:

- *Line art*—black-and-white (or bitmap), with a resolution of 1200 dots per inch.
- *Halftones*—grayscale, with a resolution of 300 dots per inch.
- *Combination halftones* (halftones with superimposed labels or lettering)—grayscale, with a resolution of 600 dots per inch.

Files created in standard office software (e.g., for word processing, spreadsheet functions, or presentations) cannot be used for printing, primarily because the resolution of the files is too low. Files created in presentation software are unacceptable because the maximum resolution is only 72 dots per inch.

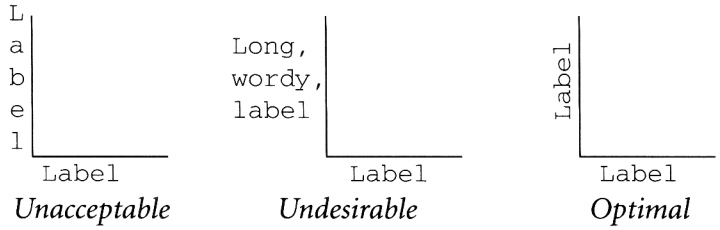
3.81 *Creating Graphs*

Follow these guidelines in creating a graph mechanically or with a computer. Computer software that generates graphs will often handle most of these steps automatically. Nevertheless, you should examine the resulting graph to ensure that it follows these guidelines and make any needed adjustments.

- Use bright white paper.
- Use medium lines for the vertical and horizontal axes. The best aspect ratio of the graph may depend on the data.
- Choose the appropriate grid scale. Consider the range and scale separation to be used on both axes and the overall dimensions of the figure so that plotted curves span the entire illustration.
- In line graphs, a change in the proportionate sizes of the x units to

the *y* units changes the slant of the line. Thus, for example, disproportionately large units on the vertical axis will exaggerate differences. Be sure the curve or slant of the line accurately reflects the data.

- Indicate units of measurement by placing tick marks on each axis at the appropriate intervals. Use equal increments of space between tick marks on linear scales.
- If the units of measurement on the axes do not begin at zero, break the axes with a double slash.
- Clearly label each axis with both the quantity measured and the units in which the quantity is measured. Carry numerical labels for axis intervals to the same number of decimal places.
- Position the axis label parallel to its axis. Do not stack letters so that the label reads vertically; do not place a label perpendicular to the vertical (*y*) axis unless it is very short (i.e., two words or a maximum of 10 characters). The numbering and lettering of grid points should be horizontal on both axes.



Unacceptable *Undesirable* *Optimal*

- Use legibility as a guide in determining the number of curves to place on a figure—usually no more than four curves per graph. Allow adequate space between and within curves, remembering that the figure may need to be reduced.
- Use distinct, simple geometric forms for plot points; good choices are open and solid circles and triangles. Combinations of squares and circles or squares and diamonds are not recommended because they can be difficult to differentiate if the art is reduced, as can open symbols with dots inside (e.g., ⊙).

3.82 *Using Photographs*

Because reproduction softens contrast and detail in photographs, starting with rich contrast and sharp prints is important. The camera view and the lighting should highlight the subject and provide high contrast; a light or dark background can provide even more contrast.

Photographs must be of professional quality and on black-and-white film. Do not submit color prints because the transition from color to black and white for reproduction is unpredictable and usually inaccurate in tone. Have a color negative, slide, or print developed as a black-and-white print before submitting it for publication. (If you intend to have a photograph printed in color, be sure to consult your publisher or the publication's instructions to authors.)

Photographs usually benefit from cropping (i.e., eliminating what is not to be reproduced). Cropping recomposes the photograph, eliminates extraneous detail, and recenters the image. Cropping can also remove blemishes.

To prepare for cropping a photograph, first determine the ideal area to be reproduced, that is, the part of the photograph that will appear on the printed page. The area to be reproduced need not be the same shape as the larger photograph, but the edges should be straight lines at right angles to each other.

Next, mark the area to be reproduced. One way to indicate the area is to outline it on a piece of acetate or tissue paper covering the photograph. Write lightly with a felt-tipped pen on tissue overlays. Never write directly on the face of the photograph.

Finally, have a print made of the outlined area of the photograph, and submit the new print with the manuscript.

If you group photographs for purposes of comparison or to save space, butt the photographs right next to each other. The printer can insert a thin white or black line between the photographs to separate them. Some printers prefer unmounted photographs for compatibility with reproduction equipment; be sure to consult the publication's instructions to authors for this information.

Photomicrographs are produced with specialized equipment. Photomicrographs should be submitted so that they can be reproduced at their exact size for optimal print quality. Therefore, be sure to find out which dimensions are acceptable for the journal to which you are submitting your manuscript (for APA journals, see Table 3.10). If you mark on a tissue or acetate overlay the most important areas of the photomicrograph, the printer can pay particular attention to them when making the halftone. Indicate the degree of magnification by including a scale line on the photograph. Also, indicate in the figure caption the type of staining materials and any unusual lighting used.

If you photograph a person, get a signed release from that person to use the photograph. If you use a photograph from another source, try to obtain the original photograph because photographs of photographs do not print clearly. Obtain written permission for reuse (in both print and electronic form) from the copyright holder, and acknowledge the author and the copyright holder in the figure caption (see section 3.73).

3.83 *Identifying and Citing Figures*

Number all figures consecutively with arabic numerals throughout an article in the order in which they are first mentioned in text (i.e., Figure 1, Figure 2). Write this number lightly with a pencil or pen (but do not use a ballpoint pen) as close to the top right edge of the figure print as possible, taking care to write *outside* of the image area. If the image area takes up the entire print, write the number on the back of the figure instead. Also on the back of the print, write the article's short title and the word *TOP* to designate the top of the figure.

In the text, refer to figures by their numbers:

> as shown in Figure 2, the relationships are
>
> data are related (see Figure 5)

Never write "the figure above" (or below) or "the figure on page 12,"

because the position and page number of a figure cannot be determined until the typesetter lays out the pages.

3.84 *Figure Legends and Captions*

In APA journals, a legend explains the symbols used in the figure; it is placed within and photographed as part of the figure. A caption is a concise explanation of the figure; it is typeset and placed below the figure.

On the final print, make certain that the symbols, abbreviations, and terminology in the caption and legend agree with the symbols, abbreviations, and terminology in the figure, in other figures in the article, and in the text. When preparing the final version for production and again when proofing the typeset article, compare the caption with the figure; proofread all lettering, and make sure no labels are missing.

Legends. The legend is an integral part of the figure; therefore, it should have the same kind and proportion of lettering that appear in the rest of the figure. Because it is scanned as part of the figure, the legend must appear on the final print, preferably within the axis area (if any). Capitalize major words in the legend.

Captions. The caption serves both as an explanation of the figure and as a figure title; therefore, the artwork should not include a title. The caption should be a brief but descriptive phrase. Compare the following captions.

Too brief:

Figure 3. Fixation duration.

Sufficiently descriptive:

Figure 3. Fixation duration as a function of the delay between the beginning of eye fixation and the onset of the stimulus in Experiment 1.

After the descriptive phrase, add any information needed to clarify the figure: A reader should not have to refer to the text to decipher the figure's message. Always explain units of measurement, symbols, and abbreviations that are not included in the legend. If your graph includes error bars, explain whether they represent standard deviations, standard errors, confidence limits, or ranges; it is also helpful to define the sample sizes used (see Figure Example 1). If statistically significant values are marked in the figure, explain the probability in the caption (follow the same system used for table notes; see section 3.70).

Because the caption is typeset and placed outside the figure, type all figure captions, with their numbers, double-spaced starting on a separate sheet (see section 5.22 for typing instructions).

If you reproduced or adapted your figure from a copyrighted source, you must obtain written permission for print and electronic reuse from the copyright holder and give credit in the figure caption to the original author and copyright holder. Use the wording shown in section 3.73, and place this notice at the end of the caption.

3.85 *Submitting Figures*

With the original submitted manuscript, paper copies of figures are acceptable. Glossy or final prints must be prepared before the manuscript is accepted for publication. Final figures must be photographed and submitted as 8 × 10 in. (20 × 25 cm) glossy prints or submitted as final prints on bright white paper. Computer-generated figures should be on 8½ × 11 in. (22 × 28 cm) high-quality, bright white paper or other material that produces a sharp image and high contrast. If it is necessary to submit smaller prints, remount them on 8½ × 11 in. (22 × 28 cm) paper.

To reproduce the figure, the printer scans the glossy or final print to create a digital image file. Flaws in the glossy or final print will appear in the published figure. Therefore, do not attach anything to the print with staples or paper clips, and avoid pressing down on the print when you write the identification information on the back. Protect the figure

by putting a piece of tissue paper over it. Place the prints between pieces of cardboard to protect them.

3.86 *Figure Checklist*

- Is the figure necessary?
- Is the figure simple, clean, and free of extraneous detail?
- Are the data plotted accurately?
- Is the grid scale correctly proportioned?
- Is the lettering large and dark enough to read? Is the lettering compatible in size with the rest of the figure? (Freehand, typewritten, or jagged computer-generated lettering is not acceptable.)
- Are parallel figures or equally important figures prepared according to the same scale?
- Are terms spelled correctly?
- Are all abbreviations and symbols explained in a figure legend or figure caption? Are the symbols, abbreviations, and terminology in the figure consistent with those in the figure caption? In other figures? In the text?
- Are digital files in TIFF format at the appropriate resolution and accompanied by a high-quality laser printout?
- Are all figure captions typed together on a separate page?
- Are the figures numbered consecutively with arabic numerals?
- Are all figures mentioned in the text?
- Is each figure an 8 × 10 in. (20 × 25 cm) glossy print or photostat or an 8½ × 11 in. (22 × 28 cm) final print?
- Are all figures identified lightly in pencil or felt-tip pen on the back by figure number (on the front or back) and short article title (on the back)?
- Is TOP written on the back of figures to show orientation?
- Is written permission for print and electronic reuse enclosed for figures that are being reproduced or adapted from another source? Is proper credit given in the figure caption?

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