

CURRENT RESEARCH IN SOCIAL PSYCHOLOGY

Volume 3, Number 5

Submitted: September 23, 1998

Accepted: October 9, 1998

Publication date: October 14, 1998

A PROGRAM FOR CALCULATING P(S) IN COMPLEX, SYMMETRIC STATUS STRUCTURES

Joseph Whitmeyer

University of North Carolina, Charlotte

[64]

[65]

Current theory in the expectation states program uses a graph-theoretic model that yields the effect of a given status structure on the aggregate performance-expectation value, e_p , of a member of that structure (Berger, Fisek, Norman, and Zelditch 1977). The difference between performance-expectation values of two members of the structure, $e_p - e_o$, constitutes the expectation advantage of one over the other. In the standard experimental design of the expectation states program, expectation advantage predicts $P(s)$, the probability that a person will not change an initial choice when informed that a particular other chose the opposite. Expectation advantage is used predictively also in studies outside the standard experimental design that involve effects of differential status. For example, it is an element of various models of hierarchy formation in groups, including those of Fisek, Berger, and Norman (1991) and Skvoretz and Fararo (1996).

However, calculating the performance-expectation value for a person—and $P(s)$ if in the standard experimental setting—can be tedious. Calculation is straightforward, from the positive and negative paths given by the diagram of the status structure. However, if there are many paths there can be considerable calculation. For example, Berger, Norman, Balkwell, and Smith (1992) in their condition 6, had a total of 14 paths: five of length -4 , five of length -5 , two of length 4, and two of length 5. Moreover, at times, such as in designing an experiment, it may be desirable to investigate the predicted effects of several different status structures to anticipate differences that will result. (A useful rule of thumb is that for effects to be visible the difference in $P(s)$ should be at least 0.04.)

In short, a fast easy way to calculate performance-expectation values and $P(s)$ values for status diagram would be useful. Below I give the code for a Basic language program to do this. On an Intel processor machine it might be implemented using, for example, QuickBASIC, within DOS or any Windows environment.

The program calculates $P(s)$ from the performance-expectation values of person and other, e_p and e_o , assuming a symmetric status structure (i.e., whatever characteristics p is high on, o is low on, and vice versa). It uses the linear model for $P(s)$, that is, $P(s) = m + q(e_p - e_o)$ (see Berger et al. 1977). M and q are parameters estimated from the data. m is a baseline tendency to reject influence, essentially a population parameter. q is the overall influence of status (expectation advantage) on changing one's response, essentially a situational parameter. $e_p - e_o$ is status advantage, generally the variable of interest.

Currently, there are three different ways to calculate the performance-expectation value e_p , based on three different ways of calculating the contribution of given path lengths. These are a linear model with coefficients estimated from empirical data (Berger et al. 1977), a linear model with theoretically derived coefficients (Balkwell 1991), and a theoretically derived exponential model (Fisek, Norman, and Nelson-Kilger 1992). The program presents performance-expectation values (e_p) and $P(s)$ values for all three. Generally all three methods yield similar values.

[65]

[66]

Before running the program, the researcher should draw a status diagram, reflecting all actors (p , o_1 , o_2 , and so on) and their possessed characteristics (D_1 , D_2 , C_1 , C_2 , and so forth). The researcher should add induced elements (Γ , τ , Υ) and induced links, and connect all actors to $T+$ and $T-$ through all possible paths. Finally, all path lengths should be listed.

The program may now be run. In QuickBASIC, Shift-F5 will do this. Values for m (typically about 0.65 for college students), q (typically, $0.10 < q < 0.15$), and the path lengths should be entered. Negative path lengths should be entered as negative numbers. After the last path length has been entered, hit <enter> (or 0) for the next path length. Calculations appear, as in the example in Figure 1 below.

```
m? .65
q? .1
Path length? 4
Path length? 5
Path length? -4.8
Path length? -5.8
Path length?
Fisek exponential:
  e(p) is 9.346545E-02
  p(s) is .6686931

BFNZ polynomial:
  e(p) is .1263731
  p(s) is .6752746

BFNZ polynomial, Balkwell coeffs.:
  e(p) is .1115733
```

p(s) is .6723146

more? N

Figure 1. P(s) Program Output For Second Order Expectations Experiment (Webster, Whitmeyer, and Troyer 1998)

[66]

[67]

Note that in the example of Figure 1, the negative path lengths were not whole numbers. Recently the possibility of variable (non-whole number) path lengths has been introduced to handle source effects (Fisek, Berger, and Norman 1995) and second order expectations effects (Webster, Whitmeyer, and Troyer 1998) using the graph-theoretic model. As shown in the example, this program also can calculate performance-expectation values and P(s) values for variable path lengths.

In the future, it would be desirable to have a graphical version of this program, which could calculate these values directly from status structures. However, until that time, this program may help to ease some of the calculation burden of estimating effects of status structures.

APPENDIX

.BAS file for Whitmeyer's Expectation Advantage Program

```
REM
REM This computes p(s) for paths of given lengths. It uses three
REM methods to compute f(i) for path-lengths. One is Fisek's exponential
REM function; one is the polynomial function from Berger, Fisek
REM Norman, and Zelditch (1977: ch. 5) with user-input values, and
REM one uses Balkwell's (1991 Advances) values for k and f(7).
REM
PRINT
PRINT "Three different models for f(i) (Fisek, BFNZ, Balkwell)."
```

PRINT

```
f4 = .1768: k = 3
REM PRINT "For BFNZ, to calculate f(i), give f(4) (usually 0.1768)"; : INPUT
f4
REM PRINT " ... and k (usually 3)"; : INPUT k
xk = 3.191636: f7 = .005
PRINT : PRINT "Put path length of 0 when done.": PRINT
alefta = 1: blefta = 1
aleftb = 1: bleftb = 1
aleftc = 1: bleftc = 1
PRINT "m"; : INPUT m
PRINT "q"; : INPUT q
p = 0: n = 0
100 PRINT "Path length"; : INPUT i
IF i = 0 THEN
    PRINT "Fisek exponential:"
    ep = (1 - blefta) * p - (1 - alefta) * n
```

```

PRINT " e(p) is "; ep
sp = m + q * ep * 2
PRINT " p(s) is "; sp
ep = (1 - bleftb) * p - (1 - aleftb) * n
PRINT : PRINT "BFNZ polynomial:"
PRINT " e(p) is "; ep
sp = m + q * ep * 2
PRINT " p(s) is "; sp
ep = (1 - bleftc) * p - (1 - aleftc) * n
PRINT : PRINT "BFNZ polynomial, Balkwell coeffs.:"
PRINT " e(p) is "; ep
sp = m + q * ep * 2
PRINT " p(s) is "; sp
PRINT : PRINT "more"; : INPUT a$
IF a$ <> "y" THEN STOP
alefta = 1: blefta = 1
aleftb = 1: bleftb = 1
aleftc = 1: bleftc = 1
p = 0: n = 0
ELSE
  IF i < 0 THEN
    j = -i
    fa = 1 - EXP(-2.618 ^ (2 - j))
    xp1 = k ^ (4 - j)
    fb = 1 - (1 - f4) ^ xp1
    xp = xk ^ (7 - j)
    fc = 1 - (1 - f7) ^ xp
    n = 1
    alefta = alefta * (1 - fa)
    aleftb = aleftb * (1 - fb)
    aleftc = aleftc * (1 - fc)
  ELSE
    xp1 = k ^ (4 - i)
    fa = 1 - EXP(-2.618 ^ (2 - i))
    fb = 1 - (1 - f4) ^ xp1
    xp = xk ^ (7 - i)
    fc = 1 - (1 - f7) ^ xp
    p = 1
    blefta = blefta * (1 - fa)
    bleftb = bleftb * (1 - fb)
    bleftc = bleftc * (1 - fc)
  END IF
END IF
GOTO 100
END

```

[67]

[68]

REFERENCES

Balkwell, James W. (1991). "Status Characteristics and Social Interaction." Pp. 135-176 in *Advances in Group Processes*, Vol. 8, Edward J. Lawler, Barry Markovsky, Cecilia Ridgeway, and Henry A. Walker (Eds.). Greenwich, CT: JAI.

Berger, Joseph, M. Hamit Fisek, Robert Z. Norman, and Morris Zelditch, Jr. (1977). *Status Characteristics and Social Interaction: An Expectation States Approach*. New York: Elsevier.

Berger, Joseph, Robert Z. Norman, James Balkwell, and Roy F. Smith (1992). "Status Inconsistency in Task Situations: A Test of Four Status Processing Principles." *American Sociological Review* 57:843-855. (Reprinted with revision as Ch. 10, pp. 207-228 in J. Berger and M. Zelditch, Jr. (Eds.) *Status, Power and Legitimacy: Strategies and Theories*. New Brunswick, NJ: Transaction.

Fisek, M. Hamit, Joseph Berger, and Robert Z. Norman (1991). "Participation in Homogeneous and Heterogeneous Groups: A Theoretical Integration." *American Journal of Sociology* 97:114-42.

_____ (1995). "Evaluations and the Formation of Expectations." *American Journal of Sociology* 101:721-746.

Fisek, M. Hamit, Robert Z. Norman, and Max Nelson-Kilge. (1992). "Status Characteristics and Expectation States Theory: A Priori Model Parameters and Test." *Journal of Mathematical Sociology* 16:285-303.

Skvoretz, John and Thomas Fararo (1996). "Status and Participation in Task Groups: A Dynamic Model." *American Journal of Sociology* 101:1366-1414.

Webster, Murray Jr., Joseph Whitmeyer, and Lisa Troyer (1998). "Building Theories of Second-Order Expectations." Paper presented at the Specialized Conference on Theory Development and Theory Testing in Group Processes, 17-18 August, Vancouver, BC.

AUTHOR BIOGRAPHIES

Joseph M. Whitmeyer is assistant professor of sociology at the University of North Carolina at Charlotte. His work is focused principally on identifying and quantifying the various determinants of social power. His email address is jwhitmey@email.uncc.edu.