

Placebo studies and ritual theory: a comparative analysis of Navajo, acupuncture and biomedical healing

Phil. Trans. R. Soc. B 2011 **366**, 1849-1858
doi: 10.1098/rstb.2010.0385

References

This article cites 51 articles, 12 of which can be accessed free
<http://rstb.royalsocietypublishing.org/content/366/1572/1849.full.html#ref-list-1>

Subject collections

Articles on similar topics can be found in the following collections

[neuroscience](#) (506 articles)
[behaviour](#) (2019 articles)
[health and disease and epidemiology](#) (451 articles)

Email alerting service

Receive free email alerts when new articles cite this article - sign up in the box at the top right-hand corner of the article or click [here](#)

To subscribe to *Phil. Trans. R. Soc. B* go to: <http://rstb.royalsocietypublishing.org/subscriptions>

Review

Placebo studies and ritual theory: a comparative analysis of Navajo, acupuncture and biomedical healing

Ted J. Kaptchuk*

*Program in Placebo Studies, Beth Israel Deaconess Medical Center, Harvard Medical School,
330 Brookline Avenue, Boston, MA 02215, USA*

Using a comparative analysis of Navajo healing ceremonials, acupuncture and biomedical treatment, this essay examines placebo studies and ritual theory as mutually interpenetrating disciplines. Healing rituals create a receptive person susceptible to the influences of authoritative culturally sanctioned ‘powers’. The healer provides the sufferer with imaginative, emotional, sensory, moral and aesthetic input derived from the palpable symbols and procedures of the ritual process—in the process fusing the sufferer’s idiosyncratic narrative unto a universal cultural mythos. Healing rituals involve a drama of *evocation, enactment, embodiment and evaluation* in a charged atmosphere of hope and uncertainty. Experimental research into placebo effects demonstrates that routine biomedical pharmacological and procedural interventions contain significant ritual dimensions. This research also suggests that ritual healing not only represents changes in affect, self-awareness and self-appraisal of behavioural capacities, but involves modulations of symptoms through neurobiological mechanisms. Recent scientific investigations into placebo acupuncture suggest several ways that observations from ritual studies can be verified experimentally. Placebo effects are often described as ‘non-specific’; the analysis presented here suggests that placebo effects are the ‘specific’ effects of healing rituals.

Keywords: placebo effect; ritual; Navajo healing; placebo acupuncture; biomedicine

1. INTRODUCTION

Biomedicine primarily confines its examination of the placebo effect—dummy pill, bogus injection or fake surgery—to *simulating* a biomedical intervention within a randomized controlled trial (RCT). This perspective is derived from the importance of placebos in RCTs. In fact, the RCT was developed to exclude the confounding effects of imagination, will, belief or what is usually called bias from the accurate assessment of medical treatments [1–5]. Demonstrations of efficacy beyond placebo control in RCTs are fundamental to biomedicine’s claim that its treatments are based on the objective physical–mechanical effects of pharmacology or physiological procedures and are not ‘merely’ rituals devoid of active ingredients. Placebo controls demarcate legitimate from illegitimate healing [6].

Yet, patients frequently report relief in the placebo arms of RCTs. This creates a challenge to the centrality of proximal causality in biomedicine [7]. While some of the amelioration observed in placebo groups in RCTs is related to the natural course of an illness and regression to the mean, recent sophisticated laboratory studies of placebo treatment point to a genuine placebo effect beyond natural processes. Experiments reveal that

changes in symptoms owing to placebo treatment are accompanied by objective changes in neurobiology [8]. Such findings have led to an explosive expansion of placebo studies in biomedicine [9].

Curiously, with noteworthy exceptions [10–13], the discussion of placebo in biomedicine has not benefited from an examination of healing ceremonies. This essay seeks to mutually expand placebo studies and ritual theory. It treats the placebo effect component of biomedical treatment as one form of a socio-cultural healing ritual and finds placebo experiments to be making valuable contribution to ritual theory.

Rituals are repetitive ‘prescribed formal behaviours’ [14] and ‘more or less invariant sequences of . . . acts and utterances not entirely encoded by the performer’ [15]; cf. [16]. They usually share ‘an ordering or procedure that structures them, a sense of . . . the purposive (devoted to the achievement of a particular objective), and an awareness that they are different from ‘ordinary, everyday events’ [17]. Symbols are the smallest component unit of ritual that still retain specific properties of the ritual, and symbols invariably repeat the message of the entire ritual [14]. The ritual is embedded in an authoritative cultural truth or mythos with an ‘overarching narrative structure’ [18]. Healing rituals take participants ‘to the heart of a society’s cultural concepts of power and potency, their sources and modes of manifestation, and [to] the persons . . . who have *potency*’ [19]. In a post-enlightenment and post-Newtonian world, the

*ted_kaptchuk@hms.harvard.edu

One contribution of 17 to a Theme Issue ‘Placebo effects in medicine: mechanisms and clinical implications’.

dominant mythos can be thought of as an absence of unifying myths and its replacement with components of secular narratives of reason, humanism, nationalism or scientific causality [20].

Although they often include narrative accounts, healing rituals are never simply enactments of plots, stories or assertions of truth. Instead, they are compelling multi-sensory dramas involving evocation, enactment, embodiment and evaluation [21]. Rituals and their sensory, affective, moral and aesthetic components transmute the mythos into an experiential reality for participants. Metaphors and symbols, the healer's prestige, social interactions with relatives and community members in the course of preparation and performance of the ritual, and gesture, recitation, costume, iconography, touch, ingestion and the physical ordeal—all provide vehicles for and multi-dimensional guideposts to a process that is meant to transform a patient from brokenness to intactness. Healing rituals are surrounded with belief and uncertainty, positive expectancy and worry, anxiety and fear. While hope sustains the process, people know that healing ceremonies are sometime unsuccessful [22,23]. Healing rituals have 'as if' or 'could be (subjunctivizing)' dimensions: one performs these behaviours because they may lead to relief of discomfort or disability. The person with an illness, family members participating in their care and healers are strongly committed to portraying a world in which healing is an open possibility [24]. Rituals create a receptive or 'porous' individual open to culturally defined potent influences. Ritual healing usually requires the guidance of a healer with technical expertise and charisma to make the universal mythic world accurately converge, penetrate and elicit changes in the idiosyncratic biographic world of the patient. As will be shown below, even scientifically validated biomedical treatments administered by medical professionals retain performative aspects characteristic of rituals.

This essay comparatively describes three healing encounters: Navajo ceremonial chants, acupuncture treatment in the Western world and biomedical provision of healthcare. Navajo ritual was chosen because their ceremonies might be considered the healing ritual's equivalent to the giant squid axon in neurology: the phenomenon is readily visible even to the naked eye. Acupuncture was chosen because it also provides an elaborate ritual and because, in the West, placebo acupuncture has been the subject of a significant corpus of scientific experimentation. The third type of healing encounter, biomedical treatment, is discussed because biomedicine created placebo treatment and first detected what it calls 'placebo effects'. Biomedicine also gave rise to 'placebo studies'. The essay will summarize comparative findings, and then examine recent experimental evidence in placebo studies. The simultaneous exploration of *ritual theory* and *placebo studies* will expand the discourse of both fields.

2. NAVAJO HEALING

The Navajo nation is the most populous American Indian tribe in the USA. While traditional Navajo ceremonies coexist with other forms of healthcare [25], this essay limits its examination to the dramatic traditional

'chantway' rituals that remain a vital contemporary component of Navajo healthcare [26].

When home remedies such as herbs or sprinkling corn pollen with a prayer provide insufficient relief for a health problem, a Navajo may turn to chantway rituals. About 30 distinct ceremonies, which engage between 1 and 9 days, have been described [27]. To select a particular chant and uncover the supernatural, moral or behavioural taboo that has been transgressed, a sick person or the family often first consults divining diagnosticians. After determining the trespass such as looking one's mother-in-law in the eye or chopping down a tree where bats (messengers to the Holy People) live, an appropriate ritual such as Hail Way, Red Ant Way, Mountain Top Way or Big Star Way is recommended [28]. Some families consult multiple diagnosticians because an inaccurate diagnosis and incorrect treatment plan will doom the ritual to failure [29].

The ritual chant is a recapitulation and performance of the process whereby the Holy People came to give a particular chant to the Navajo. The chant tells the story of a hero who usually begins as a marginal person and who goes through a series of unfortunate, dangerous and catastrophic episodes to be finally redeemed and transformed into a Holy Person. In a representative episode of the Hail Way chant, after committing adultery, Rainboy, originally a good-for-nothing gambler, is blasted to pieces by the jealous husband, Winter Thunder, master of the rare winter thunder. Because other Thunder People and allies such as Pink Wind and various Insect People know that the wife actually seduced Rainboy, they take pity and gather Rainboy's pieces between sacred buckskin and perform songs and dances to re-constitute him. Additional episodes of dismemberments and restorations continue, each involving a host of other supernatural beings with new songs, prayers, dances, chants and sandpaintings [28]. Eventually, Rainboy goes to live with the Holy People, but before he departs, he teaches the Navajo ancestors the precise rites he learned during his travails.

The entertaining plot is merely the scaffold for the ritual performance. The primary Navajo goal for a healing ceremony is to invite, cajole and even coerce various Holy People to attend the ritual as participants and eventually to inhabit the famous Navajo sandpaintings made of pulverized stones (figure 1) [31]. The ritual creates an 'osmosis' that conjoins the supernatural agency active in the cosmos with the individual patient and, to some extent, to all participants and observers. 'Specific healing practices are more significant than narratives relating to their formation' [31]. At the height of the chant, the medicine man touches in turn the hero's sand-painted feet and then the feet of the patient, the hero's legs and then the patient's legs, the belly of the hero's image and then the patient's and so forth. The patient, sitting on the sacred buckskin corresponding to Rainboy's buckskin, is transformed. The divine presence inhabiting the sandpainting becomes the patient. The patient repeats, many times, after the chanter:

This I walk with, this I walk with
Now Rainboy I walk with.
These are his feet I walk with,
This is his body I walk with,

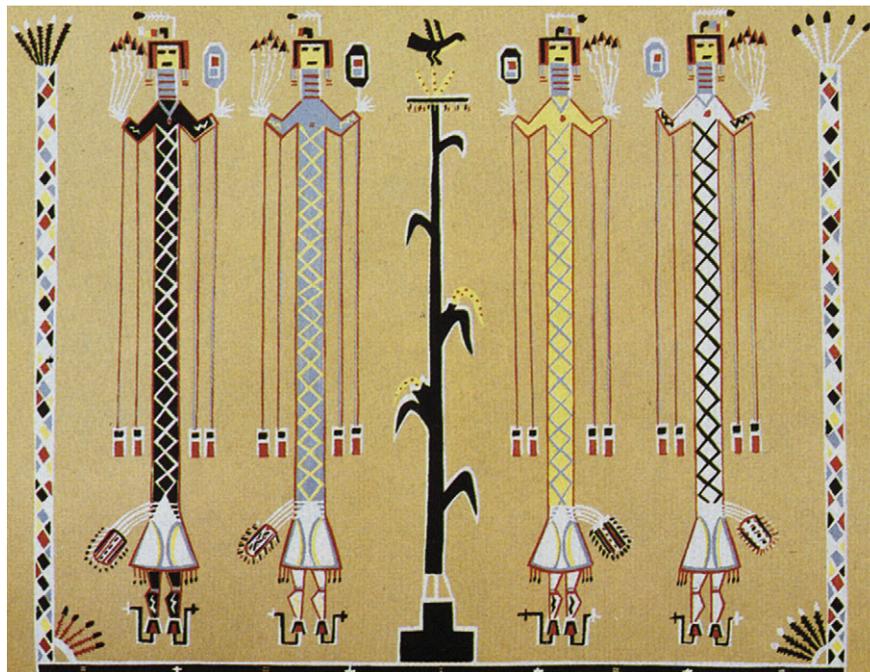


Figure 1. Thunder People. A sandpainting of various Thunder People all of whom help to put Rainboy back into one piece. The image represents what the healer sings and dancers perform during this episode of the Hailway Chant. The zigzags on the Thunder People are lightening. In one hand they hold octagonal hailstones, and in the other, more lightning. They are also travelling on black and white lightning represented by zig-zags under their feet. (Adapted from Kaptchuk & Crocher [30].)

This is his mind I walk with,
 This is his twelve plumes I walk with. . .
 In beauty I walk. . . living again I walk
 It is finished in beauty.
 It is finished in beauty [30].

For four days after the conclusion of the ceremony, the patient is considered, by family and friends, as if he or she is a Holy Person and given an opportunity to focus, evaluate, interpret and experience a new self. The ritual, not the story, is what drives this transformation. The ritual re-enacts—words, songs, iconography and actions—the adventure and healing episodes originally performed by the Holy People and taught to the Navajo.

For the Holy People to participate, the performance arena has to be purified and marked as sacred. The Navajo dwelling must be cleaned, fumigated and arranged to the tiniest detail. Douglas fir boughs, snake-weed and straight and crooked snake and prayer sticks, are placed at exact angles in relation to the four directions and sacred Navajo landmarks where the Holy People reside. The patient, and to a lesser extent family and audience, are cleansed: scrubbed with yucca soap, sweated in lodges, administered emetics, sprinkled with pollen, rubbed with herbal fragrances and if physically able, made to jump over fires. Moral cleaning includes confessions and apologies. Once the chant begins, dancers, masked impersonators of the deities, circle the patient. Different sandpaintings made of pulverized stones depict and concretely embody the Holy People. The final critical sandpainting brings the hero into the room. Throughout the ceremony, sounds from thunder whips, gourd rattles, basket drums, bullroarers, talking prayersticks and eagle bone whistles remind everyone of divine numinous presences.

Everything is supervised by the healer or *hataali* (translated as medicine man, chanter or singer). He directs the proceedings and is responsible for what would be the equivalent of an entire Wagnerian opera including the ‘orchestral score, every vocal part, all the details of the settings, stage business, and each requirement of costume’ [27, p. 163]. For example, the Hail Way ritual can include 433 different songs and chants. While the chantway ritual is scripted and supposedly invariant, the healer needs to be flexible and able to make quick decisions in relationship to circumstances (such as insufficient resources to execute the ritual, incorrect paraphernalia discovered during the ritual or an accidental taboo violation). Ultimately, the healer directs the convergence of sacred and human reality and has to improvise a balance between ‘preoccupation with order and a tolerance of ambiguity, a tension between the need for correctness and precision and the recognition of open-endedness and subjunctivity’ [32].

3. ACUPUNCTURE

Unlike the general community involvement of the Navajo ceremony, it is usually an individual patient who enters the acupuncturist’s office. For the Western patient, the acupuncturist’s office is both unique and familiar. The space is filled with acupuncture charts and manikins, Asian art work and Chinese herbs. Juxtaposed to this are the trappings of biomedicine such as intake forms, billing information, sterile trays, cotton balls and diplomas. The area has distinct smells that can include Asian incense or burning mugwort, a herb used to heat acupuncture points. For Western patients, the authorized truths are closer to what would be considered alternative cultural paradigms.

Patients bring a wide assortment of complaints [33,34]. They also bring their hopes, expectations, doubts, fear, anxiety and a limited knowledge of what will happen [23,35]. Using observation and examination, the acupuncturist performs a formalized diagnosis. Questions and examination can be unusual: do you sweat very little or very much? What is your favourite season of the year? What are your recurrent dreams? And favourite foods? May I examine your tongue? Can I feel your pulse on both wrists in various depths and positions? Western patients know this is different. Afterwards, the acupuncturists offer a diagnosis, and, in the West, an explanation of the diagnosis. If the patient does not know beforehand, by the end of the first session, he or she becomes aware of the potency of vitalistic energies (qi), yin-yang, wind, dampness, and fire and how they regulate both human health and the entire cosmos. If a person's joints especially hurts in winter, 'stuck cold' and 'insufficient yang' are probably the problem, if they hurt in the damp weather accumulated 'dampness' and 'excess yin' is the likely culprit [36]. The diagnosis links the patient's condition to meteorological and macrocosm forces and connects the patient to a wider world of coherent and intentional forces [37]. The acupuncturist's goal is to balance these forces within the patient. Acupuncturists appeal to more 'naturalistic' impersonal forces (e.g. yin, yang, qi, wind) compared with the Navajo supernatural Holy People. But for the patient (and perhaps the acupuncturist), these naturalistic elements probably still pertain to what might be experienced as numinous spiritually charged forces. Like the Navajo chanter, the acupuncturist, whose training also takes many years, is the skilled mediator of the troubled microcosm and all powerful macrocosms.

The explicit narrative acupuncturists communicate to their patients usually concerns balancing various 'energies' to bring harmony to the patient [36]. But the non-spoken implicit meta-enactment is a dramatic ritual of 'porousness' and opening to the cosmic influences. Through elaborate calculations honed by intense training and experience, the acupuncturist deftly wields the needles. One needle, two three . . . up to 20 or so. Fingers are twirled. Penetration happens. Inserted in seemingly incomprehensible spots, the needles harmonize the patient's microcosm to reflect macrocosmic balance. Other supplemental forms of touch—bleeding, scarification, cupping, even a kind of burning—create additional openness. All the time the acupuncturist is concentrating like a surgeon and self-reflectively nods their head as he/she studies reactions and makes tiny sighs of approval or disapproval to each needle insertion. The acupuncturist will feel the qi and any changes in the pulse. Occasionally, the acupuncturist will break the silence and ask the patient if he or she feels a particular sensation, called 'deqi' or 'feeling the qi' [38]. The practitioner responds positively when the patient says 'yes' and tries again if the patient says 'no'. Some effect can be immediately anticipated and, at the end of the session, the patient is asked whether he or she feels anything different. Any sensations, changes or feelings the patient reports (at this session or later sessions) are considered important and interpreted on the grid of pre-existing cultural conceptions [22]. The patient is usually told to come back for more

treatments. Supplemental herbal treatment can provide additional potent regulatory influences.

4. BIOMEDICAL TREATMENT

Sitting in the waiting area, silent with hushed anticipation or nervously thumbing the magazines, the patient visiting a biomedical practitioner is eventually called into the examination room. He or she meets the physician, the mediator between 'the salvational . . . powers of science' and sickness [39]. Despite a physician's commitment to science, for the patient, the healer still retains some of the numinous power of a priestly profession. But before the use of scientifically based interventions can begin, patient and physician (or other biomedical practitioners) engage a stereotypical ritual. A patient-physician connection needs to be established to both ensure collaboration and promote accurate diagnosis. Patient and physician engage in formal behaviours including 'practices, conventions and procedural rules' based on established obligations and expectations in a context of decorousness [40]. Wearing a sacerdotal white coat and stethoscope, the physician is supportive and compassionate and manages to conceal any pressure to move patients through efficiently [41]. The patient shows the proper deference. Implicitly allows for medical trust and an interaction transpiring with a full 'sensory repertoire [that] conveys messages [with] manual gesticulations, facial expressions, bodily postures, rapid, heavy, or light breathing, [and] tears' [42]. While the encounter is formally scripted, contingencies and idiosyncrasies of the moment allow the physician to show his or her 'individual character, personal style, rhetorical skills and [unique] moral and aesthetic differences' [42]. Any major violation of the prescribed ritual codes—'an unguarded glance, a momentary change in tone of voice, an ecological position taken or not taken can drench . . . [an encounter] with judgmental significance' and threaten the relationship [40, p. 33]. For building trust, sincerity is less an issue than the correct performance of the prescribed behaviours.

Establishing a collaborative bond with the physician moves the patient from 'free agent to docile patient' [43]. Under the direction of the physician, the scientific gaze penetrates the body. The patient changes from clothing to flimsy gown. So begins an incremental dramatic process of ever-increasing exposure and inner probing. The chest is heard, the abdomen is palpated and orifices are inspected, and the abdomen is palpated. Bits and pieces of the person's inner being are removed as samples of different fluids and discharges are prepared to go to the laboratory. Genetic samples may be sent for decoding. Machines with thunderous Olympian names—computerized axial tomography, myocardial perfusion imaging, magnetic resonance imaging, positron emission tomography—begin their cacophony of clicks, buzzes, clangs, screeches, thumps and roars. Eventually a universal structural, physiological or psychophysiological abnormality 'that conforms to a culturally sanctioned conception of disease' is detected [44]. After all the reports are returned, the physician makes a diagnosis, explains the treatment strategy and selects a prescription from over 3000 approved

pharmaceuticals available on the market. Pills, tablets or injections can be analgesics, anxiolytics, antihypertensives, hypnotics, β -blockers, antihistamines, hormones, antibiotics, tumour shrinking agents, antidepressants and so on. Medications are thought to operate according to the same universal chemical and physical laws that govern all that science has already illuminated and technology has built. The patient can take multiple prescriptions several times a day as a repetitive ingestion of the scientific potion. While the patient is hopeful, patients know that there is a chance for therapeutic failure. A period of observation, interpretation and additional consultation follows. If medications are not successful, more invasive methods and procedures including surgery can be used for such purposes as correcting anatomical abnormalities, removing tumours or implanting mechanical devices, joints or entire organs. Despite its scientific and secular orientation, biomedical treatment and technology for the patient can still retain a mysterious and numinous quality. Like the Navajo and acupuncture healing, the biomedical treatment fuses universal forces (which are described in scientific terms) onto a single person's unique suffering.

5. RITUAL AND HEALING

Navajo ceremonies, acupuncture and biomedical pharmaceuticals and procedures map the personal dislocation of illness onto culturally sanctioned universal narratives of power. Rituals focus on 'sharing emotional, cognitive and attentional states and coordinating actions relevant to those states' and involve processes that are attention grabbing, redundant, rhythmic, repetitive, decorous, well-rehearsed and somewhat invariant [45]. Patients situate themselves in the 'liminal' space between brokenness and intactness. With an aesthetic persuasiveness and adroit craftsmanship, healers create an 'osmotic' bridge between cultural mythos and idiosyncratic biography.

While story, plot and explanation are important as framework, it is the ritual and its symbols that forge transactional processes attaching the patient's life-world to the universal order of phenomenon. The performance provides the patient with a palpable and participatory experience of empowerment and enlarged self-identity. The patient is opened and is persuaded [46]. Each ritual described is 'emotionally saturated' with touch, sounds, smells, kinesthesia, paraphernalia and costumes representing 'condensations' or symbols of culturally certified power integrating explicit and implicit personal narratives with cultural truths of ultimate agency and meaning [14]. Layers of sensations and behaviours address different patient sensitivities and probably work synergistically. The 'patient is not passively incidental to the ceremonial process, but is possessed with hope, frustration, confusion, uncertainty, understanding and relief' [32]. While illness is accompanied by despair, worry, anxiety and pain, patients' health seeking behaviours represent hope (desire for improvement), potential re-moralization and an openness to new possibilities, if not necessarily absolute confidence and positive expectations (belief in likelihood of improvement).

With Rappaport's model of ritual [21] providing a starting point, all three healing rituals—Navajo

ceremonies, acupuncture and biomedical treatment—can be said to provide:

- *An evocation of space, time and words separate from the ordinary.* A unique designated arena is established especially designed to create a receptive person. The patient as seeker meets the healer as trustworthy guide and protector. This space also provides the location of solemn pronouncements of diagnosis and treatment plan. While only a prologue, the space and words by themselves may decrease a patient's fear and improve symptoms [47,48].
- *A pathway of enactment that guides and envelops the patient.* The ritual grabs the patient's attention and provides multi-sensory compelling experiential evidence of being embraced by universal forces. The healer is the impresario and guide, the patient is supplicant and follower.
- *A concrete embodiment of potent forces.* Healing influences are directly ingested, injected, absorbed or incorporated. The healer ensures that these forces accurately penetrate and precisely regulate the personal world of the patient. For the patient, the rite is tangible, immediate and physically experienced.
- *An opportunity for evaluation of a new status.* Each of these rituals give patients and healers a chance to interpret what happened. This feedback takes place within pre-existing cultural preconceptions of how healing takes place. Any outcome—positive, negative, unclear or any combination of these—is generally explainable within the elaborate models of each framework. If dissatisfied with the outcome, patients may elect to try other systems; all three rituals described above coexist in pluralistic medical environments with multiple alternative options [25,49]. If faced with failure, healers will have post hoc rationalizations and, if sufficiently charismatic, have new opportunities to practice, fine tune and obtain further success with their skills.

Rappaport's description of ritual emphasizes the dramatic process of 'what happens' to a person in a ritual. Csordas proposes an alternative framework [50] that emphasizes the internal states a patient undergoes in a healing ritual. Specifically, Csordas points to three stages of inward experience:

- *A predisposition to be healed.* Predisposition involves the seeking behaviour, entrance into a healing domain, and reaching some tentative agreement on a strategy or diagnosis. It is the first step in creating receptiveness and openness to universal potent forces. A subjunctive, as if, world is established.
- *An experience of empowerment.* Empowerment happens when the coherent universal forces—deities, yin-yang or chemical-physical adjustments—infuse the chaotic world of the patient. A multi-dimensional performance merges with patient hope to produce concrete experiences of engagement with healing forces. The ritual provides a direct experience of being contacted with culturally recognized healing influences.

— *A concrete perception of transformation.* Perceptions of relief and recovery come from bodily experiences, emotional adjustments, new behavioural options, cognitive interpretations and moral renewal. The truth of performance is not so much a belief but is felt with unimpeachable experiences.

Taken together Rappaport's and Csordas' models suggest that for the patient, healing is a performative process that is accompanied by a series of shifting internal states. Both of these scholars would agree that the healing ritual with its dramatic narrative and compelling aesthetics has a 'performative efficacy': the participatory experience of the ritual itself automatically shifts perceptions, emotions, meaning and self-awareness [17,19].

Notwithstanding their similarities, the Navajo, acupuncture and biomedical treatments are distinct in many ways. Besides the details of the ritual, and from a biomedical viewpoint the relative proportion of 'specific' effective material-physical causal agents, the internal self-awareness on the relevance of ritual in all three practices is profoundly different. For the traditional Navajo, or the Navajo who, at least temporarily, adopts the traditional framework, there is no separation of ritual and the healing. Healing is the enactment or performance. The Navajo would not be likely to make use of the word 'ritual', but instead would speak of healing ceremonies or chants. Any component of the Navajo ceremony that, from a biomedical perspective, might have specific, 'proximal' or 'non-ritual' causality—herbs, sweat lodges, fasting—would be considered to have 'numinous' power that helps to cajole the Holy People. Ceremony is the self-defining mechanism of the healing and its correct enactment is the primary recognized vehicle of healing. Ritual is explicitly religious and moral: healing ceremonies, religion, morality and art are fused into a single unity. For the biomedical physician, the ritual is much more problematic: a central pillar of biomedicine is the banishment, through the apparatus of the RCT, of any therapy that is primarily reliant on ritual. While the ritual of the patient-physician relationship is recognized for its supportive value in official pronouncements, its purpose is to foster cooperation and adherence for the 'real', specific or non-ritual treatment. Pharmaceutical treatment, procedures and surgery are recognized for their instrumental causality, and discussion of their performative aspects is generally marginalized. The ideology of biomedicine places ritual (or placebo effects) to the margin where, at best, it has a subordinate role as the 'art' as opposed to the 'science' of medicine [51]. The ritual is submerged and implicit and devoid of religious or an explicit belief-system but rather is based on what is self-described as non-cultural and universal 'evidence-based knowledge'. In fact, the official elimination of ritual as a concept within biomedicine may partially infuse biomedical procedure with an additional charged symbolic 'power'. Despite the scientific ethos, for patients and perhaps for physicians, biomedicine goes beyond technical expertise and retains aspects of a healing ritual albeit with a secular mythos. It can evoke the awe and inspiration of touching ultimate

sources of agency in the cosmos. It also retains implicit moral dimensions such as the social legitimation of the sickness role, the support of proper lifestyle behaviours and the ethical integrity required of the physician. The acupuncturist inhabits a place somewhere between the Navajo and physician. Yin-yang theories can be only secular but easily can have an explicit religion, moral or a meaning-centred praxis framework. No less than biomedicine, practitioners can support healthy behaviours and encourage reframing of self-awareness. Furthermore, early classical Chinese texts and well-known historical cases describe the importance of ritual performance and charismatic healers [36,52,53]. In its attempt to look scientific, contemporary Asian textbooks in China play down this 'non-specific' effect and, in fact, the patient-physician relationship can be extremely curtailed [33,54,55]. Unknowingly, acupuncture in the West has adopted and maybe rescued the now disappearing old-fashioned Western-style intimate patient-practitioner relationship but mistakenly seeing it as a unique Eastern 'holistic' practice [37].

6. RITUAL AND THEATRE

Healing rituals have been described as performance in this essay, and, indeed, one helpful way of thinking about rituals is in contrast with theatre, especially tragedy. An examination of their similarities suggests the potential persuasive power of healing rituals. Both tragedy and healing are about difficult life problems. Both involve an aesthetic of narrative and symbols and prescribed enactments that depend on skilled craftsmanship and artistry. Like patients, to echo Aristotle, the audience of tragedy experiences emotional agitation (e.g. fear and dread) and physical arousal (e.g. tears, coldness and shuddering) [56]. Through evocative and crafted enactment, both theatre and healing entice us into a subjunctive (as if or 'could be') world of open possibilities [15,24]. The truth of theatre and healing rituals is lived 'not in the sense that their truth value is certified by logic or argument but in the sense that they are taken into the imagination and lived with, if only for a time' [18]. For both the simulation becomes authentic, the imaginative becomes reality and the illusion becomes palpable.

Uncertainty is involved in both theatre and ritual healing. While a drama is scripted before any performance and has an inevitable outcome, the audience accepts the representation as uncertain [21]. As we have noted, medical rituals necessarily have built-in uncertainties. And these uncertainties are tempered by hope and openness as the audience and patients both look for a successful resolution of either social conflicts or health disturbances.

But theatre and healing are not identical and a comparison of differences suggests some reasons why healing rituals are ultimately more persuasive than drama. While actors in theatre and healers in rituals connect audiences and patients to the deepest truths and core behaviours of a culture, the stakes are much higher for patients. In theatre, audience and actors are separate, while, in ritual, the patient and healer are at once both actor and audience. In rituals, patients

are self-revelatory and engage in a back-and-forth exchange involving intimacy and trust. The theatre audience is more passive and can always touch the chair or notice the stage and switch to awareness of the illusion. They can return to pre-theatre reality when the drama ends. In healing rituals, patients and healers anticipate and hope for permanent (or at least temporary) change and rarely find moments to escape the awareness of a precarious predicament. The arousal is deeper. Patients are active and search for clues that the performance is real [23]. Theatre demands a limited and temporary degree of absorption, while healing ritual demands a much greater degree of commitment and surrendering the self [57]. While theatre and ritual both touch existential, affective and behavioural self-appraisal, healing ritual often emphasizes potential changes in physical discomfort, disability and disfigurement. A theatre audience can passively accept, reject or consider the theatre's drama, patients have much more at stake. Ultimately, theatre is for pleasure and, and what Aristotle calls catharsis, while healing involves the concrete and immediate life-worlds.

7. BIOMEDICAL RESEARCH OF PLACEBO EFFECTS

Scientific research does not usually consider ritual within its scope of research. Rituals come in too many varieties with too many variables to easily allow rigorous controls and experimental manipulation. Analysing the effects of the images or songs of the Thunder Gods will never become a high priority for biomedicine. The closest biomedicine comes to the study of ritual is with placebo studies. Recent reviews elsewhere [8,58] make a systematic presentation of recent scientific research unnecessary in this essay. But to briefly summarize, placebo research has clearly described psychological mechanisms—e.g. expectations, conditioning, anxiety reduction, learning, memory, motivation, somatic focus and reward—that contribute to a response to a 'simulated' treatment. More recent research has begun to describe how the appearance of treatment elicits quantifiable changes in neurotransmitters, hormones, immune regulators and regionally specific brain activity that could influence peripheral disease processes through plausible physiological mechanisms [9,59]. In particular, the effects of placebo treatment in various illnesses have been linked, at least, to activation of the opioid, dopaminergic and serotonergic systems [8]. It has become clear that the performance of healing, without any biomedically defined active ingredients, unleashes endogenous chemicals with salubrious effects. Importantly, one research programme—the 'hidden drug versus open drug paradigm' as developed by Benedetti and colleagues [60]—demonstrates that even when active medications are used, the ritual of treatment can be a significant component of biomedical treatment outcome. In these experiments, researchers administer potent drugs intravenously in a manner that the patient remains uninformed about the drug's provision and compares this outcome to the situation where the patient is fully informed about the drug administration. Such studies show that when patients

are administered unaware buprenorphine, tramadol, ketorolac and metamizol for pain control by hidden infusion, these powerful analgesics have significantly less effect than when they are provided openly in full view of the patient [60]. Another study demonstrated that diazepam (valium) provided unknowingly to the patient has no effects on post-operative anxiety; only if accompanied by the ritual of treatment does the drug work [61]. Such experiments suggest that ritual is an active component of biomedical treatment, especially when patient-centred subjective symptoms are the measured outcome [62].

8. RESEARCH INTO THE RITUAL OF ACUPUNCTURE

Placebo acupuncture study has become a multi-disciplinary subcategory of placebo research. This research can help illuminate the potential utility of connecting placebo studies and ritual theory. Placebo acupuncture research has been made possible with the development and validation of placebo acupuncture devices where patients experience a penetrating needle (over non-acupuncture points), but in actuality the needle retracts or telescopes up the shaft of the needle handle [63]. These experiments offer helpful insights into healing rituals.

One such placebo experiment was an RCT that randomly treated 270 patients with chronic arm pain with either placebo acupuncture or placebo pill and found that placebo acupuncture was significantly better in reducing pain over time, but placebo pills offered more benefits in improving pain-disturbed sleep [64]. Subsequently, a functional magnetic resonance imaging (fMRI) study examining the same placebo needle demonstrated that healthy volunteers given calibrated thermal pain and treated with placebo acupuncture had significantly less pain compared with those who received the same thermal pain without treatment. Importantly, volunteers treated with the placebo needle demonstrated unique activation of rostral anterior cingulate cortex, which is involved in emotion modulations, and a pronounced activation in the right anterior insula, which is involved with bridging sensations to emotions [65]. A subsequent study using positron emission tomography (PET) and a radioactive tracer to measure endorphins followed patients with fibromyalgia receiving eight weeks of placebo acupuncture treatment [66]. Placebo acupuncture increased endorphin release.

Later, components of placebo acupuncture treatment were disassembled and incrementally combined and compared in a six-week three-arm RCT of 262 patients with irritable bowel syndrome (IBS) [67]. In *group 1*, patients received no treatment but had to respond to a large battery of research questions at baseline, midpoint and endpoint. Twenty-eight per cent of these patients reported adequate relief on a validated IBS measure. This could have been due to the sympathetic attention from the research team, natural fluctuations or regression to the mean. *Group 2* received the same questionnaires plus fake acupuncture and a 'limited' business like patient–healer interaction. Acupuncturists told participants that the RCT was testing acupuncture so they

were not allowed to engage the patients in conversation. In this group, patients registered 44 per cent adequate relief. *Group 3* received the same questionnaires and fake acupuncture, but the acupuncturists now engaged patients in a highly organized ritual which included an augmented patient–healer interaction that included taking medical and psychosocial histories and demonstrations of compassion, support, attentive-listening, 20 s of thoughtful silence and expressions of confidence. Patients reported 62 per cent adequate relief. The study showed that components of the ritual of acupuncture could be incrementally added—sympathetic general questioning < sympathetic general questioning + fake treatment < sympathetic general questioning + fake treatment + supportive patient–practitioner relationship—in a manner analogous to being dose dependent. The effect of the augmented placebo was as large and significant as any pharmaceutical ever tested for IBS. An analysis of biomarkers in the serum of all patients revealed that changes in immunological biomarkers were associated with symptom improvement and provides a possible molecular signature of response to placebo [68].

Within this placebo-IBS RCT, a nested qualitative study of 27 patients, involving interviews by a medical anthropologist at baseline, midpoint and endpoint was implemented [23]. The study found that patients who entered the trial had already seen countless specialists, were desperate, did not have positive expectations but rather consistently expressed hope and an openness to see what could happen. Improvement varied widely from dramatic changes in social relationship to concrete steady improvement in symptoms and capacity to function. An analysis of psychological characteristics in the entire large three-arm RCT found that patients in the augmented patient–healer relationship who were extroverted and open to new experiences were especially likely to respond to the augmented ministrations [69]. Interestingly, the impact of the trial on patients varied significantly among the four acupuncturists even though each followed a scripted procedure that was videotaped to check for fidelity to treatment protocols. Could this be a measure of the unique charisma of each practitioner? A subsequent RCT of 450 patients with knee osteoarthritis also examined placebo acupuncture in the context of an augmented versus a neutral patient–practitioner relationship. Again it was found that a more persuasive clinical interaction positively affected clinical outcomes [70].

9. PLACEBO STUDIES ILLUMINATE RITUAL THEORY

Taken as a whole, the study of placebos illuminates theory in several concrete ways. Minimally what has been found includes:

- Rituals have neurobiological correlates. This suggests that patient improvement is not only report bias or desire to please the healer but represents changes in neurobiology. Specific areas of the brain are activated and specific neurotransmitters and immune markers may be released.

- Biomedical treatment with powerful medications has a ritual component that is clinically significant.
- As with pharmaceuticals, each type of ritual, for example, fake needles versus fake pills, has a unique outcome.
- Components of rituals can be disaggregated and incrementally combined in a manner analogous to a dose response. For example, adjusting components of a ritual could make it more or less persuasive.
- When engaged in a ritual, patients do not abandon practical sensibilities. Hope, openness and positive expectancy are tempered with uncertainty and realistic assessment.
- Different healers can have different effects on patients even when they perform an identical prospectively defined precise scripted interaction.

At a minimum, healing rituals provide an opportunity to reshape and recalibrate selective attention [71–73]. In a more expanded model, rituals trigger specific neurobiological pathways that specifically modulate bodily sensations, symptoms and emotions. It seems that if the mind can be persuaded, the body can sometimes act accordingly. Placebo studies may be one avenue to connect biology of healing with a social science of ritual. Both placebo and ritual effects are examples of how environmental cues and learning processes activate psychobiological mechanisms of healing.

10. LIMITATIONS

This essay is, at least partially, guilty of reductionism. As a part of biomedicine and a scientific discipline, placebo studies try to deal with the universal and generalizable concepts. In some ways, placebo studies try to treat placebo effects as a kind of specific psychobiological drug-like intervention, quantifiable and measurable. From the perspective of ritual theory and anthropology, this approach can be seen as an avoidance of the particular. For example, this essay has insinuated that Navajo chants may have some rough equivalence to the clanging of a CT scan. From a more nuanced anthropological perspective, this assertion clearly distorts the meaning of chants and CT scans. Navajo chants are explicit articulated cultural rhymes and enactments that have been shared across generations of families and the wider community. They are a part of the fabric of the peoples' lives. CT scans are large doughnut-shaped X-ray machines producing cross-sectional views of the body used by physicians with the explicit purpose of diagnosis of disease. A person only encounters a CT scan when sick. Both chant and CT scan probably produce awe and anticipation, yet it is also likely that chants and scans are non-equivalent in meanings, experiences and impact. Maybe one day, science will be able to learn whether their neurocircuitry is similar or different. But will reductionist neuroscience ever tell us the whole story? This essay has spoken in broad sweeps. The author sees this as a step in making links between placebo studies and ritual theory. An important next step would be expanding

mix-method research methodologies that somehow merge the biomedical need for the universal and the anthropological requirement for the particular.

11. CONCLUSION

For biomedicine, the 'placebo effect' has been primarily of interest as a non-specific process that needs to be controlled. In contrast, for ritual theory, the placebo effect is the specific effect of a healing ritual. Combining placebo studies with ritual theory can help provide a conceptual shift to counteract the ideological devaluation of ritual in biomedicine. The linkage of ritual theory and placebo studies can expand the discourse of both fields.

This work was supported by NCCAM-NIH grants no. K24 AT004095, P01AT002048, R01 AT001414-01 and R01 AT004662. All opinions are exclusively those of the author. The feedback of Franklin Miller, Luana Colloca and Janet Littell was extremely helpful.

REFERENCES

- Kaptchuk, T. J. 1998 Powerful placebo: the dark side of the randomized controlled trial. *Lancet* **351**, 1722–1725. (doi:10.1016/S0140-6736(97)10111-8)
- Kaptchuk, T. J. 1998 Intentional ignorance: a history of blind assessment and placebo controls in medicine. *Bull. Hist. Med.* **72**, 389–433. (doi:10.1353/bhm.1998.0159)
- Kaptchuk, T. J. 2001 The double-blind, randomized, placebo-controlled trial: gold standard or golden calf? *J. Clin. Epidemiol.* **54**, 541–549. (doi:10.1016/S0895-4356(00)00347-4)
- Kaptchuk, T. J. 2003 Effect of interpretive bias on research evidence. *BMJ* **326**, 1453–1455. (doi:10.1136/bmj.326.7404.1453)
- Kaptchuk, T. J., Kerr, C. E. & Zanger, A. 2009 Placebo controls, exorcisms and the devil. *Lancet* **374**, 1234–1235. (doi:10.1016/S0140-6736(09)61775)
- Sullivan, M. D. 1993 Placebo controls and epistemic control in orthodox medicine. *J. Med. Phil.* **18**, 213–231. (doi:10.1093/jmp/18.2.213)
- Comaroff, J. 1976 A bitter pill to swallow: placebo therapy in general practice. *Sociol. Rev.* **24**, 79–96.
- Finniss, D. G., Kaptchuk, T. J., Miller, F. & Benedetti, F. 2010 Biological, clinical, and ethical advances of placebo effects. *Lancet* **375**, 686–695. (doi:10.1016/S0140-6736(09)61706-2)
- Benedetti, F. 2009 *Placebo effects: understanding the mechanisms in health and disease*. New York, NY: Oxford University Press.
- Thompson, J. J., Ritenbaugh, C. & Nichter, M. 2009 Reconsidering the placebo response from a broad anthropological perspective. *Cult. Med. Psychiatry* **33**, 112–152. (doi:10.1007/s11013-008-9122-2)
- Moerman, D. 2002 *Meaning, medicine and the 'placebo effect'*. Cambridge, UK: Cambridge University Press.
- Hahn, R. A. & Kleinman, A. 1983 Belief as pathogen, belief as medicine: 'voodoo death' and the 'placebo phenomenon' in anthropological perspective. *Med. Anthropol. Q.* **14**, 16–19.
- Kleinman, A. M. 1973 Medicine's symbolic reality. On a central problem in the philosophy of medicine. *Inquiry* **16**, 206–212. (doi:10.1080/00201747308601685)
- Turner, V. 1967 *The forest of symbols: aspects of Ndembu ritual*. Ithaca, NY: Cornell University Press.
- Seligman, A. D., Weller, R. B., Puett, M. J. & Simon, B. 2007 *Ritual and its consequences*. New York, NY: Oxford University Press.
- Bell, C. 1997 *Ritual: perspectives and dimensions*. New York, NY: Oxford University Press.
- Tambiah, S. J. 1981 A performative approach to ritual. *Proc. Br. Acad.* **65**, 113–169.
- Kirmayer, L. J. 1993 Healing and the invention of metaphor: the effectiveness of symbols revisited. *Cult. Med. Psychiatry* **17**, 161–195. (doi:10.1007/BF01379325)
- Tambiah, S. J. 1977 The cosmological and performative significance of a Thai cult of healing through mediation. *Cult. Med. Psychiatry* **1**, 97–132. (doi:10.1007/BF00114812)
- Taylor, C. 2007 *A secular age*. Cambridge, MA: Harvard University Press.
- Rappaport, R. A. 1999 *Ritual and religion in the making of humanity*. Cambridge, UK: Cambridge University Press.
- Li, B. O., Kirmayer, L. J. & Groleau, D. 2010 Therapeutic process and perceived helpfulness on Dang-Ki (Chinese shamanism) from the symbolic healing perspective. *Cult. Med. Psychiatry* **24**, 56–105.
- Kaptchuk, T. J., Shaw, J., Kerr, C. E., Conboy, L. A., Kelley, J. M., Lembo, A. J., Csordas, T. J. & Jacobson, E. E. 2009 'Maybe I made up the whole thing:' placebos and patients' experiences in a randomized controlled trial. *Cult. Med. Psychiatry* **33**, 382–412. (doi:10.1007/s11013-009-9141-7)
- Good, B. J. & Del Vecchio Good, M. J. 1994 In the subjunctive mode: epilepsy narratives in Turkey. *Soc. Sci. Med.* **38**, 835–842. (doi:10.1016/0277-9536(94)90155-4)
- Csordas, T. J. 2000 The Navajo healing project. *Med. Anthropol. Q.* **14**, 463–475. (doi:10.1525/maq.2000.14.4.463)
- Kim, C. & Kwok, Y. S. 1998 Navajo use of native healers. *Arch. Intern. Med.* **158**, 2245–2249. (doi:10.1001/archinte.158.20.2245)
- Kluckhohn, C. & Leighton, D. 1948 *The Navajo*, p. 168. Cambridge, UK: Cambridge University Press.
- Spencer, K. 1957 *An analysis of Navajo chantway myths*. Philadelphia, PA: American Folklore Society.
- Gill, S. D. 1977 Prayer as person: the performative force of Navajo prayer acts. *Hist. Relig.* **17**, 143–157. (doi:10.1086/462785)
- Kaptchuk, T. J. & Croucher, M. 1986 *The healing arts*, p. 108. London, UK: British Broadcasting Corporation.
- Faris, J. C. 1990 *The nightway. A history and a history of documentation of a Navajo ceremonial*. Albuquerque, NM: University of New Mexico Press.
- Csordas, T. J. 2004 Healing and the human condition: scenes from the present moment in Navajoland. *Cult. Med. Psychiatry* **28**, 1–14. (doi:10.1023/B:MEDI.0000018095.54422.66)
- Cherkin, D. C. et al. 2002 Characteristics of visits to licensed acupuncturists, chiropractors, massage therapist, and naturopathic physicians. *J. Am. Board Fam. Pract.* **15**, 463–472.
- Napadow, V. & Kaptchuk, T. J. 2004 Patient characteristics for outpatient acupuncture in Beijing, China. *J. Altern. Complement. Med.* **10**, 565–572. (doi:10.1089/1075553041323849)
- Kaptchuk, T. J. 2002 Acupuncture: theory, efficacy and practice. *Ann. Intern. Med.* **136**, 374–383.
- Kaptchuk, T. J. 2000 *The web that has no weaver: understanding Chinese medicine*. New York, NY: McGraw-Hill.
- Kaptchuk, T. J. & Eisenberg, D. M. 1998 The persuasive appeal of alternative medicine. *Ann. Intern. Med.* **129**, 1061–1065.
- Kong, J., Gollub, R., Polich, G., Napadow, V., Hui, K., Vangel, M., Rosen, B. & Kaptchuk, T. J. 2007 Acupuncture deqi, from qualitative history to quantitative

- measurement. *J. Altern. Complement. Med.* **13**, 1059–1070. (doi:10.1089/acm.2007.0524)
- 39 Geertz, C. 1988 *Works and lives. The anthropologist as author*. Stanford, CA: Stanford University Press. (doi:10.1525/si.1989.12.1.171)
- 40 Goffman, E. 1967 *Interaction ritual: essays in face-to-face behavior*. New York, NY: Pantheon Books.
- 41 Blumhagen, D. W. 1979 The doctor's white coat. *Ann. Intern. Med.* **91**, 111–116.
- 42 Turner, V. 1982 *From ritual to theatre: the human seriousness of play*. New York, NY: PAJ.
- 43 Kirmayer, L. J. 1988 Mind and body as metaphors: hidden values in biomedicine. In *Biomedicine examined* (eds M. Lock & D. Gordon). Dordrecht, The Netherlands: Kluwer Academic.
- 44 Good, B. J. 1994 *Medicine, rationality, and experience*. Cambridge, UK: Cambridge University Press.
- 45 Rossano, M. J. 2008 Ritual behavior and the origins of modern cognition. *Camb. Archaeol. J.* **19**, 243–256. (doi:10.1017/S0959774309000298)
- 46 Frank, J. D. 1961 *Persuasion and healing*. Baltimore, MD: Johns Hopkins Press.
- 47 Brody, H. & Waters, D. B. 1980 Diagnosis is treatment. *J. Fam. Pract.* **10**, 445–449.
- 48 Kaptchuk, T. J. 2002 The placebo effect in alternative medicine: can the performance of a healing ritual have clinical significance? *Ann. Intern. Med.* **136**, 817–825.
- 49 Kaptchuk, T. J. & Eisenberg, D. M. 2001 Varieties of healing. 2: a taxonomy of unconventional healing practices. *Ann. Intern. Med.* **135**, 196–204.
- 50 Csordas, T. J. 1983 The rhetoric of transformation in ritual healing. *Cult. Med. Psychiatry* **7**, 333–375. (doi:10.1007/BF00052238)
- 51 Armstrong, D. 1977 Clinical sense and clinical science. *Soc. Sci. Med.* **11**, 599–601. (doi:10.1016/0037-7856(77)90041-5)
- 52 Ng, V. 1990 *Madness in late imperial China*. Norman, OK: University of Oklahoma Press.
- 53 Kaptchuk, T. J. 1998 Preface. In *Acupuncture in practice*. New York, NY: Churchill Livingstone.
- 54 Napadow, V., Liu, J. & Kaptchuk, T. J. 2004 A systematic study of acupuncture practice; acupoint usage in an outpatient setting in Beijing, China. *Complement. Ther. Med.* **12**, 209–216. (doi:10.1016/j.ctim.2004.10.001)
- 55 Klienman, A. 1980 *Patients and healers in the context of culture*. Berkeley, CA: University of California Press.
- 56 Lain Entralgo, P. 1970 *The therapy of the word in classical antiquity* (eds L. J. Rather & J. M. Sharp). New Haven, CT: Yale University Press.
- 57 Simon, B. 1978 *Mind and madness in ancient Greece*. Ithaca, NY: Cornell University Press.
- 58 Enck, P., Benedetti, F. & Schedlowski, M. 2008 New insights into placebo and nocebo responses. *Neuron* **59**, 195–206. (doi:10.1016/j.neuron.2008.06.030)
- 59 Kaptchuk, T. J. 2008 An audience with Ted Kaptchuk. *Nat. Drug Discov.* **7**, 554.
- 60 Amanzio, M., Pollo, A., Maggi, G. & Benedetti, F. 2001 Response variability to analgesics: a role for non-specific activation of endogenous opioids. *Pain* **90**, 205–215. (doi:10.1016/S0304-3959(00)00486-3)
- 61 Colloca, L., Lopiano, L., Lanotte, M. & Benedetti, F. 2004 Overt versus covert treatment for pain, anxiety, and Parkinson's disease. *Lancet Neurol.* **3**, 679–684. (doi:10.1016/S1474-4422(04)00908-1)
- 62 Miller, F. G., Colloca, L. & Kaptchuk, T. J. 2009 The placebo effect: illness and interpersonal healing. *Perspect. Biol. Med.* **52**, 518–539. (doi:10.1353/pbm.0.0115)
- 63 Streitberger, K. & Kleinhenz, J. 1998 Introducing a placebo needle into acupuncture research. *Lancet* **352**, 364–366. (doi:10.1016/S0140-6736(97)10471-8)
- 64 Kaptchuk, T. J. *et al.* 2006 Sham device versus inert pill: randomized controlled trial of two placebo treatments. *BMJ* **332**, 391–397. (doi:10.1136/bmj.38726.603310.55)
- 65 Kong, J., Gollub, R. L., Rosman, I. S., Webb, J. M., Vangel, M. G., Kirsch, I. & Kaptchuk, T. J. 2006 Brain activity associated with expectancy-enhanced placebo analgesia as measured by functional magnetic resonance imaging. *J. Neurosci.* **26**, 381–388. (doi:10.1523/JNEUROSCI.3556-05.2006)
- 66 Harris, R. E., Zubieta, Z. J. K., Scott, D. J., Napadow, V., Gracely, R. H. & Clauw, D. J. 2009 Traditional Chinese acupuncture and placebo (sham) acupuncture are differentiated by their effect on μ -opioid receptors. *Neuroimage* **47**, 1077–1085. (doi:10.1016/j.neuroimage.2009.05.083)
- 67 Kaptchuk, T. J. *et al.* 2008 Components of the placebo effect: a randomized controlled trial in irritable bowel syndrome. *BMJ* **336**, 999–1003. (doi:10.1136/bmj.39524.439618.25)
- 68 Kokkotou, E., Conboy, L. A., Ziogas, D., Quilty, M. T., Kelley, J. M., Davis, R. B., Lembo, A. J. & Kaptchuk, T. J. 2010 Serum correlates of the placebo effect in irritable bowel syndrome. *Neurogastroenterol. Motility* **22**, 285–e81. (doi:10.1111/j.1365-2982.2009.01440.x)
- 69 Kelley, J. M. *et al.* 2009 Patient and practitioner influences on the placebo effect in irritable bowel syndrome. *Psychosom. Med.* **71**, 789–797. (doi:10.1097/PSY.0b013e3181acee12)
- 70 Suarez-Almazor, M., Looney, C., Kiu, Y., Cox, V., Pietz, K., Marcus, D. & Street, F. 2010 A randomized controlled trial of acupuncture for osteoarthritis of the knee: effects of patient–practitioner communication. *Arthritis Care Res.* **62**, 229–236. (doi:10.1002/acr.20225)
- 71 Allan, L. G. & Siegel, S. 2002 A signal detection theory analysis of the placebo effect. *Eval. Health Prof.* **25**, 410–420. (doi:10.1177/0163278702238054)
- 72 Parker, S., Garry, M., Engle, R. W., Harper, N. D. & Clifasefi, S. L. 2008 Psychotropic placebos reduce the misinformation effect by increasing monitoring at test. *Memory* **16**, 410–419. (doi:10.1080/09658210801956922)
- 73 Cioffi, D. 1991 Beyond attentional strategies: a cognitive-perceptual model of somatic interpretation. *Psychol. Bull.* **109**, 25–41. (doi:10.1037/0033-2909.109.1.25)