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ISCP Newsletter

International Society for Comparative Psychology
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Editor: Gary Greenberg, Wichita State University, Wichita, Kansas U.S.A.

9th Biennial ISCP Meeting 1998: Cape Town, South Africa.

September 1-5, 1998
The 1998 meeting will take place from 1-5 September 1998 and will be hosted by Professor L.C Simbayi and The Department of Psychology on the campus of the University of the Western Cape which is located in Cape Town, the legislative capital of South Africa. The Society welcomes current scientific studies on all aspects of comparative psychology, and also includes a regional perspective of animals, animal behaviour or animal ecology as related to South African Society. The meeting format includes a variety of symposium topics, individual papers and poster presentations. Post Conference activities will include scientific tours incorporating some major game parks. The international program committee consists of Professor L.C Simbayi as chair and the following continental representatives: Ethel Tobach (USA), Nancy Innis (Canada), Cesar Ades (Central and South America), R. Bryan Jones (Europe), and Sally McFadden and Lesley Rogers (Australasia).
Further information can be obtained from the above representatives or Professor L.C Simbayi, Department of Psychology, University of the Western Cape, Private Bag X17, Bellville 7535, Cape Town South Africa tel: (0404) 22011; fax: (0404) 31643
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South Africa has made an amazing transformation, seemingly overnight, from being a proponent of racial segregation to an advocate of multiracial tolerance.

It is difficult to look at the country's recent history and not be amazed. Nelson Mandela, who spent 26 years in jail for his opposition to apartheid, is today president of the country that once persecuted him. He has managed to involve all parties, including his former oppressors, in the peaceful transition of the country from racial segregation to democracy. There is a remarkable spirit of cooperation in South Africa, and we hope this spirit can weather the difficult road that still lays ahead.

The one thing that hasn't changed is the sheer beauty of the country. South Africa packs a wide range of natural attractions within its borders; the green vineyards and rocky coast of the Cape; the arid mountains of the Karoo; the rich farmland of the Transvaal; the snowcapped peaks of the Drakensburg Range; and the verdant hills and wide beaches of Zululand. The country also has more than 300 game and nature reserves, which help to make it one of Africa's premier travel destinations. And with the end of apartheid, travelers can enjoy this wonderful country with a trouble-free conscience.

The Spring, 1998 issue of the Newsletter will contain travel and touring information for South Africa.

New Feature.

In our on-going pursuit to improve the quality of this newsletter, we have decided to print submitted articles significant to the area of animal behavior. These articles are not necessarily appropriate for publication in the ISCP journal, but are of importance none the less. If you have a contribution for this feature please contact the editor.

THE STATISTICAL ANALYSIS OF BEHAVIOURIAL LATENCY MEASURES.

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This article concerns two important problems with the statistical analysis of behaviourial latency measures: they typically have severely skewed distributions, and are often censored (truncated). These problems, however, were not generally recognized by animal behaviour researchers: most people either allot an arbitrary score to all censored values or simply ignore them. Yet, such treatments could easily lead to dubious conclusions because of reduction of power and spuriously significant p-values. Thus, one should always use specially devised survival analysis methods whenever the study involves the measurement of censored latencies. The present article provides a short catalogue of some appropriate references, concentrating on the methods which are not "standard" for the common biomedical applications of survival analysis, but may be crucial in many behavioural studies. The statistical analysis of uncensored latencies is also discussed, with a particular attention to the analysis of variance.

ANALYSIS OF CENSORED LATENCIES

Specialized statistical techniques are necessary for an analysis of censored behavioural latencies to be valid. Survival analysis has been especially devised for this sort of data (see Eland-Johnson & Johnson, 1980; Kalbfleisch & Prentice, 1980; Lawless, 1982; Allison, 1984; Cox & Oakes, 1984; Blossfeld et al., 1989; Lee, 1992, and also Haccou & Meelis, 1992 for general overviews), and some widespread methods were previously discussed in both animal behaviour (Fagen & Young, 1978; Bressers et al., 1991; Haccou & Meelis, 1992) and behaviour ecology (Muenchow, 1986; Pyke & Thompson, 1986) literature.

Statistical power is greatly reduced (by up to 60% and even more in some circumstances, see Bressers et al., 1991 for instance) if one applies ordinary statistical methods without the necessary adjustments for censors (e.g. treating them as if they were uncensored or merely omitting altogether). In some cases adjustment for censoring does not increase power, however. For example, there is no difference between unadjusted and censor-adjusted tests based on ranks (e.g. on the Wilcoxon statistic), provided all censored times are exactly the same (i.e. if the latencies are truncated), since in both cases the actual values are replaced by their ranks (see Bressers et al., 1991). Yet, in this case a large reduction of power may take place because the tied points cannot be ranked. Unfortunately, it is generally impossible to determine the degree to which censoring affects the results of tests and estimates; this depends on the sort of problem being analyzed, the type of censoring mechanism and other factors. (But in most cases simply omitting all censored values would lead to the greatest loss of the data analysis efficiency.) Thus, applying standard statistical methods to censored data one must expect biased estimates and a very high risk of both Type I; II errors particularly when the censoring mechanism is not consistent across treatment groups. Finally, it is worth noting that complex parametric statistical procedures like ANOVA and ANOVA with repeated measures are likely to lead to particularly misleading results due to inconsistent estimation of variance components in the presence of censors (see Kimber & Crowder, 1990, for example). Because of inherent assumptions of linearity and zero expectation of residuals, Pearson product-moment correlation is also highly inappropriate in these cases (Amemiya, 1984; Muthen, 1989).

The later versions of all comprehensive general-purpose statistical packages (such as BMDP, SAS, Solo, SPSS, Statistica and Systat) incorporate procedures to perform the common types of survival analysis, sometimes with its advanced extensions (e.g. competing risks analysis in BMDP 7). The user's manuals and on-line help systems of all these packages contain informal introductions to the respective methods and the basic examples of data analysis. In addition, McCullagh & Nelder (1983) showed how censored data could be put into the framework of generalized linear models, so that the software like GLIM can easily be adapted for some kinds of survival analysis.

However the survival analysis is borrowed from a very different field of study (primarily, human mortality and equipment failures) and does not meet some specific requirements of comparative psychology and ethology. For example, while a lot of techniques were developed for computing various descriptive statistics, distribution fitting, group comparisons and regression (in which the dependent variable is the survival time and predictors represent some risk factors), relatively less was done for analyzing repeated latency measures (also, these are never discussed in the context of ethological analysis of behavioural sequences). None the less, they do exist and may be readily used in the studies of animal behaviour. Schemper (1984 a,b) and Krauth (1988), for instance, developed generalized nonparametric correlation coefficients (based on Kendall and Spearman statistics, respectively), and Schemper (1984c) - a generalized Friedman test applicable to censored data. Furthermore, an ANOVA-like repeated measurements regression model (Crowder, 1985; Kimber & Crowder, 1990) with a flexible error structure, and a new approach to factor analysis of non-normal variables that are skewed and censored (Muthen, 1989) were recently developed. Finally, several years ago two extremely simple techniques were described (Theobald & Goupillot, 1990), which allow one to collapse several repeated latencies to a single composite score, as well as to extend the page test for ordered alternatives to censored data.

A minor problem might be that the methods of survival analysis are often based on the assumption of random censoring, but in most experiments the observational period is fixed, which would lead to fixed censoring times. Despite this, most techniques are relatively robust in cases of moderate censoring, and one could easily design an experiment of randomized length, assuring, of course, some fixed minimum duration to avoid unusually short observations (see Budaev, 1996a for an example).

In fact, survival analysis provides a powerful approach for analysis of the latency data, which can answer many important questions not completely recognized otherwise (also see Fagen & Young, 1978). For instance, in the context of "free" exploration of a novel adjacent arena in the guppy (Poecilia reticulata) I found (Budaev, 1996a) that the distribution of the latency to enter a novel environment converged upon an exponential distribution with repeated exposures to the same test situation. An identical trend was also observed in case of the latency to perform predator inspection behaviour (Budaev, unpublished data). This means that after some experience the fish were entering (and inspecting) in a way resembling radioactive decay (that is, with a constant hazard rate), which may be meaning full interpreted in terms of a reduction of curiosity.

Furthermore, survival analysis may be applied to a wide range of research problems far beyond the mere analysis

of the latency data. For example, in studies of learning, some portion of individuals often fail to reach the necessary criterion, inevitably leading to censored data. Within a very different context, Kimber & Crowder (1990) and Muthen (1989) showed (see also Amemiya, 1984) how censor-adjusted models can be employed in cases when substantial "ceiling effect" heavily undermines most parametric assumptions - all values reaching either of the scale bounds may be legitimately viewed left-or right-censored. Sometimes even missing values may be handled in this way (e.g. simply setting zero censored values if all these normally exceed zero, see Kimber & Crowder, 1990 for more discussion). This provides an important possibility to design repeated-measurements experiments, while each subject has one or more missing components in its data vector (e.g. because of ethical concerns, to diminish the carry-over effect of traumatic procedures).

To assist a broader use of the appropriate statistical approaches, I provide here a short list of the most straightforward alternatives to the ordinary statistical methods for censored data (Table 1; please contact the author for a copy of this table).

ANALYSIS OF UNCENSORED LATENCIES

If all latencies turned out uncensored, how should one cope with the severe non-normality, typical in this case? Of course, nonparametric methods (e.g. Krauth, 1988) and, particularly, randomization tests (Manly,1991) will work satisfactory in most such circumstances.

There is a common belief that, provided all samples are of equal size, mild variance inhomogeneity (see Wilcox, 1987) may also be inconsequential - it is the correlation between means and variances, that is most important (Lindman, 1974; Rencher, 1995; and many other textbooks on ANOVA). Yet, blindly assuming variance homogeneity when the deviations are, in fact, excessive will almost certainly have detrimental effects on both power and the probability of Type I error (e.g. Wilcox, 1987). Unfortunately, the correlation between means and variances is very likely to occur in cases of exponential and similar distributions typical for latency data.

Thus, the use of data transformations is generally unavoidable when latency measures are analyzed. Most often the common logarithmic and square-root transformations work quite well, although the resulting scores might sometimes be difficult to interpret meaningfully. In addition, Box & Cox (1964) and Lindman (1974) pointed out that the reciprocal transformation has a natural appeal for the analysis of survival times and latencies, which become easily interpretable in terms of "rate of dying" or risk (see also McCullagh & Nelder, 1983). Furthermore, in cases where the analysis of individual means and comparisons between them rather than the overall significance of a treatment effect are of primary interest, several innovative ANOVA techniques specifically adjusted for various kinds of inhomogeneity and not requiring data transformations may be particularly appropriate (see McCullagh & Nelder, 1983; Wilcox, 1987 and Bechhofer et al., 1995).

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Meeting News

American Psychological Association August 1997 Chicago Illinois. The division 6 program this year was highlighted by an extremely interesting set of reminscences by former division presidents Karl pribram, Eliot Valenstein, and Sir Sidney Weinstein. The Division's D. O. Hebb award for best paper by a new investigator was won by ISCP member and newsletter editorial assistant, Emily Weiss. The 1998 meeting will be in San Francisco 14-18 August. Contact Jeremy Wolfe, Center for Ophthalamic Research, Brigam and Women's Hospital, 221 Longwood Ave, Boston, Massachussetts 02115. Tel 617.732.7841 wolfe@search.bwh.harvard.edu

4th European Congress of Psychology July 1997 Dublin Ireland. Thanks to John Kent, University College Dublin for organizing 2 comparative psychology symposia at this meeting. The symposia included presentations by John Crook, Jeannette Ward, Leslely Rogers, Ethel Tobach, R. J. Andrew, Jim McKnight and others. Thanks too to John for hosting a lovely garden party at his farm in Wicklow which everyone enjoyed.

Upcoming Meetings

Northeast Regional Animal Behavior Meeting. October 3-5, 1997 Marine Biological Laboratory, Woods Hole, MA 02543.
Keynote Address: "Do Clark's nutcrackers have cognitive maps?"Dr. Alan C. Kamil University of Nebraska. Inquiries to: NERAB, c/o Dr. Jennifer Basil, Boston University Marine Program, Marine Biological Laboratory
Woods Hole, MA 02543. E-mail {basil@acs.bu.edu}Please contact for early registration

New England Psychological Association meeting October 24-25, 1997, North Easton, Mass. Duncan A. White will give the presidential address on "Comparative Psychology: a model for the undergraduate curriculum" and Ethel Tobach will give a talk on "The relevance of comparative psychology for scientific literacy."

Primate Socio-ecology: Causes and Consequences of Variation in the Number of Males Goettingen, Germany, 9 - 12 December 1997. This meeting aims to integrate various aspects of primate socioecology related to variation in the number of adult males across groups and taxa, but birds and other mammals will also be discussed. Confirmed speakers include J.Altmann, T. Clutton-Brock, M. Cords, N. Davies, R. Dunbar, E. Heymann, C. Janson, P.Jarman, Pl Kappeler, J.Mitani, C. Nunn, T.Pope, T. Rowell, B. Smuts, V. Sommer, L. Sterck, K. Strier, T. Struhsaker, J. van Hooff, C. van Schaik, D. Watts and R. Wrangham. The conference is also open to guests without presentations. Additional details available from Peter Kappeler (pkappel@gwdg.de) and the conference web site: http://www.dpz.gwdg.de/freiland.htm

5th Biennial Symposium on the Science of Behavior: Behavior, evolution and culture. 23-25 Feb, 1998 Guadalajara, Mexico. Contact Emilio Ribes Inesta, Universidad de Guadalajara, 12 de deiembre 204, Col. Chapalita, Apartado Postal 5-374, Zapopna Jal. 45030 Mexico
tel (3)1223323 fax (3)121158
ribes@udgserv.cencar.udg.mx

7th Biennial T. C. Schneirla Conference 1-5 April 1998 Wichita State University, Wichita Kansas USA The theme is The Four Horsemen revisited: Racism, sexism, militarism, social Darwinism, with presentations by Richard M. Lerner, Jay Rosenblatt, Vera Paster, Joseph L. Graves, Ethel Tobach and others. Contact Gary Greenberg Psychology Department, Wichita State University, Wichita, Kansas 67260 USA tel. 316.978.3823 fax.316.978.3086, greenber@wsuhub.uc.twsu.edu

Southwestern Psychological Association April 9-11, 1998, New Orleans, Louisiana.
Ethel Tobach will give an invited address on "Evolutionary Psychology and the Human Genome Project." The **SW Comparative Psychology Association** will hold its annual

Unpublished Addendum

Table 1. A list of some alternatives to standard statistical methods applied in cases where the data values are censored, * indicates "standard" survival analysis methods, that are implemented in many statistical packages

Problem and the standard approach	Appropriate survival analysis methods	References
Analysis of distribution patterns, estimating and fitting parameters of distributions	Log-survivor plot, Kaplan-Meier estimate of the survival function, generalized least-squares estimates of distribution parameters (unweighted and weighted)*	Bressers et al. (1991); many tests are discussed by Haccou & Meelis (1992) and Lee (1992)
Comparing groups: t-test, Mann-Whitney or Kruskal-Wallis test	Cox F-test, Gehan's Wilcoxon test, log-rank test, Prentice's Wilcoxon test, Peto and Peto's Wilcoxon test*	see Lee (1992) for an overview of many tests; see also Bressers et al. (1991); Pyke & Thompson (1986) provided an informal discussion in the ecological context
Aggregating several censored variables into a single composite	A simple scoring method	Theobald & Goupillot (1990)
Friedman test for repeated measures	Generalized Friedman test	Schemper (1984c)
Testing a monotonous trend in repeated measures	Page test	Theobald & Goupillot (1990)
Calculation of correlation between two censored variables (or one censored and another uncensored)	W-test (a generalized Spearman correlation test) Generalized Kendall correlation coefficient	see Krauth (1988) for a simple description Schemper (1984 a,b)
Multiple regression analysis in which the dependent variable is censored and predictors are uncensored, ANOVA	Cox proportional hazard regression model*	Allison (1984); Blossfeld et al. (1989); Lee (1992); an informal discussion in the ecological context is given by Muenchow (1986)
Multi-way repeated measures ANOVA	The multivariate Burr model	see Kimber & Crowder (1990) for an example of its application in psychology