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ODA *vs*. *t*-Test: Lysozyme Levels in the Gastric Juice of Patients with Peptic Ulcer *vs*. Normal Controls

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Lysozyme levels in gastric juice of peptic ulcer patients were compared against normal controls[1] by *t*-test, finding $p<0.05$. Because standard deviations differed by a factor of two between groups, and were proportional to the means, analysis of natural logarithms was instead deemed appropriate: the resulting *t*-test *wasn't statistically significant*. Analyzed by ODA no statistically significant between-group difference emerged, and results obtained for raw data and for natural logarithms were identical because ODA results (i.e., *p* and ESS) are invariant over all monotonic transformations of the data.

This example illustrated the effect of violating assumptions on results of statistical analysis by *t*-test: "An assumption underlying the *t* test and the *F* test that has not been emphasized yet is that the measurements are normally distributed within the groups being compared.[1] …non-normality frequently has only a trivial effect on the significance levels" (p. 66).[1] This example is an exception—distributions are right-skewed with long tails: "one or two high values exert a powerful effect on the sample mean for measurements from such distributions, and the tabulated significance levels for the *t* test or the *F* test comparing different means are suspect. Ulcer patients may have a mean (lysozyme) level that is as much as 20% below that of normal, or they may have a mean level nearly 3½ times that of normals" (p. 67).[1]

Legacy nonparametric tests likewise found no difference between the two groups. "By neither the Kolmogorov-Smirnov test nor the Mann-Whitney-Wilcoxon test does the difference between the two distributions approach statistical significance. It is obviously the *t* test on the original, untransformed values…that is the odd one out" (p. 67).

Training (total sample) analysis exploratory ODA treating group as a binary class variable and lysozyme level as an ordered attribute yielded $p<0.26$, ESS=25.1 (marginally above the lower bound of a moderate effect[2]). Training analysis exploratory ODA treating group as a binary class variable and the natural logarithm of lysozyme level as an ordered attribute yielded $p<0.26$, ESS=25.1.

A new and increasing literature reveals that ODA finds effects which actually exist but does not find effects which do not exist, but the opposite is true for legacy methods such as *t*-test and regression analysis.[3-8]

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Author Notes

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