Study of the Therapeutic Effects of Proximal Intercessory Prayer (STEPP) on Auditory and Visual Impairments in Rural Mozambique

Candy Gunther Brown, PhD, Stephen C. Mory, MD, Rebecca Williams, MB BChir, DTM&H, and Michael J. McClymond, PhD

Background: Proximal intercessory prayer (PIP) is a common complementary and alternative medicine (CAM) therapy, but clinical effects are poorly understood, partly because studies have focused on distant intercessory prayer (DIP).

Methods: This prospective study used an audiometer (Earscan® 3) and vision charts (40 cm, 6 m "Illiterate E") to evaluate 24 consecutive Mozambican subjects (19 males/5 females) reporting impaired hearing (14) and/or vision (11) who subsequently received PIP interventions.

Results: We measured significant improvements in auditory ($P < 0.003$) and visual ($P < 0.02$) function across both tested populations.

Conclusions: Rural Mozambican subjects exhibited improved audition and/or visual acuity subsequent to PIP. The magnitude of measured effects exceeds that reported in previous suggestion and hypnosis studies. Future study seems warranted to assess whether PIP may be a useful adjunct to standard medical care for certain patients with auditory and/or visual impairments, especially in contexts where access to conventional treatment is limited.

Key Words: audition, complementary and alternative medicine (CAM), intercessory prayer, spirituality, vision

Proximal intercessory prayer (PIP), a term we coined to refer to direct-contact prayer, frequently involving touch, by one or more persons on behalf of another—is one of the commonest complementary and alternative medicine (CAM) therapies. Pentecostals and Charismatics—the fastest growing subgroups of Christianity—often pray for their own healing and request distant intercessory prayer (DIP), but they consider PIP to be particularly efficacious. Pentecostals model PIP on New Testament accounts of Jesus and his disciples laying hands on the sick. Pentecostals conceptualize the Holy Spirit's "anointing," sometimes represented by oil, as a tangible, transferable substance, or love energy, communicated through human touch. Comparing anointing with electricity or radiation therapy, Pentecostals believe efficacy correlates with frequency and length of exposure, types of prayers, and

Key Points

- Although commonly employed as a complementary and alternative medicine (CAM) therapy, the clinical effects of proximal intercessory prayer (PIP) are poorly understood, partly because most research has focused on distant intercessory prayer (DIP).
- This study found a significant effect of PIP on auditory function across the tested population ($P < 0.003$).
- This study found a significant effect of PIP on visual function across the tested population ($P < 0.02$).
- Further study seems warranted to assess whether PIP may be a useful adjunct to standard medical care for certain patients with auditory and/or visual impairments, especially in contexts where access to conventional treatment is limited.

From the Department of Religious Studies, Indiana University, Bloomington, IN; Nashville, TN; Johannesburg, South Africa; and Department of Theological Studies, Saint Louis University, St. Louis, MO.

Reprint requests to Candy Gunther Brown, PhD, Department of Religious Studies, Indiana University, 1033 E 3rd St., Bloomington, IN 47405-7005. Email: browncg@indiana.edu

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"faith" and anointing levels of those receiving and offering prayer. Some persons are considered more anointed than others or as "specialists" in praying for specific conditions.

Scholarly research on the therapeutic effects of intercessory prayer and other forms of "distant" healing has flourished in the past two decades. However, most studies have focused on DIP rather than PIP and/or failed to differentiate PIP from healing techniques such as Therapeutic Touch and external qigong that posit a different healing mechanism (eg, *prana*, *qi* vs Holy Spirit, Jesus) and may engender correspondingly different levels of anticipated efficacy. There is an inadequate evidential basis for generalizing findings from studies of one class of healing technique to another, yet researchers persist in making such generalizations.[1] The resultant literature has yielded uncertainty as to whether prayer and/or distant healing is therapeutically beneficial, neutral, or detrimental.[2,3]

Of particular concern are findings like those of a well-publicized "STEPP" (Study of the Therapeutic Effects of Intercessory Prayer) paper, which concludes that "intercessory prayer itself had no effect on complication-free recovery from CABG (coronary artery bypass graft), but certainty of receiving intercessory prayer was associated with a higher incidence of complications."[4] Notably, one of the three groups of intercessors, the only Protestant group, included in the study, Silent Unity, Lee's Summit, MO, has a theology and practice of intercessory prayer that differs so widely from Pentecostal prayer that the study analyzed an essentially different phenomenon: ie, Unity is a New Thought group that understands prayer not as supplication to a deity outside the self, but as an exercise of the divine/human power of mind. Unity cofounder Myrtle Fillmore taught: "We do not promise to say a prayer of words and have the saying work a miracle in another individual. Our work is to call attention to the true way of living and to inspire others to want to live in that true way."[5]

Most studies have, moreover, in seeking to avoid confounds resulting from patients' knowledge that they are receiving prayer, focused on DIP. Although several prospective, double-blind, randomized, controlled clinical trials concluded that DIP has positive therapeutic effects,[6–8] interestingly, Matthews et al[9] found no significant effect for patients receiving DIP, but found a significant benefit for patients receiving PIP. Although acknowledging possible confounds of Hawthorne and placebo effects, Matthews's study design better corresponds with pentecostal PIP. Unfortunately, the condition isolated for study, rheumatoid arthritis, is relatively susceptible to psychosomatic improvements.[10] Notably, Matthews et al[9] reported that improvements in swollen and tender joints and reduction in pain and functional disability was not accompanied by a parallel reduction in serum inflammatory markers, suggesting that "clinical improvement might be attributable more to alteration of patients' perceptions regarding their illness than to changes in inflammatory pathways affecting their joints."

Our study follows Matthews in focusing on PIP, but diverges by isolating two conditions, auditory and visual impairments, that are relatively less sensitive to, although not unaffected by, psychosomatic factors.[11,12] Indeed, researchers have investigated effects of suggestion and hypnosis on vision and hearing and claimed significant effects.[13–15] We pursued two research questions: 1) Does PIP result in measurable effects? If so, 2) how does the magnitude of effects compare with suggestion and hypnosis findings?

Materials and Methods

Subjects were recruited prospectively at Charismatic Protestant meetings cosponsored by Iris Ministries (headquartered in Pemba, Cabo Delgado, Mozambique) and Global Awakening (headquartered in Mechanicsburg, PA), at four locations in Mozambique. The site was selected because Iris leaders are widely reputed among Pentecostals globally as "specialists" in praying for those with hearing and vision impairments—especially during village outreaches in rural Mozambique.[16]

During evangelistic meetings (4–12 June 2009, in Impiri, Namuno, and Chiúre villages and Pemba city) Iris leaders invited the "deaf" and "blind" to designated areas to receive prayer for healing by themselves and other Western and Mozambican affiliates. Every consecutive subject was included in the study who received prayer for vision or hearing loss and assented to diagnostic tests (all subjects assented). We provided study information sheets in Portuguese and offered Makua (local language) translation. Measurements were taken immediately before and after PIP.

PIP Methods

Western and Mozambican Iris and Global Awakening leaders and affiliates who administered PIP all used a similar protocol. They typically spent 1–15 minutes (sometimes an hour or more, circumstances permitting) administering PIP. They placed their hands on the recipient's head and sometimes embraced the person in a hug, keeping their eyes open to observe results. In soft tones, they petitioned God to heal, invited the Holy Spirit's anointing, and commanded healing and the departure of any evil spirits in Jesus' name. Those who prayed then asked recipients whether they were healed. If recipients responded negatively or stated that the healing was partial, PIP was continued. If they answered in the affirmative, informal tests were conducted, such as asking recipients to repeat words or sounds (eg, hand claps) intoned from behind or to count fingers from roughly 30 cm away. If recipients were unable or partially able to perform tasks, PIP was continued for as long as circumstances permitted.

Measurement Methods

We prospectively evaluated a consecutive series of 24 Mozambican subjects (19 males/5 females) reporting auditory (14 subjects) and/or visual (11 subjects) impairments who received PIP. One subject reported both hearing and vision impairment. Three subjects (eg, Subject A in Supple-

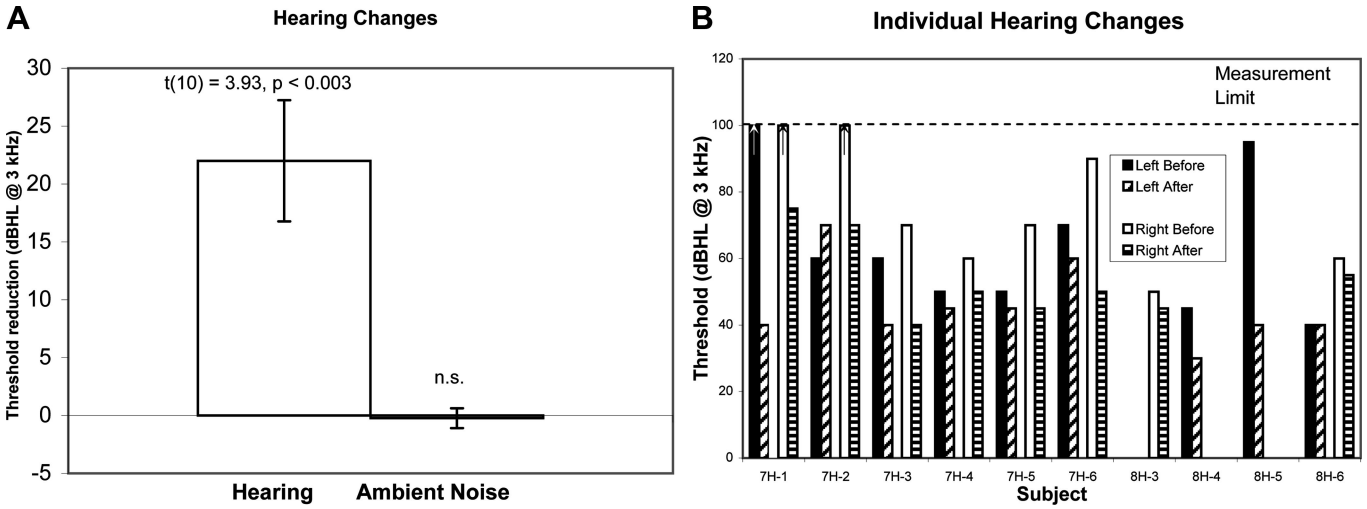

Fig. 1 **Auditory results. *A,* Hearing thresholds at 3 kHz were significantly improved across the population. Improvements cannot be accounted for by reductions in AN (dB SPL). *B,* Hearing threshold changes ranged from a 10 dB HL increase to over 60 dB HL improvement.**

mental Digital Content, http://links.lww.com/SMJ/A1) were excluded from analysis because of false positive responses during audiometric testing. Due to field-imposed time constraints, those subjects who self-reported improvements were given priority for retesting after PIP; we lacked time to re-test two subjects, so we reported them as unimproved. Also because of time constraints, some subjects reporting problems only in one ear were only tested (pre- and post-PIP) in that ear. No subject ordinarily wore hearing aids or corrective lenses.

For hearing assessment, a handheld audiometer (Earscan ES3, Micro Audiometrics Corp, Murphy, N.C., calibrated 3 months prior to the study, with calibration valid for 12 months) was used to measure hearing thresholds. Measurements could not be conducted in an acoustically isolated room due to the remote field location, and the high ambient noise (AN) from the nearby crowd of people presented a considerable challenge to measurement accuracy. AN was measured with a sound meter (Tenma model 72–935) in dB SPL in order to investigate whether its fluctuations presented a potential confound in the before vs after PIP measurements; maximum and minimum AN was tested for each subject during both pre- and post-tests.

Due to time constraints, hearing thresholds were measured for all subjects only at 3 kHz in each ear separately instead of across the whole frequency spectrum; we took additional measurements as time allowed. A total of 18 ears in 11 individuals with hearing impairments were analyzed. The maximum intensity that could be generated by the audiometer was 100 dB HL. Subjects responded by button press or verbally. Subjects whose pre-PIP hearing thresholds exceeded 100 dB HL were assigned a conservative 105 dB HL threshold for subsequent analysis. The measurement protocol followed the standard Carhart-Jerger method.[17] (See Supplemental Digital Content, http://links.lww.com/SMJ/A1.)

Eleven visually impaired subjects were tested using 40 cm (6 subjects) and/or 6 m (5 subjects: this chart was used for elderly subjects reporting distant vision problems) logarithmic, "Illiterate E" visual acuity charts (Precision Vision, La Salle, Ill.), using both eyes together, or with each eye separately as time allowed. The minimum measurable acuity was 6/120 on the 40-cm chart and 6/30 on the 6-m chart. A premeasured string was used to hold charts at the appropriate distance. As researchers pointed to each letter, subjects pointed or verbally indicated which direction it faced; researchers did not indicate whether responses were correct, making it less likely that subjects memorized the chart.

Results

Audition

There was a highly significant improvement in hearing across the 18 ears of 11 subjects ($t(10) = 3.93$, $P < 0.003$, two-tailed) (Fig. 1). Two subjects showed hearing thresholds reduced by over 50 dB HL. AN was very high during testing (50–100 dB SPL), but AN (85 dB SPL), calculated for each subject individually as the average of the minimum and maximum noise during measurement was unchanged between pre- and post-PIP tests ($t(10) = -0.48$, $P = 0.64$, two-tailed), indicating that AN was not likely to be a confound (Fig. 1, *A*). The average 3 kHz threshold after PIP was 49.4 dB HL, which was slightly high, perhaps due to high AN.

Vision

Significant visual improvements (both difference and ratio of before vs after) were seen across the tested population (Wilcoxon signed rank test $z = 2.49$, $P < 0.02$, two-tailed) (Fig. 2, *A*). Three of eleven subjects improved from 6/120 or

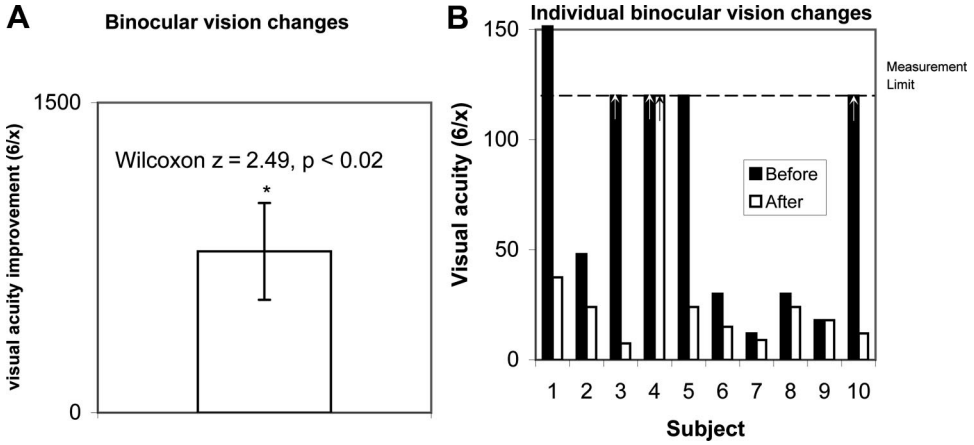

Fig. 2 **Vision results. *A,* Binocular visual acuity increased significantly across the population. *B,* Individual improvements ranged from no change to an improvement from >6/120 to 6/7.5.**

worse to 6/24 or better, and one subject improved from unable to count fingers at 30 cm (6/2400) to 6/38 (Fig. 2, *B*). All but one vision subject was tested in broad daylight; the remaining subject was tested after dark, with electricity provided by generator-powered stage lights and a flashlight (See Subject E in Supplemental Digital Content, http://links.lww.com/SMJ/A1); the lighting level did not appear improved between the pre- and post-test (conducted less than one minute later), making it unlikely that variable lighting was a confound.

Discussion

Both auditory ($P < 0.003$) and visual ($P < 0.02$) improvements were statistically significant across the tested populations. Generally, the greater the hearing or vision impairment pre-PIP, the greater the post-PIP improvement.

There are several limitations of the study. First, field conditions were challenging. There were no modern clinical facilities available, and we were unable to diagnose the etiology of auditory or visual impairments or to assess whether structural changes occurred. There is no way of knowing whether hearing changed at untested frequencies, or whether subjects tested only with 40 cm or 6 m charts would have exhibited change with the other chart. Second, although the study was prospective and controlled for some potential confounds such as AN, there was no control group, only a null hypothesis of no significant effect. Third, the study was not double-blinded. In support of experimenter reliability, several audition subjects showed no measurable improvement, despite self-reported improvement.

Studies of PIP by nature expose subjects to suggestions that their conditions will improve. Could observed effects be attributable to suggestion or hypnosis?[12] Sheehan et al[13] showed that a few minutes of suggestion led to statistically significant visual acuity improvement, but the effect was so small that a subject would not be able to read one line smaller on the Snellen chart. Several studies of hypnotic suggestion showed an average 2[14] or 2.5[15] times increase in visual acuity, with the largest reported improvement from 6/60 to 6/6,[13] despite no measurable changes in ocular refraction. Other studies reported no improvement in vision or auditory thresholds after hypnotic suggestion.[18] A 2004 review article summarizes the results of suggestion and hypnosis studies as failing to demonstrate significant improvements in vision or hearing.[12] The average visual acuity improvement measured here was over tenfold, significantly higher than in suggestion or hypnosis studies (Fig. 3). It seems reasonable, however, that Hawthorne,[19] placebo, hold-back effects,[20] and/or empathy[21] may have contributed to improved function. Conversely, demand effects[12] may also account for some cases in which subjects reported improved hearing (but not vision) despite no measurable improvement. It should be noted, however, that in the Mozambican cultural context, traditional healers typically charge clients more when healing occurs; thus, subjects may have been predisposed to minimize reporting post-PIP improvements.

Practice effects[22] might also have contributed to some observed improvement, but these would also be present in hypnosis studies to similar degrees and therefore may not fully account for the larger effects observed here. Furthermore, the amount of practice was minimal at best. Subjects with measurable hearing thresholds experienced the test tones of a given frequency only a few times in each ear, following the Carhart-Jerger protocol. In some cases, the threshold verification pass of the Carhart-Jerger protocol revealed a lower pre-PIP threshold than the initial pass, apparently due to practice effects, and so the protocol continued until the measured pre-PIP psychophysical hearing threshold was stable. In this way, any existing practice effects were largely accounted for already in the pre-PIP test. Subjects with no measurable hearing threshold pre-PIP were deemed deaf in the corresponding ear(s) if they both self-identified as deaf and exhibited no tone response or visible startle response even to tones of 100 dB HL, in which case it is unclear how such an experience might constitute practice. Likewise, visually impaired subjects were allowed minimal experience with the eye chart

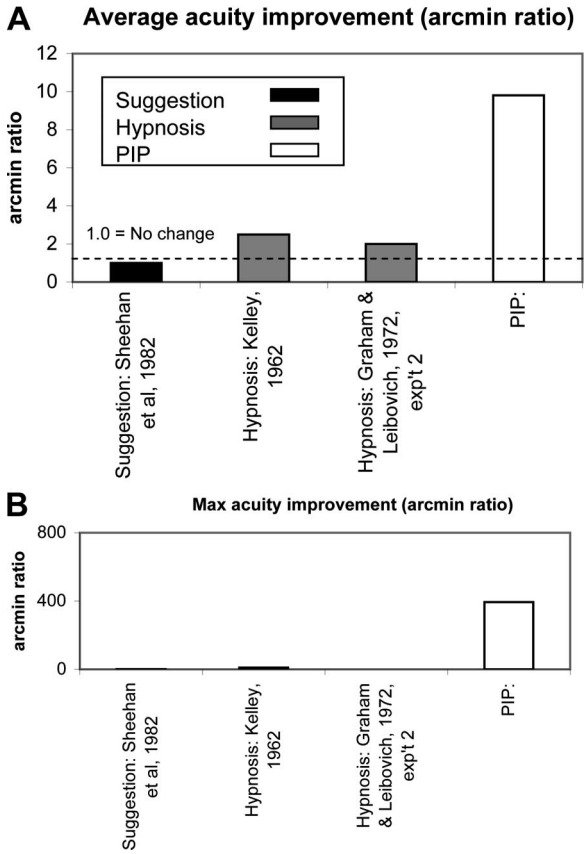

Fig. 3 **Comparison with suggestion and hypnosis. *A*, Studies of hypnotic suggestion and suggestion without hypnosis have found small but statistically significant improvements in visual acuity. The magnitude of effects across the population was significantly larger in PIP than in suggestion and hypnosis. *B*, The maximum improvement in visual acuity for PIP was larger than the maximum improvement reported for suggestion and hypnosis.**

during the pre-PIP test. They were asked to read as far down the eye chart as they were able to a single time, and care was taken not to reveal the smaller lines below their pre-PIP acuity threshold prior to the post-PIP test. It seems reasonable that subjects whose pre- and post-PIP visual thresholds differed by only one or two lines on the eye chart may have been exhibiting practice effects. It seems much less likely that subjects who went from being unable to read a single line (in which case it is unclear that this experience constituted practice) to reading far down the chart were exhibiting practice effects.

This study leaves unanswered the question of to what extent PIP by different individuals would have resulted in further improvements (or diminishments) in function. One particular Iris leader was involved in administering PIP in 13 out of 25 interventions.

This research, which focused on clinical effects of PIP, did not attempt to explain mechanisms by which functional improvements occurred. Future studies might be designed to test whether impairments with certain etiologies are more susceptible to improvement through PIP, to probe the mechanisms by which PIP produces effects, and to assess whether improvements are long term. It would be desirable to follow-up with subjects several days or weeks after PIP, although systematic follow up would be extremely difficult under similar field conditions (we tried but could only locate one subject for retesting the following day—see Subject B in Supplementary Digital Content, http://links.lww.com/SMJ/A1). Conducting similar studies under controlled clinical conditions in North America would be desirable, yet neither Iris nor Global Awakening claims comparable results in industrialized countries (arguing that "anointing" and "faith" are lower where medical therapies are available)—see Supplemental Digital Content (http://links.lww.com/SMJ/A1) for our unsuccessful attempts to collect data in the US. Possible control groups for future investigations might include subjects receiving "sham" PIP or Therapeutic Touch. The researchers might use themselves as controls by testing their own hearing in conditions of low and high AN. Effects of AN and subject-subjectivity might be mitigated by using earbuds instead of supra-aural headphones and by utilizing otoacoustic emissions technology.

Our study has three main findings. First, Mozambican subjects did exhibit improved auditory and/or visual acuity subsequent to PIP interventions. Second, the magnitude of measured effects exceeds that reported in previous studies of suggestion and hypnosis. Although it would be unwise to overgeneralize from these preliminary findings for a small number of PIP practitioners and subjects collected in far-from-ideal field conditions, future study seems warranted to assess whether PIP may be a useful adjunct to standard medical care for certain patients with auditory and/or visual impairments, especially in contexts where access to conventional treatment is limited. The implications are potentially vast given World Health Organization estimates that 278 million people, 80% of whom live in developing countries, have moderate to profound hearing loss in both ears, and 314 million people are visually impaired, 87% of whom live in developing countries, and only a tiny fraction of these populations currently receive any treatment.[23]

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SUPPLEMENTAL DIGITAL CONTENT

DESCRIPTION OF HEARING TEST METHODS

The hearing test protocol followed the standard Carhart-Jerger method. Subjects were given a 3 kHz tone well above threshold to verify ability to respond to instructions; then the intensity was reduced to well below threshold. The intensity was increased systematically by 5 dB HL until a response was made, then the threshold was verified by lowering the intensity by 10 dB HL at a time and increasing it by 5 dB HL until a response was made. Participants responded by button press or verbally when they heard a sound. Some participants needed prompting to indicate whether or not they heard a sound, apparently due to difficulty following directions with the unfamiliar equipment. In these cases, prompts were periodically given intentionally when no sound was presented in order to detect false positive responses. To avoid overestimating sensitivity, we excluded from further analysis those subjects (3) who gave false positive responses under these conditions.

The population statistics on hearing improvement following PIP included samples of both ears from some individuals, which may constitute nonindependent samples. To correct for this, the reported paired t-test was performed on data from all ears individually, but the probability was evaluated by conservatively assuming only 1 degree of freedom for each individual.

FOLLOW-UP STUDY IN URBAN BRAZIL

While the results in the main text suggested significant improvement in hearing and vision with PIP interventions in rural Mozambique, it was unclear whether these findings would generalize to other regions and cultural groups. To investigate replicability, we performed a

follow-up study. The study was conducted during Charismatic Protestant evangelistic healing meetings in three cities in Brazil (Sao Paulo, Barretos, and Uberlandia), during September-October 2009, sponsored by Global Awakening (Harrisburg, PA). The measurement methods for hearing and vision were the same as those used in Mozambique.

Hearing

The auditory data from Brazil were analyzed as follows (Figure S1). All and only those individuals who were tested both before and after PIP were included in the analysis. Of those, two subjects were excluded due to failures in measuring AN during testing. A total of 18 subjects were analyzed, with both ears for each subject included individually as separate measurements. AN was measured separately during pre- and post-PIP testing, with minimum and maximum AN recorded during each subject session. AN for each subject session was taken as the average of minimum and maximum AN in dB SPL, as in the main paper.

At 3kHz, the results showed a significant population reduction in hearing thresholds ($t(35)=3.25$, $P = 0.0013$, one tailed). This finding must be treated with caution, however, because AN also showed a reduction, from an average of 60.4 dB SPL before PIP to 52.2 dB SPL after PIP. This AN reduction was also significant ($t(17) = 3.84$, $P < 0.001$, one tailed). Thus, it is unclear whether the reduced hearing thresholds were the result of reduced AN or improved hearing. To investigate this further, the threshold reduction was correlated with AN in the subset of ears showing reduced hearing thresholds (n=16). Although the correlation was positive ($r=0.17$, it was not significant ($t(14)=0.63$, $P =0.27$). Therefore it remains unclear how much of the threshold reduction can be attributed to reduced AN, and how much can be attributed to other factors.

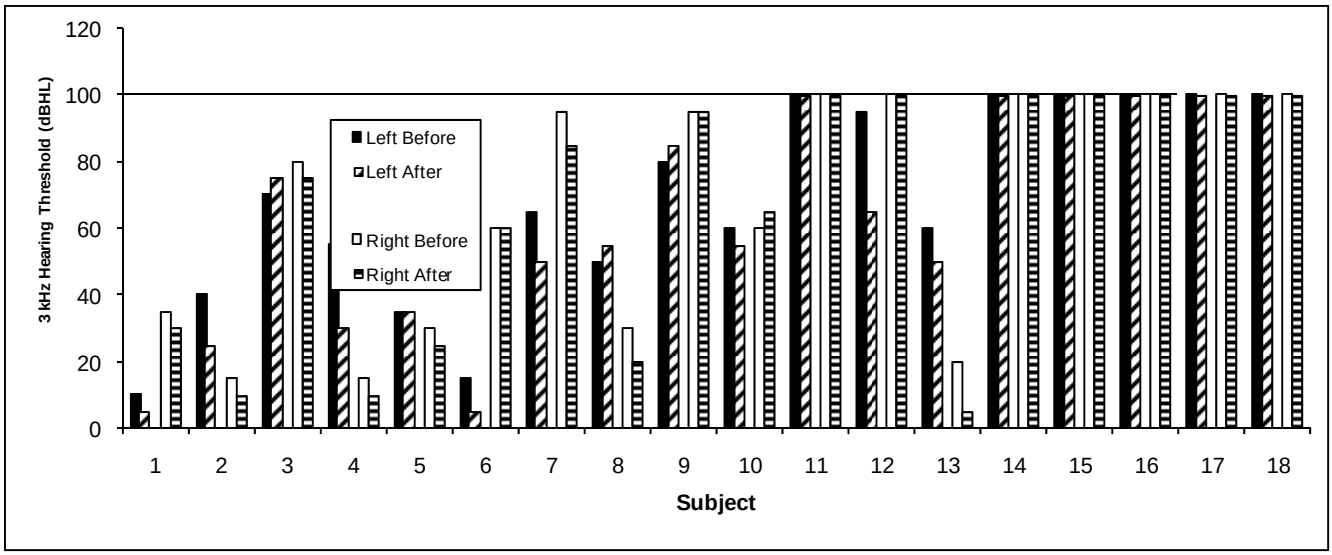

Figure S1. **Hearing.** Results from replication study in urban Brazil, showing the degree of hearing threshold improvement at 3kHz.

Vision

Visual acuity was measured using the 6 m vision chart. All subjects who were tested both before and after PIP were included in the analysis (Figure S2). A total of 23 pre- and post-measurements were taken (6 left, 6 right, 11 both eyes). The ratio of before vs. after acuity was calculated for each measurement pair.

The null hypothesis of no improvement in visual acuity after PIP (acuity ratio = 1) was tested, and the acuity improvement ratio (mean = 2.94, range 1 to 14.8) was significantly greater than 1 ($t(22)=2.66$, $P=0.007$, one tail). These results are consistent with a significant population improvement in visual acuity after PIP.

Overall, the results from the follow-up study in Brazil replicate the findings of significant improvement in visual acuity as reported in Mozambique in the main paper. The auditory

thresholds at 3kHz were also significantly reduced, but the measured hearing improvements were confounded with reduced AN.

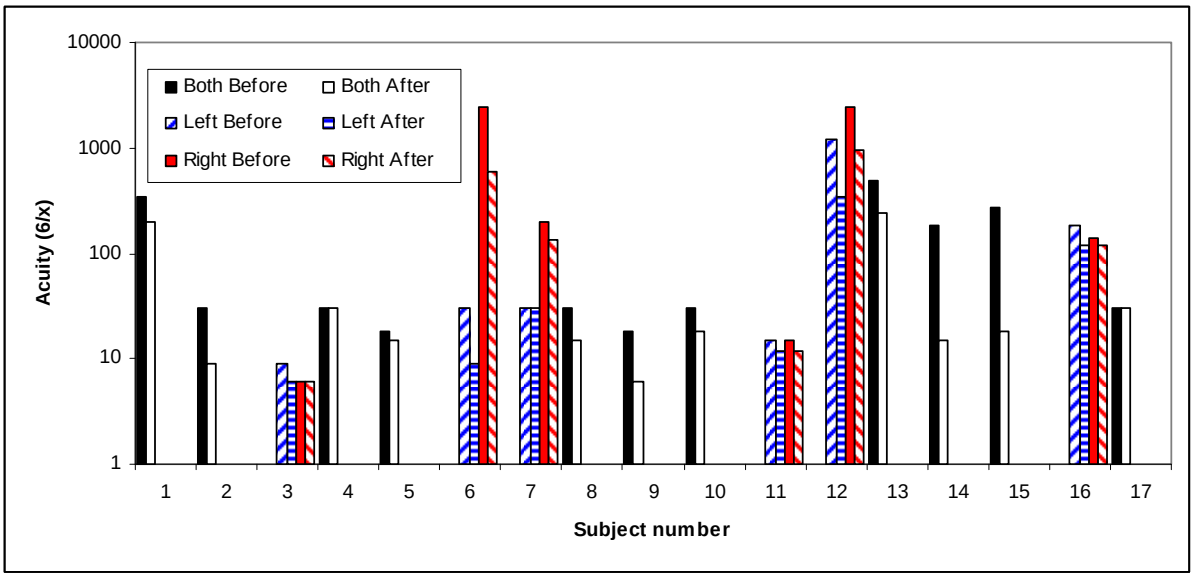

Figure S2. **Vision.** Results from a replication study in urban Brazil, showing acuity before and after PIP on log scale. Note subjects 14 and 15 who improved from 6/180 or worse to 6/18 or better.

DESCRIPTION OF RESEARCH SITES

Most of Iris's claims of healing were made during village outreaches in rural Mozambique. By contrast, our research team administered several dozen pre-PIP hearing and vision tests at a Charismatic Protestant conference in Chicago, IL (Oct. 26, 2009) where an Iris leader was the scheduled speaker; not a single subject claimed healing that particular evening—although Iris leaders asserted that four deaf children had been healed during a similar conference in Boston, MA the previous week. We also measured vision and hearing at a Global Awakening conference in Seattle, WA (June 25-27, 2009); only 2 of 17 pre- and post-tested subjects exhibited measurable improvements.

Typically during a village outreach in Mozambique, several Mozambican and Western team members drive several hours from the Iris base in Pemba over primitive roads that see little

vehicular traffic—or they fly a small airplane to cover longer distances, and set up a portable generator to power stage lights and a sound system, with which Iris attracts a crowd of between several hundred and several thousand people by singing to keyboard accompaniment and showing a local-language film (very much a novelty in these areas) before an Iris leader stands up to preach—which they generally preface by calling up the "deaf" and "blind" and praying publicly (usually with a crowd gathered to watch the process) for their healing. Villages typically consist of a collection of between a few dozen and several thousand mud huts without electricity or running water. Village culture is nonliterate; clocks, calendars, and modern technology are unknown, and few people have even a general idea of their own age. Iris leaders are not the only persons to administer PIP; other Mozambican and Western Iris affiliates also pray for healing, both during evening outreaches and daytime "medical clinics"—during which Iris staff typically set up a tent from which a medical doctor and several nurses, with the help of Mozambicans and other Westerners, distribute basic pharmaceuticals and administer PIP. Attendance at medical clinics is much lower than at evening meetings (several dozen people, most of whom are seen in private), and emotional stimulants such as loud music and public healing displays are minimal.

Global Awakening conducts evangelistic healing conferences in 36 countries, most frequently Brazil. Meetings in Brazil are typically conducted in urban churches or outdoor sports arenas. Many attendees are poor (Global Awakening provides bus service from squatter areas) and have little access to reliable medical care, but electricity, mobile phones, and sanitation services are generally available, and a basic level of education is common. Global Awakening emphasizes that the prayers of "ordinary" team members (the group typically travels with 60-180 Westerners) are at least as effective as an up-front leader's prayers in effecting healing; Global Awakening leaders administered PIP to only 1 of the 41 subjects analyzed. Interviewing subjects

about the nature of their impairments and healing experiences proved much more feasible in Brazil than Mozambique, so most of our case reports come from Brazil.

CASE REPORTS

We include below notes on several subjects who presented with noteworthy details and/or whom we were able to interview about their PIP experiences.

Hearing

Subject A. is a young adult Mozambican man brought to Iris for PIP during an evening outreach (Impiri, June 4, 2009) by his father, who described him as having been deaf and mute since birth, an assessment with which several villagers present in the crowd concurred. A. had apparently learned to read his father's lips. A. did not have an opportunity to observe other apparent healings, as he was the first person brought for prayer during the outreach. The father explained the audiometry test instructions to A.. We ran the full test sequence on the automated setting. A. made no responses to tones at any frequency, nor did he appear to notice any sounds in his surroundings. When asked, the young man indicated by gestures that he had not heard anything. An Iris leader briefly (approximately 1 minute) administered PIP and then stood behind A.'s line of sight and asked him to repeat words and hand claps at increasing distances. A. imitated the words and sounds in a hoarse but intelligible voice. His father and several villagers (approximately 30 of whom crowded around to observe) indicated that this was the first time they had heard A. speak. We then re-ran the audiometer's automatic test protocol. A. responded to several tones at around 60 dB HL, but for other tones his response was delayed until 90 dB HL, and sometimes he did not push the response button even at 100 dB HL (AN levels remained in

the same range as during the pretest). The audiometer aborted the automated test due to inconsistent responses. We switched to the manual test mode to try to find the threshold. A. again responded to some tones at around 60 dB HL, but he also gave several false alarms—pressing the button even when a tone was not presented (we periodically tried to elicit false alarms by pretending to present a tone and asking if one was heard), causing us to exclude this subject's data from the statistical analyses. We tried the automatic protocol a second time, but it again aborted with an inconsistent results error. Either the subject's hearing had not improved after PIP and he only appeared to respond to tones because he coincidentally pressed the button when tones were being administered; or, he did not understand the test instructions, that he should press the response button immediately every time and only when he heard a tone, perhaps as a result of never having learned to communicate complex ideas. (Even Mozambican subjects with partial hearing exhibited difficulty understanding how to use the response button on the unfamiliar audiometer—few if any had ever seen a similar device. Thus, after our experience testing this subject we switched from using the response button to asking subjects to respond verbally when they heard tones). A. seemed to press the button consistently whenever we reminded him that he should press the button when he heard a sound, but otherwise he did not press the button. He responded more consistently when, instead of being asked to press the button, he was asked to imitate the tone when he heard it, or when he was asked after each tone whether he had heard it. After 45 minutes of attempting to get consistent results using the audiometer, we ceased making further attempts. Although we could not include A. in our analysis, after PIP, A. could imitate words and sounds even when he could not see the source of the sound.

Subject B. is an elderly Mozambican woman brought to Iris for both hearing and vision impairments during an evening outreach (Namuno, June 7, 2009). Before PIP, she made no response at 100 dB HL in either ear at 3 kHz (AN 79.1-98.7 dB SPL). After PIP, B., at 3 kHz, responded at 75 dB HL in the right ear, 40 dB HL in the left ear (AN 76.3-103.1 dB SPL). B. reported that she could not read the 6/120 line of the 40 cm vision chart with both eyes together; she did not exhibit any improvement in visual acuity after an Iris leader administered PIP. We had a rare opportunity to retest B. the following morning (it is extremely difficult to conduct follow up given that villagers quickly disperse after meetings, leaving no "address," let alone possessing phones), when she came to Iris's medical tent to receive additional PIP for her eyes. B. responded to tones in her left ear: 500 Hz, 60 dB HL; 1 kHz, 50 dB HL; 2 kHz, 45 dB HL; 3 kHz, 40 dB HL; 4 kHz, 35 dB HL; 6 kHz, 55 dB HL; 8 kHz, 65 dB HL; right ear: 500 Hz, 55 dB HL; 1 kHz 45 dB HL; 2 kHz, 35 dB HL; 3 kHz 30 dB HL; 4 kHz, 30 dB HL; 6 kHz, 60 dB HL; 8 kHz, 55 dB HL; AN 57.9-68.6 dB SPL, and during tests at 6 and 8 kHz, a strong wind was making a high frequency noise. Notably, B.'s hearing threshold remained unchanged in the left ear at 3 kHz compared with the previous evening's post-PIP level, but the right ear at 3 kHz seemed further improved (potentially confounded by the fact that the AN was also reduced). Interestingly, pentecostals claim that healing is often progressive, and that improvements may begin or intensify hours or days following PIP. Despite having received PIP the previous evening, B. still reported being unable to read the 6/120 line of the 40 cm vision chart. After further PIP (approximately 10 min. duration) by Iris-affiliated Mozambicans and Westerners (Iris leaders were not present), B. accurately read the 6/24 line.

Subject C. is a 37-year-old Brazilian man tested in Uberlandia (Oct. 2, 2009). He has worked for Global Awakening for five years as a translator and has attended many healing

conferences. On Oct. 2, 2009, a Global Awakening leader was teaching a group of Brazilians how to pray for healing and used his translator, C., as an example. The speaker said, as C. reports it, “for example if [C.] here had a problem with his ear and I’ll pray for him, and he put his hand on my left ear . . . I said, you know [_____] if you are going to demonstrate that, I have a problem with the right ear so if you could pray for that. He said, Oh sure, this is good. So you actually have a problem. Let’s see how it goes. So he starts to pray for me, teaching the church how to do it, praying for me. And then I started to feel heat. And it started to feel like a little ant started to crawl up and down the inner ear, deep down inside. And I still feel it tingling right now. I think it is an on-going process.” [C. had received PIP about four hours before making this statement and believed that the PIP was still taking effect.] The speaker had next prayed using the phrase “more Lord, and I felt it jump to four [ants]. More Lord again and it jumped to about ten. He said, more Lord and it was about twenty . . . and it was like a whole ant nest was here crawling. And then it became a tingling. It just became a tingling. And then it was very hot, very hot, very hot. And then it suddenly became very cold as if someone had come with like a mint or something very fresh in the mouth and then blew. Very cold. And I also felt a cold hand on my shoulder. And I looked back and no one was there; it was just [_____] touching my ear. So exactly the moment that I felt this cold hand on my shoulder, [_____] said, yes Lord, thank you for your angels. They are here with us helping in this healing. . . . And then at the end of the prayer I felt like when you clean your ear. It was very itchy, very itchy. And you know when you clean it with a Q-tip and it hurts, you pressure too hard, that is the feeling I had. Okay, so people start to talk to me and I could hear better so it started to hurt a little bit and I was covering it, you know, for a while. . . . and I can still feel it is a little tender, there is still movement in there. So I think it is not over yet [ie, the healing process was in his view still occurring].” Interestingly,

C.'s hearing thresholds for both his left and right ears changed between the pre- and post-tests (except in the right ear at 3 kHz, which remained the same): left at 500 Hz 35 dB HL to 10 dB HL; 3 kHz 15 dB HL to 5 dB HL; 6 kHz 20 dB HL to 10 dB HL; 500 Hz right 30 dB HL to 15 dB HL; 3 kHz 60 dB HL before and after PIP; 6 kHz 35 dB HL to 20 dB HL). This was a rare instance when it was possible to follow up by e-mail one month later: C. reported that his hearing had remained improved and that he could still "tell the difference."

Subject D. is a 31-year-old Brazilian woman whose hearing was tested (and retested a second time the following day) in Uberlandia (October 3, 2009). The numerical changes measured were subtle, especially in the right ear, and might reasonably be dismissed given that AN also diminished (from 60-67 dB SPL to 29-65 dB SPL): left at 500 Hz 100 dB HL to 85 dB HL; 3 kHz 95 dB HL to 65 dB HL; 6 kHz 85 dB HL to 75 dB HL; right 500 Hz >100 dB HL to 80 dB HL; 3 kHz >100 dB HL to >100 dB HL; 6 kHz >100 dB HL to >100 dB HL).Yet, interestingly, D. claimed that after PIP she could hear her son's voice for the first time. She reported that she had been sleeping normally the day after receiving PIP when, in the words of her interpreter, "she woke up with a sound and then she got very, very worried with this different sound. And she was so happy because she could listen. She got scared to hear this sound. And she calmed down after that and she cried. And the sound she heard was this boy and she was so, so emotional because she was listening to the son and for the first time she could hear her son. And she cried and wept."

Vision

Subject E. is an elderly Mozambican woman brought to Iris during an evening outreach clinic (Impiri, June 4, 2009) who reported that her vision had been "very bad" "for a long time."

E. did not have an opportunity to observe other apparent healings, as she was the first person who came forward for prayer in that vicinity. After E. could not identify any characters on the 40 cm vision chart, an Iris leader asked her to count the number of fingers she held up from approximately 30 cm away (6/2400); E. said she could not see the fingers. The Iris worker hugged E. and briefly (i.e. less than one minute) administered PIP. She again held up fingers, and E. counted them accurately. She was then able to read as far down as the 6/38 line of the vision chart with each eye singly; the only lighting was supplied by generator-powered stage lights and a flashlight, and there is no way of knowing how well she could have seen during daylight. Interestingly, E.'s right eye, which was observably discolored white, remained discolored after PIP. E. reported that she felt very happy because before she could only see a little, but now she could see much.

Subject F. is a young adult Mozambican man who came to a morning medical clinic (Chiuré, June 12, 2009) set up by Iris from the back of a truck parked along an unpaved roadside. F. came seeking prayer for his vision; he waited in line while another man received PIP for neck pain, but F. did not observe any other subjects having their vision tested. Before PIP, F. could not read the 6/120 line of the 40 cm chart with both eyes together. After PIP of approximately 5 minutes' duration by Western Iris affiliates (Iris leaders were not present), F. read the 6/38 line with both eyes; after several additional minutes of PIP, he read the 6/12 line. F. reported that he wanted to be baptized immediately (Iris leaders were then at a nearby river baptizing new converts).

Subject G. is a 67-year-old Brazilian woman tested in Sao Paulo (September 27, 2009) who read the 6/30 line with her left eye during the pretest and the 6/9 line with her left eye during the post-test. G. reported feeling heat in her eyes while people prayed for her, and said

that pressure in her ears affected her vision. When she opened her eyes after PIP, G. reported that the people close to her looked totally different, and she could see clearly like she never had before.

Subject H. is a 48-year-old Brazilian woman tested in Barretos (September 30, 2009) who, with both eyes together, read the 6/18 line during the pretest and the 6/6 line during the post-test. H. reported that during prayer she felt intense heat in her body. Before PIP, she could not see the details on faces or read the Bible without glasses, but after PIP she could do both.

Subject I. is a 68-year-old Brazilian woman tested in Barretos (September 30, 2009) who with her left eye read the 6/30 line during the pretest and the 6/15 line in a post-test administered the next day; after receiving additional PIP, she was retested a second time that same day and read the 6/9 line. With her right eye, I. counted fingers at 30 cm (6/2400) during the pretest and at 1.2 m (6/600) during the post-test. She reported that during prayer she started to feel a lot of heat in her body.

Subject J. is a 38-year-old Brazilian woman whose vision was tested, both eyes together, in Uberlandia (October 2, 2009). During the pretest, she could count fingers from 2.7 m (6/800) away. During the post-test, she could read the 6/18 line on the eye chart. J. reported that as soon as she opened her eyes after receiving PIP, she found that she could read the name badge of the person who had been praying for her, that everything became clear, and that the pain she had been experiencing from straining to see was gone. The Global Awakening team member who prayed for her reported that when J. came for prayer her eyes were squinted together; J. had told him that she was experiencing pain from forcing her facial muscles to strain to see, and that something was wrong with her corneas.

Subject K. is a 61-year-old Brazilian woman whose vision was tested, both eyes together, in Uberlandia (October 4, 2009). During the pretest, K. could count fingers at 3.9 m (6/600). During the post-test, she could read the 6/15 line of the vision chart. K. reported that she could see much more clearly.