

Science and the Alternative

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In this issue of the *Journal*, Gordon and colleagues¹ present the results of a small prospective randomized, single-blinded clinical trial of therapeutic touch (TT) in the treatment of knee osteoarthritis. They found statistically significant symptomatic improvements in most (but not all) dimensions of a pain and function inventory, but no improvements in a measure of functional disability. A qualitative interview also favored TT over the placebo (mock TT) and control groups. The authors interpreted their results as supportive of TT.

An experimental trial of an alternative therapy with a positive result deserves two responses: first, a conventional discussion of the implications for clinical practice; second, a more exciting discussion of the implications for physiology, chemistry, and physics.

This particular trial was a pilot study of an ill-defined and mysterious phenomenon with a complex and challenging experimental design. Not surprisingly, there are some methodologic problems that should be addressed in a more definitive study. We are not told how subjects were recruited, so it is difficult to say how representative they are of persons with knee osteoarthritis. More important, of the original 31 patients, 4 dropped out and were excluded from analysis, and another 2 patients were included in the analysis but were absent for the third set of tests. These absences are critical because proportionate randomization was used to make the three original groups more comparable, and the statistical comparisons are based on group averages. If the subjects who left the TT group were more ill than the subjects who left the placebo group, bias could be introduced.

The authors measured a large number of outcomes, increasing the risk of spurious correlations. The positive outcomes were emphasized, but many of the study outcomes were negative. The qualitative results were supportive of TT, but it is difficult to assess these results without more detail about the actual analysis. A future qualitative interview might also be used to test whether the attempted blinding of the study subjects was successful. Finally, the authors note that the practitioner, with whom patients had extensive contact over 6 weeks, was a variable between the placebo and treatment groups. The researchers went to some lengths to control for this variable, and to measure any practitioner effect, but the results would have been stronger if the contact between practitioner and patients had been minimized.

Given the small sample size and methodologic problems of this pilot study, it would be very premature for evidence-oriented clinicians to incorporate TT into their prac-

tice. Another recent experimental study of TT found that practitioners failed to demonstrate a claimed ability to sense a human energy field.² The authors of that study found no previous research that would meet accepted standards for evidence-based medical practice.

Even if the evidence were stronger, the alleged mechanism of manipulating healing energy fields is beyond our current ability to analyze. The authors claim that TT is safe and without side effects, but they do not reference any supporting studies. It would be exceedingly difficult to conduct such studies, since in the absence of a mechanism of action we would not know what to look for. Does altering energy fields promote financial misfortune, for example? The novel (or absent) mechanism also has interesting legal implications. If a patient claims harm from TT, how can one decide whether the harm is related to the therapy? Enterprising lawyers will answer this question in court.

Of course, a therapy's mechanism (the model for the way it works) has a scientific importance beyond anticipating toxicity or assessing liability. Alternative therapies have explanatory narratives, but these narratives are not, by definition, compatible with the current models of physiology, biology, chemistry, and physics. If they were, they would be conventional therapies. To understand the implications of these alternative therapies for conventional science, it is worth reviewing what science is about.

Science is an intellectual activity with a unique process of disproof through the testing of predictions. Over the past few hundred years, scientists have developed a framework of self-reinforcing explanatory models, none standing alone, all sharing to varying degrees the capacity to make testable predictions. These models cannot be proved correct; they can only be proved incorrect or incomplete. Newtonian mechanics, for example, was found to be incomplete, but it is still a good model under a wide variety of conditions. At the heart of the scientific enterprise is an unprovable assertion that there is such a thing as reality, or truth, and that our scientific models and theories are convergent. Many scientists also believe that it is "physics all the way down"; that is, all phenomena arise from the interactions of fundamental particles and forces.

Human limitations force us to divide science into artificial domains: physics, chemistry, biology, physiology, epidemiology, clinical trials, and so forth. These boundaries obscure the interconnectedness of the scientific world view; if a biological finding contradicts physics, then one model or the other must be fixed. Reality does not respect academic departments.

Our current scientific models are fairly elastic, but there are some phenomena they cannot embrace. Diluting a substance to near nothingness cannot increase its chemical activity; classic homeopathy ignores what we know of

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physics and chemistry. Spinal manipulation cannot treat ischemic heart disease; much of chiropractic breaks our rules of anatomy and physiology. There are four fundamental forces in physics; none of them can produce healing auras.

Properly executed and blinded TT experiments with positive results are challenges to our overall scientific framework and, most of all, to physics. If the data is convincing, then we have discovered predictive and explanatory failures in our most tested and trusted models of the universe. This would be exciting! A generation of experimental physicists and chemists would turn forests into theses exploring these phenomena. Novel and intense experimentation could forge new rationalistic and reductionist models of the universe. The upheaval would be titanic. So, is the data convincing? Should we address these challenges now, or wait for more studies and better data?

The small studies to date are, like all small studies by pioneers in new fields, very susceptible to submission and publication bias. If negative results are not submitted for publication, or if positive results are not published when submitted, then statistical variability will give us the wrong answers. There is also intense political, economic, and social pressure. Billions are being spent on alternative remedies, the engines of American

capitalism are throttling up, politicians are receiving the usual financial incentives.³ Therapeutic touch is widely taught in nursing programs, and many medical schools are adding courses in alternative therapies. A popular article, coauthored by a former panel cochair National Institutes of Health Office of Complementary and Alternative Medicine, warns of the risks of malignant prayer.⁴ Science is never free of politics and commerce; we must weigh those pressures, too.

Let us then do a large, well-designed, and well-regulated study of TT. This study should be definitive, and managed by experienced scientists willing to publish both positive and negative results. If the results are negative, then we can return to our existing scientific models, and look for new challenges from other directions. If, however, the answers are positive, then we shall all have a great adventure that will go far beyond mere medicine.

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