including mean, standard deviation, and percentage change were performed. A parametric test for difference, the Student *t* test, was used in the drug holiday study, and, while not so stated, was probably used in the deprenyl study as well.

The objection is that the clinical rating scales represent ordinal level measurement, and parametric statistical tests are only appropriate with interval or ratio level measurements.³ An example of interval level data is that of centigrade temperature measurement, where, for example, it would be correct to assert that there is twice as much difference between measurements of 20° and 40° C as between measurements of 10° and 20° C. If, however, one patient with parkinsonism had clinical ratings of 20 and 40 before and after intervention, and a second patient had ratings of 10 and 20 before and after intervention, it would not be correct to assert that there was twice as much change produced in the first patient as in the second. This is because a slightly different (although equally valid) rating scale could easily produce quite different scores in the same patients. The level of measurement is therefore ordinal, where appropriate statements include: (1) that the first patient had worse parkinsonism than the second, (2) that the parkinsonism of both patients increased with intervention, and (3) that the intervention caused a greater increase in the parkinsonism of the first patient than in the second. Median and range would be appropriate expressions of central tendency and dispersion of measurements derived from a group of such patients. The Wilcoxon matched-pairs signed-ranks test³ would be an appropriate test for statistical difference before and after intervention using ordinal rating scales. Use of the Student *t* test could yield a false-positive statistical significance, since the use of the test assumes and incorporates information not actually present in the original data.

In the deprenyl study, use of appropriate statistics would not have altered the conclusions, since no statistical differences were found. In the drug holiday study, however, the differences noted should not be considered significant until the appropriate statistical tests are performed.

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Reply from the Authors: Dr. Cordingley's letter about our article "Drug holiday and management of Parkinson's disease,"¹ raises the issue of whether or not appropriate

statistical analysis was performed on the clinical data that we presented. He contends that the Wilcoxon matched-pairs signed-ranks test should be used instead of the Student *t* test. Although his letter raises some interesting questions about the use of rating scales that are often employed in clinical research settings, his contention about the statistical test to analyze our data is incorrect since the Wilcoxon matched-pairs signed-ranks test is not appropriate for ordered classifications.

Although it would be theoretically possible to construct a ratio scale to measure clinical features of Parkinson disease (e.g., rigidity and tremor), it would be tedious and difficult to do this in practice. In fact, the general approach to this problem in the analysis of clinical data in which different degrees of the measured phenomenon can be recognized has been to attach a score to each recognized class, and to create an ordered scale. In describing this approach to analysis of clinical data, Snedecor and Cochran² state, "the assignment of scores is appropriate when (1) the phenomenon in question is one that could be measured on a continuous scale if the instruments of measurement were good enough, and (2) the ordered classification can be regarded as a kind of grouping of this continuous scale by a cruder scale that is the best we can do in the present state of knowledge." These authors go on to state that "... the standard methods of analysis of continuous variables, like the *t* test, can be used ..." and that "... the standard methods appear to work well enough for practical use."

Although Dr. Cordingley is correct in stating that different rating scales could produce different scores in the same patients, Snedecor and Cochran, continuing their discussion of the use of ordered classification, state that "... moderate differences between two scoring systems seldom produce marked differences in the conclusion drawn from the analysis."

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Correction

"Tuberous sclerosis, early onset of seizures, and mental subnormality: Study of discordant homozygous twins" by M. R. Gomez, N. L. Kuntz, and B. F. Westmoreland, June 1982, pp. 604-11. The term "homozygous" should be changed to "monozygous" in the title, the abstract, and the table.

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Correction

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