

Can the *Transcendental Meditation* Program Reduce the Medical Expenditures of Older People? A Longitudinal Cost-Reduction Study in Canada

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We examined whether a method for enhancing psychological and physiological balance and health, the Transcendental Meditation (TM) technique, can reduce medical expenditures in people over 65 years old. Inflation-adjusted payments to physicians for treating 163 TM practitioners were compared with those for 163 control participants matched for age, sex, and median pre-intervention payments. Yearly changes in physician payments were estimated for each participant using separate least squares regressions for pre- and post-intervention periods. During the pre-meditation period, mean changes in payments differed nonsignificantly between groups ($p = .27$). After learning the TM technique, the mean annual change in payments for TM practitioners was significantly lower than for controls ($p = .001$). The TM group's five-year cumulative reduction relative to controls was 70%.

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INTRODUCTION

Economic Environment of Physician Services in Canada

With universal health care for all its citizens, the coverage of Canada's medical system seems ideal compared with that of the United States. In the U.S., the percentage of workers without health insurance rose from 15% in 1979 to 23% in 1995 (Kronick & Gilmer, 1999). The Census Bureau reported that 15.3% of US citizens, or 42.6 million people, had no health insurance in 1999 (Hall, 2000).

In Canada, all citizens are entitled to full, free physician and hospital services for all types of necessary care (excluding unnecessary treatment such as elective cosmetic surgery). In Canada, there is also comprehensive medical expense record keeping for individuals (before and after age 65). There is greater uniformity and standardization in Canadian medical care than in the US (Whitcomb, & Desgroseilliers, 1992). Each Canadian province operates an independent health insurance plan that functions according to the guidelines of the Canada Health Act. Both the federal and provincial governments pay for the operation of the provincially administered health plans. In 1971, the Canadian provinces began providing health insurance plans that cover all medically necessary physician and hospital care.

Declining Federal Support of Medicare

Canada's economic problems affect its medical care system. Per citizen, the Canadian national debt is one of the highest in the world, and Canada's political leaders believe this situation might threaten their economic progress (Emes & Kreptul, 2000). To restore economic balance, Prime Ministers Mulroney and Chretien have attempted to diminish their national debt and budget deficits through several means, including the reduction of the federal government's contributions to the provincial medical care systems. Before 1980, Ottawa paid over 50% of the nation's annual medical expenditures. In the 1990s, however, the federal contribution to the provincial medical plans was less than 30% of total expenses, and these outlays may continue to decline further in the long-term (Horry & Walker, 1994). Most health economists and other experts have concluded that the development of new, advanced medical technologies is the main contributor to the long-term increase in medical care spending (Fuchs, 1999). As Bethune (2000) explained "For more than a decade, high-tech, high-cost medicine has been colliding with the escalating health-care demands of an aging population." Rising health care expenses are a major concern for Canadians (Demers, 1996; Dalziel, 1996).

Figure 1 shows the average annual physician payments for Canada as a whole and Quebec Province in current dollars from 1981 to 1994

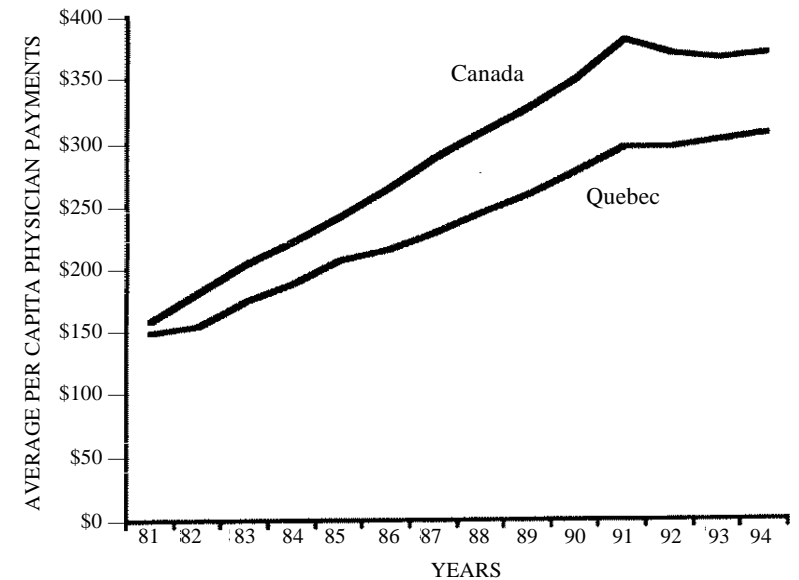


FIGURE 1 Per Capita Mean Annual Physician Payments for Canada and Quebec Province for All Age Groups and Sexes (in current Canadian dollars)

(includes all age groups). On average, Quebec physician expenses were lower than those for Canada as a whole during this period. This phenomenon has been attributed to Quebec's application of more rigorous physician fee controls (Evans et al., 1989; Barer, Barer, & Labelle, 1988).

Declining Medical Quality and Services

Since the federal government began reducing its contributions to the provincial health care systems, many Canadians have noticed a decline in the quantity and quality of medical care in Canada. "The results, as governments struggled to balance their budgets in the 1990s, have been a shock to Canadians: hospital closures, delisted services, lengthy waiting lists, overcrowded emergency rooms, doctors and nurses heading south—and a system still costing \$86 billion a year to run" (Bethune, 2000). Many diagnostic and surgical procedures widely available in the US and other developed nations are unavailable or scarce in Canada (McArthur, Ramsay, & Walker, 1996). Canada ranks low compared with

other developed nations for the availability of diagnostic equipment such as CT scanners and MRI devices (McArthur, Ramsay, & Walker, 1996).

In response to this crisis, the Premier of Quebec, Lucien Bouchard, stated that remedying the problems of the Quebec health care system will be the highest priority of his ruling party, the *Parti Québécois* (Thompson, 2000). The premiers of the other Canadian provinces are also taking steps to improve medical care for their citizens. For example, the Conservative government in Alberta Province has introduced legislation to privatize much of their medical care system (Janigan, 2000). For many Canadians this is a drastic remedy. Nevertheless, support for privatizing at least portions of Canadian medical care seems to be increasing. A recent poll suggests that 58% of Canadians favor privatizing parts of their medical care system (Kennedy, 2000). The survey also indicated that 29% of those questioned believe governments will be unable to contain medical expenses by operating the system more effectively, and 45% think that medical costs will continue to rise rapidly (Kennedy, 2000). The provincial premiers are requesting increased medical care funding from the federal government surplus.

Prevention and Medical System Effectiveness

Even if the provincial premiers obtain increased federal funds for their health plans, there will be a need to improve medical system effectiveness. As Geddes (2000) pointed out “Some observers are worried that the emphasis on restoring funding in Canada threatens to delay badly needed reforms.” Expanded disease prevention, for instance, is needed (Evans, Barer, & Marmor, 1994). Cost-effective, scientifically proven preventive interventions would be desirable because research shows that at least 70% of all disease is preventable (Evans, Barer, & Marmor, 1994; US Department of Health & Human Services, 1991, 1996, 2000). Most disease is self-inflicted—caused by an epidemic of unhealthy habits, including improper diet, stressful lifestyles, inadequate exercise, smoking, and alcohol and drug abuse (Evans, Barer, & Marmor, 1994; US Department of Health & Human Services, 1991, 1996, 2000). These factors are responsible for a wide range of chronic diseases, including heart disease, cancer, and stroke. Unhealthy lifestyles are also a major contributor to skyrocketing medical costs. Yet, for decades a relatively small percentage of medical expenditures have been spent to address these problems (Evans, Barer, & Marmor, 1994).

From the most comprehensive viewpoint, the best medical care is that which never needs to be given because of prevention. Paradoxically, past attempts to “reform” Canadian Medicare have focused mainly on the financing and delivery of even more medical treatment, and not

prevention. Consequently, the Canadian medical system may continue to be an unnecessarily expensive “disease-care” system (Evans, Barer, & Marmor, 1994).

Canadian leaders have been pressured by various groups such as the Canadian Medical Association and drug industry to spend ever-increasing amounts of money on more medical treatment. However, allocating more money without reforms in overall approach may make their system increasingly expensive, but not necessarily more effective in producing healthy people (Geddes, 2000). To achieve improved effectiveness, a fundamental change in strategy seems to be needed (Evans, Barer, & Marmor, 1994). This study evaluated the Transcendental Meditation program, which might be a key component in a prevention-oriented health care system. The study was executed in Canada because it could be conducted there at a lower expense (approximately 1/10th) than the cost for a similar Medicare study conducted in the United States.

Complementary/Alternative Medicine

The use of Complementary/Alternative Medicine (CAM) is growing rapidly in both Canada (Blais, Maïga, & Aboubacar, 1997; Millar, 1997; Kelner & Wellman, 1997) and the United States (Astin, Pelletier, Marie, & Haskell, 2000; Eisenberg, Davis, Ettner, Appel, Wilkey, Van Rompay, & Kessler, 1998; Druss & Rosenheck, 1999; Astin, 1998; Paramore, 1997; Eisenberg et al., 1993). CAM is being taught in medical schools (Wetzel, Eisenberg, & Kaptchuk, 1998) and even being used and prescribed by some conventional physicians (Borkan, Neher, Anson, & Smoker, 1994). According to the US National Institutes of Health’s National Center for Complementary & Alternative Medicine “CAM covers a broad range of healing philosophies (schools of thought), approaches, and therapies that mainstream Western (conventional) medicine does not commonly use, accept, study, understand, or make available” (see: <http://nccam.nih.gov/nccam/an/general/index.html#whatcam>). The Transcendental Meditation program could be considered a form of CAM.

The Transcendental Meditation Program

The Transcendental Meditation technique of Maharishi Mahesh Yogi is a standardized procedure practiced for 15 to 20 minutes twice daily while sitting comfortably with eyes closed. The TM practice involves the use of specific sounds that have beneficial vibratory effects on the nervous system (Sharma & Clark, 1998). During the TM session, the mind transcends even the subtlest thoughts to achieve a unique state of deep physiological rest (Jevning, Wallace, & Beidebach, 1992).

Over 600 studies have previously examined the TM technique's impact on numerous health, lifestyle, physiological, psychological, and other outcomes (Alexander, Robinson, & Rainforth, 1994; Alexander, Robinson, Orme-Johnson, Schneider, & Walton, 1993; Alexander, Rainforth, & Gelderloos, 1991; Alexander, Langer, Davies, Chandler, & Newman, 1989; Orme-Johnson & Walton, 1998; Orme-Johnson & Herron, 1997; Eppley, Abrams, & Shear, 1989; Dillbeck & Orme-Johnson, 1987). The TM technique produces distinctive physiological and psychological effects that have been reported to be useful in preventing disease and promoting health (Sharma & Clark, 1998; Sharma, 1993). The physiological effects include:

- (a) reduced carotid atherosclerosis; atherosclerosis is a cause of strokes and heart attacks (Castillo-Richmond et al., 2000),
- (b) lower baseline cortisol levels, a stress hormone (Subrahmanyam & Porkodi, 1980; Jevning, Wilson, & Davidson, 1978; Jevning, Wilson, & Smith, 1978),
- (c) reduced blood pressure, in both the general population (Cooper & Aygen, 1978; Wallace, Silver, Mills, Dillbeck, & Wagoner, 1983; Alexander et al., 1989) and hypertensive patients (Schneider et al., 1995; Walton, Pugh, Gelderloos, & Macrae, 1995),
- (d) decreased heart rate (Dillbeck & Orme-Johnson, 1987; Wallace, 1970; Wallace & Benson, 1972),
- (e) reduced respiratory rate (Dillbeck & Orme-Johnson, 1987; Wallace, 1970),
- (f) global reduction in somatic arousal, which indicates a more relaxed and balanced style of physiologic functioning (Jevning et al., 1992),
- (g) reduction of neuroendocrine correlates of drug abuse (Walton & Levitsky, 1994), and
- (h) reduction of chronic stress (Orme-Johnson & Walton, 1998; Eppley, Abrams, & Shear, 1989).

With regard to its psychological effects, the TM technique's most important contribution to health may be to decrease health-damaging habits such as tobacco use, heavy alcohol usage, and drug abuse, which are behavioral correlates of chronic stress (Alexander, Robinson, Orme-Johnson, Schneider, & Walton, 1993; Alexander, Robinson, & Rainforth, 1994; Brooks & Scarano, 1985; Gelderloos, Walton, Orme-Johnson, & Alexander, 1991; Royer, 1994; Taub, Steiner, Weingarten, & Walton,

1994; Orme-Johnson & Walton, 1998). These findings are important because half of all deaths (McGinnis & Foege, 1993) and most diseases (Evans, Barer, & Marmor, 1994; US Department of Health and Human Services, 1991, 1996, 2000) have been attributed to such unhealthy lifestyle factors.

When considering medical utilization, one cross-sectional study (Orme-Johnson, 1987) examined medical utilization by 2,000 TM practitioners compared with controls using five years of health insurance data. When compared with normative data or other groups of similar profession, TM participants had 50% lower inpatient and outpatient medical utilization. This trend held across all age groups and disease categories. Clinically significant findings included 87% less hospitalization than norms for heart disease, and 55% less hospitalization than norms for cancer. For this cross-sectional study, the participants' medical utilization data were unavailable for the period prior to their starting the Transcendental Meditation program.

Purpose of the Study

In the present longitudinal cost minimization study, the sole purpose was to assess whether practice of this meditation procedure can contribute to the reduction of medical expenditures. This study was not designed to elucidate the causal mechanisms of how the intervention reduces medical expenses. Furthermore, this study was not conducted to document the relationships among TM practice and numerous health-related variables, such as actual health status, perceived health status, lifestyles, socioeconomic levels, self-efficacy, race, sex, age, ethnicity, medical beliefs, job satisfaction, or employment status. Thus, the hypothesis was that the practice of the Transcendental Meditation technique would reduce medical payments in Quebec, Canada.

METHODS

Design

This retrospective, longitudinal, pre- and post-intervention study compared 14 years of government payments to physicians for treating two groups—a sample of 163 Quebec health insurance enrollees who practiced the TM technique and 163 controls who did not practice this procedure. Medical expense data for this study were provided by the Régie de l'assurance-maladie du Québec (RAMQ), the government health insurance agency for the province of Quebec.

Sample

TM Group. The TM group examined in this study was drawn from a broader sample of 1,418 Quebec citizens of all ages who practiced the

Transcendental Meditation technique. A TM practitioner was defined as a person who had learned the Transcendental Meditation technique in the standard seven-step course taught by the Quebec TM program organization. Recruitment of participants occurred between September 1990 and September 1992. Participants were solicited by distributing questionnaires to TM practitioners who attended events at the Montreal TM Program Center and by mailing questionnaires to TM practitioners throughout the province. Unfortunately, no records were kept on the number of people who attended events or received questionnaires at the Montreal TM Program Center. Also, accurate records were not kept on the number of people who were mailed questionnaires. No financial or other material incentives were provided to encourage response or participation in the study. These solicitations yielded a total of 1,756 returned questionnaires. Of the returned questionnaires 1,418 were both legible and complete enough to use.

Data on TM participants were collected using a one-page questionnaire that explained the study and asked each participant for several items of information: (a) medical insurance number (which enabled the government health insurance agency for Quebec, to retrieve the participant's physician payment records), (b) date of Transcendental Meditation instruction (which enabled us to determine the participants' pre- and post-intervention periods), (c) present occupation, (d) level of regularity in practicing the technique (regular, irregular, or stopped), and (e) age and sex. All participants who had learned the TM technique were included in this intent-to-treat analysis (regardless of their indicated regularity of practice).

The TM group is a nonprobabilistic, or convenience sample, because the TM participants self-selected to practice the TM technique and later self-selected into the study, and the number of possible respondents was indefinite.

Control Group. The Non-TM group examined in this study was drawn from a broader sample of 1,418 Quebec citizens of all ages who did not practice the Transcendental Meditation technique. The control group in this study is a probabilistic sample, because it was randomly selected by an independent organization, the Régie de l'assurance-maladie du Québec (RAMQ).

Participants Over 65 Years Old Selected. Using the information the participants provided on their age, the TM and Non-TM groups were divided into two groups (a) those equal to or over 65 years of age, and (b) those less than 65 years of age.

The participants were matched by age, sex, and median annual pre-intervention physician payments to avoid the possibility of regression to

the mean. Thus, only those equal to or over age 65 and who could be matched with control participants by age, sex, and their median annual pre-intervention physician payments were analyzed and reported in this study. A previous study analyzed the physician expenses of all participants in both groups (Herron & Hillis, 2000).

Of the 2,836 participants (1,418 in each of two groups; average age: 38 years) in the broader sample, 163 TM practitioners and 163 Non-TM participants were over 65 years and could be matched by age, sex, and their median annual pre-intervention physician payments. After matching was completed, there were 78 males and 85 females in each of the two over-65 groups with a mean age of 72 years (range: 65 to 82 years). The over-65 TM participants had practiced the technique an average of five years.

Measures

The dependent variable in this study was annual payments in inflated-adjusted Canadian dollars (constant 1992 Canadian dollars) to private physicians for treating the participants over 65 years old in all settings. The demarcation point of age 65 was used because during adult life medical expenditures tend to grow slowly, but from age 65 onwards, these expenses grow exponentially (Meerding, Bonneux, Polder, Koopmanschap, & van der Maas, 1998; Hodgson & Cohen, 1999; Waldo, Sonnefeld, McKusick, & Arnett, 1989). The independent variable was stress-reduction treatment status: Non-TM controls or TM practitioners. The Régie de l'assurance-maladie du Québec has maintained centralized database records of its payments to private physicians from 1981 onwards, and RAMQ provided the total annual physician payments for each of the 326 participants in both groups (163 TM Group and 163 Non-TM controls) from 1981 to 1994. Other medical expenditure data, such as medical tests, hospital, and drug costs, were unavailable for individual participants in the RAMQ database. RAMQ has been considered a reliable source of physician expenses and related data for Quebec, and it has provided these data for other similar studies (e.g., Préville, Potvin, & Boyer, 1998).

Statistical Methods

To make all years (1981–1994) of data comparable, annual physician expenses for each participant were adjusted for inflation using the medical cost component of the Canadian government's Consumer Price Index (CPI). This CPI was provided by Statistics Canada at its website,

<http://www.statcan.ca>. All data in this study were analyzed and presented in constant 1992 Canadian dollars.

Our objectives were to estimate the mean annual inflation-adjusted change in payments to physicians in Canadian dollars, to evaluate the statistical significance of this change between groups, and to estimate the magnitude of this change as a percentage both between groups and within groups. To accomplish these goals, the annual change in payments was estimated for each participant using least squares regression. Each participant's annual, inflation-adjusted expenses were regressed on time using a simple linear least squares model, with separate regressions for the pre- and post-intervention periods. The resulting slopes were used to estimate each participant's pre- and post-intervention rate of change in physician expenditures per year in 1992 Canadian dollars. The TM participants started the intervention in different years, on average in 1988. For the control group, the time period 1981–1988 was used to estimate the annual rate of change before the intervention. The period 1987–1994 was the post-intervention period for the control group, with 1987 as the base year for the linear least squares regression calculation. For the TM group, the annual rate of change before the intervention was estimated using the years 1981 until the year TM practice commenced. The period for estimating the post-intervention annual rate of change for the TM participants was the year immediately before the start of TM practice to all subsequent years for which expense data were available.

The distribution of annual changes in physician payments for both groups, as estimated by the regression slopes for the pre- and post-intervention periods, was non-normal with heavy tails (see skewness and kurtosis in Table 1). Although it is well-known that the t-test for the difference in the mean of two independent samples is quite robust to non-normality, including heavy-tailed distributions such as these, nonetheless the t-test may be unduly affected by a few extreme cases or outliers (Hogg, 1979, 1974; Kingery, Ellsworth, Corbett, Bowden, & Brizzolara, 1994; Zhou, Melfi, & Hui, 1997). Thus, in analyzing the differences in the annual change in physician payments between groups, the TM and Non-TM groups were compared using both the t-test and the nonparametric Mann-Whitney U test (Wilcoxon rank-sum test). As an alternative robust test, the groups were compared using t-tests based on 1% and 5% trimmed means (Hogg, 1974, 1979). The 1% trimmed mean is the mean of the annual change in payments after the largest 1% and the smallest 1% of the observations have been omitted. Similarly, the 5% trimmed mean omits the largest and smallest 5% of the annual changes in payments. Thus, the 1% and 5% trimmed means provide estimates of the means for the middle 98% and middle 90% of the population values. The

TABLE 1 Summary Statistics and Nonparametric Comparison of Payments to Physicians for Treating Non-TM and TM Participants 65 Years and Older

	<i>Pre-intervention Total payments</i>	<i>Pre- intervention yearly change</i>	<i>Post- intervention yearly change</i>
Non-TM (n=163)			
Minimum	5.59	-306.61	-225.70
Maximum	1639.14	256.19	464.26
Range	1633.50	562.80	690.04
Mean	196.61	2.28	21.63
Standard Deviation	227.83	59.34	85.26
Standard Error	17.84	4.65	6.68
Skewness	3.04	-1.15	2.33
Kurtosis	13.06	8.93	8.82
Median	125.46	2.80	2.94
TM (n=163)			
Minimum	1.00	-193.12	-848.79
Maximum	1649.75	242.98	821.87
Range	1648.75	436.10	1668.66
Mean	203.63	11.70	-12.41
Standard Deviation	226.84	51.23	119.59
Standard Error	17.77	4.01	9.37
Skewness	3.03	0.76	-.23
Kurtosis	13.10	4.73	27.70
Median	130.39	3.48	-7.03
Comparison^a	p = .408	p = .274	p = .001

^a The pre-intervention median total physician payments, pre-intervention yearly change, and post-intervention yearly change in payments for the Non-TM and TM groups were compared using the Mann-Whitney U test (Wilcoxon rank-sum test). Data is expressed in 1992 Canadian dollars.

trimmed means were compared using the t-test for independent samples without the assumption of equal variances. Test statistics were calculated using SYSTAT 5.2 (1992, SPSS Inc., Chicago, IL). The reported p-values for all tests are two-sided, and all confidence intervals were calculated at the 95% level.

If the practice of the TM program had no effect, then one would expect the estimated average annual change in expenditures to be non-significantly different between the two groups in the post-intervention

period. On the other hand, a significantly lower average annual change in expenditures for the TM group compared with controls during the post-intervention period would support the hypothesis that the Transcendental Meditation technique reduced the use of conventional medical care and related expenditures.

Estimates of the annual percentage rate of change in inflation-adjusted physician expenses for the post-intervention period were calculated using both the means and trimmed means. Between and within group estimates of percentage change were also made. For the between group estimate, the annual change percentages were calculated by dividing the estimated annual change in expenses by the median of the year before the intervention commenced. These medians were \$141.90 for the TM group and \$143.31 for the Non-TM group. For the within group estimate, the five-year cumulative and annualized change percentages were calculated. The five-year cumulative percentage change estimate was calculated by dividing the group mean of the last year of physician expense data by the corresponding mean of expenses in the year immediately before the intervention commenced. This result was multiplied by 100 to give a percentage. The within group annualized compound percentage change was estimated using a commonly applied financial method (Brigham & Gapenski, 1985). Similarly, within-group percentage changes were calculated using the median and trimmed means.

RESULTS

Figure 2 shows the 1% trimmed mean of annual inflation-adjusted payments to private physicians for treating Non-TM and TM participants age 65 or older during the pre- and post-intervention periods. Because the participants in both groups in Figure 2 are over age 65, their expenses in the first year of the study were higher than those shown in Figure 1 for the general population, which had a lower average age. We calculated results for the pre- and post-intervention periods.

Pre-Intervention Period

Figure 1 shows a trend of increasing physician payments for the Quebec and Canadian populations from 1981 to 1994. Similarly, in Figure 2 during the pre-intervention period we see a general trend of rising payments for both the TM and Non-TM groups. Table 1 presents the summary statistics for both groups for the pre- and post-intervention periods. The mean annual change in physician payments for the TM group (\$11.70 per year) was higher than that for the Non-TM group (\$2.28 annually), but this difference was not statistically significant ($p = .27$, Mann Whitney U test) (see Table 1). Likewise, the pre-intervention

median total annual physician payment for the TM group (\$130.39) did not differ significantly from that for the controls (\$125.46) ($p = .41$) (Table 1). Table 2 reports the comparable results for the t-tests for independent samples, both trimmed and untrimmed, for differences in pre-intervention payment increases. No significant differences in annual payment increases between groups were found on any of the t-tests at the .05 level.

Annual increases in physician payments during the period of this study were typical in Quebec due to increased utilization of physicians' services (Régie de l'assurance-maladie du Québec, 1982-1995). In Quebec, between 1982 and 1992, there was a major increase in payments to specialists, especially for treating the elderly (Demers, 1996). General practitioners also started providing more expensive services than in previous years (Demers, 1996; Dalziel, 1996). Thus, consistent with the general rise in medical payments in Quebec during this period, both the TM and Non-TM groups exhibited similar increasing trends in physician payments prior to the intervention. As shown in Figure 2, immediately prior to the onset of the intervention period, both groups had similar annual physician payments, as measured by the 1% trimmed mean (\$339.35 for the TM group, and \$293.69 for the Non-TM group), but this difference was not significant—nonparametric Mann-Whitney U test ($p = .99$). Likewise, the pre-intervention medians were very close (Table 1).

Post-Intervention Period

In Figure 2, during the post-intervention period, we see that the Non-TM group's expenses continued to rise, while the TM group's expenses declined substantially below those for the control group. In the post-intervention period, as shown in Tables 1 and 2, the Non-TM group's estimated annual physician payments continued to increase at a higher rate of annual change than in the pre-intervention period. The latter increase appears to be typical of this over-65 age group during this period in Quebec (Demers, 1996; Dalziel, 1996). In contrast, during the post-intervention period, the TM group's physician payments decreased steadily. As reported in Table 1, mean annual changes in physician payments for the TM group were significantly less than the controls for the post-intervention period ($p = .001$, Mann-Whitney U test). Likewise, as shown in Table 2, all t-tests for the group difference in mean annual change in physician payments were statistically significant at the .001 level. Table 3 presents the within-group estimates of cumulative and annualized change in physician payments. The five-year cumulative declines ranged from 58.99% to 69.84%. Overall, these data suggest that

TABLE 2 Estimates of Annual Inflation-Adjusted Change in Payments to Physicians for Treating TM and Non-TM Participants over Age 65

Estimators groups	Annual expense change (95% confidence levels)		Annual % change Post	p-value ^a	
	Pre	Post		Pre	Post
Mean					
Non-TM (n=163)	\$2.28 (11.39, -6.83)	\$21.63 (34.72, 8.54)	15.09	.27	.001
TM (n=163)	\$11.79 (19.65, 3.92)	-\$12.41 (5.94, -30.77)	-8.75		
Difference ^b	\$9.51	\$34.04	23.84		
1% Trim. Mean					
Non-TM (n=159)	\$3.29 (10.33, -3.75)	\$18.93 (29.44, 8.41)	13.21	.10	.000
TM (n=159)	\$11.32 (17.87, 4.78)	-\$12.00 (-1.32, -22.69)	-8.46		
Difference ^b	\$8.03	\$30.93	21.67		
5% Trim. Mean					
Non-TM (n=147)	\$4.02 (9.14, -1.09)	\$12.96 (19.91, 6.00)	9.04	.10	.000
TM (n=147)	\$9.98 (14.94, 5.02)	-\$9.88 (-2.37, -17.39)	-6.96		
Difference ^b	\$5.96	\$22.84	16.00		

Note: All dollar figures are in 1992 Canadian dollars.

^a P-values indicate the significance of the comparison between the TM and Non-TM groups.

^b TM group minus Non-TM group.

the rising trend in physician expenses for the TM group during the pre-intervention period was significantly reversed after the participants learned the TM technique. Thus, these data strongly suggest that a medical cost reduction benefit may have resulted from the TM practice.

DISCUSSION

The results reported above tend to support the hypothesis of decreased payments to physicians for treating TM practitioners over age 65. The Transcendental Meditation practitioners' mean physician payments decreased 23.84% annually relative to controls (Table 2). For the within subject estimation of percentage change in physician payments, the TM participants exhibited a five-year cumulative decline of almost 70% in payments relative to controls (Table 3). The results were significant using several statistical tests, including parametric, nonparametric, and robust methods. Thus, the findings were not sensitive to one particular method for analyzing the data that might have yielded a uniquely favorable result.

These longitudinal results are supported by a previous cross-sectional study of Blue Cross and Blue Shield enrollees in the US. In that study, participants over age 45 who practiced the TM program for many years and who utilized advanced procedures in the Maharishi Vedic Approach to Health had 88% fewer total hospital days over an 11-year period compared with controls. They also incurred total medical expenditures that were approximately 60% below the levels for controls and norms (Orme-Johnson & Herron, 1997).

In this ongoing research project in Quebec, the TM group's 23.8% annual decline relative to controls (Table 2) or 69.8% five-year cumulative decline (Table 3) are of a larger magnitude than those previously reported for the general Quebec population (5% to 13% annual decreases) (Herron et al., 1996; Herron & Hillis, 2000). The elderly typically have had more years of exposure to stress, and the accompanying stress-related psychological and physiological imbalances can contribute to increased illness and attendant medical expenses. It appears that the over-65 TM participants in this study may have experienced a significant improvement in health that resulted in a reduction in physician expenses. Given the previous research in this area, the present results may be due to reduction in stress and increased psychological and physiological balance resulting from the TM practice.

Issues in Interpretation

This study has limitations that affect the interpretation of results. A major concern is the issue of self-selection. Participants elected to start and continue practice of the TM technique and also chose to enter the study. Those who entered the study may not be representative of all those who began the technique. Those who chose to begin the practice of the TM technique may not be representative of the general population or the control group. In this study, the method of sampling limits the

TABLE 3 Within Group Cumulative and Annualized Percentage Change in Physician Payments during Five-year Post-Intervention Period

<i>Estimators</i>	<i>Groups (n)</i>	<i>Cumulative 5-year % change</i>	<i>Annualized % change</i>
Mean	Non-TM (n=163)	39.22	6.84
	TM (n=163)	-30.62	-7.05
	Difference ^a	69.84	13.89
Median	Non-TM (n=163)	43.44	7.48
	TM (n=163)	-26.23	-5.90
	Difference	69.67	13.38
1% Trimmed Mean	Non-TM (n=159)	39.21	6.83
	TM (n=159)	-30.61	-7.04
	Difference	69.82	13.87
5% Trimmed Mean	Non-TM (n=147)	33.38	5.93
	TM (n=147)	-25.61	-5.75
	Difference	58.99	11.68

^aDifference equals TM group minus Non-TM group.

generalizability of the results. This limitation was considered acceptable because this ongoing project is the first longitudinal study attempting to assess the long-term medical costs of individuals over age 65 who practice the TM technique. As such, this study can be considered preliminary in nature. To improve the design, future randomized research should include an active control group of committed practitioners of some other complementary/alternative medicine therapy (CAM).

The results can be interpreted in the context of the earlier studies that have evaluated the health effects of the TM program. Many of these studies, including randomized clinical trials, indicate that the TM technique can improve health status, decrease tobacco use, reduce substance abuse, and decrease other unhealthy habits (Alexander et al., 1994, 1993, 1991, 1989; Orme-Johnson & Walton, 1998; Orme-Johnson & Herron, 1997; Eppley et al., 1989; Dillbeck & Orme-Johnson, 1987). When considering the previous research on the TM program and the intractable and complex factors involved in rising medical expenses for the elderly in Quebec (Demers, 1996; Dalziel, 1996), it seems unlikely that

self-selection, or sampling methods, alone could account for the observed results.

Because we did not monitor the participants' adherence to the TM course instructions, we do not know what level of compliance the participants may have had. All participants who learned the TM technique in the standardized course were included in this study and analyzed on an intent-to-treat basis. Thus, one could argue that the results might be conservative because we may have underestimated the actual effect of the TM technique on medical expenditure reduction. The effect of the procedure and the power of the study might have been reduced to the degree that the TM participants may have failed to comply with the instructions for correct practice of the TM technique (Hulley, Feigel, Martin, & Cummings, 1988). For most research designs, including randomized clinical trials, the intent-to-treat analysis is preferred to evaluation based on compliance, which is often difficult to measure accurately and reliably (Morales, 1996; Fisher, 1999).

Another potential issue is the possibility of regression towards the mean. The elderly tend to have higher medical expenses than the general population. Whenever extreme values are examined, regression to the mean is a potential concern. Regression towards the mean has been defined as a tendency of extreme measures to move closer to the mean when they are repeated over time. This phenomenon was first described by Galton in 1885, and since described in medical settings by many authors (McDonald & Mazzuca, 1983). Figure 2 shows that in the first three years of the study, the one percent trimmed means of annual physician payments were similar. Subsequently, the TM group's expenses increased faster than those for the controls in the pre-intervention period.

However, regression to the mean seems an unlikely explanation for the results reported in Tables 1, 2, and 3 because the two groups were equivalent with regard to age, sex, insurance plan, medical access, median annual physician payments, as well as the and median change in annual total physician expenses before the intervention. Table 1 shows the pre-intervention median payment for the TM group (\$130.39) differed nonsignificantly from that of the controls (\$125.46) ($p = .41$). Likewise, in Table 2, we see that in the pre-intervention period, the annual change in expenses was nonsignificantly different on all statistical tests. Also, for the year prior to the intervention, follow-up statistical tests showed that the difference in physician expenses between groups was nonsignificant based on both the nonparametric Mann-Whitney U test ($p = .99$) and the t-test ($p = .34$). In sum, it does not appear that the post-intervention results can be plausibly attributed to regression toward the mean.

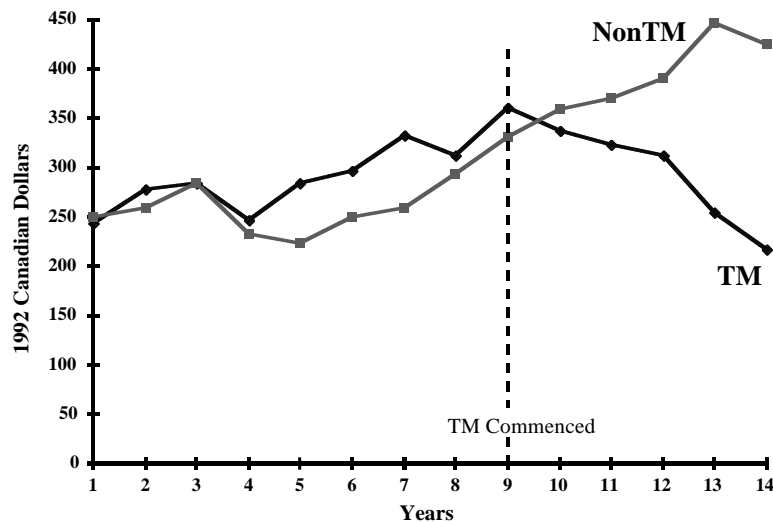


FIGURE 2 1% Trimmed Mean of Annual Inflation-Adjusted Payments to Private Physicians for Treating Non-TM and TM Participants Age 65 or Older in All Settings

Alternative explanations for the results, such as the placebo effect, must also be considered (Eisenberg et al., 1993). In a meta-analysis of 146 independent outcomes, Eppley et al. (1989) found the TM technique was significantly more efficacious than a placebo or other relaxation techniques in reducing anxiety (stress). Moreover, several studies showing positive effects of the TM technique on hypertension (Schneider et al., 1995; Alexander et al., 1989; Orme-Johnson & Walton, 1998) and psychological health (Alexander et al., 1991; Orme-Johnson & Walton, 1998; Eppley et al., 1989; Brooks & Scarano, 1985; Taub et al., 1994) have used prospective, random assignment designs that included both placebo and active control groups. Thus, the placebo effect seems an unlikely explanation for the results.

Another possible explanation could be that the TM participants increased more than control participants in their use of other unconventional care, or complementary/alternative medicine (CAM), which was not monitored in this study. To date, there have been no studies in Canada evaluating whether the TM technique has been used as a substi-

tute or complement to Western medicine. There is no evidence that the utilization patterns of the TM program differ from those of other forms of meditation or CAM. Although approximately 14% of the Quebec population uses some form of CAM (Millar, 1997), the Quebec government keeps records only of utilization of standard physician treatment, because RAMQ pays only for conventional care and not for CAM. From Tables 1 and 2, we see that before starting the technique, the TM group's use of conventional physician care was increasing faster than that for the Non-TM group. However, upon commencing the technique, TM participants may have reduced their conventional care, and started utilizing more complementary/alternative medicine than controls. However this explanation appears unlikely for the following four reasons.

First, Eisenberg et al. (1993), Eisenberg et al. (1998), Astin et al. (2000), Astin (1998), Druss and Rosenheck (1999), and Paramore (1997) provide evidence from US national surveys suggesting that unconventional medical care is generally used to supplement or complement conventional medical treatment, and *not to replace it*. Druss and Rosenheck (1999) explained "unconventional therapies appear to serve more as a complement than an alternative to conventional medicine." Astin (1998) found that 95.6% of his sample used alternative care to complement their conventional treatment, and only 4.4% used CAM as primary care. The same phenomenon also appears to occur in Canada (Blais, Maïga, & Aboubacar, 1997; Millar, 1997; Kelner & Wellman, 1997).

Second, past research indicates that users of unconventional medicine are more likely to have higher physician utilization than the rest of the population. Druss and Rosenheck (1999) found that "Overall, having any visit for unconventional therapies was associated with an approximately twofold increase in the odds of having a physician visit." They also found that for those who practice some form of meditation (excluding TM), there was a 1.45 odds ratio, (CI, 0.88-2.49; $p < .001$), for increased visits to conventional physicians. Paramore (1997) found that "users of alternative care made almost twice as many visits to conventional (or orthodox) medical providers as nonusers made." In Canada, users of CAM tend to have more chronic illnesses than the general population (Millar, 1997; Kelner & Wellman, 1997), which usually leads to higher physician utilization rates.

However, the meditators in this study showed the opposite trend in physician use. What might explain this difference? Recent meta-analyses have indicated that different relaxation methods produce widely differing results (Orme-Johnson & Walton, 1998). TM practice appears to be associated with decreased physician utilization because of im-

proved actual health status (Castillo-Richmond et al., 2000; Schneider et al., 1995; Alexander et al., 1989; Orme-Johnson & Herron, 1997). Other factors, however, might also be involved. For instance, there is evidence that TM practice improves brain function, which might affect health-related lifestyles and psychological and physiological health. Numerous electroencephalographic (EEG) studies have found that TM practice produces distinctive and comprehensive EEG patterns, indicating enhanced brain orderliness (Travis & Wallace, 1997; Mason et al., 1997; Petrenko, Orlova, & Lyubimov, 1993; Travis & Orme-Johnson, 1990; Banquet, 1973). Several neuroendocrine studies also indicate the TM technique generates major changes in the neurophysiology in the direction of improved health (Walton et al., 1995; Walton & Levitsky, 1994; MacLean et al., 1994; Subrahmanyam & Porkodi, 1980; Jevning, Wilson, & Davidson, 1978; Jevning, Wilson, & Smith, 1978).

Reduced anxiety (Eppley et al., 1989) may affect perceived health status, another determinant of medical care use. TM practice strengthens self-efficacy (Alexander et al., 1991), which may influence utilization rates. Research shows that the TM technique improves cognitive flexibility (Alexander et al., 1989; Dillbeck, 1982), which might enable meditators to easily adopt new lifestyles that are less health-damaging and more health-promoting, and thus help reduce medical expenses. There is also evidence that the TM practice broadens comprehension (Dillbeck, Assimakis, Raimondi, Orme-Johnson, & Rowe, 1986; Gelderloos, Lockie, Chuttooragoon, 1987; Pelletier, 1974) and improves orientation toward more positive values (Gelderloos, Goddard, Ahlström, & Jacoby, 1987), which may affect health-related habits, health status, and medical usage. Future research might explore the numerous possible mediating variables that may interact to reduce medical utilization and expenses. However, it was beyond the scope of this study to investigate the causal mechanism underlying the observed results.

Third, until recently, many forms of CAM have been difficult to obtain in Quebec. At the request of the Quebec physicians' association, the provincial government has discouraged the practice of many forms of unconventional medicine during most of the years covered by this study, 1981–1994. The highly publicized trial of Dr. Gaston Naessens is an example of this policy (Bird, 1990). Chiropractic care was legalized in 1973 and acupuncture in 1986. CAM has grown rapidly in recent years in the large cities. However, Quebec still lags behind other Canadian provinces and the United States in CAM utilization. In the US, Eisenberg et al. (1998) estimated that almost half the population uses some form of CAM. In contrast, in Quebec only 14% of the people use CAM, but in the

Canadian Prairie and British Columbia, usage rates range from 19% – 21% (Millar, 1997).

Fourth, if the TM participants had a higher socioeconomic status (SES) than the controls, they would have had more money to spend on unconventional medicine. We have data on the occupation of the TM participants, but RAMQ did not provide that data for the Non-TM group. Thus, no comparison could be made on socioeconomic status. However, the TM participants' professions were distributed evenly among numerous occupations, with most falling into the middle-class, or medium SES, as found in numerous US national surveys. Eisenberg et al. (1998) explained that "the use of alternative therapies is distributed widely across all sociodemographic groups."

Even if the TM participants had more out-of-pocket money to spend on unconventional medical care, it is unlikely that socioeconomic status alone could account for the results of this study. The reason is that CAM usage in Canada is a complex, multidimensional phenomena that involves personal beliefs or worldview, health status, education, age, gender, disenchantment with allopathic medicine, and other variables in addition to socioeconomic level (Blais et al., 1997; Millar, 1997; Kelner & Wellman, 1997). An important finding is that randomized studies have shown that the TM technique produced health improvements for individuals of all socioeconomic levels. For example, randomized studies have shown that TM practitioners from low socioeconomic strata exhibited numerous statistically significant improvements on health and lifestyle outcomes (Castillo-Richmond et al., 2000; Schneider et al., 1995; Alexander et al., 1989; Brooks & Scarano, 1985; Taub et al., 1995). Thus, for the four above reasons, the substitution of unconventional medical care for conventional care appears to be an unlikely explanation for the results in this study.

Low Physician Fees in Quebec

Compared with the other Canadian provinces and the US, average physician payments in Quebec have been extremely low. This phenomenon is mainly due to vigorous physician fee control by the Quebec government (Evans, Barer, & Hertzman, 1991; Evans, Lomas, Barer et al., 1989; Barer, Evans, & Labelle, 1988). Figure 1 shows the average annual physician payments in Quebec have been lower than the Canadian average during the years of this study. In Quebec, the prices of physician services are determined by periodic negotiations between the Quebec Ministry of Health and Social Services and the doctors' organization. The government sets prices for each physician service in each region of the province. In the Quebec medical system, market forces do

not interact to affect price, and physician fees there are relatively low even in the midst of a physician shortage. Normally, when there is a shortage of a service its price will tend to rise. However, the elimination of natural market forces might help explain why in Quebec there are amazingly low physician fees compared with other areas of North America.

Policy Implications

The results of the present study may have important policy implications for government health insurance programs that cover the elderly in Canada and possibly other nations with similar medical systems. Most countries need to find innovative ways to reduce the medical expenses of their fast-growing, elderly populations. Since many Canadians have adopted alternative health approaches (Blais et al., 1997; Millar, 1997; Kelner & Wellman, 1997), the CAM intervention examined in this study might be applied to reduce physician expenses on a large scale.

The post-intervention, mean annual percentage decline of 23.8% for the TM group in Table 2 represents potential savings for the Canadian medical system. For example, the federal Ministry of Health's statistical division, Health Canada, estimated that all of the provinces combined spent approximately \$12 billion for physician services in 1999. With a 23.8% reduction (Table 2) the Canadian physician payments could be reduced approximately \$3 billion in one year, and this savings might be expected to continue for at least five years, the post-intervention length of this study. If the five-year cumulative decline of almost 70% shown in Table 3 were applied, there would be cumulative savings of \$8 billion for the Canadian medical system. Such results from preventive interventions appear to be consistent with previous research (Messonnier, Corso, Teutsch, Haddix & Harris, 1999; Pelletier, 1999, 1996).

In Canada, payments to physicians have been approximately 20% of total annual health sector spending. The findings in our study cannot be extrapolated to make inferences about total medical expenditures. However, the present results on physician payments may be important because doctors' decisions determine most other medical expenditures such as medical testing, prescription medication, follow-up doctor's visits, surgery, and hospitalization (Eisenberg, 1986).

Although it has limitations, this study supports and extends the earlier research on the TM technique and contributes to the growing evidence that the procedure may reduce medical care utilization and expenses. If one considers the health care spending outlook for the next decade, it is encouraging to see that it might be possible to reduce at least one component of national medical expenditures. The results of this preliminary study suggest that the TM program should be seriously

considered as a possible component of any comprehensive cost containment strategy or medical system reform program. Further research on this topic is clearly warranted.

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