Musical Training and Psi in the Ganzfeld: A Partial Replication

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Abstract

Progress in the field of psi research is directly dependent on the identification of populations and procedures for replicating the effect. This in turn is dependent upon our ability to identify correlates of successful psi performance. This study drew on our previous work with the ganzfeld as a psi conducive procedure and our observation that advanced artistic populations may be good psi subjects. The current study involved 25 ganzfeld psi sessions with musicians (including people with five years or more of musical training) and 25 psi sessions with non musicians (less than five years of training). The experiment made use of a "sender" and "receiver" model in which a "receiver" of psi information was placed in a sensory restriction environment and asked to describe a randomly selected target being viewed by a "sender" in another room. EEG data were collected using a comfortable 28-channel electrode-cap connected to a NeuroScan SynAMP set of digital amplifiers. Data were recorded on disk and analyzed offline using NeuroScan SCAN 4.0 software. GSR data were also recorded. Both subjects and experimenters served as judges. The study attempted to address three hypotheses: there would be an overall psi effect across subjects based on effect size and statistical significance, that musicians would score higher than non-musicians in the psi task, and that musicians would display a distinctive psychophysiological profile as compared with non-musicians. While we did not find statistically significant evidence of psi, the effect size was well within the range expected for ganzfeld studies with unselected subjects (.3 for subject judging and .35 for experimenter judging). No significant difference was found between musicians and nonmusicians, with a reverse trend identified, and no distinctive psychophysiological profile was found for musicians. A highly significant gender difference was found, with women scoring significantly better than men. A discussion follows of the differences between this and previous studies with musical populations. Additional analyses are now under way in the EEG and GSR data.

Background

In the search for reproducibility in psi experiments, many researchers have focused on psi conducive procedures and exceptional populations. The study made use of a ganzfeld paradigm (Honorton, et al, 1990), which was selected for five reasons: 1). It involves a free response ESP task within the context of an internal state induction technique that gives the volunteer access to unconscious mental processes. This maximizes characteristics identified in the anecdotal reports concerning psi and creativity, including relaxation, dissociation, a demand for new and unusual experiences, and a tolerance for the unrealistic. 2). The ganzfeld provides an interesting experience for volunteers – a point that is especially relevant to studies involving creative populations. 3). Based on various reviews and meta-analyses of the database, the ganzfeld procedure has been shown to facilitate psi performance in a laboratory setting with self-selected volunteers (Child, 1986; Honorton, 1985; Honorton, et al, 1990; Rosenthal, 1986). 4). The method has been critiqued and designed to reduce error, eliminating potential procedural problems in earlier free response studies. A large database of ganzfeld studies allows a direct comparison between this study and others

In the search for exceptional populations, several recent studies suggest that classically trained musicians are a particularly promising population. In a Ganzfeld experiment among students at the renowned Juilliard School, Schlitz and Honorton (1992) reported highly significant psi data with the gifted students specializing in music, dance, and drama; musicians produced the highest success rate of 75% where 25% was expected by chance. Likewise, Dalton (1998) reported particularly strong psi results with creative populations, with classically trained musicians again producing the highest success rate.

A variety of studies have suggested that the brains of musicians are structurally and functionally different from non-musicians. For example, Hirshkowitz et al. (1978) found that non-musicians, but not musicians, showed a right hemispheric activation during musical listening tasks, suggesting a relative increase in importance of the left hemisphere associated with musical training. This result has been recently replicated (Steinberg et al., 1992). Also, musicians with perfect pitch show stronger leftward temporal plane asymmetry than non-musicians or musicians without perfect pitch (Schlaug et al., 1995). Such insights regarding the psychophysiology of musicians may shed light on their unique aptitude in psi experiments.

This study drew on previous findings with the ganzfeld procedure as well as with artistic populations whose psi performance was found to be significantly higher than unselected groups. In particular, this work focused on trained musicians, who seemed to have an aptitude for good psi performance in previous work and who also seemed to show a characteristic psychophysiological profile. As such, this study offered to shed light on the use of ganzfeld as a conductive procedure, identify

possible psychophysiological correlates of psi, as well as insights into the nature of psi conducive populations.

Study Objectives:
The study sought to address three principle hypotheses: 1) There will be evidence for an overall psi effect among all participants, based both on effect size and overall significance; 2) the effect size would be greater for musicians as compared to non-musicians; 3) there would be a unique psychophysiological profile for musicians as compared to non- musicians.

Method:

Experimental Paradigm & Materials:

A standard ganzfeld procedure, as identified by Honorton, et. al, was used for this study. The target materials included four sets of four targets, which were selected from the target pool developed by Honorton and his colleagues. This target pool was used in two previous studies with musical populations. .

EEG and EKG Recordings:
EEG/EKG was collected using a comfortable 28-channel electrode-cap connected to a NeuroScan SynAMP set of digital amplifiers. Data were recorded on disk and analyzed off line using NeuroSCAN 4.0 software.

Questionnaires:
Participants were asked to complete several questionnaires prior to their arrival at our laboratory in the Psychology Department of Stanford University. The first of these was the Participant Information Form (PIF) typically given to assess demographic and background variables for participants. The second was the NEO personality inventory, to assess what personality characteristics may correlate with psi hitting in this population. A third questionnaire (the Handedness Scale) assessed participant's handedness (left, right or ambi-dexterous) in order to explore the possibility of differing brain states associated with hemispheric dominancy.

Subjects
It was originally planned that we would recruit classically trained professional musicians from the Bay area. Several contacts with the local orchestras, symphonies, and universities led us to expect that this was a realistic goal. In the process of recruiting subjects over a 12 month period, many attempts were made to gain access to professional musicians; unfortunately, we had virtually no luck finding the subjects we anticipated to allow us to test our second and third hypotheses. As such, it became necessary to revise our criteria to compare people with 5 years or more of classical training and to compare them with a control group of self-selected volunteers who expressed an interest in participating. There were 20 sessions contributed by males and 30 sessions contributed by females. 37 participants were included for a total of 50 sessions. 5 people contributed

2 sessions and 1 person contributed three sessions. Of these, 20 were classified as musicians and 23 as non musicians.

METHODS

Presession

Prior to the session, the experimenter took out the folder for the current session from the file cabinet marked with the current Participant number, e.g., 26 for the 26th participant. They then checked to see that the following were in the folder: one blank cassette tape labeled with participant number, PIF*, NEO*, Handedness*, Consent*, Mentation, and Session Record forms, together with other notes as appropriate. While participants were encouraged to mail the forms back prior to the session, many brought them with them on the day of the experiment.

To set up Ganzfeld Room, the experimenter adjusted the chair, provided a blanket, and turned on all equipment, including a computer monitor for judging (in sleep mode), and turned on the power supply to the receiver's microphone.

They set up EEG materials by laying out paper towels for wet gel & wipes, gel (plastic jar), abrasive (tube), Q-Tips, 6, Micropore tape, 8 white wire electrodes, reference electrodes, HEOG electrodes, VEOG electrodes, skin response electrodes, syringes, alcohol wipes, O-rings for placing electrodes on skin, with tabs separated & bent upward, round foam pieces with peel off tape, box of tissues, and a towel to wipe hands. Also available were ping pong ball eye shields and electrode caps.

In the Experimenter Room the experimenter set out mentation and session record forms on a clipboard for filling in during the session. They put the blank cassette with complete session number on it into Deck B for backup voice recording. They opened the computer folder for the Ganzfeld study and conducted a monitor and sound check in both the sender and the receiver rooms. They then set the date and time to synchronize the computer with the Stanford University server. Digital voice recording was activated through the UltraRecorder program on the PC Computer.

The experimenter filled in information for the current session, including the subject #, trial status (Pilot or formal session, session number, gender for sender and receiver, and sender/receiver relationship.) They then placed the put relaxation tape in Deck A, wrote the title of the session on a new 90 minute tape and inserted it in Deck B for backup voice recording.

The experimenter began the EEG recording by turning on the Syn Amp hardware and turning on the PC. They then set date and time to assure the two computers (EEG and ganzfeld target were on different computers) were in synchrony. The experimenter then set up for checking electrode impedance.

In the Sender's Room, where the initial meeting between sender/receiver and experimenter was held, the experimenter provided an audio check of sender's headphones. They turned on iMac, entered the password, set date and time, put iMac to sleep, placed the sender's clipboard on their chair, and prepared snacks.

Experimental Session
The experimenter greeted the participants at the front door of the Stanford Psychology Department. If the co-experimenter was the sender, they waited in the Sender's room. Once in the Sender's room, the experimenter provided a short orientation to the participants, including introductions, collecting PIF and Handedness forms, asking about previous psi experiences, describing previous Ganzfeld studies, and providing an overview of what to expect, emphasizing the team aspect. The group them walked down one floor to the receiver's room where the experimenter prepared the subject for the session.

In preparing for the EEG, the experimenter places the Reference Electrodes on the receiver behind each ear, checking to see they were symmetrical. Using a Q-Tip and small amount of abrasive paste, they gently abraded the skin exposed in the center of the ring. They tested impedance with a hand-held tester. When the impedance tester showed 5.0 or less, they applied a piece of tape from the precut strips over each electrode to hold them in place. They next put on the eye movement electrodes. Once this was complete, the experimenter placed the EEG cap on the receiver, measuring for placement between nasion & innion. The electrode gel was then inserted with a syringe. Following this, the experimenter put the Skin Electrodes on the nondominant hand. Electrodes were placed on the forearm and the palm side of finger, at base (pad at first joint). Impedance was then checked for all electrodes.

After preparing the receiver, they were moved from the preparation room into a shielded room in the sleep laboratory. They were seated in a reclining chair with a blanket and headphones. The eye shields were placed on the eyes with tape and the experimenter left the room. A final audio check was performed before the door to the receiver's room was closed, the red light was turned on, the relaxation tape was initiated, and the experimenter and the sender moved to the sender's room.

The sender was taken to a room on another floor of the psychology department. They were seated in a comfortable chair with headphones on. They were instructed to focus on the video clip that would come up on a monitor before them.

Physiological Recording
Prior to beginning the formal session, the experimenter recorded the psychophysiology of the receiver with eyes open and closed. The experimenter then began the relaxation tape, and repeated the instruction that they could begin to speak their impressions out loud when the white noise began at the end of the relaxation tape.

Review and Judging
After completion of the session, the experimenter turned off the relaxation tape, turned up the experimenter microphone to the receiver, and asked them how they were feeling. They

then asked the receiver to evaluate on scale of 1-10 how deep an altered state they were in during the session. They then asked the receiver on a scale of 1-10 how strong an intention they set to receive information about the video the sender was viewing during the session. They then asked the receiver how long it has been between end of taped voice and the end of the session.

The experimenter told the receiver that the session was over and to remove their eye shields. They were informed that the experimenter would now review their mentation with them and that they could add comments or elaborate on what they said. They then reviewed the four video clips with the receiver, pointing out any correspondences they noticed and asking for clarification or elaboration after the videos were played. The Receiver was asked to give a score between 1-100 for each Video, representing how much they felt the video clip matched their impressions.

They were told that they could score the targets according to their visual impressions, emotions, or any other way they choose, including an intuitive feeling or knowing. They were informed that all the judgments did not have to add up to 100, but that there could be no ties. In this way, the rating data was converted to ranks. When the receiver was satisfied, they clicked on a "Done Judging" prompt and the data was saved to disk. The experimenter conducted their rating on the session record sheet while the subject did their own judging.

The experimenter then asked the receiver to request that the sender come downstairs to view the target, since they had a microphone that allowed one way communication to the sender's room so that the sender could hear the receiver's mentation during the session. The experimenter then left the control room and went to the receiver's room, turned on the room light, and opened the door of the experimental chamber. When the sender arrived, the experimenter back to the control room, clicked on "Show Target" and rejoined the sender and receiver to view the target.

Post Session

While discussing the session with receiver and sender, the experimenter assisted the receiver in removing electrode cap. The receiver was asked to sign the Session Record and they were paid $20 for their participation.

Results

Psi Analysis:
The ganzfeld data were evaluated using an exact binomial in which the probable outcome of 25% was compared to the actual study outcome to determine statistical significance for the ranked data.

Overall psi results for the participants' judging yielded 15 hits out of 50 or 30%, ($p = 0.25$), and then for the experimenters yielded 17 hits out of 49 or 35%, ($p = 0.08$). The 1994 meta-analysis by Bem & Honorton found an overall hit rate of 32% in 354

autoganzfeld trials, so the present results are in close alignment with previous ganzfeld experiments using unselected subjects. However, the musical population studies by Schlitz and Honorton (1988) and Dalton (1992) found overall hit rates of 50%, suggesting that something about this study was different from the previous studies.

Defining non-musicians as those with no musical training (7 subjects) and comparing them to an equal number of the most highly-trained musicians (average 23 years), this study shows no significant differences in performance, as shown below in Table 1.

Table 1

	Average subject rank	Average experimenter rank
Non-musicians	1.86	2.00
Musicians	2.43	2.29
P (2-tail)	0.16	0.32

To calculate the following performance correlations (Table 2), first we created a *z* score for each trial based on the participant's ratings (not ranks) by calculating the value $z = (T - \mu)/\sigma$, where T was the participant's rating given to the actual target, μ was the mean rating for all four target possibilities, and σ was the standard deviation of the four target possibilities. Then we created a similar *z* score for experimenter ratings, and finally we formed a single, composite *z* score by taking the average of these two scores. We then co varied this *z* against 37 variables collected in the participant questionnaire form.

With 37 correlations, one would expect approximately 2 correlations to be significant at $p < .05$, 2-tailed. Seven were observed ($p = 0.002$, exact binomial), suggesting that some of the correlations observed in this study were meaningful.

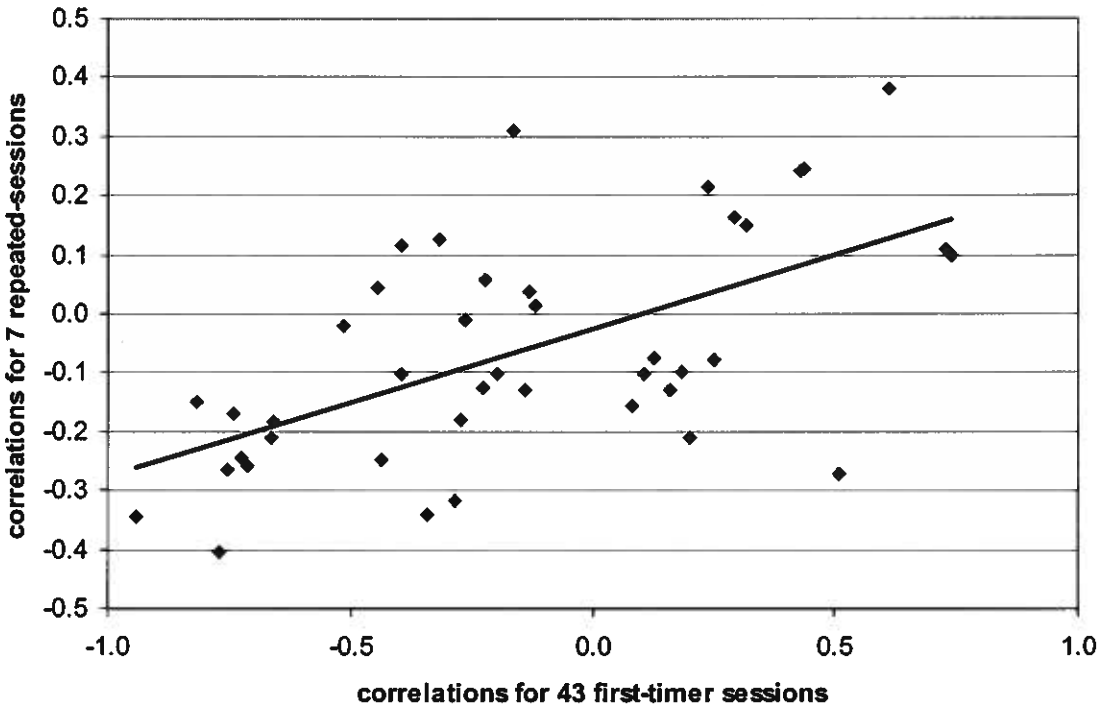
Table 2: PIF Correlational Data

Question	r	t	df	p (2-tail)	performance is better for people who ...
competitiveness	-0.40	-3.05	50	0.00	are less competitive
handedness	0.38	2.85	50	0.01	are right-handers
time absorption	-0.34	-2.55	50	0.01	are less time-absorbed
left-handers in family	-0.34	-2.50	50	0.02	have fewer left-handers in their family
NEO - extraversion	-0.32	-2.30	50	0.03	are more introverted
hours of sleep	0.31	2.26	50	0.03	sleep more at night
years musical training	-0.27	-1.97	50	0.05	have had less musical training
extravert/introvert	-0.27	-1.92	50	0.06	are more introverted
space absorption	-0.26	-1.86	50	0.07	are less space-absorbed
creativity	-0.25	-1.76	50	0.08	are less creative
gender	-0.24	-1.75	50	0.09	are female
# lucid dreams in last 6 months	0.24	1.74	50	0.09	have more lucid dreams
NEO - agreeableness	0.22	1.53	50	0.13	
GMF Ap Index	-0.21	-1.50	50	0.14	
Age starting 1st musical instrument	-0.21	-1.39	44	0.17	
sunspots	-0.18	-1.29	50	0.20	
clairvoyance	-0.18	-1.26	50	0.21	
10cm solar flux	-0.17	-1.20	50	0.23	
dream recall (1=most, 5 = least)	0.16	1.15	50	0.25	
total musical training	-0.16	-1.10	50	0.27	
Time	-0.15	-1.03	48	0.31	
practice	0.15	0.96	43	0.34	
NEO - openness	-0.13	-0.91	50	0.37	
lucid dream	-0.13	-0.87	47	0.39	
psi in this expt	0.12	0.81	50	0.42	
mental	0.11	0.76	50	0.45	
experience with precognition	-0.10	-0.71	50	0.48	
experience with telepathy	-0.10	-0.70	49	0.48	
family psi experience	-0.10	-0.66	43	0.51	
NEO - neuroticism	-0.08	-0.54	50	0.59	
participant age	-0.07	-0.48	50	0.64	
creative practice	-0.07	-0.46	49	0.65	
age starting 2nd musical instrument	0.10	0.45	22	0.66	
medical conditions	0.06	0.41	50	0.68	
NEO - consciousness	0.04	0.26	50	0.79	
belief in psi	0.01	0.09	50	0.93	
estimate of own psi ability	-0.01	-0.06	50	0.95	

Graph 1 shows the relationship between telepathy test outcomes vs. PIF variables based on 43 first-timer sessions contributed by 43 people (on the y axis), compared to the same correlations based on 7 repeated sessions contributed by 6 people (on the x axis). The

linear relationship between these correlations is r = 0.59, p = 0.00004, indicating that the telepathy vs. PIF correlations observed in the 43 first-timer sessions tended to persist in new data. As a result, to increase statistical power data from all 50 sessions was pooled to examine the correlations between telepathy outcomes and PIF variables.

Graph 1: Correlations for 43 1st timers



Post hoc analyses (Table 3) found that data for females is independently significant (.05). However, females did not have more musical training than M. Male data is almost significantly NEGATIVE (.09).

Table 3: Male and Female Data

Hits	N	M/F	Hit rate	P	(Exact binomial)
12	30	Female	40%	0.05	9.5 years average music training
3	20	Male	15%	0.91	9.6 years average music training

Splitting top/bottom 10 females by musical training (Table 4) shows results in right direction. The top half produced a 40% success rate as compared to 20% for the bottom half, but there are not enough data to be significant.

Table 4: Musical training as related to gender on psi outcomes

Hits	N	F M/F NM	Hit rate	P	(Exact binomial)
4	**10**	**FM**	**40%**	**0.22**	**18.9 years average music training**
2	**10**	**F NM**	**20%**	**0.76**	**1.0 years average music training**

EEG/EKG Analysis:
EEG/EKG data were collected during 4 periods: Pre-trial; ganzfeld free response; Subject judging; and Post trial. The EEG measure was added in an effort to determine EEG correlates, and possible indications of brain localization of the cognitive modules accounting for the previously demonstrated psi abilities of musicians.

The design called for comparing EEG and psi performance measures on two groups, Musicians and NonMusicians, with the expectation that compared to the NonMusician group, the Musician group would demonstrate a much higher hit rate on the ganzfeld task, resulting in an EEG dataset that could be classified into two groups, Musicians with high Psi performance, and NonMusicians with low psi performance. According to plan, we would have proceeded with discriminant analysis on the EEG to determine EEG features and brain localization associated with the expected exceptional psi performance of the musicians. Unfortunately, for a variety of possible reasons discussed below, the Musician group showed no evidence for psi ability on the ganzfeld task. On the other hand, the NonMusician group came close to showing a significant psi effect. These results failed to replicate the previously observed high psi ability in musicians and precluded the planned EEG discriminant analysis.

Discussion

How do the observed results compare with previous ganzfeld studies? In the first place, although the present results were not statistically significant, the effect size was in the same direction as the combined result for the 28 studies examined in Bem and Honorton's (1996) meta-analysis, and therefore this study provides additional support for psi. The average hit rate calculated by Bem and Honorton was 35% with a 95% confidence interval from 28% to 43%. Thus this study's average of 28% is within the confidence interval of the meta-analysis, but definitely at the low end.

However, in terms of the previous results with musicians, this study's results are far from what we expected. For example, Schlitz and Honorton (1992), using 8 musicians from the Juilliard school obtained ganzfeld hit rates of 75%, three times better than the 25% (chance) observed in the present study. The musicians in the present study were substantially less musically trained and potentially talented than the Juilliard group. The original plan was to recruit classically trained musicians

from the Bay Area, based on contacts with several professional orchestras and to compare them with non-musicians selected from the general population.

Unfortunately, we were unable to recruit musicians from professional orchestras and so were forced to relax our standards to include people with five years or more of musical training in order to complete the study. We did find a .13 correlation with years of training, suggesting that years of practice may be important. However, the overall study was statistically underpowered given our expectations about the possible subject population we would be working with.

The fact that non musicians did better on the psi task that musicians may have been due to their higher level of motivation. While we worked very hard to get musicians, frequently requiring a number of calls to coax them to the laboratory, a number of people in the non musician group volunteered out of interest in the study. This may explain why they performed better on average than the musicians.

We attempted to keep the previously successful design constant but with the addition of EEG measurements. It is conceivable that possible discomfort associated with the EEG electrocap and the requirement for minimal movement had an inhibitory effect on psi, perhaps through distraction of the receivers during the ganzfeld relaxation process.

In future experiments studying EEG correlates of psi, it is recommended that the experiment be designed with the requirements of EEG studies more centrally in mind. In the present experiment, the principal design consideration was to attempt to repeat the previously successful procedure precisely, and simply add EEG as an extra measure. However, presuming that psi actually occurs during the ganzfeld session, it might only require a few seconds in the 30 minute session to acquire the psi data. If that time is not known it will be necessary to analyze the entire 30 minutes with the resultant reduction in signal to noise ratio by perhaps two orders of magnitude. It seems wiser to use short (5-10 second) trials repeated many times to allow averaging noise-reduction methodology. This would probably be more effective even given the likelihood that the psi hit rate in such tasks would likely be much smaller than in the conventional ganzfeld. Given the unplanned but significant differences between males and females, we intend to undertake additional analyses to compare EEG and GSR data based on gender.

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