

Magnetic Therapy: Plausible Attraction?

Long considered only a component of quack medicine, magnetic therapy has received a boost from a recent study at the Baylor College of Medicine. Is it plausible?

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A double-blind study at Baylor College of Medicine, published last November in *Archives of Physical and Rehabilitation Medicine* (Vallbona 1997), concluded that permanent magnets reduce pain in post-polio patients, and the results were heralded in *The New York Times* and on Bryant Gumbel's *Public Eye*. PBS's *Health Week* and *Time* magazine recently reported on the growing use of magnets by champion senior golfers and other professional athletes to relieve pain. Magnetic pain relief products are now sold in many golf shops, and ads for them appear in national golf and tennis magazines. Long a significant component of the health industry in Japan and China, magnetic therapy is becoming a more and more visible part of the alternative-medicine boom in the United States and Europe. Is it all just hokum, as many previously assumed, or is magnetic therapy becoming scientifically respectable?

Early History

For thousands of years, wonder and magic were associated with the mysterious forces exerted by natural magnets—magnetite-rich rocks, today called lodestones. Many trace magnetic therapy back to Paracelsus (1493-1543), a physician and alchemist who reasoned that since magnets have the power to attract iron, perhaps they can also attract diseases and leach them from the body. Charles Mackay, in *Extraordinary Popular Delusions and the Madness of Crowds* (1841), says of Paracelsus that “his claim to be the first of the magnetisers can scarcely be challenged.” But Paracelsus was also aware of the important role of the patient’s mind in the process of healing (Buranelli 1975). He wrote, “The spirit is the master, the imagination is the instrument, the body is the plastic material. The moral atmosphere surrounding the patient can have a strong influence on the course of the disease. It is not the curse or the blessing that works, but the idea. The imagination produces the effect.” Paracelsus was apparently well aware of the placebo effect.

The development in eighteenth-century England of carbon-steel permanent magnets more powerful than lodestones brought renewed interest in the possible healing powers of magnets, and among those interested was Maximilian Hell, a professor of astronomy at the University of Vienna. Hell claimed several cures using steel magnets, but he was rapidly eclipsed by a friend who borrowed his magnets to treat a young woman suffering from a severe mental illness. The friend was Franz Anton Mesmer (1734-1815), and Mesmer’s success with the “magnets from Hell” led directly to his widespread promotion of his theory of “animal magnetism.” Although he first used actual magnets, he later found he could “magnetize” virtually anything—paper, wood, leather, water—and produce the same effect on patients. He concluded that the animal magnetism resided in himself, the various materials simply aiding the flow of the “universal fluid” between him and the patients.

Mesmer became so successful in Paris that in 1784 King Louis XVI established a Royal Commission to evaluate the claims of animal magnetism, a commission that included Antoine Lavoisier and Benjamin Franklin among its members. They conducted a series of experiments and concluded that all the observed effects could be attributed to the power of suggestion, and that “the practice of magnetization is the art of increasing the imagination by degrees.” Thomas Jefferson, arriving in Paris soon after the Commission report, noted in his journal: “Animal magnetism is dead, ridiculed.”

Ridiculed, perhaps, but not dead. Mesmer himself faded from public view, but “magnetizing” persisted in various forms.

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Many early magnetizers evolved into students of hypnosis and developed various forms of hypnotherapy. (The trance induced in many of Mesmer’s patients is thought to be what is now called a hypnotic trance, and most dictionaries today list mesmerism as a synonym for hypnotism.) One American who became interested in magnetic healing was Daniel David Palmer, who opened Palmer’s School of Magnetic Cure in Iowa in the 1890s. His ideas developed into the system of hands-on therapy known as chiropractic. Others focused on hand gestures without actual touch, an approach recently reborn as “therapeutic touch.” [See “Catching Up With Eighteenth Century Science in the Evaluation of Therapeutic Touch,” by Thomas S. Ball and Dean D. Alexander, this issue, p. 31] Mary Baker Eddy was “cured” by a magnetizer, but she later became convinced that cures could best be achieved through prayer, and founded Christian Science.

Most of these byproducts of mesmerism, like Mesmer himself, ceased to use actual magnets. But the development of electrical technology in the late nineteenth century impressed the general public with the mysterious powers of electric and magnetic fields, and therapeutic magnets had a rebirth, with many “doctors” promoting magnets to relieve pain, enhance sleep, and cure a wide variety of diseases. The most notable of these was Dr. C. J. Thacher, whom *Collier’s Magazine* dubbed “King of the magnetic quacks” (Macklis 1993). His 1886 mail-order catalogue offered a variety of magnetic garments, and a complete costume contained more than 700 magnets, which provided “full and complete protection of all the vital organs of the body.”

In the twentieth century, materials scientists and engineers have developed stronger and stronger permanent magnets—alnico magnets in the 1930s, ferrite (ceramic) magnets in the 1950s, and rare-earth magnets in the 1970s and 1980s. The latest rare-earth magnets, neodymium-iron-boron, are more than a hundred times more powerful than the steel magnets available in the last century to Edison, Bell, and C. J. Thacher (Livingston 1996). Both ferrite magnets and the latest “neo” magnets have had a tremendous impact on modern technology, but they have also restimulated interest in the use of permanent magnets for magnetic therapy. Most magnetic therapy products today, like most refrigerator magnets, contain inexpensive ferrite magnets, but many suppliers offer neodymium “supermagnets” in their top-of-the-line products.

Magnetic Therapy Today

Both ferrite and rare-earth magnets, unlike earlier magnetic materials such as steels and alnicos, have great resistance to demagnetization, allowing thin disks to be magnetized. (Earlier magnets had to be long and thin to avoid being demagnetized by the internal fields produced by the poles at the ends.) This feature allows modern magnets to be mounted in a variety of thin products that can be applied to the body with the magnetic field emanating from the surface.

Some suppliers recommend applying magnetic patches directly to your aches and pains, while others recommend applying small Band-Aid-like patches to acupuncture points.

Magnetic belts containing sixteen or more magnets are purported to ease back pain, and similar magnetic wraps are offered for almost any part of the body, including hands, wrists, elbows, knees, ankles, and feet (magnetic insoles are particularly popular). For headaches you can wear magnetic headbands, magnetic earrings, or magnetic necklaces. (One company marketing magnetic necklaces provides simple instructions: the necklace should be put on as soon as the headache appears and removed as soon as it goes away. Since most headaches come and go, following these instructions precisely will clearly produce persuasive evidence of the necklace's efficacy.)

Many magnetic necklaces, bracelets, and earrings are formed from silver- and gold-rich magnetic alloys and promoted as both fashionable and therapeutic. One catalog claims magnetic earrings "stimulate nerve endings that are associated with head and neck pain," and magnetic bracelets "act upon the body's energy field" and "correct energy imbalances brought by electro-magnetic contamination or atmospheric changes." Larger items include magnetic seat cushions, magnetic pillows, and magnetic mattress pads, the last claiming to produce an "energizing sleep field." One supplier offers a PCD—Prostate Comfort Device for older men. If properly placed while you sit watching television or driving your car, you will no longer have to get out of bed several times a night to relieve yourself!

To avoid trouble with the Food and Drug Administration, most suppliers emphasize only "comfort" and usually specifically state "no medical claims are made." Some, however, are far less careful. One company in Kansas markets a book entitled *Curing Cancer With Supermagnets*. The authors of the book claim to have cured cancer simply by hanging a neodymium "supermagnet" around the patient's neck. The cancer discussed in the advertisement was a breast cancer, but they report that "the supermagnets influence the whole body" and "our method can cure all types of cancer."

Many magnetic therapy products have alternating arrays of north and south poles facing the patient. Some have detailed explanations of why a circular pattern of poles is optimal, while others offer poles in checkerboard or triangular patterns. Nikken, the Japan-based firm that has used a multilevel marketing scheme to expand from an annual business in the U. S. of \$3 million in 1989 to \$150 million today, primarily offers products with alternating poles.

One clear difference between such multipolar magnetic

Neck Wrap

This popular wrap comes complete with two removable magnetic pads. Each pad contains 10 powerful neodymium magnets for optimum penetration and effectiveness. Simply place the pad(s) in the desired position or use as shown to contact the mastoid bones and the muscles of the upper back.

NEW

The perfect wrist remedy tennis and everyday use

Most sports require the use of your wrists. Some form or another, and if your wrists are in pain, then chances are you're suffering from wrist arthritis, tendonitis or Carpal Tunnel Syndrome. Instead try wearing our Magnetic Wrist Wrap to get you through your day. Our wrist band comes with a closure that's easy to adjust for comfort and pressure and has a soft cotton pile lining that stretches for flexibility during any activity. It contains nine ceramic unipole magnets and is approximately 10" length. One size fits all. 3,450-gauss rating.

Magnetic Wrist Wrap
\$14.95 each

"Back" control of your life
Back pain can affect everything. Work. Play. Even your sleep. If your back is beginning to rule your world, you need the Magnetic Back Belt—perfect for well-coming control back into your life. Our backbelt delivers comfort from pain with 16 individual magnetic energy points targeted directly at your aches and pains. Its wide surface area offers lumbar support, helps to increase circulation and reduce inflammation. Lightweight, elastic, and tapered for maximum comfort, you can wear our backbelt during any sport, all day.

Velcro attachments, expandable side straps and stretch material give you a custom, comfortable fit, that's thin enough to wear under any clothing. 3,950-gauss rating. (Specify waist size when ordering.)

Magnetic Back Belt... \$69.95 each

ALL MAGNETS COME WITH A MONEY BACK GUARANTEE

Superpowerful Chains

Beautiful chains are delicate but strong, lightweight powerful. Each contains 10 magnets made of the highest quality optimum strength material. 20" (50cm).

Stainless Steel
Wear it always and everywhere. Will never tarnish.

B. Extra heavy Gold Plating on stainless steel ensures both beauty and durability.

Magnetic Bead Necklace

Each large bead is an expertly cut magnet. Luxurious high quality finish with the look of onyx. Strung on heavy duty stainless steel wire. Tarnish resistant stainless steel clasp. Available in 20" or 24"

Twirl Bracelet/Anklet
Constructed with unique, heavy duty memory

3 BEAD STYLES
A. Large Twist
B. Small Twist

Magnetic therapy products

devices and unipolar devices (with only one pole facing the patient) is the "reach" of the magnetic field. The field from even unipolar magnets decreases very rapidly with increasing distance from the magnet, but the field from multipolar magnets decreases much more rapidly. If multipolar magnets really have any effects on the human body, they will be limited to depths of penetration of only a few millimeters. (Many refrigerator magnets are multipolar, which limits the thickness of paper they can hold to the refrigerator, but also limits the damage they can do to nearby credit and ATM cards.)

Other suppliers offer only unipolar magnets, and some emphasize the importance of having only south-seeking poles facing the body. Contrary to common scientific usage, they call south-seeking poles north poles. Since opposite poles attract, they argue that a pole that seeks south must be a north pole. (Here practitioners of magnetic therapy are perhaps more logical than mainstream science, which calls the south-seeking pole a south pole, requiring that the earth's magnetic pole in Antarctica is, by the standard scientific terminology, a north pole.) Dr. Buryl Payne, in his book *The Body Magnetic* (1988), argues that south-seeking poles calm tissue but north-seeking poles stimulate tissue, and you should therefore never expose tumors or infections to north-seeking poles. When I suggested to one practitioner that different effects from different poles seemed to violate basic rules of symmetry, he assured me that the rules were reversed in the southern hemisphere.

One of the most ardent advocates of magnetic therapy is Dr. William Philpott of Oklahoma, who publishes his own *Magnetic Energy Quarterly*. He is also on the board of the

Bio-Electro-Magnetics Institute of Reno, Nevada, a nonprofit "research and educational organization" and an advisor to the NIH Office of Alternative Medicine. His wife happens to have a business selling "Polar Power Magnets." Dr. Ronald Lawrence of California is President of the North American Academy of Magnetic Therapy and reports that he has successfully used magnets to relieve pain in hundreds of his patients. He is associated with Magnetherapy, a Florida company that markets "Tectonic Magnets." Both Dr. Philpott and Dr. Lawrence favor unipolar magnets.

The efficacy of magnetic therapy (or of any other medical treatment, mainstream or alternative) does not depend on our understanding the biological mechanism. Nevertheless most promoters of magnetic therapy recognize the need for offering some plausible explanation. The mechanism most commonly offered for various therapeutic effects of magnets is improved blood circulation, despite a lack of clear evidence for such an effect. Other suggestions include alteration of nerve impulses, increased oxygen content and increased alkalinity of bodily fluids, magnetic forces on moving ions, and decreased deposits on the walls of blood vessels.

The broadest explanation was presented by Dr. Kyochi Nakagawa of Japan, who claims that many of our modern ills result from "Magnetic Field Deficiency Syndrome." The earth's magnetic field is known to have decreased about 6 percent since 1830, and indirect evidence suggests that it may have decreased as much as 30 percent over the last millennium. He argues that magnetic therapy simply provides some of the magnetic field that the earth has lost.

Magnetic therapy is also prominent in the treatment of thoroughbred racehorses. An injured racehorse represents potential loss of a substantial investment, providing considerable incentive to try "alternative medicine" to supplement mainstream veterinary treatment. Magnetic pads for a variety of leg problems, magnetic blankets, magnetic hoof pads, etc., all get ringing endorsements from many horse trainers—and even some veterinarians. One marketer of magnetic products for humans reports that he first became convinced of their effectiveness when he used them on his ailing llama! Enthusiasts argue that the placebo effect could not be effective on horses or other animals, but forget that it may influence the human who is interpreting the effect of magnetic therapy on the animal.

The Baylor Study

These examples and the centuries-old connection between magnets and quackery, have led many to consider modern magnetic therapy as total hokum, with the many testimonials for the success of magnetic treatments explainable by placebo effects. But the Baylor study, seemingly a careful double-blind study, has surprised many.

The study was conducted by Dr. Carlos Vallbona on fifty post-polio patients at Baylor's Institute for Rehabilitation

Research in Houston. Bioflex, Inc., of Corpus Christi provided both the magnets (multipolar, circular pattern) and a set of visually identical sham magnets to serve as controls. To keep the study "double-blind" neither the patients nor the staff were informed as to which devices were active magnets, and which were shams. Before and after the forty-five-minute period of magnet therapy, the patients were asked to grade their pain on a scale from 0 to 10. The twenty nine patients with active magnets reported, on average, a significant reduction of pain (from 9.6 to 4.4), while the twenty-one patients with shams reported a much smaller average reduction (from 9.5 to 8.4). This is a substantial difference, and if the double-blind study was successfully conducted, cannot be explained by a placebo effect.

For a hardened skeptic, some doubts remain. Both Dr. Vallbona and his colleague, Dr. Carlton Hazlewood, had reported the successful personal use of magnets to relieve their own knee pains prior to the study, raising doubts as to their objectivity. Conscious or unconscious biases of researchers can

One marketer of magnetic products for humans reports that he first became convinced of their effectiveness when he used them on his ailing llama!

have very subtle and unrecognized effects on the results of their studies, and a serious difficulty of conducting any double-blind studies with magnets is the ease of distinguishing active magnets from sham magnets (although the patients were reportedly observed during the therapy period to assure that they were not surreptitiously testing their magnets). Another difficulty of any studies of pain relief is the highly subjective nature of the data.

Despite these various reasons for caution, the results of this study have altered the views of many physicians. Dr. William Jarvis, president of the National Council Against Health Fraud, had formerly dismissed magnet therapy as "essentially quackery." He now tentatively admits that it may have value for post-polio pain.

More studies will be needed before magnetic therapy will be accepted by a majority of the medical community, and some studies are already underway. Last year the NIH Office of Alternative Medicine gave a million-dollar grant to Dr. Ann Gill Taylor of the School of Nursing of the University of Virginia to study the use of magnets to relieve pain. Among other things, she will be testing the effectiveness of magnetic sleep pads in relieving pain in patients suffering from fibromyalgia, a common disease involving joint and muscle pain. While we wait for the results of these and other studies, does what we know about magnetic fields and the human body make it plausible that magnetic therapy for pain might have a physical basis beyond mind/body effects?

Magnetic Fields and the Body

The electrochemical processes of the human body are extremely complex and incompletely understood, and physical

effects of magnetic fields cannot be ruled out. Many thousands of papers have in fact been published on biological effects of electromagnetic fields, much of it focused on the effects of radio-frequency and microwave fields or, in recent years, on fields at power-line frequencies (fifty or sixty cycles per second). Studies of biological effects of steady magnetic fields (reviewed by Frankel and Liburdy 1996) have concentrated mostly on high fields of the level encountered in MRI magnets, typically of the order of 10,000 gauss (1 tesla). Unfortunately, research has been very limited at field levels typical of magnetic therapy products, most of which are limited to a few hundred gauss, even at the magnet surface. (The earth's field is a bit less than half a gauss.)

Viewed simply as inert material, the human body, like its primary constituent, water, is *diamagnetic*, i.e., weakly repelled by magnetic fields. In response to an applied magnetic field, the electrons in water molecules make slight adjustments in their motions, producing a net magnetic field in the opposing direction about 100,000 times smaller than the applied field. With the removal of the applied field, the electrons return to their original orbits, and the water molecules once again become nonmagnetic. (We perhaps should note that some promoters of magnetic therapy also promote "magnetized water." You can't magnetize water. Although water responds weakly to an applied field, the response disappears as soon as the field is removed.) Although the diamagnetism of water and most living things is very weak, a high-field electromagnet producing 160,000 gauss (16 tesla) at the center of the coil has recently been used to levitate not only water drops but also flowers, grasshoppers, and small frogs (Berry and Geim 1997), the "flying frogs" drawing worldwide media coverage. Since fields of that magnitude are required to balance gravitational forces, the much lower fields of magnetic-therapy devices can only produce diamagnetic forces that are thousands of times smaller than gravity. (The repulsive force will be proportional to the product of the field and the field gradient.)

Some dubious literature suggests that magnetic fields attract blood, citing all the iron it contains. However, iron in the blood is very different from metallic iron, which is strongly magnetic because the individual atomic magnets are strongly coupled together by the phenomenon we call *ferromagnetism*. The remarkable properties of ferromagnetic materials are a result of the cooperative behavior of many, many magnetic atoms acting in unison. The iron in blood consists instead of isolated iron atoms within large hemoglobin molecules, located inside the red blood cells. Although each of the iron atoms is magnetic, it is not near other iron atoms, and remains magnetically independent.

The net effect of the weak *paramagnetism* of the isolated iron atoms in hemoglobin is only a slight decrease in the overall diamagnetism of blood. Blood, like water, is weakly repelled by magnetic fields, not attracted.

Although most components of the human body and other living things are weakly diamagnetic, many organisms have been shown to contain small amounts of strongly magnetic materials, usually magnetite (Fe_3O_4). The most extreme case is that of

magnetotactic bacteria, originally found in mud collected from the marshes of Cape Cod. Each contains a long chain of magnetite particles that interact strongly enough with the earth's magnetic field to orient the bacteria along the field. Magnetite crystals have also been found in pigeons, honeybees, many mammals, and even in the human brain, but in proportionately much smaller amounts than in the bacteria. It seems very unlikely that there is enough magnetite within the human body to provide a possible mechanism to explain magnetic therapy. However, if magnetite particles were located at strategic places, they could locally amplify the effects of low magnetic fields and, for example, modify ion flow across cell membranes, of the type involved with electrical transmission in nerve cells.

More likely mechanisms are those based on magnetic forces on moving charged particles, possibly including ions or charged molecules in flowing blood, moving across cell membranes, moving across synapses between nerve cells, etc., or those based on more subtle effects on biochemical reactions (Frankel and Liburdy 1996). Although no physical mechanisms for magnetic therapy have been established, the possibilities are numerous and complex. Only further clinical tests, carefully controlled to account for placebo effects, can confirm or dispute the results of the Baylor study and prove or disprove the claims of magnetic therapy.

Some media reports have not sufficiently distinguished the Baylor form of magnetic therapy, based on modest static fields from permanent magnets, with a more accepted form of "magnetic therapy" based on high pulsed magnetic fields from electromagnets (Malmivuo and Plonsey 1995). Pulsed magnetic fields are very different from static magnetic fields, because, via Maxwell's equations, time-varying magnetic fields induce electric fields. Electric fields have pronounced biological effects, particularly on nerve and muscle cells, as we have known since the days of Galvani and his twitching frogs' legs. Many years ago the FDA approved the use of pulsed magnetic fields in "bone growth stimulators" for the treatment of fractures that were slow to heal, and research on "magnetic stimulation"—pulsed magnetic fields applied to the brain or other components of the nervous system—has grown rapidly in recent years. Transcranial magnetic stimulation, in which the patient receives hundreds of magnetic field pulses of 1 tesla or more, each only a millisecond in duration, has shown considerable promise as a means of treating depression. However, these forms of pulsed-field magnetic therapy are based on biological effects of induced electric fields, and are very different from the use of the static fields from permanent magnets.

Conclusions

Claims of therapeutic effects of permanent magnets should still be regarded with considerable skepticism. Most of the many testimonials to the effectiveness of magnetic therapy devices can be

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birth. It also replaces social responsibility with fate.

Because it replaces social responsibility with fate. You bumble through life, you die, you get your grades. (Think of it. You're going to hear "Not living up to your potential" even when you're dead.) You are assigned to your next life as a punishment or as a reward. Good news, perhaps, for babies Trump and Gates. Hurrah for the divine right of kings! But consider a starving Tutsi toddler who watched his mom get hacked to pieces by the neighbors. What do you say? "Let's get you the hell out of here and by the way, have a sandwich." Or "Firm but fair, laddie. You musta really screwed up last time. I sure hope you learned your lesson."

Because it perverts personal responsibility to a control freak's dream. In this version, you, not Mrs. Grundy or the archetypal Dad, choose the circumstances of your birth. The essentials come from Tibetan Buddhism, a wise

and compassionate tradition. Remember all the stoners who read *The Tibetan Book of the Dead*? Maybe it was the dope, maybe it was television, but we now have a population with the attention span of a chihuahua. A very American chihuahua full of pioneer spirit, can-do enthusiasm, and a nasty little territorial domain habit. An American Chihuahua for the millennium who barks the Twelve-Step slogan: "Take what you like and leave the rest."

We'll take the "choice of rebirth" part. Choices put us in the driver's seat. And thirty-one flavors and 500 channels aren't enough. So why did I choose myopia, chubby knees, and a predisposition to heart disease? Never mind, I'm sure I had my reasons. We'll even take the Bardo concept—sort of a post-mortem Department of Motor Vehicles, right? Purgatory with a lot of waiting in line?

But the lifetime of meditation, service, and discipline required to calm the mind so that the soul can withstand the

onslaught of forty-two peaceful deities, fifty-eight wrathful ones, flashing lights, the whirlwinds of karma, a barrage of visions—excuse me, my beeper just went off. What was I saying? Oh yeah, the vision thing. Who has the time?

Think of weary cafeteria ladies, janitors who sign their paychecks with an X, junkie babies, schizophrenics who sleep in cardboard boxes. A psychic once told me my profoundly retarded sister had chosen her brain and body so that she could help my mother grow. I asked if he could see any dental work in his future. He didn't get it.

Accepting the concept of reincarnation leads to a callousness about life and a callousness about death. Because when we invoke the power of choice where there is no power and no choice, we pass the irretrievable minutes of the one life we are sure of in illusion. And real choices, hard ones, are waiting.

Like it or not, things end. Personally I work better under a deadline. □

MAGNETIC THERAPY

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attributed to placebo effects and to other effects accompanying their use. For example, the magnetic back braces used by many senior golfers may help ease their back pains through providing mechanical support, through localized warming, and through constant reminder to the aging athletes that they are no longer young and should not overexert their muscles. All these effects are helpful with or without magnets. One British study of pulsed-field bone-growth stimulators, which were approved decades ago by the FDA, found that they were equally successful when the devices were not activated (Barker 1984), and concluded that their effectiveness resulted from the enforced inactivity associated with their use, rather than from the pulsed magnetic fields.

The more extreme claims of magnetic therapy, such as curing cancer by hanging supermagnets around your neck, are not only nonsense but also dangerous, since they may divert

patients from seeking appropriate treatment from mainstream medicine. Magnetic jewelry and most other magnetic-therapy products probably are harmless beyond a waste of money. Several years ago, a double-blind study found that magnetic necklaces produced no relief of neck or shoulder pain (Hong 1982).

The results of the Baylor study, however, raise the possibility that at least in some cases, topical application of permanent magnets may indeed be useful in pain relief, a conclusion that should be regarded as tentative until supported by further studies. Any mechanism for such an effect remains mysterious, but an effect of static magnetic fields on the complex electrochemical processes of the human body is not impossible. My own guess is that inexpensive refrigerator magnets are as likely to provide help as the more expensive magnets marketed specifically for therapy. (But since human nature leads us to expect more from more expensive items, use of refrigerator magnets will probably decrease the placebo effect!)

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