PAPER 320

THE TRANSCENDENTAL MEDITATION PROGRAM AND CRIME RATE CHANGE: A CAUSAL ANALYSIS

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The results of two studies reported in this paper support a causal relationship between participation in the Transcendental Meditation programme and decreased crime rate in urban areas.

—EDITORS

Causal analysis using cross-lagged panel correlation was performed to assess whether the relationship between Transcendental Meditation (TM) program participation and decreased crime rate in urban areas is causal. One study involved a random sample of 160 U.S. cities measured from 1964 to 1978; the second study used a random sample of 80 metropolitan areas. Results of both studies suggest that the relationship is not spurious and that TM program participation is the causal factor.

During the past decade, scientific study has generated a substantial research literature on the effects of the Transcendental Meditation (TM) technique (1), a popular practice learned by over one million Americans (2). Initial studies suggested that the TM technique resulted in physiological changes indicative of a unique "wakeful hypometabolic" state (3) with subsequent physiologically and psychologically beneficial effects (4). The broad outlines of these initial suggestions have been supported by many studies (5).

One of the most dramatic predictions about the technique, however, is that "field effects" in the surrounding social environment may be elicited by practice of the technique; specifically, it was predicted that area-wide decreases in social turbulence and disorder, particularly crime, would result from practice of the technique by a small proportion, on the order of one percent, of a community (6). Apparent action-at-a-distance phenomena in physics have traditionally been theoretically explained by positing the existence of underlying fields (7). Similarly, in the case of these predicted social field effects it is proposed that the field at the basis of the phenomenon is consciousness itself (6). Interestingly, in the last five years there have been several studies which lend support to this predicted relationship between TM program participation and crime rate change (8).

Unfortunately, such research, as all sociological research, is hampered by methodological difficulties associated with the problem of inferring causality from correlational data, in the presence of a large number of alternative hypotheses. This concern is increased for research on this topic, because the prediction is dramatically new in the light of current paradigms of either social behavior or the nature of consciousness. In one published study (9), decreased crime rate was found in 1973 among the 24 cities larger than 10,000 population which reached one-percent TM participation in 1972, compared
with 24 cities matched for geographic region, population, and college population, statistically controlling through analysis of covariance for demographic variables related to crime on which the groups of cities differed; decreased crime rate trend over the following five years was also found by the same method of analysis. However, even though studies may have controlled for particular alternative hypotheses suggested either by the data or by current criminological theory, what is needed is a methodology to reject the alternative that any unmeasured variable might serve as an alternative hypothesis to the prediction being tested. The method of cross-lagged panel correlation (CLPC), a specific example of structural modeling, is designed to serve this purpose when its assumptions are met (10). The purpose of our studies reported here is to see whether the previously-reported relationship between TM technique participation and crime rate decrease would still be found in large random samples of cities and metropolitan areas, and whether CLPC would suggest such a relationship to be causal or spurious.

Cross-lagged panel correlation involves at least two variables (X and Y) measured at (at least) two points in time (1 and 2). To state the CLPC procedure most simply, one compares the two cross-lagged correlations, i.e., the correlation of variable X at time 1 with variable Y at time 2, and the correlation of variable Y at time 1 with variable X at time 2. If the statistical assumptions of CLPC are met (11), then a finding of unequal cross-lagged correlations indicates rejection of the null hypothesis that the relationship between the two variables is due to any unmeasured variable (a spurious relationship) rather than causality.

The first study using this analysis procedure assessed crime rate patterns in a large sample of U.S. cities. A random sample of 40 cities was selected from each of four population groups: over 250,000; 100,000–250,000; 50,000–100,000; and 25,000–50,000 (12). This sample comprised 26% of all cities larger than 25,000 population and 25% of the total U.S. metropolitan population in 1970 (13). Federal Bureau of Investigation (FBI) "Uniform Crime Index" totals were obtained for each year from 1964 to 1978 and expressed as rates per 10,000 population. Although FBI data are not free from bias, this is the only reliable data source for a large-scale study of crime rate changes over time such as this one; the sources of bias in FBI statistics are not those which could reasonably be expected to covary with TM participation (14), and the data were obviously collected independent of the hypothesis being tested. In order to assess crime rate changes beginning in 1972, the crime variable used, for each year from 1972 to 1978, was the deviation of the actual crime rate from that predicted by linear regression from the city’s prior trend (1964–1971). This measure was selected on the basis of prior research (9) as a sensitive index of change which controls for the differing prior history of each city. TM participation was defined as the percentage of a city’s population instructed in the TM technique as of the beginning of the given year (15), and the relationship between this variable and decreased crime rate was investigated by CLPC using partial correlations controlling for other social variables which might represent obvious alternative causes. The following social variables, found from previous research to be related to crime rate variation (16), were included in a multiple regression analysis to assess their contribution to crime rate change each year: median years education, percentage unemployment, per capita income, percentage of families in poverty, stability of residency over five years, median age, percentage over age 65, population size and density, and police rate (number of police per unit population). The following four variables made consistent significant independent contributions to predicting crime rate from 1972 to 1978 and were statistically controlled by partial correlation: police rate, median years education, unemployment rate, and percentage over age 65 (17). In addition, as a final guard against violation of the assumptions of the analysis, correlations at each time period with two other variables were included to allow for adjustment of the cross-lagged and synchronous (single-year) correlations for changes in reliability which might result in cross-lagged differences in the absence of a causal effect, and to allow for testing of the major assumption of CLPC (11). These two variables were deaths by motor vehicle accidents and by suicide, measured in the same manner as the crime variable from death rate data over 1967–1977 (18). These variables were included as measures of urbanization and breakdown of social cohesion which were easily available and measured quite accurately.

The synchronous (same-year) partial correlations between TM participation and crime rate change were of low order but significant for each year from 1973 to 1978 (table 1). The cross-lagged panel analy-
TABLE 1
CROSS-LAGGED PANEL ANALYSIS OF CITIES

<table>
<thead>
<tr>
<th>YEAR</th>
<th>N</th>
<th>SYNCHRONOUS PARTIAL CORRELATION</th>
<th>CROSS-LAGGED DIFFERENCE</th>
<th>Z-SCORE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1972</td>
<td>146</td>
<td>-1.135</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1973</td>
<td>146</td>
<td>-1.43*</td>
<td>-1.156</td>
<td></td>
</tr>
<tr>
<td>1974</td>
<td>146</td>
<td>-1.60*</td>
<td>-0.781</td>
<td></td>
</tr>
<tr>
<td>1975</td>
<td>146</td>
<td>-2.16**</td>
<td>-1.622</td>
<td></td>
</tr>
<tr>
<td>1976</td>
<td>146</td>
<td>-2.09**</td>
<td>-1.727*</td>
<td></td>
</tr>
<tr>
<td>1977</td>
<td>145</td>
<td>-2.08**</td>
<td>-2.359**</td>
<td></td>
</tr>
<tr>
<td>1978</td>
<td>145</td>
<td>-1.59*</td>
<td>-1.263</td>
<td></td>
</tr>
</tbody>
</table>

*p < .05  **p < .01

CROSS-LAGGED PATTERN OF ADJUSTED PARTIAL CORRELATIONS


NOTE: Synchronous (same-year) correlations between TM program participation and crime rate change are listed, with the tests of significance of difference of cross-lagged correlations for the lags from 1972 to each subsequent year. Patterns of cross-lagged correlations are listed for the two significantly different lag periods.

The second study replicated this procedure among a sample of 80 standard metropolitan statistical areas (SMSAs). SMSAs were chosen as the unit of analysis to give greater control for the possibility of proximity effects between cities in a single metropolitan area. Random samples of 40 SMSAs were chosen from the two population groups of 500,000 or larger and 200,000-500,000 by 1970 census figures. This sample constituted 55% of SMSAs over 200,000 population, and included 47% of the total metropolitan population of the U.S. in 1970 (13). The methodology of this study exactly replicated that of the first study, with three differences. The first is that the crime index figure used excluded the larceny category, because the FBI reporting system changed the larceny category definition in 1973 and published reports do not allow SMSA larceny figures after 1973 to be made comparable to earlier figures. The second difference is that 1979 crime figures were available at the time of the study and were included (21). The third variation is that a slightly expanded list of variables was selected as potential variables for which to control by partial correlation: median education, median age, percentage of families in poverty, per capita income, percentage unemployment, population, population density, change in population, area, black population, change in black population, stability of residence over five years, and percentage of college students (22). Multiple regression analysis indicated that the two variables, per capita income and number of black population, made consistent independent contributions to predicting the crime rate variable each year, and were controlled by partial correlation (23).

The synchronous (same-year) partial correlations between TM participation and crime rate change among the SMSAs were again low order negative correlations which were significant in 1974, 1975, and 1979 (table 2). The relationship showed a later onset among the SMSAs than among the cities. This apparently developmental situation raises questions about the statistical assumption of a stable causal model in CLPC (11); however, after adjusting the synchronous and cross-lagged partial correlations for changes in reliability, the assumptions of the analysis were not vitiated by the data (24). Nevertheless, the cross-lagged differences were assessed both from 1972 and from 1973 to each later year; by 1973 the relationship between TM participation and crime rate change had become more evident. As indicated by z-scores in table 2, all of the cross-lagged differences of partial correlations from 1972 reached statistical significance; similarly, four of the six lags from 1973 showed significant cross-lagged differences. The direction of significance is again...
consistent with a hypothesis of TM participation causality in decreased crime rate. Table 2 also lists the partial correlation patterns for the sample cross-lagged time periods 1972–1976 and 1973–1976.

The results of the two studies, rather than suggesting a spurious relationship, give evidence for a causal influence associated with practice of the TM technique. Although the size of the correlations suggesting a spurious relationship, give evidence for a gramm participation and crime rate change are denoted. The high TM participation; the average level of participation in 1976 was .45% for cities and .33% for SMSAs (25). In addition, the size of the effect is apparently substantial; it has been recently pointed out that a correlation of .20 (conservatively typical for our studies) actually corresponds, in effect size, to an effect of a 20% change in improvement rate by a treatment procedure (25).

The methodology used in these studies could be refined further by testing more specific causal models; nevertheless it is essentially the most rigorous general strategy available, when its restrictive assumptions are met, for assessing causal influences for many issues of social relevance which are not amenable to experimental intervention (10). Recent evidence suggests, however, that such intervention studies are possible in the testing of the hypothesis of this study; advanced procedures of the TM program, for which an even smaller number of participants is predicted as necessary for the same field effects, allow a practically-sized group of practitioners to be moved into areas for such studies. Interventions of this type have been carried out with positive results (26). Such experimental intervention is obviously the most powerful direction for future rigorous research on the phenomenon found in the present studies.

**ACKNOWLEDGMENTS**

We are grateful for the assistance of Terry Bauer, Kathy Carella, Larry Evertson, Mary Haupt, René Hernandez, and George Hyatt.

**REFERENCES AND NOTES**

1. More than 400 references on the topic are listed as of September 1981 in the following computerized data bases: *Science Citation Index, Psychological Abstracts, and Dissertation Abstracts*.

2. World Plan Executive Council, responsible for teaching the TM technique in the U.S., 5000 14th St., N.W., Washington, D.C. 20011.


11. The major assumption is termed “stationarity,” which means that the underlying structural equation of the statistical model is the same at the two time periods, i.e., that the causal process did not change during the period studied. Equality of the synchronous correlations has been used as a test of stationarity in the two-variable, two-time-period case, but unfortunately this equality is neither a necessary nor sufficient condition for stationarity. A more realistic situation is found in the case of a many-variable, two-time-period analysis. In this case a number of exogenous variables may be considered to cause (spuriously) the observed relationship, and there is a presumed factor structure of the variables posited; if so, the stationarity assumption may be relaxed to “quasi-stationarity,” which indicates that the structural equation is invariant after adjustment for changes in communality. Importantly, under the assumption of quasi-stationarity, communality ratios for each variable may be computed and used to correct cross-lagged correlations for changes in communality. (In the text the term “reliability” is used; communality is strictly correct, although this will equal reliability for a variable with no specific factor (10).) In addition, if the set of variables is four or more, the equality of similarly-corrected synchronous correlations will test the assumption of quasi-stationarity. In the two studies described here, two additional variables were added to the two primary variables of interest in order to make use of these obvious advantages of the four-variable case. A second major assumption of cross-lagged panel analysis is “synchronicity,” which simply states that variables must be measured at the same time. Threats to this assumption are retrospection (in psychological data) and aggregation. A third major assumption of CLPC which has recently been discussed is that the method assumes equal stability (correlation from time one to time two) of the two variables (D. Rogosa. 1980. Psychological Bulletin 88: 245).
Unlike the assumption of quasi-stationarity, this assumption was not directly tested for. However, it has been identified that the direction of bias in case of unequal stabilities is that the variable with lower stability will appear to be the causal factor (D. Rogosa, ibid.). As noted above (tables 1 and 2), the crime variable consistently had lower stability than the TM program participation variable; this indicates that any bias in the results due to unequal stability would work against finding results consistent with the major hypothesis. Thus, the size of effects reported below with respect to the hypothesis of TM program participation causing crime rate decrease should be considered quite conservative.
12. Cities with 10% or more college population were excluded from the sample. Prior to 1973 a majority of those beginning the TM technique were college students, and the mobility of this population might create serious measurement error over the long time span of the study.
15. A computer print-out listing the number of persons instructed in the TM technique in each U.S. city each year was obtained from the source cited above (2). It may be questioned whether the TM participation variable violates the assumption of synchronicity as an aggregated measure (11). However, this variable described the percentage of people in a city who, at any one time, are presumed to be regularly practicing the technique. Attrition from regularity is assumed constant across cities. If so, the linear relationship between variables will not be affected; if not, measurement error is compounded which should reduce the magnitude of measured effects, should they exist.
17. Control variables should explain equivalent amounts of variance in the two time periods assessed in order not to introduce bias. Although none of the four variables was equally correlated with crime over time, their combination was. In addition, the results of the cross-lagged analysis were virtually identical for both simple and partial correlations.
18. The baseline period for the motor vehicle death and suicide data was 1967–1971. Data for 1978 for these two variables was unavailable at the time of the study and as a result 1977 figures were included for these two variables in the 1978 cross-lagged analysis; the results for this year

19. All significance tests for the magnitude of synchronous correlations and for differences of cross-lagged correlations are one-tailed tests because the direction of effects is clearly predicted. Two-tailed tests were employed, however, for assessing differences in synchronous correlations in order to test the assumption of quasi-stationarity, because a difference in either direction would violate the assumption. Tests of significance on the difference in synchronous correlations at each time lag were consistent with the assumption of quasi-stationarity (z < .4 in absolute value in each case). Differences in synchronous correlations prior to adjustment for changes in communality were also nonsignificant; in addition, the adjustment decreased the size of the difference in five of the six cross-lags.

20. It has been pointed out that two causal hypotheses are actually consistent with any significant difference in cross-lagged correlations (10). In the present case, the differences found here could be consistent with either TM participation causing decreased crime rate, or decreased crime rate causing an increase in TM participation. However, two lines of evidence support the first of these hypotheses (10). One is that the sign of the correlation is negative, a result consistently found in prior research; the second is that in the 1972–1977 pattern of correlations of table 1 and in the consistent pattern of unreported cross-lagged analyses of correlations, the cross-lagged correlation is larger than the synchronous correlations.

21. Correspondingly, 1978 figures on deaths due to motor vehicle accidents and suicides were available, and were included in the same way as noted above (18) for not only 1978 but 1979 cross-lagged analyses. This did not affect the pattern of results for 1979 data. In addition, the TM participants variable used for 1979 was the degree of participation by August 1978; this was the most recent figure available at the time of the study.

22. All data were taken from 1970 census figures, except “change” variables, which indicated changes from 1960 to 1970. Police coverage figures were not included for partial correlation because these data are not published for SMSAs.

23. As in the first study (17), the two variables were not equally correlated with crime data at all points in time; there was a slight decrease over time from 1970. However, the results were comparable for both simple and partial correlations.

24. None of the tests of the difference of synchronous correlations (adjusted for change in communalities) reached significance, consistent with the assumption of quasi-stationarity. In addition, the adjustment decreased the difference in the synchronous correlations in 11 of 13 cases (as indicated by comparison of z-scores).

25. ROSENTHAL, R., and RUBIN, D. B. 1982. *Journal of Educational Psychology* 74: 166. For example, allowing for a 20 percent attrition due to population migration because of the large percentage of college students among TM participants prior to 1975, only six cities in study 1 and two SMSAs in study 2 reached one percent TM program participation during the time of these studies. Each of these displayed decreased crime rate in the years after reaching this threshold, both relative to the level predicted from the baseline and relative to the prior years beginning with 1972.