What can science teach us about prayer?

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Despite impressive progress in our understanding of subjects such as conception, heritability and parturition, it seems inevitable that some sense of mystery will always surround reproduction.

Some questions it raises may remain forever unanswerable, for example, at what stage of gestation does consciousness arise? Given this, and given the high infant mortality rates in pre-scientific society, it's little wonder that there's a long tradition of prayer associated with childbirth. Is there any way of trying to figure out if prayers like these actually do anything?

This article provides a brief overview of the recent profusion of attempts to study prayer scientifically. Interestingly, obstetrics has had a significant role in developments in this field, although most studies are of prayers related to non-obstetric medical topics. However, some terms need to be defined before considering whether scientific research of prayer is even possible.

Prayer is defined by the *Oxford English Dictionary* as an address or petition to God or a god in word or thought.[1] Distant intercessory prayer (IP) is when: 'an appeal is made to a god or gods for the health or wellbeing of another person, undertaken beyond the physical proximity of the subject and usually without their direct knowledge.'[2]

How might the putative effects of prayer be studied scientifically? There is plenty of population-based evidence claiming that religious communities may enjoy better health outcomes than non-religious communities. However, this is scarcely surprising when the package of behaviours that is encompassed by religious observance is often concordant with healthy lifestyle choices, such as those relating to alcohol and tobacco, and in any case these are not studies of prayer per se. In fact, no data suggests a need for a supernatural explanation for the disparities described and the effects of religiosity on morbidity are probably overstated.[3]

The double-blind randomised controlled trial (DBRCT) is widely used in the study of the effects of prayer. Considering a trial of a medication as a prototype, the main features of a DBRCT are the use of randomisation to minimise intergroup variation; the use of blinding to ensure that observer bias is minimised; the administration of a defined exposure of an agent to the intervention group and either no exposure or usual care to the control group, minimising within-group variation; the use of a reliable measurement tool to assess the effects of the intervention or control on the subjects; and statistical tests for comparison of groups to determine the statistical significance of the findings.[4]

When compared to parallel pharmacological studies, attempts to study IP present immediate problems. An obvious problem is the concept of measuring the 'dose' of prayer. Is it binary – prayed for/not prayed for? Is it multifactorial – prayers by the worthy being more powerful than prayers by the frightened, desperate, but not particularly religious? Is the denomination and strength of the religious conviction of those praying and the subjects of their prayers relevant? Is geography important? Do the duration or frequency of the prayers or the number of people praying matter? Prayer is a concept lacking causal construct validity because there is no way of making its application quantitative.[5]

'Prayer may be useful for some individuals in times of stress, so we should not attempt to influence our patients' and their families' desire to pray at such times[17], but as a scientific discipline we should not perform, publish or lend the slightest credence to studies purporting to study intercessory prayer scientifically.'

Even if a technique could be developed for quantitating the size of a 'dose' of prayer, there is no scientific or theological reason to expect an omnipotent, omnipresent, omniscient deity to be bound to act in proportion to the size of the prayer dose. Given certain antecedent conditions, a particular outcome could not be predicted. In other words, there is no explanatory relevance linking cause and effect.[5] The situation is complicated further, of course, by the unmeasured prayers of others not involved in the study. The problem of prayer 'dose' is thoroughly covered by Sloan[6] and Hobbins[2].

The generic, null hypothesis of a DBRCT into IP is intrinsically illogical: 'Assuming God can't heal at the bequest of human intercessors, how probable are these results?'[5] The null hypothesis makes no sense if God is omnipotent and without a valid null hypothesis, there is no basis for a DBRCT.

It is clear, then, that the DBRCT is not an appropriate or logical method for the investigation of intercessory prayer. Its null hypothesis is illogical, it lacks causal construct validity and it lacks explanatory relevance.

Given that there are sound logical reasons for not doing DBRCTs on the effects of IP, there must consequently be ethical arguments against doing them. The *Declaration of Helsinki*[7] states that research involving humans 'must conform to generally accepted scientific principles'. It is clear that IP DBRCTs do not conform to scientific principles, so there is a strong ethical case for not conducting such studies. Further ethical reasons against IP DBRCTs relate to methodological problems concerning confidentiality and consent.[2] *Continued on page 37.*

Despite the logical and ethical arguments against IP DBRCTs, they still get done and still get published. A brief discussion of a few key papers follows.

One of the best-known is the study by Byrd[8], which showed some beneficial effects in a prayed-for group of coronary care (CCU) patients. However, these results have subsequently been reproduced, most notably in a similar but more rigorous study by Harris.[9] A criticism of these studies and others like them is that they did not apply the *Bonferroni correction* to compensate for the multiple outcomes assessed, thus greatly elevating the probability of finding apparently significant results through chance alone.[10] In both the Byrd and Harris studies, significance was accorded to results that were not obviously major endpoints (for example, a difference in the rate of antibiotic use), while other assessed endpoints failed to achieve statistical significance (for example, the death rate or length of hospital stay). This is an example of the Texan sharpshooter fallacy, named for the marksman who fired six rounds into the side of a barn and afterwards painted a target on it to make his shots look good.[6] That aside, one could ask why on earth an omnipotent deity would create a difference in an apparently minor endpoint, but not in explicitly prayed-for ones.

There is a *Cochrane* review of IP DBRCTs, using the results of ten trials including the two mentioned above.[11] Five were in CCU patients: one involved the treatment of alcohol abuse; one involved patients with sepsis; one involved patients with leukaemia; and one a mixed patient group. However, the most statistically significant yet notorious study was a randomised controlled trial (RCT) on the effects of IP on the success rate of IVF. Other studies were examined by the *Cochrane* reviewers but were felt to be of insufficient quality to be included.

The IVF study in question was by Cha, Wirth and Lobo.[12] A complex methodology involving intercessors in three countries praying for IVF patients in Korea (as well as for other intercessors) yielded an astounding result: a doubling of the per cycle IVF success rate from 22.2 per cent in the control group to 46.6 per cent in the prayed-for group. This paper has been debunked by Flamm, a Californian obstetrician, who, inter alia, pointed out that the creator of its Byzantine methodology, Wirth (who has no medical or scientific qualification), had been jailed for multiple counts of fraud.[13,14] The *Journal of Reproductive Medicine*, which published the article, removed it from its website and Lobo, a Professor of Obstetrics at Columbia University, withdrew his name from the paper and was reprimanded by his university. However, the study's widely-reported findings[15] were not followed by equally prominent reports of fraud, so it is still cited in the literature, including in *Cochrane* [11] and the *MJA* [16], as though its findings were valid. The lead reviewer of the *Cochrane* review intends to remove the Cha study from a revised review next year (Roberts L, personal communication). Without the Cha article, the conclusions drawn by the *Cochrane* group would be that the extant DBRCTs show no clear effect of IP.

The many review and commentary articles written on this field of research fall into two broad groups. More sceptical reviewers (such as Sloan[6,10], Masters[17,18], Gaudia[19] and Hobbins[2]) tend to argue against IP DBRCTs on methodological, logical and ethical grounds as I have done here, highlighting logical fallacies and incommensurabilities, and concluding that as IP DBRCTs cannot be done properly, they ought not be done at all. The article by Chibnall *et al* [5] is especially interesting. He and his colleagues sought to devise a DBRCT measuring the effects of IP on depression and rapidly realised that such a study was impossible.

The other sort of review seems remarkably credulous. Such reviews largely ignore the logical and ethical objections to IP RCTs. Instead, they prefer to outline the results of numerous RCTs examining the effects of intercessory prayer, consistently emphasising 'promising' or positive results, whilst acknowledging that several studies had failed to yield a positive result. This sort of appraisal leads, quite logically, to a conclusion something like: 'Further study is needed to elucidate the complexities of this emerging and fascinating field'. Examples are review articles by Astin[20], Jantos and Kiat[16] and Dossey[21, 22].

Bayesian logic is helpful in assessing extraordinary claims such as those made by proponents of IP DBRCTs. Bayes explained that the evidentiary standard required for scientific acceptance of an extraordinary claim has to be very high. If there is a low pre-test probability, then the sort of outcome that results in a high post-test probability has to be really convincing.[23] Yet proponents of the IP RCTs complain that the bar is set too high.[22]

So what should we do as clinicians involved in obstetrics? Our scientific training ought not at all to detract from our appreciation of the joy and mystery of childbirth – indeed, an argument may be mounted that it can enhance it. Prayer may be useful for some individuals in times of stress, so we should not attempt to influence our patients' and their families' desire to pray at such times[17], but as a scientific discipline we should not perform, publish or lend the slightest credence to studies purporting to study intercessory prayer scientifically. They are universally, intrinsically illogical and without merit.

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Full list of references available on request.