Viewpoint: Do your digits betray you or does rounding raise your reputation?

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A quick glance at a person's fingers and fingernails may reveal a lot about them. The transverse Beau's line on fingernails can indicate if, and roughly when, an acute illness has occurred. Heavy smokers and nervous nail biters instantly disclose their habits.

The digits presented by an author in a paper may be similarly revealing. Reporting means with an excessive number of digits (e.g., an animal's weight as 351.3 kg) has 6 disadvantages for other people and brings 4 unwanted consequences for the author(s) in return for 1 dubious advantage. The practice has declined since Van Dyne's (1969) plea in this journal but as a quick look at recent issues of this and other scientific journals will show, it is still prevalent. Our viewpoint, prompted by the cogent articles in the September 1988 issue of the *Journal of Range Management* on writing for the benefit of readers, draws attention to the disadvantages for authors as well as for editors, printers, and readers, of failure to consider carefully the number of significant figures to be used in presenting data.

The disadvantages for other people of using excessive digits are that it:

- 1) takes longer to read tables;
- 2) makes treatment effects harder to grasp;
- 3) prevents rapid mental comparisons;
- 4) discourages readers from (fully) perusing tables;
- 5) costs more to type, print, and check; and
- 6) may prevent a table fitting across a page.

Unwelcome consequences for authors are that it:

- 1) warns readers that the data have not been thoughtfully considered;
- raises a suspicion that the author(s) do not understand their own work;
- 3) increases the chance that readers will not take in the desired message; and
- 4) may imply that the author(s) disparage the reader's intelligence.

The only possible advantage for authors that we can see is that they may delude undiscriminating or ingenuous readers into thinking that their work was more detailed, precise, or "scientific" than it really was.

We suggest that adherence to the following principles, drawn from the literature cited, will do much to ensure that tables present clear, easily grasped information.

- 1) Tabulated figures must reflect closely the precision of the original observations.
- 2) Consider bias and other sources of inaccuracy.

3) Round means to a number place indicated by taking a quarter of the standard error of the mean, e.g.,

- SE = 400; 400/4 = 100; round to nearest 100
- SE = 8.55; 8.55/4 = 2; round to nearest integer.
- 4) Never use more than 2 or 3 significant figures unless there is a specific need, for example, write 2.34, 234, 2340 or 2300.

Round values even more if the data are to be used in slides during a lecture; where feasible use graphical presentation in talks.

Note also, that a correlation coefficient r = .8861 or .886 accounts for within 1% of the same percentage of the variance, as r = .89.

Tables can frequently be made clearer, more informative and more attractive by providing a least significant difference rather than by using a range test and its fringe of superscripts (Carmer and Walker 1982).

Table 1. Examples of Superfluous Digits and Appropriate Rounding.

	Published	SE/4	Round to
Live weight gain (g/d)	78.5-114.1	1.4	78-114
Milk vield (kg/301 d)	2401-2617	341	2400-2620
Wool growth (g/d)	9.96-10.53	0.38-0.50	10.0-10.5
Green forage production			
(kg/ha)	1633-3259	93‡	1600-3300
Dry matter intake (g/d)	488.9	17.4	490
Volatile fatty acid			
concentration (mM/1)	88.9	2.9	89

‡Calculated from SD or LSD.

Some examples of the use of excessive digits and their suggested rounding are given in Table 1. These examples are taken from recent published conference proceedings in animal science but others may readily be found in current range science and agronomy publications.

In our view, writing with the interests of readers in mind implies also a careful consideration of all the means presented and a rigorous exclusion of unnecessary digits.

Further Reading

- Carmer, S.G., and Walker, W.M. 1982. Baby bear's dilemma: a statistical tale. Agron. J. 74:122-24.
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- Terman, G.L. 1978. Comments on significant figures in relation to experimental errors. Agron. J. 70:519-20.
- Van Dyne, G.M. 1969. A plea for fewer but more-significant digits. J. Range Manage. 22:52-4.

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