Optimal Data Analysis
Vol. 4 (July 10, 2015), 122-123

2155-0182/10/$3.00

UniODA *vs.* Kruskal-Wallace Test: Gender and Dominance of Free-Ranging Domestic Dogs in the Outskirts of Rome

Paul R. Yarnold, Ph.D.
Optimal Data Analysis, LLC

The Kruskal-Wallace test and UniODA are both used to compare investigator-ranked dominance ratings of male versus female dogs. Exposition highlights the insufficiency of statistical reliability as a singular criterion for evaluating model performance, as well as the importance of testing confirmatory hypotheses in the context of increasing statistical power when assessing statistical reliability.

This paper adds to literature on comparative use of UniODA[1,2] and the Kruskal-Wallace test.[3,4] Table 1 gives the dominance rankings (1=most dominant, 27=most submissive) of 27 free-ranging domestic dogs observed in the outskirts of Rome.[4] Statistical comparison of dominance rankings of male versus female dogs made using the Kruskal-Wallace test revealed: "The mean rank for males (11.1) is lower than the mean rank for females (17.7), and the difference is significant (H=4.61, df=1; p<0.032)."

Table 1: Rankings of Male and Female Dogs

Male Dogs	Female Dogs
1, 2, 3, 4, 5, 6,	7, 8, 9, 10
11, 12, 13, 14,	15, 16,
17, 18, 29, 20, 21	22, 23, 24, 25, 26, 27

UniODA was conducted next, modeling dog gender (class variable) as a function of dominance ranking (ordered attribute).[1] First the *a priori* hypothesis was tested that male dogs are more dominant, and thus had lower rankings on the dominance scale used presently than the female dogs. The model was: if ranking≤21 then predict male dog; otherwise predict female dog. The model correctly classified all 15 (100%) male dogs, but only 6 of 12 (50%) female dogs. This performance was statistically significant (for 10,000 Monte Carlo experiments the exact p<0.0252, 99.9% certainty for p<0.05). This level of accuracy was relatively strong[1] based on the achieved Effect Strength for Sensitivity value of ESS=50.0: on this scale ESS=0 is the level of accuracy expected by chance; ESS=100 is perfect, errorless classification; and ESS≥50 is the conventional criterion for a relatively strong effect.[1] Consistent jackknife analysis results (exact p<0.0099) suggest these findings may cross-generalize if the model is applied to classify an independent random sample.

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For expository purposes a second non-directional UniODA analysis was conducted. Although the discriminant threshold and resulting classification performance of the directional and non-directional models were identical, the performance of the latter exploratory model was *not* statistically significant: exact $p<0.052$.

References

[1]Yarnold PR, Soltysik RC (2005). *Optimal data analysis: A guidebook with software for Windows*, Washington, DC, APA Books.

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[3]Yarnold PR (2015). UniODA *vs*. Kruskal-Wallace test: Farming method and corn yield. *Optimal Data Analysis*, *4*, 113-115. URL: http://odajournal.com/2015/07/09/unioda-vs-kruskal-wallace-test-farming-method-and-corn-yield/

[4]http://www.biostathandbook.com/kruskalwallis.html

Author Notes

This study analyzed published de-identified data and so it was exempt from Institutional Review Board review. The author reported no conflict of interest.

Mail: Optimal Data Analysis, LLC
6348 N. Milwaukee Ave., #163
Chicago, IL 60646
USA