

## Drumming At Seven Hz and Automated Ganzfeld Performance

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### Abstract

An automated ganzfeld study was conducted using the standard procedure with dynamic film clips, but no sender, using an auditory stimulus of drum beats at 7 Hz and a control of drum beats at 2 Hz. A questionnaire was used to examine the effects on ESP performance of subjects' prior psi experiences and whether they practiced a mental discipline. The overall results were significant with 21 hits in 51 sessions ( $z = 2.506$ ,  $p < 0.005$ , one-tailed). Performance was nonsignificantly better during 7 Hz ( $t = 1.51$ ,  $p < 0.10$ , one-tailed). There was a correlation between the questionnaire items (prior psi experiences and the practicing of mental disciplines) and psi scoring ( $p < 0.05$ ). The findings of this study may have implications for Honorton's (1969) noise reduction model, in that they suggest that pattern in auditory stimuli can be useful in the automated ganzfeld. The findings also suggest that the ganzfeld procedure can be significantly streamlined.

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during the experiment a red light flashes in the experimenter's room. The door of the room is locked before the experiment starts and the key is stored draw in the foyer of the ganzfeld suite.

### **Subjects**

Fifty one subjects were used, 14 males and 37 females, all students or staff at the University of Edinburgh aged between 18 and 41 years old. They were recruited by questioning people at social events, plus a poster in the psychology building asking for potential subjects. Once a person had shown interest in the experiment they were asked to fill out a screening questionnaire. It was agreed in advance that the study would run until at least 25 subjects had been run under each randomly assigned condition.

### **Questionnaire**

The questionnaire used was a brief version of the Participant Information Form (PIF) used by the Koestler Unit. The first two questions asked whether the subject had ever participated in any parapsychological studies. The next two questions asked if the subjects practiced any mental or spiritual regimes, such as yoga, tai chi, relaxation or biofeedback. The last section of the questionnaire incorporated a selection of questions about the subjects' own psi experiences and beliefs about them, including whether they believed they might be able to demonstrate psi under laboratory conditions. Potential participants were accepted into the study if they scored at least 13 points on this questionnaire.

### **Procedure**

Having chosen the subject by evaluation of their questionnaire the experimenter arranged to meet them in the Psychology Department concourse. On meeting the subject the experimenter took them to the reception area of the ganzfeld suite. Here it was briefly explained how the equipment worked and what the procedure involved. Once the experimenter felt that the subject was comfortable, they had a brief discussion about the nature of the mentation. The subject was made to feel relaxed about reporting imagery as truthfully as possible. The subject was also told that if there was anything they did not wish to tell, they could say a code word which would allow the experimenter to remind them of it later. The nature of the ganzfeld and ESP was discussed with the subject. The subject was then instructed on a five minute relaxation technique which they could undertake themselves in silence prior to the presentation of the drumming stimulus and target stimulus commencing.

The subject was then shown the target room and asked to sit down in the senders chair and look at the target screen for a short time. The subject was told that there would not be a sender and that research had found that there was little difference between using a sender and not. The experimenter attempted to maintain a light-hearted atmosphere throughout the session. The experimenter then took the subject down to the receiver's room, locking the door to the target room when leaving.

On entering the receiver room the subject was asked to sit in the chair. The experimenter then attached the subject's microphone and headphones. The subject was then shown how to switch on the TV and use the volume control for the headphones. The eye shields were then placed on the subject and they were wished good luck as the experimenter left the room. The program was then started and the experimenter tested whether the subject could hear him and told them to begin their relaxation. The subjects were instructed to start monitoring their mentation as soon as the drumming began. After the relaxation exercise, the experimenter started the mentation recorder, the autoganzfeld program and the drumming tape (which was already in the cassette player, since the experimenter was blind to which tape was being used). The mentation of the subject was written down by the experimenter as well as being recorded

on cassette. The drumming and target presentation lasted around 27 minutes., similar to the duration of previous auto-ganzfeld sessions.

The target was shown on the monitor in the sender's room 13 times with a 50 second interval between each presentation and there was also a 10 second delay prior to the first presentation of the target. Once the presentation of the target had finished, the drumming tape was stopped and the mentation was read back to the subject. They were asked to add any mentations that the experimenter had left out. Having done this the subject was asked to remove their eye shields and turn on the monitor. While waiting for the monitor to warm-up, the experimenter asked the subject how long they thought they had been in the ganzfeld. The reported estimation was recorded on the computer. Then reviewing of the video clips commenced. Subjects watched the four clips and then they could watch them again in whatever order they wanted and as many times as they wanted. Then the subject rated the clips according to how well they resembled their mentation, 99 being the degree of similarity and 1 being the lowest. The subject was allowed to view the ratings on the monitor and alter them if desired. Most of the time the subject was not assisted by the experimenter in choosing the ratings for the clips, since the experimenter had a chance to rate the clips himself. On a few occasions, the experimenter repeated part of their mentation. However, this did not usually lead to the subject changing their ratings. When the subject was happy with their ratings they were told that the experimenter would come into their room shortly and they would both find out together what the target had been. The clips were then rated from the experimenter's point of view. When the experimenter was happy with his ratings he removed the drumming tape from the tape player and recorded, on the computer, which tape had been playing. The computer did not reveal the target until all the ratings and the type of auditory stimulation had been fully entered. saved to the hard drive and floppy disk. Having done this the experimenter went into the receiver's room to find out the target with the subject.

If we had obtained a hit we were very excited and celebrated. if we had not got a hit the subject was told that they were not to worry and many other people had not got hits so that they did not feel too bad. Having removed the subject's microphone and headphones the experimenter asked the subject to fill in a questionnaire about their mentation in the reception room while everything in the receivers room was powered down. The subject was then asked to put the drumming tape back into the tape player on whichever side they wanted and to press rewind (this was done so that the experimenter was blind to the tape being used); the experimenter departed and powered down the target room so as not to get any cues about which tape was being used, from the length of time it was rewinding. (This procedure was satisfactory, resulting in changes 26 times and no change 24 times). The questionnaire was then taken from the subject, and they were thanked for taking part. The two copies of the data from the session were printed out. One was kept by the experimenter and the second was given to the second author, who served as his supervisor. The floppy disk and the tape of the subject's mentation were then removed by the experimenter and stored safely.

## RESULTS

There were two sets of results for each subject: those based on the subjects' own ratings, and those from the experimenter's ratings. Subjects obtained direct hits 21 of 51 sessions, for a hit rate of 41.2%, which was statistically significant ( $z = 2.506$ ,  $p < .01$ , one tail). The experimenter's hit rate was 25 of 51, or 49.0%, also statistically significant ( $z = 3.80$ ,  $p < .0001$ , one tail). Using Cohen's  $h$ , effect size for subjects was  $h = .36$  and for the experimenter,  $h = .50$ . Thus the first hypothesis, that the overall number of direct hits would exceed chance expectation, is supported by the data. It should be noted that one early session

involved a system crash such that the session was aborted, but the experimenter restarted it and it ran to conclusion. The subject was rescheduled and a proper session obtained later from them. If the score from the anomalous session is included, the overall data are still significant ( $z = 2.40$ ,  $p < .01$ , one tail). The anomalous session has not been included in the process oriented analyses, a decision made in consultation with the second author without knowledge of how its inclusion would have affected these outcomes. The authors agreed that aborted sessions should not be restarted as they would produce data not comparable with data from regular sessions.

For further analyses, a modified z-score for the ratings for each subject was calculated by dividing the difference between the target rating and the mean of all four ratings by the square root of the standard deviation of all four ratings. For the subjects' ratings the mean of the z-scores for the 2Hz condition was 0.850 and for the 7Hz condition was 2.765, a suggestive but not significant difference in the expected direction ( $t = 1.50$ ,  $df = 50$ ,  $p = .09$ , one tail). For the experimenter ratings the mean of the z-scores for the 2Hz condition was 2.653 and for the 7Hz condition was 3.436, which was clearly non significant ( $t = 0.95$ ,  $df = 50$ ,  $p > 0.30$ , one tail). Thus the second hypothesis, that those hearing the 7Hz tapes would do better than those hearing the 2Hz control tapes, was not confirmed although the results from the subjects' ratings were encouraging.

Two analyses of the questionnaire responses were carried out, to test the third and fourth hypotheses specified in advance. One was to see if those who practiced a mental discipline or spiritual regime performed better than those who did not. The results for the subjects' z-scores were non significant ( $t = 1.50$ ,  $df = 50$ ,  $p = .09$ , one tail); the results for the experimenter's z-scores were significant ( $t = 2.90$ ,  $df = 50$ ,  $p < .005$ , one tail). Thus there is partial confirmation of this hypothesis. A second analysis was carried out to see if there was a positive correlation between the extent of the subjects' psi experiences and attitudes about them (the last section of the questionnaire) and success in the ganzfeld. A significant positive correlation was found with subject z-scores ( $r = .308$ ,  $df = 49$ ,  $p < .025$ , one tail); a significant positive correlation was also found with the experimenter's z-scores ( $r = .206$ ,  $df = 49$ ,  $p < .05$ , one tail). Thus this hypothesis was significantly supported by the data.

A post-hoc comparison indicated that the experimenter's hit rate got better as the number of sessions per day increased (38% for one per day, 43% for two per day and 66% for three per day). This is the reverse of what has been observed in some earlier ganzfeld testing, e.g. Morris et al. (1994). A second post hoc analysis found no significant correlation between subjects' estimated time in the ganzfeld and either subjects' z-scores ( $r = .218$ ,  $df = 49$ ,  $p > .05$ , two tail) or the experimenter's z-scores ( $r = .078$ ,  $df = 49$ ,  $p > .50$ , two tail), although the result for the subjects' z-scores was suggestive. All sessions were conducted in the afternoon, so no analyses based on time of day were attempted.

## DISCUSSION

The overall significant positive result for subjects' and experimenter's hit rates appears to confirm the presence of a psi effect using the stringent conditions of the autoganzfeld and with no sender needed. As noted in Dalton et al. (1996), the autoganzfeld setup at the Koestler Unit has been constructed specifically to address some of the criticisms that have been offered against other ganzfeld studies. Sensory leakage from target system to receiver or experimenter seems very unlikely, given the presentation of the target in a remote locked room with known strong sound attenuation between the target room and the experimental area, with the sound available only through headphones in the target room with the sound

turned down. The electrical connections have all been tested to confirm that there is no crosstalk among the various leads and mixer connections. The VCR used to present the target is housed in a sound shielded room away from the experimenter, as is the separate VCR used to present a duplicate tape for judging. Communication systems between sender and receiver are ruled out because there is no sender, and third party accomplices are also unlikely given the number of separate subjects involved and the care taken to maintain the target presentation so that nothing is visible even through insertion of an optical device under the door of the room, and the lack of sound available to anyone outside the target room in the corridor. Experimenter elimination of sessions after the data are known to be unfavorable is unlikely given that hard copy of results from all sessions were given to the second author as the study progressed and conscious repeated violations of experimental protocol would have been required, in an environment where several other active research projects were ongoing. It would not be easy to conduct spare sessions that were then removed as the progress of the study was monitored by the second author. One session where there was a question occurred early in the study and was immediately resolved, as described above. Undetected experimenter deliberate modification of the computer program to allow the experimenter to dictate the selection of the target is possible in principle, but he is the third Edinburgh experimenter of six possibilities to successfully obtain results with the classical autoganzfeld procedure and single session participants. Undiscovered experimenter fraud is only finally eliminated through replication by others, and we have at least partial replication of the autoganzfeld effect in our facility, in addition to the ganzfeld results at other labs.

Another possibility to be addressed is bias in the source of randomness that matches a comparable bias in the response patterns of the receivers, thus producing an inflation of the hit rate. The currently used pseudo random algorithm has been tested repeatedly in the past without providing problems. It has provided a variety of chosen targets at various positions within the target pool. When the target is chosen its position in the order of presentation to the subject for judging is rereandomised. In the present study there was a nonsignificant tendency for the target to be in the first or second judging position (Chi Square with 3df = 5.86,  $p > .10$ ). There was also a tendency for the judges to assign the highest rating to the target presented first or second. This could be a position preference or it could be that the first or second position was only rated higher when it was in fact the target. In fact when the target was actually in the first position that position was rated highest by the receiver 9 of 18 times, or 50%; when the target was in another position, the first position was only rated highest 8 of 33 times, or 24% of the time. When the target was actually in the second position, that position was rated highest 8 of 16 times, or 50%; when the target was not in the second position, that position was rated highest only 7 of 35 times, or 20% of the time. Thus there is no general judging bias toward the first or second position. The preference only shows up when the target is actually in that position, otherwise there is a slight tendency for the rating to be slightly below chance expectation. The experimenter's ratings confirm this. The experimenter tends to rate the first or second position highest only when the target is actually there (11 of 18 for first and 8 of 16 for second, a total of 55.9% of the time). When such is not the case, the experimenter shows a tendency to rate the first or second position highest slightly below chance expectation (6 of 33 for first and 9 of 35 for second, a total of 22% of the time). Thus there is evidence against the hypothesis that judges achieved extra chance results due to a general judging bias or learning by the experimenter that matched an uneven distribution of the output of the target selection algorithm.

In summary, it appears that the present study provides additional support for the efficacy of the ganzfeld procedure in eliciting evidence for ESP under well controlled conditions. The effect was obtained under more simplified conditions, without a sender and without the use of a prementation induction tape. Any noise introduced by the social dynamic between sender and

receiver is removed, although so is any benefit from the social facilitation/ motivation and diffusion of responsibility provided by the presence of a sender. It is also easier to recruit participants and schedule sessions if only one participant is involved and reduces the likelihood that one's sender/partner is just along for the ride, not really committed to the success of the session.

How much of the success can be attributed to the use of drumming tapes as a special enhancer of internal state? In this study the tape of interest was the tape that had given indication in advance that it would produce acoustic driving at roughly 7Hz, a frequency of potential importance given the presence of this rhythm in a variety of psi-relevant practices in different cultures. We used a tape of 2Hz, a frequency with no special theoretical or empirical significance, as a control against expectancy of success or characteristics of drumming tapes other than the frequencies that they induce. Ideally we might also have used a non-drumming tape, but chose not to do so, given limited resources and time. If there was more of an alteration of state during the 7Hz condition we might expect more time distortion in this condition than under the 2Hz condition. The mean time estimation for the 7Hz condition was 19.36 minutes and that for the 2Hz was 18.69. This difference was in the expected direction, but not at all close to significance. Further analysis of the verbal reports and ratings under the two conditions may cast further light on this question but are still to be done. Although there was a suggestive difference in the success rate for the two conditions, further research with enough sessions to provide more statistical power is needed to assess whether there is any special significance to drumming at one frequency versus another. Ideally EEG monitoring would be incorporated to allow correlation of psi success with actual theta abundance

Of additional interest are the partial confirmation of the finding from various others that those who have had prior involvement with a mental or spiritual discipline perform better than those who have not, as well as the confirmation of the frequent finding that the extent of the subject's prior psi experiences and attitudes about them are correlated positively with performance. These are consistent with what one might expect if there were a generalizability from lab to life, and both relationships can also be interpreted as indicating that there is an advantage for those who have an interest already in the exploration of internal states or an acceptance of the legitimacy of psi based interpretations of personal experiences. It is also possible that these relationships are the product of the greater tendency for such participants to exploit some sort of artifact such as subtle cues from experimenter or physical environment. The viability of this last interpretation would seem to be minimized by the controls against such sources of artifact in the present conditions.

In conclusion there seems to have been a significant overall psi effect indicating that the auditory stimulus of drumming does not hinder ganzfeld performance and may enhance it. The results from this study may also have implications for the noise reduction model of ESP which drove the initial development of the ganzfeld procedure. Stanford (e.g. Stanford and Angelini, 1984; Stanford, 1986) has called attention to the potential effects of auditory stimulation upon mentation in the ganzfeld, and further research is clearly needed to establish whether any facilitation of repetitive drumming has effects due to its relative absence of pattern or to subtle but discernible patterns that may facilitate psi selectively through some sort of active effects upon the brain.