Journal of Scientific Exploration, Vol. 23, No. 2, pp. 139–166, 2009 0892-3310/09

RESEARCH

A Field-Theoretic View of Consciousness: Reply to Critics

David W. Orme-Johnson and Robert M. Oates

Maharishi University of Management
Fairfield, IA 52557

Abstract—This paper replies to a critique (Fales & Markovsky, 1997) of a study reporting that group practice of the Transcendental Meditation program had a measurable effect on objective measures of the quality of life in Israel and the war in Lebanon (Orme-Johnson et al., 1988). The critics proposed various cultural/political events as alternative explanations for the results. These events could not explain the results, as indicated by (1) simple inspection of the published data; (2) statistical analyses controlling for these events; (3) analyses of reduced data sets that completely eliminated the days of the events from the analyses; and (4) analyses of six random samples of 50% of the data. Although some of the cultural/political events suggested did have a significant effect on a composite index of crime, traffic accidents, fires, war intensity, stock market, and national mood, the effects of these events were independent of the effect of the meditators and could not explain it. We argue that Maharishi's theory of collective consciousness provides a unifying framework that explains these results through a logical structure of clearly defined, operationalized terms grounded in physiological and behavioral research, which makes specific quantifiable and socially important predictions that have been extensively replicated.

Keywords: Transcendental Meditation—collective consciousness—Maharishi Effect—social indicators—conflict resolution—global consciousness—distant intentionality—consciousness

Introduction

Evidence has accumulated from a number of sources over the past three decades supporting a field-theoretic view of consciousness (e.g., Dillbeck, 1990; Hagelin et al., 1999; Jahn et al., 1997; Jonas & Crawford, 2003; Nelson et al., 2002; Orme-Johnson et al., 1988, 1990, 2003; Radin, 2006; Schlitz et al., 2004; Schlitz & Braud, 1997). Research has demonstrated that both individuals and groups focusing their attention on a common event may produce small but statistically significant effects on inanimate detectors, such as random generators (Jahn et al., 1997; Nelson et al., 2002; Radin, 1997, 2002, 2006). Well-controlled electroencephalogram (EEG) studies have shown that evoked potentials in one person's brain may produce changes in the brain of another person to whom they feel close personal connections, but who was isolated from them in an

electromagnetically shielded room (Radin, 2004; Wackermann et al., 2003). Studies using functional magnetic resonance imaging (fMRI) also suggest that the brains of individuals separated from each other may become significantly correlated (Standish et al., 2003). Healers focusing positive energy on patients to whom they feel a special connection appear to produce fMRI changes in the brains of the patients, even though the patients were isolated and the periods of focusing were on a random schedule (Achterberg et al., 2005). Nineteen studies indicate that when a person sends anxiety-provoking thoughts to another person isolated from him, they may produce significant electrodermal stress reactions in that person (Schlitz & Braud, 1997). Reviews have found over 2200 reports of distant intentionality, including distant healing (Dossey, 1999; Jonas & Crawford, 2003; Schlitz, 1996; Schlitz et al., 2004).

Since 1975, 33 studies have been published in peer-reviewed journals and another 18 in research anthologies reporting that the Transcendental Meditation (TM) program and its advanced variant, the TM-Sidhi program, may have beneficial effects on the general population (Orme-Johnson, 2009). In these studies there is no obvious physical connection between the meditators and the affected population, nor is there any intention from the meditators to have any effect. The phenomenon, which has been named the Maharishi Effect, appears to be a by-product of increased coherence in the collective consciousness (Dillbeck et al., 1987). These effects are measured by changes in objective social indicators, such as crime rate, economic indicators, and war-related variables (e.g., Cavanaugh & King, 1988; Davies & Alexander, 2005; Dillbeck, 1990; Dillbeck et al., 1987, 1988; Gelderloos et al., 1990; Hagelin et al., 1999; Orme-Johnson et al., 1988, 1990).

The majority of these studies on social indicators have used Box and Jenkins (1976) autoregressive integrated moving averages (ARIMA) time series analyses. The main threat to internal validity in time series experiments is "history," that is, some other variable more or less simultaneous with the experimental variable, which, in fact, may have caused the effect. The credence of the experimental results depends on ruling out plausible and even implausible other variables or arbitrary events that may possibly have caused the observed change (Campbell & Stanley, 1963). The ARIMA methodology controls for a major class of confounds from "history," which are cycles and trends originating from known or unknown sources (such as weekends, seasonal effects, long-term changes in economic trends, and random walks). It also addresses the statistical issue inherent in most time series, which is that they are auto-correlated and are not statistically independent data points, which is a necessary condition for virtually all statistical tests.

The ARIMA methodology allows the researcher to identify, model, remove, and diagnose the effects of time dependencies in the data before applying inferential statistics. It also permits the study of multiple input variables, so that alternative explanatory or moderator variables can be modeled and their independent effects and interactions with the experimental variable can be directly quantified,

assessed and controlled. Such controls for history have been used in research on the Transcendental Meditation technique to control for monetary growth and supply shocks on an index of inflation and unemployment (Cavanaugh & King, 1988), to control for a new police vigilance system on crime rate (Dillbeck et al., 1987), to control for changes in police staffing on crime rate (Hagelin et al., 1999), and to control for the effects of holidays on a quality-of-life index (Orme-Johnson et al., 1988).

Another major research issue is external validity, which in this research means whether the results generalize to different target populations, treatment (meditator) groups, and outcome variables (Campbell & Stanley, 1963). Studies have demonstrated the Maharishi Effect in many different nationalities and cultures, e.g., Canada (Assimakis & Dillbeck, 1995; Cavanaugh, 1987); India, Philippines, and Puerto Rico (Dillbeck et al., 1987); Israel and Lebanon (Davies & Alexander, 2005; Orme-Johnson et al., 1988); and the U.S. (Cavanaugh & King, 1988; Dillbeck, 1990; Dillbeck et al., 1987, 1988; Hagelin et al., 1999). The effects have been demonstrated on the levels of cities (Dillbeck et al., 1987; Hagelin et al., 1999), states (Dillbeck et al., 1987), nations (Davies & Alexander, 2005; Orme-Johnson et al., 1988), and the world (Gelderloos et al., 1990; Orme-Johnson et al., 2003). The different groups practicing the TM technique have been composed of individuals from many nationalities, so external validity is strong for this technique.

Many of the scholarly exchanges about this research have focused on one particular study published in the *Journal of Conflict Resolution* (Orme-Johnson et al., 1988). These exchanges illustrate how criticism of the research has been addressed (Brown, 2005; Duval, 1988; Orme-Johnson et al., 1988, 1990; Russett, 1988; Schrodt, 1990). We will briefly review this published debate and then turn to replying to a critique of the study (Fales & Markovsky, 1997), which has not previously been addressed in the published literature.

The study in question, entitled "The International Peace Project in the Middle East," was a prospective experiment, supported by a grant from the Fund for Higher Education. During a 2-month period (August and September 1983), a group of Israeli meditators was assembled in Jerusalem in a hotel to practice the TM and TM-Sidhi program together as a group (Orme-Johnson et al., 1988). The outcome variables were all the relevant social indicators available and included crime, auto accidents, fires, war deaths, war intensity, stock market, and national mood. All were obtained from governmental or other public sources, and specific predictions were lodged in advance of the study with an independent project review board. Given that these were public data and predicted in advance, there was no possibility of opportunistic data mining (Campbell & Stanley, 1963). Moreover, assessor blinding is built into research on such measures because the data are routinely collected by governmental and other public agencies without any knowledge of the experiment. In addition, there were no known changes in how the data were defined or collected over the experiment, which could potentially be another confound (Campbell & Stanley, 1963).

The independent variable was the daily number of meditators in the group, which met twice a day. The size of the group, which ranged from 65 to 241, was precisely known because the meditators were counted every session. Three times during the experiment before the data were analyzed the daily totals were sent to members of the project review board (Orme-Johnson et al., 1988).

ARIMA transfer function and impact assessment analysis of daily data over the 2-month period of the study showed significant covariation in the predicted direction of the social indicators with the size of the meditator group, controlling for time-correlated history variables and religious holidays. The effect was particularly strong for composite indices of the dependent variables. This would be expected if there were a common influence on all of the variables, which was enhanced by signal averaging (Orme-Johnson et al., 1988: 806).

The study went through twice as many reviewers as usual before it was published (Russett, 1988). One reviewer suggested that the results might be due to reverse causation. He suggested that news of the war increasing could have motivated the meditators to come from various parts of Israel to join the group (Duval, 1988). But he dropped this suggestion when it was pointed out that (1) such a scenario would have resulted in an increased number of meditators in the group being correlated with increased war, which was the opposite of what was observed, and (2) changes in the meditator group size led changes in the war and other variables (Orme-Johnson et al., 1988).

Another reviewer argued that the modeling of time series is flexible, and therefore vulnerable to false positives (Schrodt, 1990). The study authors demonstrated that using the objective Akaike criteria of model efficiency the "best" model strongly supported the hypothesis (Orme-Johnson et al., 1990). The study authors also showed that the "best" model according to Liu's linear transfer function approach, as well as the simplest possible adequate model, also strongly supported the hypothesis.

The reviewer also argued that time series analysis gives many possible lags at which a significant effect could show up, which increases the chances of a Type 1 error (Schrodt, 1990). However, all the major variables showed significant effects at lags 0 or 1, indicating an immediate or next day effect, as predicted by the theory. Moreover, the conclusions were not changed if one ignored the few longer lagged effects that were statistically significant (Orme-Johnson et al., 1990). At the suggestion of the reviewer (Schrodt, 1990), the study authors also conducted robustness checks of the analysis by using random "pseudointerventions" and did not find any evidence of false positives (Orme-Johnson et al., 1990).

However, Fales and Markovsky (1997) maintain that previous reviewers overlooked several events occurring at the time of the experiment, which could potentially provide mundane explanations for the results. The remainder of this paper is a detailed reply to these critics, and all references to "the reviewers" or "the critics" will be to their paper, unless otherwise indicated. References to "the original study" and "the study" refer to Orme-Johnson et al. (1988), unless

otherwise indicated. In the first section of the paper we address the methodological issues raised by the reviewers, and then we take up the theoretical issues in the second section.

Methodological Issues

The reviewers maintain that several potentially confounding variables were not controlled: (1) other religious holidays; (2) August holidays; (3) summer heat; (4) the announcement and eventual withdrawal of Israeli troops from the Shouf mountains and its effects on the war; (5) the announcement and eventual resignation of Prime Minister Menachem Begin; and (6) a successful sweep of Beirut by the Lebanese army. (These events are described in detail in the *New York Times* Index "Middle East" for this period.) However, most of these events do not satisfy even the most minimal requirements of an alternative explanation, because they do not account for the observed significant correlations between the size of the meditator group and changes in the dependent variables in the predicted directions over the entire experiment.

Holidays

The original study did control for Rosh Hashanah, September 8, 1983, and Yom Kippur, September 17, 1983, and found that they did not diminish the meditator effect, nor did they have any effect on the war in Lebanon, although they did have a significant independent effect on a composite index for Israel, as shown in Tables 2a–e of the original study (p. 799). However, the reviewers contend that three other religious holidays, Succoth, Shemini Azeret, and Simhat Torah, could influence the results. In 1983, Succoth was celebrated in Israel over an 8-day period, from September 22 through September 29. Shemini Azeret and Simhat Torah were celebrated together in Israel on the eighth day of Succoth, so the 8 days of Succoth include all three holidays. It is obvious from simple visual inspection of figures published in the original paper that these 8 days cannot explain the co-variation between the size of the meditator group and the social indicators seen in the preceding 51 days for War Intensity (see Figure 2 of the original study, p. 794) or the Overall composite index (see Figure 3 of the study, p. 795). On 5 of the 8 days during Succoth, the war intensity in Lebanon was above the mean, disproving these reviewers' contention that these holidays might have been correlated with reduced hostilities.

August

The reviewers maintain that many people leave Israel in August because it is a vacation month and they propose that this may explain the reduction in automobile accidents. However, simple inspection of the published plots of the raw data, which were given to the reviewers, indicates that there was no special reduction in auto accidents during August (Orme-Johnson et al., 1988: Appendix A).

Summer Heat

The reviewers speculated that there may be a tendency to cook less during the hot weather of August, which might account for fewer fires in August. Again, inspection of the data plots shows that there were actually more fires in August than September, indicating more, not fewer, fires on hotter days. The reviewers also suggested that war hostilities may decrease during the desert heat of August, and inspection of Figure 2 of the original paper shows that war intensity does appear to be generally less in August than September. However, this does not explain the detailed correlation between meditation attendance and reduced warfare in both August and September.

Military/Political Events

The reviewers do not provide any rationale, specific predictions or even *post hoc* speculations for how the resignation of Prime Minister Begin, the withdrawal of Israeli troops from Lebanon, or the sweep of Beirut might be expected to influence the social indicators for Israel and Lebanon. Neither do they offer an explanation for how these events could account for the observed correlation between the rise and fall of the size of the meditator group and rise and fall of the quality-of-life indices. The quantitative analyses presented below show that although some of these events did have an effect on the quality-of-life index, they could not explain away the correlation between the meditator group size and the quality of life.

Methods

Control Variables

The first step in quantitatively assessing the reviewers' proposed alternative hypotheses was to create control variables that could be used in statistical analyses. This was done by coding the control days as "1's" and all other days as "0's" (see Table 1).

It can be seen in Table 1 that in addition to the controls suggested by the reviewers, other control variables were also coded: Allhol = all religious holidays in one variable; Aughol = August plus all religious holidays. Also coded were weekends vs. weekdays, vacation vs. work days, and hot vs. cool days. The weekend in Israel is considered to be Friday and Saturday. In additional to this definition, weekends were also defined as Saturday and Sunday, as well as Fridays, Saturdays, and Sundays taken together and also taken individually.

Dependent Variable

The Overall composite index of six individual quality-of-life indices shown in Table 1 was analyzed because it was the major dependent variable used in the

TABLE 1
Definitions of Variables

Variable	Definition
Overall	*z*-Transformed daily arithmetic mean of six standardized variables: Lebanon war intensity scale, automobile accidents, fires, stock market, total Israeli crime, and national mood. The index was *z*-transformed (mean = 0, SD = 1), and the negative variables were inverted so that positive values indicate improved quality of life.
OverallAR1	The residuals of Overall for an autoregressive 1 (AR1) ARIMA noise model.
ME Quartile	A categorical variable in which the four different quartiles of TM group size were coded as 1, 2, 3, or 4, respectively. The range of numbers of meditators in the ME group for the four quartiles were Q1 (61–124), Q2 (125–157), Q3 (158–179), and Q4 (180–241).
Succoth	The 8 days of Succoth (September 22–29, 1983) = 1's; the other 53 days = 0's.
Allhol	The 10 days of Succoth plus Rosh Hashanah (September 8, 1983) and Yom Kippur, September 17) = 1's; the other 51 days = 0's.
August	August 1–31 = 1's; September 1–30 = 0's.
Aughol	The 41 days of August 1–31 and Allhol = 1's; the other 20 days = 0's.
Weekends	The 17 days of all Fridays and Saturdays in September and August, 1983 = 1's; the 44 weekdays = 0's.
Vacations	The 26 days when the stock market was closed (all Fridays and Saturdays, August 10 and September 7, 8, 21, 22, and 26–29) = 1's; the 35 workdays = 0's.
Begin	The 19 days from when Begin announced he would resign (August 28) until he resigned (September 15) = 1's ; the other 42 days = 0's.
Pullout	The 28 days from when Israeli troops withdrew from the Shouf mountains to their own border (September 3) until the end of the study (September 30) = 1's; the 33 days from August 1 to September 2 = 0's.
Temperature	The 31 days over the median maximum daily temperature for August and September = 1's; the 30 days below the median temperature = 0's.

original study. It captures a global influence, which the theory predicts would be most clearly seen in a composite index due to signal averaging amplifying common variance (Orme-Johnson et al., 1988: 806).

In one of the analyses we used the Overall index without pre-whitening it, because a previous reviewer has suggested that the pre-whitening process may have created statistical artifacts that caused spurious significant outcomes (Schrodt, 1990). In addition, to meet the statistical assumption of independence of data points (Box & Jenkins, 1976), the prewhitened version of the Overall index was also analyzed. This variable, called "OverallAR1," has the first-order autoregression term removed. This is the simplest adequate noise model and is the same model that was used in the original paper (p. 789). Diagnostic tests showed that the AR1 model was adequate, with no significant individual autocorrelations or partial autocorrelations in the residuals, which were also not jointly significant, as indicated by the Ljung-Box Q statistic at 15 lags ($Q_{15} = 6.93$, $p < .96$). Consequently, the AR1 model rendered the data points statistically independent, effectively controlling for the possible confounding influences of cycles, trends, and drifts in the Overall index, such as from weekend effects or any other known or unknown time dependencies (Box & Jenkins, 1976).

Independent Variable

The independent variable was the quartile size of the TM group in Jerusalem (ME Quartile), in which "1's" represented days of the smallest quartile of group size and "2's," "3's," and "4's" represent successively larger quartiles, as defined in the original paper (see Table 1).

Figure 1 shows the temporal distribution of the four quartiles of meditator-group size over the course of the 61-day experiments, as well as the distribution of key controls: Aughol, Hot Days, the Begin Period, and Vacations.

Statistical Analyses

Two-way analyses of variance (ANOVAs). The effects of each control variable were first tested one at a time. Controls and ME Quartile were entered together as independent variables in two-way ANOVAs to predict the dependent variables Overall or OverallAR1. These ANOVAs provided independent main effects for ME Quartile and for each of the Controls, as well as their interactions. The ANOVA model was:

$$\text{Overall or OverallAR1} = \text{ME Quartile} + \text{Control} + \text{ME Quartile} \times \text{Control}.$$

Reduced data sets. To further test if any of the controls could account for the results, one-way ANOVAs of the effects of ME Quartile on Overall or OverallAR1 were conducted on reduced data sets *in which the control days were completely eliminated from the analyses.* For example, the effects of ME Quartile were assessed for only the 35 workdays or the 31 hottest days.

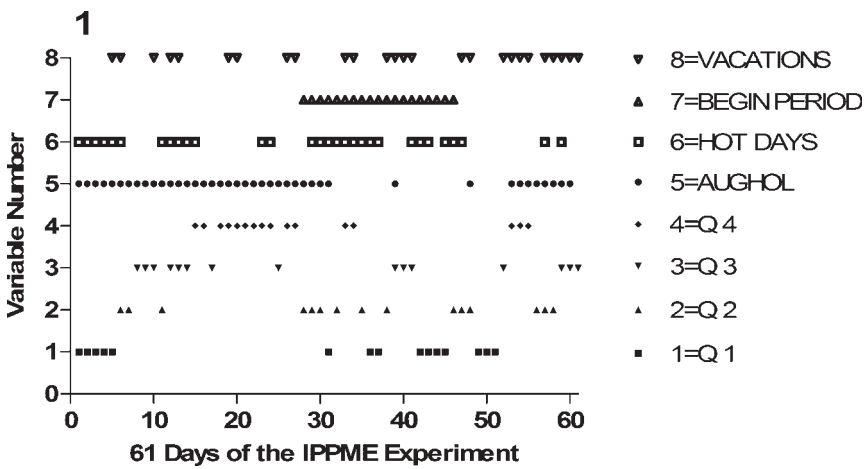

Fig. 1. The temporal distribution over the 61-day period of the International Peace Project in the Middle East (IPPME) of the independent variable, which was the quartiles of meditator-group size, Q1–Q4 (labeled 1–4), and four key control variables (labeled 5–8). It can be seen that the four quartiles of group size were irregularly distributed over the experiment, and autocorrelations indicated they were virtually randomly distributed.

Random samples. As a general test of whether the correlation between the size of the meditator group and change in social indicators was due to any particular days or events, random samples of data were also analyzed. The sequence of the 61 days of data was randomized three times, and both the first and second halves of the randomized series were used, giving six 50% random samples. One-way ANOVAs of the effects of ME Quartile on Overall and OverallAR1 were then performed on each random sample.

Analyses of covariance (ANCOVAs). To test whether any *combination* of control variables could account for the results, different sets of control variables were systematically entered as covariates in ANCOVAs, using the model:

$$\text{Overall or OverallAR1} = \text{ME Quartile} + \text{Covariates}.$$

Results

Overall and OverallAR1 met the ANOVA assumptions of homogeneity of variance, normal distribution, interval scale or better, and for OverallAR1, independence of cases.

Results of two-way ANOVAs. The simplest ANOVA model of ME Quartile without any control variables in the equation, as well as all models that included control variables, showed that ME Quartile had a significant effect in the predicted direction (see Figure 2A and B for plots of the means; Tables 2A and B for the significance levels). Some control variables had independent significant effects (Figure 3A and B; and Tables 2A and B, column 3). However, none of the controls eliminated the significance of ME Quartile on either Overall or OverallAR1 (p values ranged from $<.003$ to $<.0001$, see Tables 2A and B, column 2).

The other variables studied (i.e., weekends defined as Saturdays and Sundays; Fridays, Saturdays, and Sundays taken together or separately; the specific days of Begin's announcement and resignation; the specific day of the pullout of the Israeli army) also had no effect on the significance of ME Quartile.

Interactions. Column 4 of Tables 2A and B shows that none of the computable interactions between ME Quartile and Controls (August, Pullout, and Temperature) were significant. The other interactions could not be calculated because of too few observations in the interaction cells. However, additional analyses, in which adjacent ME Quartiles were collapsed to create cells with large enough n values to compute the interactions, found that none of the other interactions were significant (Weekends, $p < .34$; Vacations, $p < .1$; Begin, $p < .28$). This indicates that as the size of the meditator group increased, the Overall and OverallAR1 indices increased the same way during control days as during non-control days.

Effect Sizes

The effect size of the meditator group on the Overall and OverallAR1 quality-of-life indices was here defined as the difference between the means for

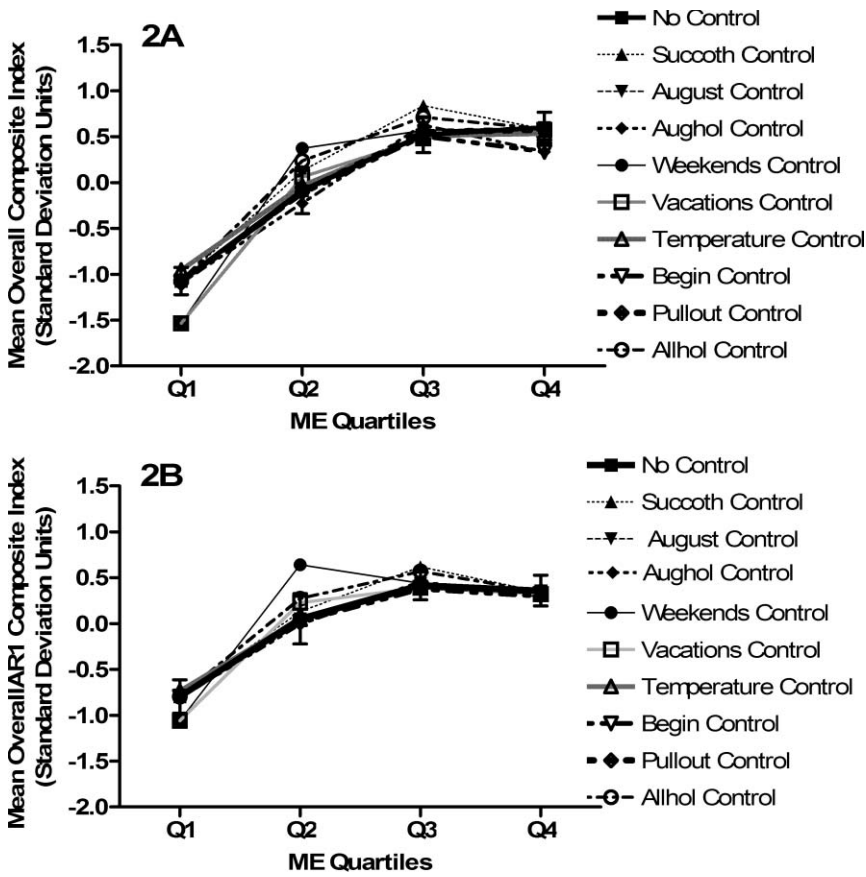

Fig. 2. A. The means from ANOVAs on the Overall composite index for each of the four quartiles of group size of Transcendental Meditation and TM-Sidhi program participants (ME Quartile). In all cases, increases in the group size were significantly associated with increases in quality of life (see *p* values in Table 2A). The darkest line shows the results with no control variable present in the analysis, and the other lines show the results with the nine various controls included. The error bars are standard errors of the mean for the analysis with no control variable. B. The results for the OverallAR1 index (the Overall index prewhitened with an ARIMA AR1 term). These results are parallel to those for the un-prewhitened index shown in A—a predicted increase in the quality of life as a function of increasing the group size of meditators, irrespective of the influences of the control variables. The error bars are standard errors of the mean for the analysis with no control variable present, indicated by the darkest line (see *p* values in Table 2B).

the smallest and largest quartiles. The effect sizes are in standard deviation (SD) units because these indices are z-transformed data, already expressed in SD units (Cohen, 1988; Glass et al., 1981).

ME Quartile had a larger effect size than any of the control variables, which can be graphically seen by comparing Figure 2A and B with Figure 3A and B.

TABLE 2A
Overall Index: *p* Values from the Two-Way Analyses of Variance

Dependent variable = Overall			
Control variable	*p* Value, main effect, ME quartile	*p* Value, main effect, control	*p* Value, interaction, ME × control
Succoth	.0001	.005	NA
Allhol	.0001	.0002	NA
August	.0001	.24	.24
Aughol	.0001	.34	NA
Weekends	.0001	.3	NA
Vacations	.003	.24	NA
Begin	.0001	.03	NA
Pullout	.0001	.09	.49
Temperature	.001	.1	.98

Note: NA = not applicable because of insufficient data in one of the ANOVA cells to compute the interaction.

TABLE 2B
OverallAR1 Index: *p* Values from the Two-Way Analyses of Variance

Dependent variable = OverallAR1			
Control variable	*p* Value, main effect, ME quartile	*p* Value, main effect, control	*p* Value, interaction, ME × control
Succoth	.0005	.1	NA
Allhol	.0001	.01	NA
August	.0003	.29	.75
Aughol	.001	.82	NA
Weekends	.001	.04	NA
Vacations	.003	.04	NA
Begin	.001	.18	NA
Pullout	.0003	.22	.9
Temperature	.003	.66	.98

Note: NA = not applicable because of insufficient data in one of the ANOVA cells to compute the interaction.

The mean effect size of the 10 two-way ANOVAs for ME Quartile on the Overall index was 1.67 SD. By comparison, the difference between the control days and non-control days was only 0.97 and 0.84 SD for Allhol and Succoth, respectively. During the Begin period, the quality-of-life index decreased by 0.5 SD compared with all other days, and during hot days it decreased by 0.36 SD compared with cool days. After the withdrawal of the Israeli army from Lebanon (Pullout, which was basically September compared with August), the quality-of-life index decreased by 0.34 SD. These data indicate that the effect size of ME Quartile was 1.7 times as large as Allhol, twice as large as Succoth, 3.3 times larger than the Begin variable, 4.6 times larger than Temperature, and 4.9 times larger than the effects of the Pullout of the Israeli army.

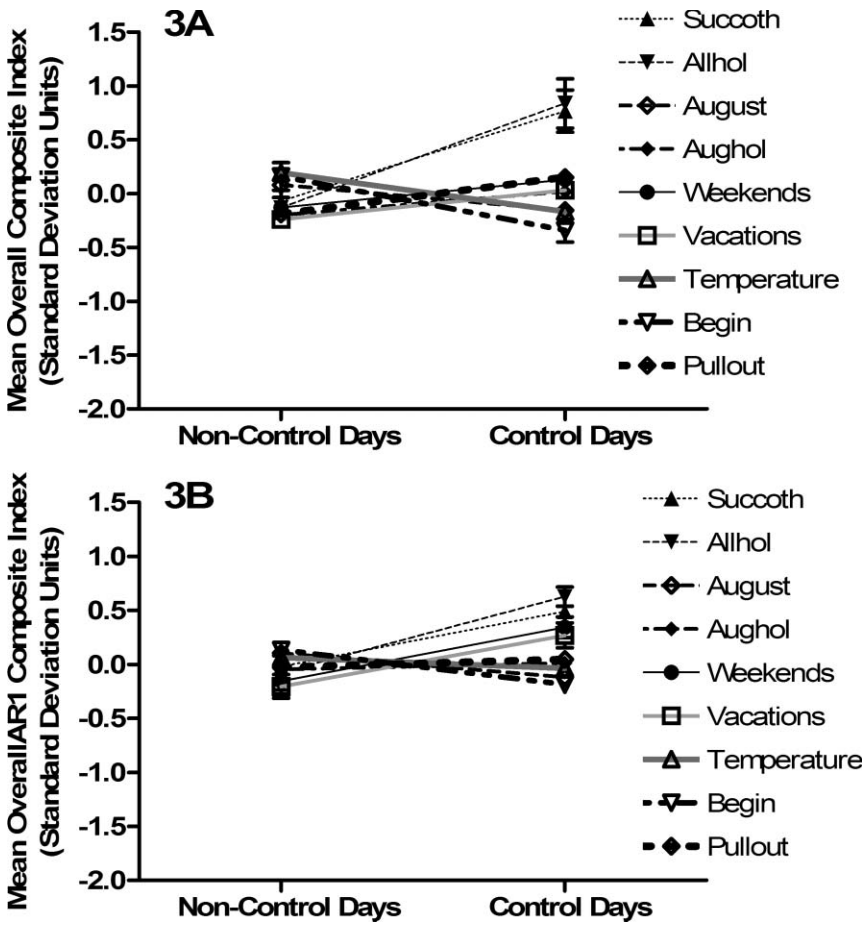

Fig. 3. A. The main effects of control days contrasted with non-control days for the Overall composite index. Standard error bars are shown for the variables that changed significantly on the control days (higher quality of life on Succoth and Allhol, lower quality of life during the Begin resignation) (see *p* values in Table 2A). B. The main effects of control days contrasted with non-control days for the prewhitened OverallAR1. The index was significantly higher during Weekends and Vacations and all religious holidays (Allhol) compared to other days, but these effects could not explain the meditator effect (see *p* values in Table 2B).

Results for reduced data sets. The results for the reduced data sets in which control days are eliminated are shown in Table 3. The *n* values in Table 3 show the number of days used in each analysis (also refer to definitions of variables in Table 1). In all cases, the ME Quartile had a significant effect, even during the days when the various control days were completely eliminated from the analysis. This conclusively shows that none of the control days could account for the effects of the co-variation between the meditator group size on the quality-of-life indices.

TABLE 3
Results (p Values) for Reduced Data Sets: One-Way ANOVAs for ME Quartile on the Overall and OverallAR1 Indices of Quality of Life for Data Sets in which the Control Days Were Eliminated from the Analyses

	Non-Succoth ($n = 53$)	Non-Allhol ($n = 51$)	September only ($n = 30$)	Non-Aughol ($n = 20$)	Week-days only ($n = 44$)	Workdays only ($n = 35$)	Non-Begin ($n = 42$)	Non-pullout ($n = 33$)	Hot days ($n = 31$)
Overall	.000001	.000001	.0006	.0009	.000002	.000001	.0003	.0001	.00006
Overall-AR1	.0007	.0003	.02	.04	.01	.002	.009	.01	.003

Note: n = number of days included in the analysis.

Results for random samples. The additional ANOVAs on the six random samples of 50% of the data showed that in all cases ME Quartile was significant for both Overall and OverallAR1 (p values ranged from $<.02$ to .00001, see Figure 4).

Results of ANCOVAs. ANCOVA showed that no combination of control variables eliminated the significance of ME Quartiles on Overall or OverallAR1. The significant controls for Overall from the two-way ANOVAs, as shown in Table 2A, were Succoth, Allhol, Begin and, marginally, Pullout and Temperature. Since Allhol included Succoth, Allhol was initially used as the covariate entered along with Begin, Pullout, and Temperature as covariates. In this combination, only Begin and Pullout were significant, and when just these two were entered together, they were both significant predictors (Begin, $p < .003$; Pullout,

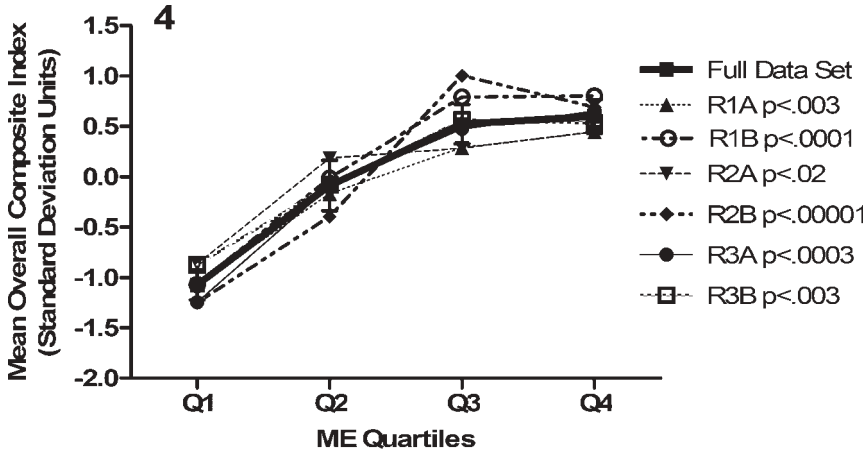

Fig. 4. The effects of ME Quartile on the Overall composite index for six random samples of 50% of the Data (R1A to R3B) as well as for the full data set (darkest line). It can be seen that the effect of the meditator group was evident for each random sample of data. The p values are indicated in the legend. Parallel results were found for OverallAR1.

$p < .009$), and they were correlated with each other $r = .3$. The multiple R was 0.45, $p < .002$. However, with Begin and Pullout added jointly as covariates, ME Quartile was, if anything, even a more significant predictor of Overall than before ($p < .000001$).

For OverallAR1, the significant controls from the two-way ANOVAs were Allhol, Weekends, and Vacations (Table 2B). These variables were highly redundant, because Vacations is a composite of the other two. We saw earlier that Vacations alone could not explain the results, because the results were significant when these days were completely eliminated from the analysis (see Table 3, Workdays, $p < .002$). Therefore, we entered Allhol and Weekends together as covariates. They were both significant ($p < .05$ and $p < .006$, respectively; $R = 0.42$, $p < .004$) and were only correlated by $r = 0.02$. This indicates that religious holidays and weekends made independent contributions to predicting the quality of life as represented by OverallAR1. However, with these covariates jointly included, the effect of ME Quartile on OverallAR1 was still strong ($p < .009$).

Other combinations of covariates also did not alter the basic conclusions. For the Overall index, the best combination of covariates, defined as the largest R, was Begin ($p < .001$), the high holidays (Yom Kippur and Rash Hashanah, $p < .03$), Pullout ($p < .03$), and Weekends ($p < .08$); multiple $R = 0.56$ ($p < .0004$). With these covariates in the model, ME Quartile was significant ($p < .000004$). The best set of covariates for OverallAR1 was Weekends ($p < .01$), high holidays ($p < .02$), and Begin ($p < .05$); multiple $R = 0.49$ ($p < .002$). With these covariates in the model, ME Quartile had a significant effect on OverallAR1 ($p < .009$).

Discussion

Formal statistical analyses verified the impression given by simple inspection of published graphs of the data that none of Fales and Markovsky's (1997) proposed alternative explanations could account for the results of the International Peace Project in the Middle East (Orme-Johnson et al., 1988). The finding that the meditator effect became more significant when controls were added as covariates indicates that the controls had an independent effect. In consequence, the inclusion of controls reduced the error variance, thus increasing the statistical significance of the meditator effect.

The positive results for the un-prewhitened "raw" Overall index demonstrate that the outcomes were not due to distortion of the data by the prewhitening process, as a previous critic has suggested (Schrodt, 1990).

The positive outcomes using the prewhitened index (OverallAR1) demonstrate that the results are not due to autocorrelations in the data, as was previously demonstrated using the ARIMA methodology in the original paper (Orme-Johnson et al., 1988) and in a reply to a critic (Orme-Johnson et al., 1990). Nor can the results be attributed to possible autocorrelations in the independent variable (ME Quartile), because an independent variable can take any form as long as the dependent variable is prewhitened (Box & Jenkins, 1976).

The results of the two-way ANOVAs demonstrate that none of the control variables *taken one at a time* could account for the effects of the meditator group of the Overall index of social indicators. The results of the ANCOVAs further showed that *no combination* of the control variables could account for the results. The results of the ANOVAs when the control days were completely removed from the data sets conclusively establish that the control variables could not account for the results. Finally, the analyses of six random samples of 50% of the data are a generalized demonstration that the meditation effect is a general feature of the data, which does not depend on any special events or days.

The effect size of the meditator group was strong in comparison to the effects of holidays and the major military/political events at the time. The fact that vacations, the Begin resignation, and the pullout of the Israeli army from Lebanon did have significant effects on the composite index of quality of life in Israel and Lebanon demonstrates construct validity for the index. It shows that the index was sensitive to key social and political events at the time. Construct validity is further supported by the apparent face validity of these effects, e.g., increased quality of life during vacations and decreased quality of life during the Begin resignation.

However, the effect sizes of the control variables, which ranged from 0.34 to 0.97, were not as strong as the effect sizes for the meditator group, which averaged 1.67. Given that an effect size of over 0.8 is considered large in the social sciences (Cohen, 1988), the effect size of 1.67 for ME Quartile is impressive. Moreover, the finding that it was 1.7 to 4.9 times larger than major events at the time supports the suggestion that the Maharishi Effect operates from the fundamental level of the unified field (Hagelin, 1987, 1989).

The lack of significant interactions between the ME Quartile and the control variables indicates that the effect operates the same way during control days as during other days. For example, the effect was apparent during both August and September, during both hot days and cool days, during both vacation days and workdays, etc. This shows that the effect is robust across different cultural, military/political, and climatic conditions, as has been demonstrated by previous research (Assimakis & Dillbeck, 1995; Cavanaugh, 1987; Cavanaugh & King, 1988; Davies & Alexander, 2005; Dillbeck, 1990; Dillbeck et al., 1987, 1988; Hagelin et al., 1999).

Since the various potentially confounding events suggested by Fales and Markovsky (1997) do not provide a mundane explanation for the results, consideration of their criticism of the theory of the collective consciousness is warranted.

Theoretical Issues

Fales and Markovsky (1997) build their critique of the theory around five main points, which they quote from the original paper (Orme-Johnson et al., 1988):

(1) Collective consciousness is the wholeness of consciousness of the group, that is more than the sum of the consciousnesses of all individuals composing that group. (p. 778)

(2) [The theory] posits a unified field of "pure consciousness" as the basis of the diverse activities of all individual minds. All processes of thought and perception are viewed as fluctuations or qualified expressions of this underlying, unqualified, least-excited state of consciousness. Maharishi likens the individual mind transcending its more active levels and experiencing its basis in pure consciousness to a localized wave settling to become the silent, unbounded surface of the ocean. Such experiences are said to create nonlocal, field-like effects of order and coherence in the environment. (pp. 778–779)
(3) Nonlocal effects could be mediated through the agency of the unified quantum field due to the intrinsically nonlocal structure of space-time at this scale. (p. 784)
(4) A potential explanation for the apparent propagation of such coherent effects may lie, however, at the ultimate scale of superunification, the Planck scale of 10^{-33} cm and 10^{-44} sec, where the fundamental force and matter fields are said to become fully unified. (p. 784)
(5) The localized conscious awareness of the individual becomes experientially connected back to pure consciousness, the unified source of order and intelligence at its base, thus increasing coherence, reducing stress, and accelerating development in the larger society. (p. 785)

The reviewers then cite an equation from the paper, which predicts how many people will be affected by the meditators living in the population and by a special advanced group. This equation was explained in the original paper as follows:

With the introduction of the more advanced TM-Sidhi program in 1976, Maharishi anticipated an even more marked influence of coherence in collective consciousness. He predicted that when the TM-Sidhi program was practiced in a group by as few as the square root of one percent ($\sqrt{1\%}$) of a population, there would be a measurable effect on standard indices of quality of life. This prediction is based on a field theoretic model describing the coherent superposition of amplitudes, in which the intensity of the effect generated is proportional to the square of the number of participants (Hagelin, 1987). For example, in coherent systems such as lasers, the coherent elements in the system have an influence that is proportional to their number squared, whereas incoherent elements generally have an influence that is proportional only to their number. Thus the predicted population size influenced by a given number of TM and TM-Sidhi program participants would be tentatively modeled by the polynomial:

$$ME = aN_1 + bN_2^2 \quad (1)$$

where ME (Maharishi Effect) is defined as the size of the population that is positively influenced by the number of independent meditators distributed throughout the population (N_1), and the number of individuals practicing the more advanced TM-Sidhi program collectively in one place (N_2). The quadratic term reflects the proposed coherent influence resulting from constructive interference of the group of N_2 subjects. Coefficients a and b are empirically defined constants, with data suggesting that both have an estimated value of approximately 10^2 (for values of N over 100). The absence of a constant term follows from the assumption that the effect vanishes (and does not diverge) as N tends to zero. (Cubic and higher-order terms are neglected because they have no clear theoretical motivation). The apparent necessity for having a single group meet at one time and place to produce this $\sqrt{1\%}$ effect may again be understood with reference to coherent physical systems such as lasers. In these systems, close proximity of elements is required to ensure that they have sufficient opportunity to stimulate coherent behavior in other members of the group. (p. 782)

In a research paper, such a short summary of theoretical issues is the norm, since the dominant interest is assumed to lie in the methodology and the resulting evidence that will tend to confirm or disconfirm the theory. Such short summaries have been a feature of all 33 published studies on the Maharishi Effect, indicating that a large number of peer reviewers have found the theory elucidated with a level of meaningfulness typical of other published research in the social sciences (Duval, 1988; Russett, 1988).

The authors of the critique, however, argue that nearly every term used in the theory section is "ambiguous," "vague," or outright "meaningless." The strategy behind their critique is revealed in the following quote: "Vagueness about a theory's empirical referents or how they interact with previously understood parts of our world will undermine any attempt to claim that certain phenomena provide evidence for (or against) that theory" (p. 2). More plainly, the reviewers argue that any such failing of the theory means that it can no longer "benefit from the test results."

To begin with, this assertion that "ambiguity" and "vagueness" undermine objective evidence is simply wrong as a matter of scientific practice. Ambiguity of terms does not prohibit a clear decisive experimental decision about the hypothesis in question, which is, simply, did the war and other social indicators co-vary with the meditation groups? That is a clear and simple question that can be answered whether or not one understands the theoretical model. The real issue is whether the theoretical hypothesis being tested is unambiguous enough to permit a decisive empirical test.

Take a simple case from quantum mechanics as an example of how a precise empirical science can develop even though key theoretical terms may be ambiguous. The primitive elements are called quanta, which famously display wave-particle ambiguity—despite the fact that a particle must by definition be highly localized and a wave must be widely extended in space. This essential ambiguity is only increased by the vagueness inherent in the Uncertainty Principle, which states that no quanta can be attributed a precise position and a precise velocity at the same time. This ambiguity and vagueness of fundamental terms and concepts helps account for the following quotation from Richard Feynman: "I think I can safely say that no one understands quantum mechanics" (Van Flandern, 1999: 118). Despite such profound theoretical failings, quantum electrodynamics is widely considered the most successful theory in the history of science—due to unprecedented precise experimental evidence that supports the mathematical predictions.

Second, the reviewers' argument that vagueness undermines objective evidence inaccurately states a scientific principle. "Vagueness" and "ambiguity" are in themselves vague and ambiguous terms. Since there is no standard against which they can be objectively evaluated, the use of these labels in any given case is necessarily a subjective decision. Thus, their position resolves to the proposition that a subjective judgment (about, in this case, theoretical clarity) has precedence over empirical data, which is a close approximation to the opposite of what the scientific endeavor means to most scholars.

Third, the terms adjudged by the reviewers as "vague" and "ambiguous" have, to the original authors, clear and understandable meanings—though the theoretical concepts are new to most, and admittedly require sustained, good-faith attention.

A similar assertion by the reviewers makes the case that a theory, to be meaningful, must articulate a precise mechanism for its predicted effects. As an apposite example, they state: "To be credible, [a theory of the Maharishi Effect] must explain (1) how group meditation affects the unified field, (2) how these effects in turn cause changes in the actions of individual human beings, and (3) how those individual actions have their claimed social impact."

The notion that experimental evidence can be undermined by a lack of theoretical mechanism is at odds with accepted scientific practice. To take a quintessential counterexample from the history of science, Sir Isaac Newton was never able to supply a mechanism that explained why massive bodies were attracted to each other by the law of gravity. His theory of gravity is still so mathematically accurate that it is used to send rockets to Saturn, but as he frankly said, "the cause of gravity is what I do not pretend to know" (Kohanski, 1984: 290). Once again, experimental evidence answers the question about whether the theory predicts observable outcomes, and in a social science article, does not and need not attempt to give a fully developed theory. That is the place of a theoretical paper (Hagelin, 1987).

Bayes' Theorem, Prior Knowledge, and Theory Confirmation

The reviewers use a version of Bayes' Theorem, usually a mathematical tool for dealing with particular types of probability issues, in a nonstandard English language formulation, as a means to address the issue of "theory confirmation." In their definition of Bayes' Theorem, a theory's confirmation is greater to the extent that (1) it is compelling in view of prior knowledge; (2) the evidence to be assessed is made probable by theory and prior knowledge; and (3) the [evidence] is not probable relative to alternative hypotheses and prior knowledge.

In this "Bayesian" framework, which becomes the logical heart of their critique, "prior knowledge" is the main criterion (1), and is essential in (2) and (3). By "prior knowledge" they mean the current state of orthodox theory and evidence in a field, what they elsewhere call a "well-entrenched position." Their intent to use "prior knowledge" as a criterion for disqualifying "heterodox" theories would eliminate any new theory from sociology. Their point is that new theories must be consistent with and coherent with previous knowledge, and by connecting pure consciousness with the unified field and the quantum level of nature, we have done that precisely. The point is that unified field theory suggests that there is a field pervading nature, that all phenomena come out of it, and that it is causally basic in nature. This is the field that, according to hypothesis, bears the responsibility for bringing about change on a large social scale. It is not necessary to establish theoretically that the unified field is a field of consciousness, for

that is what the empirical outcome of the experiment is intended to establish. As the reviewers frankly admit, sociology has only a "rudimentary understanding" of the "phenomenon we study." A similar situation holds in the rest of the social sciences; there is no generally agreed-upon theoretical basis to psychology, for instance, or political science.

Moreover, the Maharishi Effect is a consciousness-based phenomenon, and there is no systematic theory of consciousness available in any academic discipline. This complete lack of fundamental principles that can give order and meaning to studies of social phenomena in general—what to say of avowedly consciousness-based social phenomena—should be kept in mind as the reviewers emphasize that the theory behind the Maharishi Effect is improbable to the extent that it runs counter to "prior knowledge." Indeed, there are many contemporary streams of thought that are congruent with a field-theoretic view of consciousness (e.g., Dossey, 1999; Jahn et al., 1997; Jonas & Crawford, 2003; Nelson et al., 2002; Radin, 1997, 2002, 2004, 2006; Schlitz, 1996; Schlitz & Braud, 1997; Schlitz et al., 2004; Wackermann et al., 2003). Moreover, the theory does not run *counter* to prior scientific knowledge, namely of the unified field, but it adds to unified field theory a hypothetical link to consciousness that makes it accessible to human uses and purposes that benefit all mankind. This leads to practical application and testing of theory (Hagelin, 1987, 1989; Hagelin et al., 1999).

With "prior knowledge" ruled out as a meaningful criterion for a new theory in the social sciences, the reviewers' version of Bayes' Theorem relapses to two criteria: "the [evidence] to be assessed is made probable by theory," and "the [evidence] is not probable relative to alternative hypotheses." The use of "probable" in both criteria is hardly optimal; there is no objective input into their version of Bayes' Theorem, and no mathematical analysis, and thus there is no means to assess what is considered "probable" other than, once again, subjective judgment.

Why do the reviewers emphasize arguments based on subjective judgment? The logic is the same as above: "Whatever evidence we have for the improbability of a heterodox theory is, *a fortiori,* evidence for the illegitimacy of data purportedly favoring that theory" (p. 3). In this striking assertion that objective evidence can be made illegitimate, the authors use the term "evidence," but as we have seen, their version of Bayes' Theorem is free of all objective input. What is presented is not fact, but opinion.

Two other points—first, in the reviewers' version of the Bayesian framework, the last criterion assumes that the critic, who wishes to disconfirm a theory, will develop one or more "alternate hypotheses." They agree with this, as they must from adopting the Bayesian framework: "The case against the heterodox is strongest when a competing hypothesis can be established" (p. 3). Or, as peer reviewer Robert Duval (1988: 817) pointed out in the conclusion to his commentary on the original paper printed in the *Journal of Conflict Resolution,* "It is incumbent upon the critic to provide a better model." They have failed to provide a better

model to explain the observed data, whereas the model we present is supported by the data.

Nevertheless, the attempt to escape this (ambiguous) requirement, which is both self-imposed and logically necessary, becomes one of the central strategies of this critique. As we have seen in the research section, the reviewers do not offer a competing hypothesis to explain the observed data of the study—the fact that changes in the attendance at the meditation group covary with the changes in social indicators. In fact, they offer no hypothesis at all, just a few *post hoc* events and the speculation that, "In fact, it is sufficient that a well-entrenched position offer plausible alternative explanations for the challenging data." A "well-entrenched" academic or scientific position, however, would require just the type of "prior knowledge"—especially a widely accepted theoretical framework—that is totally lacking. Without the protection of any theoretical position, the critics must do better than offer an assortment of unrelated *post hoc* explanations that are plausible to them but perhaps no one else. To many scientists who have studied the theoretical model of our paradigm, this is by far the most plausible hypothesis to explain the observed data. The critics must offer an alternate hypothesis that better fits the evidence, but this, as we have seen, they never do.

Second, in the case of a theory as potentially theoretically significant as the present one, there are types of prior knowledge not considered by the reviewers that deserve mention. For example, they do not acknowledge that the original paper and other papers on the Maharishi Effect have documented that many of the founders of the social sciences, such as Emile Durkheim, Carl Jung, and William James, have proposed field-theoretic views of consciousness (Dillbeck, 1990; Dillbeck et al., 1987; Orme-Johnson et al., 1988).

Critique of the Theory of Collective Consciousness

The reviewers state that collective consciousness is non-material, omnidirectional, and in violation of the inverse-square law of signal strength (p. 5). The original paper considered and rejected the four fundamental forces—electromagnetism, weak interaction, gravity, and strong interaction—as potential candidates for mediating the Maharishi Effect because they all function at inappropriate scales (p. 784). Hagelin's (1987) suggestion that such coherent effects may be propagated at the ultimate scale of super unification is based on evidence from physics, indicating that Planck scale phenomena are described by a totally new structure of natural law, which defies characterization in the normal spatial, temporal, and causal sense. The reviewers argue that "Detailed experimental evidence is lacking for Planck scale phenomena . . . the soundness of the ME theory's quantum field connections is an open question at best" (p. 5). However, while unified field theory and its precise mathematical formulation remain lively areas of research and debate, there is little dissension among theorists as to the validity of the overall picture that natural law is unified at the Planck scale (Hagelin, 1987, 1989).

Critique of the N^2 Formula

The reviewers say that the paper ignored the specific hypothesis deriving from the N_2^2 term in the Maharishi Effect equation above. In fact, the original paper addressed this issue by noting the shape of the curves relating the effect size to meditator group size (Orme-Johnson et al., 1988: 802). The authors use the meditators group size (not squared) in the calculation, and they looked for an upturning function as evidence of a quadratic effect. Such an effect was found for the war in Lebanon, but not for the composite index. (This leveling off of the Overall index at the largest quartile of group size can be seen in Figure 2A and B above.) However, as discussed in a previous paper, testing the quadratic effect is complicated by the fact that populations are not closed systems (Orme-Johnson et al., 1990). Perhaps if the effect could be contained within a single population, say a country, then as the size of the meditator group in that country increased there would be a predicted quadratic increase in the effect. But the effect is not contained, but spreads out to other populations as the group gets bigger. What the formula predicts is how many more people are affected, not how much the effect will increase in populations in close proximity to the meditator group. A related question concerns the measurement units of the formula.

Measurement Units

The reviewers question why the measurement unit is the number of people rather than, say, physical distance (p. 5). The following quotation shows how this issue has previously been addressed.

> First, in the forty studies in this area, the √1% formula has been consistently applied based on quantification of the surrounding population in terms of political units—cities, states, nations—rather than purely on geographical distance, which ignores these community boundaries (e.g., Dillbeck et al., 1987; Dillbeck et al., 1988). These political units reflect greater homogeneity, closer personal ties, more frequent interactions, and stronger internal lines of influence (cultural, emotional, and economic, as well as political) than those across boundaries and hence cannot be ignored in calculating the pattern of "spread" of predicted coherent effects on collective consciousness and behavior. . . . Our common experience with such everyday field effects as transmission of radio or television waves tells us that local conditions (including weather, the terrain, and other electromagnetic sources, such as power lines) affect patterns of transmission across large areas. The proposed intimate connection between consciousness and the unified field would support similarly uneven patterns of influence due to local boundaries in collective consciousness. (Orme-Johnson et al., 1990: 759)

Critique of Lagged Effects and Thresholds

The reviewers also maintain that some lagged effects reported in the paper were not specified prior to the research. The authors have also previously replied to this issue: "Even if one were to dismiss the results for longer lags, the consistent and even stronger results found for lags 0 and 1 cannot be overlooked" (op. cit.:

764–765). In that reply we speculated that the longer lags may reflect effects on policy makers (a key element of the theory), which take some time to manifest down the chain of command.

The critics assert that there is no rationale for the threshold effects in the Maharishi Effect theory, which holds that the effect will suddenly manifest in the system as a whole after 1% of the population is practicing the TM technique, or a group of the square root of 1% is practicing the TM-Sidhi program. Such sudden sharp changes from relatively disordered to more ordered states are "phase transitions" which are common throughout nature. Examples are the sudden transitions between gaseous, liquid, and solid states of matter at specific temperatures, and numerous instances in which the concentration of a certain substance of the body rises slowly without effect and then suddenly, as a discrete threshold is reached, target tissues respond. To give other examples, the entire functioning of our nervous system relies upon threshold principles and a small change in one or a few component species in an ecosystem can rapidly alter the entire environmental picture. In social systems, the sudden outbreak of war, riots, and other forms of violence are evidence of threshold effects. In the present case, there is considerable empirical evidence for a sudden emergence of coherence in society once a sufficient threshold of meditators in the population is exceeded (Assimakis & Dillbeck, 1995; Cavanaugh, 1987; Gelderloos et al., 1990).

Effects on Inanimate Detectors

The reviewers point out that if the material world is presumed to be influenced by collective meditation (as it must be if the unified field is affected), then more direct measures using inanimate detectors should be possible (p. 7). In fact, research has shown that persons practicing the TM technique can directly influence quantum mechanical processes (Farwell & Farwell, 1995) and that group meditation influences random generators placed near the group (Mason et al., 2007). Moreover, independent research has shown in two replications that large groups practicing the TM and TM-Sidhi programs affect a network of 50 random generators distributed throughout the world (Nelson, 2001, 2006). Furthermore, there are research programs indicating that human consciousness may interact in a measurable way with inanimate detectors (Jahn et al., 1997; Nelson et al., 2002; Radin, 1997, 2002, 2006).

The Issue of Brainwave Coherence

Another issue raised by the reviewers is how the TM technique might increase brain wave coherence and synchrony (p. 6). The short answer is that it is through the experience of pure consciousness, which is the traditional subjective term for an experience that has been shown to be real based on its consistent physiological correlates (Jevning et al., 1992; Wallace, 1970). Research has indicated that the experience of pure consciousness is associated with a state of "restful alertness,"

which is distinct from waking, dreaming, and sleeping (Jevning et al., 1992; Wallace, 1970). Evidence shows that the experience produces long-range spatial ordering in the brain (EEG coherence and synchrony) (Badawi et al., 1984; Hebert et al., 2005; Travis & Wallace, 1997). Neuroimaging studies of subjects practicing the TM technique suggest that the pure consciousness experience is associated with reduced sensory and cognitive processing at the thalamic, and hippocampal levels as well as global integration by the frontal cortex (Newberg et al., 2006), corresponding to the reported subjective experience described as the mind settling inward to a silent state of unbounded awareness. Sympathetic markers show greater reductions during the experience than during ordinary eyes-closed rest (Dillbeck & Orme-Johnson, 1987; Jevning et al., 1978).

A fundamental principle of neuroscience is that experience shapes the brain's development. Cumulative effects of regular practice of the TM technique are evidenced by greater "coherence" of the individual, operationally defined by numerous measures, such as improved balance and sensitivity of hormonal control (Werner et al., 1986), greater stability and flexibility of perception (Dillbeck, 1982), improved general cognitive ability (So & Orme-Johnson, 2001), improved cardiovascular reactivity to stress (Barnes et al., 2001), improved general health (Herron et al., 1996; Orme-Johnson, 1987), and decreased mortality (Schneider et al., 2005). Given the assumption of Maharishi's theory that individuals are the units of collective consciousness, increased coherence at the individual level could be expected to have a positive effect on the population level.

Why Only Positive Socio-Cultural Effects?

In answer to the reviewer's question of why coherence only causes phenomena that happen to be defined socio-culturally as "positive" (Fales & Markovsky, 1997), we suggest the following explanation. Through its long evolutionary history and the process of natural selection, the brain and physiology have become "hardwired" with intrinsic pleasure/pain circuits and homeostatic feedback mechanisms, which have the obvious adaptive advantage of directing life away from physical damage and towards life-promoting influences. Maslow (1968) and others have extended this line of reasoning to say that the positive qualities of self-actualization are as fundamental to our biological makeup as the motivations for self-preservation and reproduction. Consider the potential adaptive advantages of the qualities of self-actualization: being "present" oriented rather than being distracted by non-useful thoughts and feelings; having broad comprehension and increased ability to focus sharply; increased ability to integrate dichotomies into greater wholes; heightened perception; spontaneous skilled behavior; increased empathy and ability to function cooperatively with others (Maslow, 1968).

All of these qualities have obvious adaptive advantages, for modern human life as well as for hunting mastodons. An implication of Darwin and Maslow's work

is that such self-actualizing qualities are inherent in the human genome, arising as the species evolved through its interaction with various environments. A further implication is that self-actualizing qualities are inherent in the very structure of natural law itself and are not arbitrary human conceptions. A fundamental tenet of science is that all the actors and the entire field of action are entirely comprised of the same elementary particles, forces, etc. and are governed by the same laws of nature. Furthermore, if the unified field is the basis of existence, then all that exists must in some way be inherent in it, even in seed form.

Maslow speculated that self-actualizing qualities inherent in every individual become expressed through experiences that he called "peak experiences" and "Being cognition," which are experiences pertaining to pure consciousness (Alexander et al., 1990, 1991). A meta-analysis of 42 treatment outcomes found that regular practice of the TM technique produced a threefold greater increase in self-actualizing qualities than other meditation and relaxation techniques (Alexander et al., 1991). This result supports the hypothesis that systematic transcending is the key factor contributing to the development of self-actualization. We propose that the physiological state associated with pure consciousness sets an ideal internal milieu for the expression of self-actualizing qualities inherent in the human genome. From this perspective, an influence of pure consciousness (coherence) in collective consciousness would augment the expression of these qualities in the general population as well, resulting in behavioral changes in the larger society, which would universally be regarded as more "ideal."

Replication

The association of TM practice with positive influences on social indicators has been replicated 50 times (Orme-Johnson, 2009), including seven times specifically on the Lebanon war (Davies & Alexander, 2005). It is beyond the scope of this paper to evaluate the strength of all these studies, but only to say that many of them are at least as well controlled as the present one (e.g., Cavanaugh, 1987; Cavanaugh & King, 1988; Davies & Alexander, 2005; Dillbeck, 1990; Dillbeck et al., 1987, 1988; Gelderloos et al., 1990; Hagelin et al., 1999).

Conclusion

Fales and Markovsky's (1997) criticism of the International Peace Project in the Middle East (Orme-Johnson et al., 1988) is not supported by either the empirical data nor by a logical analysis of the theory. Their conjecture that social, political, and military events at the time could explain the results does not hold up with simple inspection of the published data nor with decisive statistical tests. Their position that direct interactions between humans via a field of consciousness is a "heterodox" hypothesis not worthy of publication in social science journals is challenged by 33 published studies on the Maharishi Effect (Orme-Johnson, 2009) as well as by several other independent research programs (e.g., Dossey, 1999; Jonas & Crawford, 2003; Nelson et al., 2002; Radin, 1997,

2002, 2004, 2006; Schlitz, 1996; Schlitz & Braud, 1997; Schlitz et al., 2004; Wackermann et al., 2003).

We provide evidence that the theory of the Maharishi Effect has clearly defined, operationalizable terms and that it makes specific predictions, which have been repeatedly tested using objective, public data sources, with hypotheses being lodged in advance with independent observers. This theory has been tested on a larger scale than any other theory of conflict resolution (Orme-Johnson et al., 1990). More than any other approach in the social sciences, it has demonstrated outcomes that are directly relevant to resolving national and international conflicts and improving the quality of life in society (Assimakis & Dillbeck, 1995; Cavanaugh & King, 1988; Davies & Alexander, 2005; Dillbeck, 1990; Dillbeck et al., 1987, 1988; Gelderloos et al., 1990; Hagelin et al., 1999; Orme-Johnson, 2009; Orme-Johnson et al., 1988, 1990).

What the critics are asking for ultimately is a theory of science capable of integrating consciousness with all aspects of the physical, biological, and social sciences. This is still a ways off, simply because not enough is yet known about those fields, much less about consciousness itself. As science rapidly expands in all areas of knowledge through its objective methodologies, what is needed now is a theoretical framework and subjective methodology to explore the fundamental domains of consciousness. Arguably, the theoretical knowledge and the subjective technologies provided by Maharishi have done that (Hagelin, 1987, 1989).

References

Achterberg, J., Cooke, K., Richards, T., Standish, L. J., Kozak, L., & Lake, J. (2005). Evidence for correlations between distant intentionality and brain function in recipients: A functional magnetic resonance imaging analysis. *Journal of Alternative and Complementary Medicine, 11,* 965–971.

Alexander, C. N., Davies, J. L., Dixon, C. A., Dillbeck, M. C., Oetzel, R. M., Drucker, S. M., Oetzel, R. M., Muehlman, J. M., & Orme-Johnson, D. W. (1990). Growth of higher stages of consciousness: Maharishi's Vedic psychology of human development. In Alexander, C. N., & Langer, E. J. (Eds.), *Higher Stages of Human Development: Perspectives on Adult Growth* (pp. 286–341). New York: Oxford University Press.

Alexander, C. N., Rainforth, M. V., & Gelderloos, P. (1991). Transcendental Meditation, self-actualization, and psychological health: A conceptual overview and statistical meta-analysis. *Journal of Social Behavior and Personality, 6,* 189–247.

Assimakis, P., & Dillbeck, M. C. (1995). Time series analysis of improved quality of life in Canada: Social change, collective consciousness, and the TM-Sidhi program. *Psychological Reports, 76,* 1171–1193.

Badawi, K., Wallace, R. K., Orme-Johnson, D., & Rouzeré, A. M. (1984). Electrophysiologic characteristics of respiratory suspension periods occurring during the practice of the Transcendental Meditation program. *Psychosomatic Medicine, 46,* 267–276.

Barnes, V. A., Treiber, F. A., & Davis, H. (2001). Impact of Transcendental Meditation on cardiovascular function at rest and during acute stress in adolescents with high normal blood pressure. *Journal of Psychosomatic Research, 51,* 597–605.

Box, G. E. P., & Jenkins, G. M. (1976). *Time Series Analysis: Forecasting and Control*. San Francisco: Holden-Day.

Brown, C. (2005). Overcoming barriers to use of promising research among elite Middle East policy groups. *Journal of Social Behavior and Personality, 17,* 489–546.

Campbell, D. T., & Stanley, J. C. (1963). *Experimental and Quasi-Experimental Designs for Research.* Rand McNally.

Cavanaugh, K. L. (1987). Time series analysis of U.S. and Canadian inflation and unemployment: A test of a field-theoretic hypothesis. *Proceedings of the American Statistical Association, Business and Economics Statistics Section* (pp. 799–904).

Cavanaugh, K. L., & King, K. D. (1988). Simultaneous transfer function analysis of Okun's misery index: Improvements in the economic quality of life through Maharishi's Vedic Science and technology of consciousness. *Proceedings of the American Statistical Association, Business and Economics Statistics Section* (pp. 491–496).

Cohen, J. (1988). *Statistical Power Analysis for the Behavioral Sciences* (2nd ed.). Hillsdale, NJ: Lawrence Earlbaum Associates.

Davies, J. L., & Alexander, C. N. (2005). Alleviating political violence through reducing collective tension: Impact assessment analysis of the Lebanon war. *Journal of Social Behavior and Personality, 17,* 285–338.

Dillbeck, M. C. (1982). Meditation and flexibility of visual perception and verbal problem-solving. *Memory and Cognition, 10,* 207–215.

Dillbeck, M. C. (1990). Test of a field theory of consciousness and social change: Time series analysis of participation in the TM-Sidhi program and reduction of violent death in the U.S. *Social Indicators Research, 22,* 399–418.

Dillbeck, M. C., Banus, C., Polanzi, C., & Landrith, G., III. (1988). Test of a field model of consciousness and social change: The Transcendental Meditation and TM-Sidhi program and decreased urban crime. *Journal of Mind and Behavior, 9,* 457–486.

Dillbeck, M. C., Cavanaugh, K. C., Glenn, T., Orme-Johnson, D. W., & Mittlefehldt, V. (1987). Consciousness as a field: The Transcendental Meditation and TM-Sidhi program and changes in social indicators. *Journal of Mind and Behavior, 8,* 67–104.

Dillbeck, M. C., & Orme-Johnson, D. W. (1987). Physiological differences between Transcendental Meditation and rest. *American Psychologist, 42,* 879–881.

Dossey, L. (1999). *Reinventing Medicine: Beyond Mind-Body to a New Era of Healing.* HarperCollins.

Duval, R. (1988). TM or not TM? *Journal of Conflict Resolution, 32,* 813–817.

Fales, E., & Markovsky, B. (1997). Evaluating heterodox theories. *Social Forces, 76,* 511–525.

Farwell, L. A., & Farwell, G. W. (1995). Quantum-mechanical processes and consciousness. *Bulletin of the American Physical Society, 40,* 956–957.

Gelderloos, P., Cavanaugh, K. L., & Davies, J. L. (1990). The dynamics of U.S.-Soviet relations, 1979–1986: A simultaneous transfer function analysis of U.S.-Soviet relations: A test of the Maharishi Effect. *Proceedings of the American Statistical Association*, *Social Statistics Section* (pp. 297–302).

Glass, G., McGaw, V. B., & Smith, M. L. (1981). *Meta-Analysis in Social Science Research*. Beverly Hills, CA: Sage.

Hagelin, J. S. (1987). Is consciousness the unified field? A field theorist's perspective. *Modern Science and Vedic Science, 1,* 29–87.

Hagelin, J. S. (1989). Restructuring physics from its foundation in light of Maharishi's Vedic Science. *Modern Science and Vedic Science*, *3,* 3–72.

Hagelin, J. S., Rainforth, M. V., Orme-Johnson, D. W., Cavanaugh, K. L., Alexander, C. N., Shatkin, S. F., Davies, J. L., Hughes, A. O., & Ross, E. (1999). Effects of the group practice of the Transcendental Meditation program on preventing violent crime in Washington, D.C.: Results of the National Demonstration Project, June–July, 1993. *Social Indicators Research, 47,* 153–201.

Hebert, R., Lehmann, D., Tan, G., Travis, F., & Arenander, A. (2005). Enhanced alpha time-domain phase synchrony during Transcendental Meditation: Implications for cortical integration theory. *Signal Processing, 85,* 2213–2232.

Herron, R. E., Hillis, S. L., Mandarino, J. V., Orme-Johnson, D. W., & Walton, K. G. (1996). The impact of the Transcendental Meditation program on government payments to physicians in Quebec. *American Journal of Health Promotion, 10,* 183–191.

Jahn, R. G., Dunne, B. J., Nelson, R. D., Dobyns, Y. H., & Bradish, G. J. (1997). Correlations of random binary sequences with pre-stated operator intention: A review of a 12-year program. *Journal of Scientific Exploration, 11,* 345–367.

Jevning, R., Wallace, R. K., & Beidebach, M. (1992). The physiology of meditation: A review. A wakeful hypometabolic integrated response. *Neuroscience and Biobehavioral Reviews, 16,* 415–424.

Jevning, R., Wilson, A. F., & Smith, W. R. (1978). Adrenocortical activity during meditation. *Hormones and Behavior, 10,* 54–60.

Jonas, W. B., & Crawford, C. C. (Eds.). (2003). *Healing Intention and Energy Medicine: Science, Research Methods and Clinical Implications.* New York: Churchill Livingstone.

Kohanski, A. S. (1984). *The Greek Mode of Thought and Western Philosophy*. Madison, NJ: Fairleigh Dickinson University Press.

Maslow, A. (1968). *Toward a Psychology of Being* (2nd ed.). New York: Van Nostrand Reinhold.

Mason, L. I., Patterson, R. P., & Radin, D. (2007). Exploratory study: The random number generator and group meditation. *Journal of Scientific Exploration, 21,* 295–317.

Nelson, R. D. (2001). *Global Consciousness Project. MUM peace meditations.* Available at: http://www.noosphere.princeton.edu. Accessed 19 September 2008.

Nelson, R. D. (2006). *Global Consciousness Project. TM resonance aggregation.* Available at: http://www.noosphere.princeton.edu. Accessed 19 September 2008.

Nelson, R. D., Radin, D. I., Shoup, R., & Bancel, P. (2002). Correlation of continuous random data with major world events. *Foundations of Physics Letters, 15,* 537–550.

Newberg, A., Travis, F., Wintering, N., Nidich, S., Alavi, A., & Schneider, R. (2006). *Cerebral Glucose Metabolic Changes Associated with Transcendental Meditation Practice.* Presented at the Neural Imaging Conference, Miami, FL.

Orme-Johnson, D. W. (1987). Medical care utilization and the Transcendental Meditation program. *Psychosomatic Medicine, 49,* 493–507.

Orme-Johnson, D. W. (2009). *List of scientific research on the Maharishi Effect.* Available at: http://www.truthabouttm.org/truth/SocietalEffects/Rationale-Research/index.cfm. Accessed 18 February 2009.

Orme-Johnson, D. W., Alexander, C. N., & Davies, J. L. (1990). The effects of the Maharishi Technology of the Unified Field: Reply to a methodological critique. *Journal of Conflict Resolution, 34,* 756–768.

Orme-Johnson, D. W., Alexander, C. N., Davies, J. L., Chandler, H. M., & Larimore, W. E. (1988). International peace project in the Middle East: The effects of the Maharishi Technology of the Unified Field. *Journal of Conflict Resolution, 32,* 776–812. Reprinted in 1990 with Appendix A of data in *Scientific Research on Maharishi's Transcendental Meditation and TM-Sidhi Program: Collected Papers* (Vol. 4, pp. 2653–2678). Vlodrop, The Netherlands: Maharishi Vedic University Press.

Orme-Johnson, D. W., Dillbeck, M. C., Alexander, C. N., Chandler, H. M., & Cranson, R. W. (2003). Effects of large assemblies of participants in the Transcendental Meditation and TM-Sidhi program on reducing international conflict and terrorism. *Journal of Offender Rehabilitation, 36*(1–4), 283–302.

Radin, D. I. (1997). *The Conscious Universe.* HarperCollins.

Radin, D. I. (2002). Exploring relationships between random physical events and mass human attention: Asking for whom the bell tolls. *Journal of Scientific Exploration, 16,* 533–548.

Radin, D. I. (2004). Event-related electroencephalographic correlations between isolated human subjects. *Journal of Alternative and Complementary Medicine, 10,* 315–323.

Radin, D. I. (2006). *Entangled Minds.* Simon & Schuster.

Russett, B. (1988). Editor's comment. *Journal of Conflict Resolution, 32,* 773–775.

Schlitz, M. (1996). Intentionality and intuition and their clinical implications: A challenge for science and medicine. *Advances: The Journal of Mind-Body Health, 12,* 58–65.

Schlitz, M., & Braud, W. (1997). Distant intentionality and healing: Assessing the evidence. *Alternative Therapy Health Medicine, 3,* 62–73.

Schlitz, M., Radin, D., Malle, B., Schmidt, S., Utts, J., & Yount, G. L. (2004). Distant healing intention: Definitions and evolving guidelines for laboratory studies. *Alternative Therapy Health Medicine, 9*(3 suppl.), A31–A43.

Schneider, R. H., Alexander, C. N., Staggers, F., Rainforth, M., Salerno, J. W., Hartz, A., Arndt, S., Barnes, V. A., & Nidich, S. I. (2005). Long-term effects of stress reduction on mortality in persons ≥55 years of age with systemic hypertension. *American Journal of Cardiology, 95,* 1060–1064.

Schrodt, P. (1990). Methodological critique of "International peace project in the Middle East." *Journal of Conflict Resolution, 34,* 756–768.

So, K. T., & Orme-Johnson, D. W. (2001). Three randomized experiments on the holistic longitudinal effects of the Transcendental Meditation technique on cognition. *Intelligence, 29,* 419–440.

Standish, L. J., Johnson, L. C., Kozak, L., Johnson, L. C., & Richards, L. (2003). Evidence of correlated functional magnetic resonance imaging signals between distant human brains. *Alternative Therapy Health Medicine, 9,* 122–125.

Travis, F., & Wallace, R. K. (1997). Autonomic patterns during respiration suspensions: Possible markers of Transcendental Consciousness. *Psychophysiology, 34,* 39–46.

Van Flandern, T. (1999). *Dark Matter, Missing Planets & New Comets*. Berkeley, CA: North Atlantic Books.

Wackermann, J., Seiter, C., Keibel, H., & Walach, H. (2003). Correlations between brain electrical activities of two spatially separated human subjects. *Neuroscience Letters*, *336,* 60–64.

Wallace, R. K. (1970). Physiological effects of Transcendental Meditation. *Science, 167,* 1751–1754.

Werner, O. R., Wallace, R. K., Charles, B., Janssen, G., Stryker, T., & Chalmers, R. A. (1986). Long-term endocrinologic changes in subjects practicing the Transcendental Meditation and TM-Sidhi program. *Psychosomatic Medicine, 48*(1–2), 59–65.