

Alcoholism Through Chaos Comparison by Non-Linear Model in 7 Pacific Rim Countries

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WCPRR Oct 2008: 212-215 © 2008 WACP
ISSN: 1932-6270

OBJECTIVES Biological studies on alcoholism have been progressing over the past four decades (Arranz et al., 2001; Ferguson & Goldberg, 1997), since diagnostic criteria on the disease were founded on international consensus. Biological aspects of the disease are monotonous, which shows no difference from country to country. However the phenomenological aspects of the disease are different. Clinicians and public health service providers are handling the phenomenological aspects of the disease as thier daily tasks (Meyer, 2001). This paper shows results from three trial analyses, in order to summarize mathematical way of studying on transcultural psychiatry.

At first, some aspects of the alcoholism in the 7 Pacific Rim countries are shown through using a simple questionnaire, MALT (*Munich Alcoholism Test*; Perula de Torres et al., 2005; Gorenc et al., 1984; Feuerlein et al., 1979) through ordinary discriminant analysis to get some sub-groups among the seven countries which seem to have nothing to do with genetic factors. Secondary, we would like to show you that using discriminate function's coefficients' items sometimes give us a rather better ratio of correctly discriminant analysis results than using considered items from the point of view of the disease, for example the CAGE (Dhalla et al., 2007; Dervaux et al., 2006; Malet et al., 2005), and an arithmetic mean data sets.

Thirdly, we will check up whether the rather new statistical way in this area of study, a non-linear mathematical model, the Lorenz model, would work or not.

METHOD MALT (*Munich Alcoholism Test*; Butcher & Pancheri, 1976; Gorenc & Nadelsticher, 1985; Gorenc et al., 1983; Gorenc et al., 1984; Gorenc et al., 1985; Pacurucu et al., 1980; Pacurucu et al., 1994; Rodríguez-Martos et al., 1981; Berry, 1980; Hwu et al., 2000) was administered to 2600 peoples in seven countries in the pacific region. The seven countries are Mexico, Ecuador, Peru, Chile, Bolivia, Taiwan and Japan.

At first it is necessary for us to explain the questionnaire, MALT (Munich Alcoholism Test, which was used in this study. MALT is a convenient diagnostic questionnaire for alcoholism and widely used in many parts of the world. It is comprised of a 'physician part' (7 items) and a 'self administered part' (24 items). It is developed on the definition of alcoholism by WHO. NIAAA took it as a useful diagnostic tool in its handbook.

The S-MALT, the self administered part, was the only used in this study, because the clinical setting differs across countries and it is not so easy to get the same judgments to the same phenomenon of a psychiatric disease if the judgments are done by the clinicians in different cultural backgrounds. For example, in some countries it is not so easy to get the information on ordinary biochemical data, such as GOT, GPT and γ -GT. Subjective data, such as patients' feelings or thoughts, are sometimes rather robust and constant in the trans-cultural psychiatric studies; especially less established countries are included as the targets. That is the reason why F-MALT, physician part was not used in this study, and only S-MALT was utilized.

The sample was divided into two groups, High scorers, who got more than 11 points in S-MALT and Low scorers, who got less than 10 points. 'High scorers' are considered to be alcoholics without using the criteria of DSM-IV (AAVV, 1994) or ICD-10 (AAVV, 1993). In this study the 'High scorers' were only submitted to the analyses.

International samples consisted of 116 Japanese, 407 Taiwanese, 714 Mexicans, 145 Peruvians, 481 Ecuadorians, 652 Chileans and 115 Bolivians. Then only male samples, 921 persons, were analyzed in this study.

From an ethnic perspective, almost all Japanese and Taiwanese are neo-Mongoloids with minor numbers of other ethnic groups. On the other hand Latin, Americans consist of old-Mongoloids, Europeans, mixed-bloods of old-Mongoloids and Europeans, and others. In terms of genetic factors, Japanese and Taiwanese belong to the same group and Latin Americans belong to another one. However, Chileans are different from other Latin Americans. Almost all of them are of mixed blood. From a genetic point of view, they may be different from other Latin Americans.

At first, we administered discriminant analysis to our data set to get some subgroups among the seven countries.

Secondly we compared the correctly discriminated ratios among five types of item sets, Fischer's coefficients including 4 items, CAGE equivalent's 4 items, s-MALT itself including 24 items, the top five items the seven countries commonly have and 6 items we chose for this analysis using the Lorenz equation.

And at last s-MALT was administered to 110 Japanese alcoholics, alcohol abusers and normal persons. The data was analyzed by chaotic model, by using Lorenz equation to produce fractal graphics (Briggs & Peat, 1999; Gleick, 1987; Steeb, 1991; Acheson, 1999; Alligood et al., 1996; Lorenz, 1993; Cambel, 1993; Harold, 1993; Williams, 1997; Peitgen et al., 1992; Sardar & Abrams, 1999; Field & Golubitsky, 1992).

RESULTS A statistically significant sub-group has been found, which is consistent of Peru, Chile, and Bolivia through this discriminant analysis (P value 0.92). As we mentioned above, Chileans are different from Peruvians and Bolivians from genetic point of view. However they seem to have some same phenomenological aspects on alcoholism.

To get concrete images on this point we picked up the items which were used in the discriminant analysis as functional coefficients. We picked up the top six items from all items used as modified discriminant functional coefficients. The Chileans, Bolivians and Peruvians show the most severe sentiments, that is, 'ruin' and 'desperation'.

The Peruvian alcoholics cannot resist against desire for another glass of alcohol in spite of their doctor's prohibition, loss of their partners and that of their self-contentment. And sometimes their smelling of alcohol sometimes gets pointed out. And they feel a ruining of themselves by the effect of alcohol.

Most of the Chilean alcoholics have had these experiences and have tried to change their drinking patterns and to stop taking alcohol in vain. They feel their capabilities deteriorated from the effect of alcohol. And they despair their situation. Sometimes they feel morning nausea and ruin of themselves also.

Once the Bolivians failed to stop taking alcohol, they may be disposed to other persons' severe condemnation and pointing out of their smell of alcohol. They despair and feel ruin of themselves by the effect of alcohol.

On the other hand, Japanese, Mexicans, Taiwanese and Ecuadorians alcoholics do not present such severe sentiments on their situation as the persons in the former three countries. Taiwanese and Mexicans sometimes address their guilty feeling after drinking too much, however Japanese and Ecuadorians do not address their regretful feeling so much.

Fischer's coefficients' items can give us better discriminated ratio between alcoholics and non-alcoholics than those of CAGE equivalent's items and ordinary arithmetic top 5 items do.

At last by using the Lorenz equation we got clearly different images among normal persons, alcohol abusers and alcoholics.

CONCLUSIONS The result of the first analysis may mean that in the three countries, Bolivia, Peru, Chile, once a person may suffer from alcoholism the situation surrounded him may have changed drastically and they may suffer from more severe emotional damages than the other 4 countries. We cannot get the correct reason for this phenomenon only through this analysis; however we may have to change our attitudes toward alcoholics and alcohol problems in terms of the place, or country you work.

The second result may give us a useful hint to make short form discriminate items such as CAGE easily. In this case, it is necessary to administer S-MALT-like long form questionnaire at first, then doing discriminant analysis and taking the items used as Fischer's coefficients from all of the items in the long form, it is possible to make a short and convenient version that is suitable to use in clinical settings and different cultural background.

The third result shows that non-linear statistical model, such as the Lorenz equation, would be a rather useful device to analyze a society, especially to determine the degree of a society is contaminated by a substance, such as alcohol. It gives us rather clear image as fractal graphs.

However to mobilize the Lorenz equation you have to choose 6 items as the nodes to make calculation as you know. That is, you have to change it to another equation if you work in Mexico or Ecuador, because in these countries the alcoholics answering pattern are not consistent.

REFERENCES

- Acheson D. *From calculus to chaos*. Oxford, Oxford University Press, 1999
- Alligood KT, Sauer TD, Yorke JA. *Chaos: An introduction to dynamical systems*. New York, Springer, 1996
- American Psychiatric Association. *Diagnostic and Statistical Manual of Mental Disorders - 4th Edition*. Washington DC, American Psychiatric Publishing, 1994
- Arranz B, Rosel P, Ramirez N, San L. Genetic dysfunction of the serotonin receptor 5-HT_{2A} in psychiatric disorders. *Actas Española de Psiquiatría*, 29: 131-138, 2001
- Berry JW. *Introduction to methodology*. In: Triandis HC & Berry JW. *Handbook of Cross-Cultural Psychology*. Boston, Allyn & Bacon, 1980
- Briggs J, Peat FD. *Seven life lessons of chaos*. New York, Harper Collins, 1999
- Butcher JN, Pancheri PA. *Handbook of Cross-National MMPI Research*. Minneapolis, University of Minnesota Press, 1976
- Cambel AB. *Applied chaos theory: A paradigm for complexity*. San Diego, Academic Press, 1993
- Dervaux A, Bayle FJ, Laqueille X, Bourdel M, Leborgne M, Olic J, Krebs M. Validity of the CAGE questionnaire in schizophrenic patients with alcohol abuse and dependence. *Schizophrenia Research*, 81: 151-155, 2006

ALCOHOLISM THROUGH THE CHAOS

- Dhalla, Shayesta; Kopec, Jacek A. The CAGE questionnaire for alcohol misuse: a review of reliability and validity studies. *Clinical and Investigative Medicine*, 30: 33-41, 2007
- Ferguson RA, Goldberg DM. Genetic markers of alcohol abuse. *Clinica Chimica Acta* NLM. 257: 199-250, 1997
- Feuerlein W, Ringer C, Kufner H, Antons K. Diagnosis of alcoholism: the Munich Alcoholism Test (MALT). *Currents in Alcoholism*, 7: 137-147, 1979
- Field M, Golubitsky M. *Symmetry in chaos*. Oxford, Oxford University Press, 1992
- Gleick J. *Chaos: Making a new science*. New York, Penguin, 1987
- Gorenc KD, Nadelsticher A, Pacurucu S, Feuerlein W. Epidemiological study of alcoholism in Ecuador with the Munich Alcoholism Test (MALT). [Spanish] *Boletín de Estudios Médicos y Biológicos*, 7-8: 391-416, 1983
- Gorenc KD, Bruner CA, Nadelsticher A, Pacurucu S, Feuerlein W. A cross-cultural study: a comparison of German, Spanish and Ecuadorian alcoholics using the Munich Alcoholism Test (MALT). *American Journal of Drug and Alcohol Abuse*, 10: 429-446, 1984
- Gorenc KD, Nadelsticher A. *Comparison of drinking patterns among German, Spanish and Ecuadorian alcoholics*. In: Andrews RH (Ed). *Psychiatry*. New York, Plenum, 1985
- Gorenc KD, Feuerlein W, Nadelsticher A, Pacurucu S, Kufner H. The diagnose of alcoholism through the Munich Alcoholism Test (MALT) in Ecuador, comparison with the German study. [German] *Suchtgefahren*, 2: 468-478, 1985
- Harold JB. *Chaotic mapper*. New York, American Institute of Physics, 1993
- Hwu HG, Gorenc KD, Chou W-H. *A meta-cross-cultural analysis on Taiwan alcoholism psychopathology of alcoholism: symptom profile and Taiwan Alcoholism Screening Test*. Research report for the National Science Council (NSC 89-2413-H-002-001 and 88/08/01-89/07/31) of Taiwan, Republic of China, 2000 (unpublished report; full text in English available on request from Gorenc KD)
- Lorenz E. *The essence of chaos*. Seattle, University of Washington Press, 1993
- Malet L, Schwan R, Boussiron D, Aublet-Cuvellier B, Llorca P. Validity of the CAGE questionnaire in hospital. *European Psychiatry*, 20: 484-489, 2005
- Meyer RE. Finding paradigms for the future of alcoholism research: an interdisciplinary perspective. *Alcoholism Clinical and Experimental Research* NLM, 25: 1393-1406, 2001
- Pacurucu S, Gorenc KD, Feuerlein W, Kufner H. Verification of the alcoholism diagnosis with the MALT-Test (Münchener Alkoholismus-Test): Preliminary study. [Spanish] *Revista de la Facultad de Ciencias Médicas de la Universidad Cuenca (Ecuador)*, 14: 45-66, 1980
- Pacurucu S, Gorenc KD, Nadelsticher A, Feuerlein W. The diagnosis of alcoholism through the MALT (Munich Alcoholism Test): Empirically evaluation. [Spanish] *Revista de Neuro-Psiquiatría*, 57 : 71-87, 1994
- Peitgen H-O, Jürgens H, Saupe D. *Chaos and fractals: New frontiers of science*. New York, Springer, 1992
- Perula de Torres LA, Fernandez-Garcia JA, Arias-Vega R, Muriel-Palomino M, Marquez-Rebollo E, Ruiz-Moral R. Utility of MALT (Munich Alcoholism Test) questionnaire for detection of alcoholism in women. *Clinical Medicine*, 125: 453-455, 2005
- Rodríguez-Martos A Suárez RM, Vecino C, Arundo C. MALT (Munich Alcoholism Test) to establish the diagnosis of alcoholism, adaptation and validation in Spain. [Spanish]. Unpublished paper, Barcelona, 1981
- Sardar Z, Abrams I. *Introducing chaos*. London, Icon Books, 1999
- Steeb WH. *A handbook of terms used in chaos and quantum chaos*. Mannheim, Wissenschaftsverlag, 1991
- Williams GP. *Chaos theory tamed*. Washington, Henry Press, 1997
- World Health Organization. *The ICD-10 Classification of Mental and Behavioral Disorders, International Criteria for Research*. Geneva, World Health Organization, 1993