As members of the Final Examination Committee, we certify that we have read the
dissertation prepared by Lonnie Nelson
entitled Personality and Electrocortical Correlates of Extreme
Belief Regarding ESP.

and recommend that it be accepted as fulfilling the dissertation requirement for the
Degree of Doctor of Philosophy

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I hereby certify that I have read this dissertation prepared under my direction and
recommend that it be accepted as fulfilling the dissertation requirement.

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ABSTRACT

Forty participants from an introductory Psychology course were recruited based upon their self-reported beliefs in ESP (High, Medium, Low). Participants answered a packet of self report questionnaires, then underwent electroencephalographic (EEG) recording during eyes open and eyes closed resting baseline. Participants then completed “traditional” and “novelty enhanced” formats, of a multimodal biofield detection battery and a computerized forced-choice precognition task. Results showed no evidence of precognition for any belief level group, or either task format. Biofield detection accuracy was significantly above chance expectation for 2 of the 6 modalities tested, and correlated with self reported “energy sensitivity”. Belief in ESP was found to be psychologically related to higher levels of belief in other “spiritual experiences”, lower levels of cynicism and rigidity, and increased sense of coherence. EEG findings indicated that strong belief and strong skepticism of ESP were associated with increased frontal asymmetry scores, and that moderate degrees of belief were associated with negative frontal asymmetry scores during eyes open baseline recording. Suggestions for future research are provided.
INTRODUCTION

History of the Interpretations of Belief in ESP. Over the years, belief in so-called extra sensory perception (ESP) has been considered to be indicative of a number of different personal traits and tendencies. For example, Eckblad & Chapman, (1983) considered belief in ESP to be indicative of a schizophrenia-spectrum personality pattern (e.g., schizotypal personality), belonging to the category of bizarre mentation with other things such as “thought broadcasting” (the belief that others are listening to one’s thoughts) and “ideas of reference” (the tendency to believe that unrelated occurrences particularly refer to one’s self), indicating that holding this belief put individuals “at risk” for trait affective negativity and significant mental illness.

This view has received some support from findings of recent electrocortical investigations that revealed significantly more beta 2 (18-21.5 Hz activity) right hemisphere dipole sources (right hemisphere activity is generally associated with negative affect, [Coan & Allen, 2004]) as well as increased Omega complexity in the resting brain activity of believers relative to skeptics (Pizzagali, Lehmann, Gianotti, Koenig, Tanaka, et al., 2000). This investigation also reported higher degrees of trait affective negativity (measured via the trait version of the Positive and Negative Affective Scales [PANAS]) and higher levels of “Magical Ideation” (Eckblad & Chapman, 1983) in those reporting higher levels of belief in ESP.
Others, (e.g., Kennedy & Kanthmani, 1995) considered belief in ESP to be a sign of a creative and “spiritual” personality, pointing out the correlations between this belief and measures of creative thinking and “mystical experiences” in cross sectional studies.

A more recent perspective considers belief in ESP to be part of a pattern of “Openness to Spiritual Beliefs and Experiences” (e.g., Schwartz & Russek, 1999; Nelson & Schwartz, in press) which may be indicative of an individual’s capacity for this and other kinds of “anomalous perceptions” that are commonly related to various types of religious or spiritual experiences in their everyday lives.

This view takes this belief as a possible sign of relative “openness” to experiences which might include a range of personally meaningful, non-pathological occurrences. Other examples of these are, belief in God, angels, etc. that might be related to other psychological constructs such as “absorption” (Tellegen & Atkinson, 1974), or “energy sensitivity” (the subjective belief that one is sensitive to the biofields of others). These constructs have been observed in previous research to significantly correlate with individual’s actual performance on biofield detection tasks (Nelson & Schwartz, in press).

A related view, (Lawrence, 1993) has considered belief in ESP to be predictive of a talent for ESP, focusing on correlations between belief in ESP and performance on ESP related tasks, referred to as the “sheep-goat effect” (see below).

While the first two of these conceptualizations of the significance of belief in ESP are fairly popular in the psychological literature and well described elsewhere (e.g.
Eckblad & Chapman, 1983, Kennedy & Kanthmani 1995), the latter two views may be
less widely known and will be briefly reviewed here.

**Openness to Spiritual Beliefs and Experiences & Integrative Biofield Awareness (IBA)**

The “Openness to Spiritual Beliefs and Experiences Scale” (OSBES) was created by Schwartz, et al. (1999) to measure the interrelationships between belief in and experience of various phenomena of a “spiritual” nature. The scale includes items inquiring about belief in as well as experience of: God, Angels or “Guides”, ESP, the impact of prayer on health and well-being, and whether or not a person’s consciousness survives physical death. These beliefs and experiences were observed to intercorrelate with one another very highly (see Schwartz, et al., 1999).

This report also showed that individual’s average score on these items (higher scores indicating higher degrees of belief in and experience of the above listed “spiritual” phenomena) was correlated with the individual’s ability to detect the presence of other’s biofields under controlled conditions (see below).

To provide a framework for the above referenced finding, it may be helpful to briefly review the literature relating to “biofield detection” in general. Previous (e.g. Nelson & Schwartz, *in press*) research into the relationships between certain beliefs and behavioral performance on “biofield detection” tasks is founded on the primary claim of energy healers (also called “bioenergy healers” and “biofield healers”) that they are able to sense the “biofield” of their patients. They then claim to be able to use this information to guide their interventions that are claimed to bring about accelerated rates
of the healing process. This claim has been investigated systematically in only a few instances. Recently, the term “Integrative Biofield Awareness” (IBA) has been introduced as a term for the range of signals that these individuals claim to be capable of detecting (Nelson & Schwartz, in press).

Previous Research on IBA. A possible reason for the dearth of research in this area may have been the publication in the Journal of the American Medical Association of a highly visible negative set of findings (Rosa et al. 1998). The research report was co-authored by members of an organization with a particularly critical view of Complementary and Alternative Medicine (CAM). The study stated that 21 practitioners of therapeutic touch (TT) could not identify with accuracy above chance expectation which of their hands was closest to the child’s hand (a mean of 44% accuracy over 280 trials) the reported performance of these individuals was actually statistically below chance.

The above report concluded that experienced TT practitioners weren’t able to detect the child’s energy field and that their performance indicated that TT’s “most fundamental claim” was unfounded. They further concluded that this study served as “unrefuted evidence that the claims of TT are groundless and that further professional use is unjustified.” This sentiment was widely publicized by the media, and that exposure apparently persuaded the scientific community toward a similar perspective.

However, Rosa et al were apparently unaware of two studies published prior to that report, which used a very similar task, and completely counterbalanced designs, with
300% more subjects, 240% more trials per subject, 523% more trials total, and 22
different experimenters (who were, on the whole, unbiased with regard to CAM).

Schwartz et al. (1995) reported that undergraduate students could identify, with
accuracy statistically significantly above chance expectation, which of their hands was
closest to an experimenters hand (mean accuracy = 66% over 1464 trials, p<.00001,
compared with Rosa et al’s 44% over 280 trials).

Schwartz et al. concluded that these two studies provided empirical evidence for
“implicit performance and perception” of “interpersonal hand-energy registration” as
well as “an empirical and conceptual foundation” for viewing some of the claims of TT
and related biofield therapies (as referenced in Nelson & Schwartz, in press).

In a subsequent study, significantly above chance expected performance was
reported in three different biofield detection tasks, and was then replicated in three
additional controlled, within-subject, counterbalanced experiments using a total of 102
subjects and 102 different experimenters (each participant served the role of both subject
and experimenter) (Schwartz et al. 1999). The tasks were as follows:

1) The experimenters placed their hands a few inches behind the occipital region
   of the head versus the small of the back, and subjects were asked to determine whether
   the hand was near their head or their back.

2) As comparison tasks, the experimenters simply stared at the subjects head or
   back, requiring the same discrimination of the subjects, or:

3) Closed their eyes and imagined seeing the subjects head or back.
The average accuracies for these three tasks, across the three experiments, were 58.6%, 55%, and 56.9% respectively.

In the above described study, a wide range of individual differences have been observed in biofield awareness (BA) performance. A minority of subjects scored below chance (40-45% BA accuracy), the majority scored above chance (55-60% BA accuracy), and approximately 15% performed considerably above chance (70-80% BA accuracy) (n’s for these groups provided in results section of this paper).

As stated above, Schwartz et al. reported that the levels of detection and discrimination accuracy on these tasks were correlated with the subject’s average responses to the belief and experience items of the OSBES, with higher ratings of experience of and belief in a number of “spiritual phenomena” being related to higher degrees of accuracy on these tasks (Schwartz & Russek, 1999).

In an extension of these experiments, Nelson and Schwartz (in press) formalized a battery of “integrative biofield awareness” (IBA) tasks. The resulting “Integrative Biofield Awareness Battery” (IBAB) consists of 2 sections. In the first section, respondents are asked to estimate their performance on a set of 6 energy detection tasks (which will be described below), from 0% accuracy to 100% accuracy. The 7th item is a more general question, asking the respondent to rate (on a 0-10 scale) how “energy sensitive” they consider themselves to be.

The second section of the IBAB is a set of behavioral tasks in which the blindfolded subject actually completes 10 trials of “energy detection” in each of the 6 modalities inquired about in the self report section. The term “integrative” is used
because the battery combines the subject’s expectation of their performance with actual performance on tasks that presumably involve local bioelectromagnetics (i.e. primarily tasks 1 and 3, where the experimenter’s hands are only 6 – 8 inches from the subject’s body), with tasks that are more distal and “intentional” in emphasis (i.e. tasks 2, 4, 5 and especially 6). See the Methods and Materials section of this paper for descriptions of the six tasks.

The Nelson & Schwartz study involved 2 experiments. The first of these was an exploratory experiment which sought to determine the validity and factor structure of the battery. The results of this exploratory experiment showed that 1) respondents, on the whole, underestimated their behavioral performance (BP) on the BA tasks, and 2) that there were substantial individual differences in respondents subjective estimates (SE) of their BP (estimates and performances both ranged from 0%-100%). Factor analysis of the battery revealed two very well defined factors, factor 1 was composed of the respondent’s SE of their behavioral performance, and factor 2 was composed of the respondent’s actual BP. This experiment also found significant differences in performance by task, and performance by task and sex. The measure type (SE vs. BP) by task by sex interaction was also found to be significant.

The second experiment reported in this study was a confirmatory experiment intended to replicate the findings of experiment 1. The basic findings for factor structure and type (SE vs. BP), task and sex were all replicated, though the SE’s for this experiment were lower than those in experiment 1.
In an analysis of the combined data sets for the two experiments (n=164), several interesting correlations to BP emerged. First, it was found that SE correlated with BP (r=.26; n=165; p <.001), indicating that while respondents typically underestimated their performance; there was a significant relationship between SE and BP for the sample. Subject’s estimates of how “energy sensitive” they were overall (on a 0-10 scale) also correlated positively with BP (r=.22, n=163, p<.004).

Other correlations reported in this study involved subject’s responses to specific items on the OSBES. Significant correlations were found between subject’s ratings of their degree of experience of ESP on the OSBES and their IBAB SE, their overall ratings of energy sensitivity, as well as their actual BP.

*Belief in ESP and “Talent” for ESP.* While investigation into the kinds of detection and discrimination required for good performance on the IBAB tasks and certain parapsychological tasks is, on the whole, founded on different theoretical grounds, certain tasks within the IBAB are classically parapsychological in nature (e.g., Staring Sensing).

Parapsychological researchers have long been interested in the investigation of psychological or personality variables that may predict performance on ESP tests, also known as psi tasks. Two major meta-analyses have been conducted on this topic. The first, focusing on the relationship between extraversion/introversion and psi performance, analysed the results of 60 published studies that examined this relationship (Honorton, Ferrari, & Bem, 1992).
While the overall findings of the meta analysis were positive for this relationship, the ability of meta-analysis to uncover flaws and other variables that might modify conclusions revealed an interesting finding. Specifically, it was discovered that in the forced choice studies included in the analysis, for a significant number of the overall reports, the extraversion/introversion scales had been administered after the subjects had performed the task, and in many cases, were aware of their performance. This discovery raised the strong possibility that the previously observed correlation was due to methodological errors on the part of the investigators publishing these studies, rather than a genuine predictive relationship in the forced-choice format of ESP tests. When the studies using this order of questionnaire administration were removed, no significant correlation between introversion/extroversion and forced choice ESP performance was observed.

For the 12 studies reporting on ESP tests administered individually, in a format allowing free response, a significant correlation was found between extraversion and ESP performance ($r=.20$). Eleven of these studies documented the order in which the extraversion scales were administered. All of these studies administered the extraversion scales before the ESP test. When the single study in this category that did not document the order of administration was removed, a homogenous and significant correlation was observed between extraversion and ESP performance ($r=.21$, combined $z=4.57$, $p=.000005$). This correlation was then confirmed in a meta-analysis performed on 221 autoganzfeld trials (also a free response task) for which there was extroversion data available ($r=.18$, $t[219 df] = 2.67$, $p=.008$) (Honorton, Ferrari, & Bem, 1992).
The second meta-analysis examining a possible relationship between psychological variables and ESP performance was reported by Lawrence (1993). He conducted a meta-analysis of 73 published studies investigating a finding known as the “sheep-goat effect”. The “sheep-goat effect” is the finding that believers in the paranormal (specifically, ESP, or psi) demonstrated better performance on ESP tasks than do sceptics of ESP. Though the effect size per trial was small, (r = .029) the outcome of this meta analysis was strongly in favor of the sheep-goat effect (combined Stouffer z = 8.17, p = 1.33*10^{-16}).

While the studies analysed involved a large number of procedural manipulations and modifying variables, the effect size was not found to covary with study quality. Using Rosenthal’s “failsafe N” as a file-drawer estimate, it was determined that 1726 unreported studies with null results would be required to reduce the probability of this finding to chance expectancy.

Interest in the identification of variables that may predict performance on psi tasks (or “talent for ESP”) has not been limited to the examination of personality variables. Electrophysiological investigations have been carried out with little success in finding generalizable cortical predictors of psi-hitting, with the non-specific marker of “alpha abundance” being the dominant predictor (Alexander, Persinger, Roll & Webster, 1998; Don, McDonough & Warren, 1998). However, more current technology and understanding of the relationship between neurochemistry and cortical activity hold promise for this area of inquiry.
For example, as mentioned above, recent electrocortical investigations have revealed patterns of significantly more beta 2 (18-21.5 Hz activity) right hemisphere dipole sources as well as increased Omega complexity in the resting brain activity of believers relative to sceptics. Consequent to this pattern of activity, there was found to be decreased hemispheric asymmetry of Omega complexity in the brains of believers, 18.5-21 Hz) (Pizzagali, Lehmann, Gianotti, Koenig, Tanaka, et al., 2000).

This finding could be interpreted as an indication of a higher degree of integration across cortical hemispheres and a consequently larger degree of integrated neuronal functioning in believers. Such an interpretation of this pattern of cortical activity would also be consistent with reports of increased creativity and spiritual experience in believers relative to their sceptical counterparts (Kennedy & Kanthamani, 1995; Schwartz & Russek, 1999). Since this index of greater right hemisphere excitatory cortical activity is related to belief in the paranormal (Pizzagali, et al., 2000), it is reasonable to hypothesize that this may be a biological indicator of the sheep-goat effect reported by Lawrence (1993) and may also be related to the correlations between reports of spiritual beliefs and experiences and biofield detection accuracy reported by Schwartz et al. (1999) and Nelson & Schwartz (in press).

The Current Study

The current investigation considers each of the above described conceptualizations of belief in ESP to be equally viable views, and seeks to determine to whether belief in ESP itself is a clear indicator of risk for significant psychopathology, or
simply a relatively benign member of the larger set of “spiritual beliefs and experiences” considered in the OSBES; as well as whether or not the presence of this belief impacts individual’s abilities in tasks which might be related to talent for (and therefore a correlate of performance on) ESP related tasks and Integrative Biofield Awareness (IBA). Specifically, this study has multiple primary purposes:

1) to more clearly delineate the nature of the place of belief regarding ESP in one’s worldview and life experience (e.g. one’s openness to other “spiritual” experiences, sense of coherence in life, and capacity for positive states of mind, etc.).

2) to replicate the “sheep-goat effect” in a sample of undergraduates using a computerized forced-choice precognition task, thus investigating the role of belief in ESP as a psychological marker of “talent” for ESP related tasks.

3) to explore the possibility of a correlation between performance on a computerized “precognition” task and performance on a multi-modal “energy detection” task (Nelson & Schwartz, *in press*), given that previous research indicates that performance on both of these tasks may be related to belief in ESP.

4) to investigate the electrophysiological correlates of varying levels of belief in the paranormal during eyes open and eyes closed baseline recordings, in an attempt to replicate the findings of Pizzgali, Lehmann, Gianotti, Koenig, Tanaka, et al. (2000), and to further investigate the differences in resting electrocortical activity that may be associated with the “agnostic brain” of those who hold “moderate” or “unsure” positions regarding belief in ESP, which the above investigation did not consider.
Secondary Hypotheses. In addition to the primary purposes listed above, the current study also investigated two secondary hypotheses. These were:

1) to determine whether the alteration of aesthetic, choice option characteristics, or task administration format of the behavioral tasks at hand may decrease the ubiquitous “serial position” or “decline” effect observed in all repetitive parapsychological paradigms to date (e.g., Rhine, 1969) (see below).

2) to investigate the resting baseline electrocortical correlates of above chance expectation performance on the forced-choice precognition task and the multimodal “energy detection” task.

The “Decline Effect”. The “decline” or “serial position” effect referred to in secondary hypothesis 1 was hypothesized here to be related to interference with task performance by the basic human capacity for pattern recognition. Specifically, it was hypothesized that individuals may attempt to follow a pattern of responses based on cognitive processes known as the “gambler’s fallacy”, or the cognitive process of probability estimation that leads one to think that the probability of an individual coin flip coming up “heads” is less than .5 when it has been preceded by a series of “heads” flips. To test this hypothesis, a task was included in which the aesthetics of the display on successive trials are varied in such a way as to discourage pattern formation with regard to “placement” or “appearance” of “correct” targets (those resulting in “hits”).
MATERIALS AND METHODS

Participants

Selection Criteria. Forty subjects were recruited from a Psychology 101 subject pool on the basis of their self reported belief in and experience of Extra Sensory Perception (ESP) as follows: group 1 endorsed low belief in and low reported experience of ESP; group 2 endorsed high levels of belief in ESP, but endorsed low levels of experience of it; and group 3 endorsed high levels of both belief in and experience of ESP. Belief in and experience of ESP was measured by ratings endorsed on the ESP relevant items of the Openness to Spiritual Beliefs and Experiences Scale (OSBES) administered as part of a voluntary mass survey in a freshman level psychology class (Psychology 101).

Potential subjects were excluded via review of a self-report medical information form prior to participation for 1) any current Axis I diagnosis 2) history of psychosis or mania 3) substance abuse or dependence in the last 6 months 4) history of seizures or loss of consciousness 5) history of persistent headaches 6) history of CNS lesions or head trauma 7) history of persistent dizziness and finally, 8) use of any psychoactive prescription or recreational drugs in the last 6 months.

Sample Description. As stated above, Belief in and experience of ESP was measured using the OSBES. The OSBES uses a seven point likert scale to assess individual’s levels of belief and experience of various experiences associated with spirituality and religion. Therefore, individuals endorsing a 1 or 2 were considered to be
reporting “low” levels of belief or experience, whereas individuals reporting a 6 or 7 were considered to be reporting “high” levels of belief or experience. The sample was composed of 19 males and 20 females (mean age=18.8 years, SD= .77, range =18-22). Due to unpublished findings regarding sex pair differences in biofield detection accuracy, all males participating in this study were assigned a male experimenter, and all females were assigned a female experimenter. Both experimenters reported moderate levels of belief in/experience of ESP.

Procedure

The basic design of the current project was a 2X2X3 within subjects design. There were 2 tasks (precognition and biofield detection) with 2 formats (traditional vs. altered administration format) and 3 groups of subjects (see Data Analysis for group descriptions). Each subject completed both tasks in both formats. Upon arrival at the laboratory, individuals read and signed an IRB approved informed consent. Following consent, participants filled out a packet of self-report questionnaires. A list of the questionnaires administered in this packet follows:

1) Absorption Scale (Tellegen & Atkinson, 1974)
2) Positive States of Mind Scale (PSMS) (Horowitz, Adler, & Kegeles, 1988)
3) Openness to Spiritual Beliefs and Experiences Scale (OSBES) (Schwartz & Russek, 1999)
4) Magical Ideation Scale (Eckblad & Chapman, 1983)
5) The JAREL (Hungelmann, Kenkel-Rossi, Klassen & Stollenwerk, 2000)
6) Sense of Coherence scale (SOC) (Antonovsky, 1993)


The factor structure and scoring of these questionnaires are described in a separate section below.

Following completion of the questionnaire packet, a stretch-lycra cap with tin electrodes at 19 active EEG recording sites (placed according to the international 10-20 system: Fz, Cz, Pz, FP1, FP2, F3, F4, F7, F8, C3, C4, P3, P4, T3, T4, T5, T6, O1, O2) was fitted to the participant’s scalp and all electrode impedances were adjusted to below 5 Kohm and with homologous sites adjusted to within 2 Kohm of each other. Data were recorded with linked mastoid reference using a Lexicor Neurosearch 24 model amplifier (Lexicor, Inc., Boulder, CO). Data were digitized continuously at 128 Hz.

Following electrode attachment, a 4 minute eyes open and a 4 minute eyes closed resting baseline EEG was recorded. Participants then completed 2 sets of computerized forced choice precognition tasks (20 trials each) and 2 administrations of the “Integrative Biofield Awareness Battery” (IBAB) (Nelson & Schwartz, in press) in intermixed counterbalanced order while EEG activity was recorded. During the precognition tasks, response times were marked in the EEG files by way of the program DMDX, which fed a 500 μV pulse into an auxiliary channel at the time of subject response. During IBAB administration, a separate file was recorded for each trial of each task.
Precognition task. The computerized forced choice precognition task was administered in two formats. The first was a traditional precognition task, resembling the “card test” on the “gotpsi” website (www.gotpsi.org). The other condition was a “novelty enhanced” forced choice precognition task in which the arrangement and appearance of trials was varied so as to discourage pattern formation and the application of “gambler’s fallacy” type response patterns (see fig. 1 & 2, respectively).

Figure 1.

Four of the cards below will disappear, One will remain. Please indicate which one you think it will be by using the → or ← keys to move between choices, and the <Enter> key to make your final selection.

![Figure 1](image.png)
Figure 2.

Following the completion of each precognition task, participants were informed of their accuracy on the task and asked to fill out a questionnaire consisting of the following items: (all items used anchored 7-point likert scales)

1) How do you think you got the above score on this task?
(anchors: 1 = “Pure Luck”, 7 = “ESP”)

2) How do you feel emotionally about your performance?
(anchors: 1 = “Disappointed”, 7 = “Happy”)

3) How well were you able to concentrate on this task?
(anchors: 1 = “Very Well”, 7 = “Not at all”)

4) To what extent did you use the following method of making your choices?
(anchors: 1 = “Just guessed”, 7 = “Intuition/ESP”)

5) How interesting or engaging did you find this task?

(anchors: 1 = "Not at all interesting", 7 = "Very interesting")

Following the completion of this short questionnaire, the participants proceeded to the appropriate format of IBAB part II (behavioral section) administration.

The IBAB. As indicated above, the IBAB is a battery that consists of two parts. The first portion of the IBAB is a set of questions in which subjects are asked to give their subjective estimate of what they think their accuracy on six “biofield detection” tasks will be. This section was administered as part of the Questionnaire packet the subjects filled out. The second portion of the battery consists of actually administering 10 trials of each of the tasks and recording behavioral performance. The six tasks of the IBAB are:

1) “Hand Detection” in which the respondent must indicate whether the experimenter is holding her or his hand over the respondent’s left or right hand (distance of 6-8 inches).

2) “Face / Stomach Discrimination”, in which the respondent is asked to detect whether the experimenter is focusing on the respondent’s face or abdomen (from a distance of 3 feet).

3) “Ear Detection”, in which the respondent is asked to detect which ear the experimenter is holding their hand near (distance of 6-8 inches).

4) “Staring Sensing”, in which the respondent is asked to discriminate whether the experimenter is staring at the respondent’s back or not (from a distance of 3 feet).
5) “Head / Back Discrimination” in which the respondent is asked to discriminate whether the experimenter is focusing on the back of the respondent’s head or the small of the respondent’s back (from a distance of 3 feet).

6) “Movement Anticipation Sensing”, in which the respondent (with blindfold removed) is asked to look at the experimenter, who is focusing on one of her or his own hands with her or his eyes closed, and determine which hand the experimenter is focusing on (from a distance of 3 feet). (See appendix A for detailed administration instructions).

The IBAB was administered in 2 different formats to test for the effect of task repetitiveness on performance. The 2 IBAB administration formats were 1) “block administration”, in which the participant was administered 10 trials of each of the 6 biofield detection tasks such that all 10 trials of each task were grouped together, (e.g., 10 trials of hand detection, followed by 10 trials of “body localization”, etc.) and 2) “serial administration”, in which the 6 tasks were administered with one trial of each task followed by one trial of the next task, such that a given task was not repeated until one trial of each of the 6 tasks had been administered (e.g., one trial of hand detection followed by one trial of body localization, followed by one trial of ear detection, and so on, until all six tasks had been administered. This was repeated 10 times in a cyclical fashion).

The order of these blocks of trials and the two formats of precognition administration were counterbalanced based on subject number to prevent higher-order format related ordering effects. The four possible orders of administration were 1) “novelty enhanced” precognition, followed by block administration of the IBAB,
followed by “traditional” format precognition, followed by serial administration of the
IBAB; 2) “traditional” format precognition, followed by block administration of the
IBAB, followed by “novelty enhanced” precognition, followed by serial administration of
the IBAB; 3) “novelty enhanced” precognition, followed by serial administration of
the IBAB, followed by “traditional” format precognition, followed by block
administration of the IBAB; and finally, 4) “traditional” format precognition, followed by
block administration of the IBAB, followed by “novelty enhanced” precognition,
followed by serial administration of the IBAB. It should be noted that the
counterbalancing did not apply to the level of type of task (e.g. precognition vs. biofield
detection) but rather to the format of administration (novel or serial vs. traditional or
repetitive).

Following each of the computerized “precognition task” trial sets, individuals
were informed of their percentage correct on the precognition task and asked to fill out a
series of 7-point Likert scale items indicating what they attributed their performance to
(e.g., luck or psi) and how they felt about their performance emotionally (e.g., proud vs.
frustrated, and happy vs. disappointed).

Questionnaires. A short description will be given here of each of the questionnaires used
and their scored factors. For more in depth scale descriptions, see the original research
reports cited.

The absorption scale (Tellegen & Atkinson, 1974) is a single scale, self-report
measure of a trait related to hypnotic susceptibility. The items are keyed true or false,
and describe mild dissociative experiences. For each item, respondents indicate whether the statement is true for them or not. The summary score is the number of items endorsed as true.

The Positive States of Mind Scale (PSMS) (Horowitz, Adler, & Kegeles, 1988) is a single scale, self-report measure composed of items that ask the respondent to rate (on a 4-point Likert scale) how well they are able to experience certain types of pleasurable states (focused attention, productivity, responsible caretaking, restful repose, sharing, sensuous nonsexual pleasure, and sensuous sexual pleasure). The summary score is the total of the respondent’s ratings.

The Magical Ideation Scale (Eckblad & Chapman, 1983) is administered as a dual scale, self-report measure. The two scales are 1) a “low frequency item” validity scale, composed of statements so unlikely that their endorsement implies poor attention to question content, or random responding; and 2) the Magical Ideation Scale itself, which is variably keyed to prevent response bias, and measures the degree of bizarre mentation and experience that a respondent endorses. This scale has been shown by its authors to be related to schizotypal personality characteristics. The summary scores for each scale are the sum of the keyed items.

The JAREL (Hungelmann, Kenkel-Rossi, Klassen & Stollenwerk, 2000) is a 3 factor self-report measure that asks respondents to indicate their degree of agreement with a number of statements on a 6-point Likert scale for each item. The three factors of the JAREL measure are: religiosity and “spiritual well being”, cynicism and rigidity, and life
satisfaction and acceptance. The summary score for each factor is the sum of the factor item ratings.

The Sense of Coherence scale (SOC) (Antonovsky, 1993) is a dual factor self-report measure which asks respondents to rate their feelings and experiences on a series of 7-point Likert scales. The two factors of the SOC are: a positive coherence factor, whose items reflect feelings and experiences of consistency, clarity, meaningfulness, and connectedness in one’s life, and a negative coherence factor in which items reflect feelings and experiences of disinterest, disconnection, confusion, and failure in one’s life. The summary scores for these factors are the sum of the respondent’s ratings on the factor items.

The Marlow-Crowne Social Desirability scale (MCSD) (Crowne & Marlow, 1964) is a single factor, variably keyed, self-report measure indicating the degree to which individuals present themselves in an unrealistically socially desirable manner. The summary score is the sum of the keyed item endorsements.

The OSBES has been described elsewhere in this paper and therefore will not be described here.

**Electroencephalographic Data Processing**

Each record was visually screened to remove epochs with movement and muscle artifacts, following which a computer-based blink rejection algorithm rejected any epoch with activity greater than a threshold that was individualized based on the blink amplitude of the subject, following which, the data were again visually screened to
error-check the algorithm performance and any missed blinks, eye movement, or muscle tension artifacts were removed.

Spectral analysis was then performed via fast Fourier transform using a 1 second moving (Hanning) window with 75% overlap via the Sterman-Kaiser Imaging Laboratories (SKIL) version 2.05 software package (www.skiltopo.com) and the resulting spectral absolute magnitudes (μV) were exported to a Microsoft Excel® Spreadsheet before being imported into Statistica® for windows version 6.0 where the values were transformed to absolute power (squared) and log transformed to normalize their distributions in preparation for statistical analysis.

It should be noted that in the typical processing of EEG data, the activity is expressed from the FFT as $\mu V^2$, and the data here were expressed in terms of $\mu V$, and then the average magnitude ($\mu V$) for a 4 minute block was squared. This approach has the potential to reduce the impact of outlying epochs of data on overall estimates of activity within a block of data since each epoch is not being squared individually, thus magnifying the potential differences from one epoch to the next.
RESULTS

Results will be presented first addressing self reported belief in and experience of ESP, followed by an examination of other self report personality correlates of belief in and experience of ESP, thus describing the sample involved in this experiment. This will be followed by an examination of the impact of belief in and experience of ESP and (secondary hypothesis 1 from above) task administration format on accuracy of precognition and biofield awareness (BA) behavioral performance (BP). Following these analyses, the performance related topic of the “decline effect” will be addressed briefly. Next, an examination of participant’s reaction to their performance on the precognition tasks will be presented. Following this, BA in this sample will be examined to test for replication of the findings of Nelson & Schwartz (in press). Finally, results addressing electrocortical correlates of belief in and experience of ESP and IBA BP will be presented.

Ratings of Belief and Experience

As described above, subjects were recruited for participation based on their self-reported levels of belief in and experience of ESP via the relevant items on the OSBES (Schwartz & Russek, 1999). The OSBES was re-administered at the time of participation in the study as a part of the questionnaire packet described above. A notable number of subjects (n=12=30%) endorsed differing levels of either experience or belief at re-administration.
Given that the subjects were recruited based on their extreme responses to these questions, it was not surprising (given the phenomenon of regression to the mean) that the observed changes of endorsement were, without exception, toward a less extreme report of either belief or experience. For this reason, the “middle” group in each of the following analyses, where included, indicated a group composed of those who reported “moderate” levels of both belief and experience of ESP as opposed to the original group definition of “high belief/low experience”.

**Personality Correlates of Belief in and Experience of ESP**

Significant Pearson product-moment correlations were found between the variable “Level” (1 = low experience of and belief in ESP [n=18, OSBES items = 1 or 2], 2 = moderate experience of and belief in ESP [n=9, OSBES items = 3-5], and 3 = high experience of and belief in ESP [n=13, OSBES items = 6 or 7], mean of “Level” for total sample = 1.86, SD = 0.88) and total scores on the following self-report measures: the OSBES (mean rating for all items = 4.40, SD = 1.54, r = .482, p = .001), the Magical Ideation Scale (mean total score = 6.66, SD = 3.55, r = .507, p = .001), the IBAB total SE (mean % accuracy SE = 38.75, SD = 20.39, r = .416, p = .007), and the Tellegen absorption scale (mean total score = 17.49, SD = 7.30, r = .420, p = .008).

These correlations indicate that individuals who reported higher degrees of belief in and experience of ESP also reported higher levels of 1) openness to spiritual beliefs and experiences, 2) magical ideation, 3) SE of detection accuracy on the IBAB, and 4)
the personality trait known as “absorption” (see table 1 for questionnaire means and table 2 for all intercorrelations).

Table 1.
Valid N, Means, Minimum, Maximum, and Standard Deviation (SD) for all questionnaires, grouped by level of belief/experience.

<table>
<thead>
<tr>
<th></th>
<th>Level 1</th>
<th></th>
<th>Level 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n Mean</td>
<td>Min  Max</td>
<td>SD</td>
</tr>
<tr>
<td>OSBES</td>
<td>18 4.07</td>
<td>1.00  6.90</td>
<td>2.12</td>
</tr>
<tr>
<td>Mag. Id.</td>
<td>18 4.44</td>
<td>1.00  10.00</td>
<td>2.89</td>
</tr>
<tr>
<td>IBAB SE</td>
<td>18 29.12</td>
<td>1.43  65.71</td>
<td>21.70</td>
</tr>
<tr>
<td>PSMS</td>
<td>18 24.83</td>
<td>20.00 28.00</td>
<td>2.31</td>
</tr>
<tr>
<td>ABS</td>
<td>18 13.61</td>
<td>3.00  27.00</td>
<td>6.50</td>
</tr>
<tr>
<td>SOCP</td>
<td>18 73.39</td>
<td>54.00 93.00</td>
<td>10.62</td>
</tr>
<tr>
<td>SOCM</td>
<td>18 38.67</td>
<td>25.00 68.00</td>
<td>9.66</td>
</tr>
<tr>
<td>JAREL 1</td>
<td>18 16.94</td>
<td>6.00  32.00</td>
<td>9.97</td>
</tr>
<tr>
<td>JAREL 2</td>
<td>18 30.94</td>
<td>16.00 42.00</td>
<td>8.77</td>
</tr>
<tr>
<td>JAREL 3</td>
<td>18 15.11</td>
<td>10.00 29.00</td>
<td>4.76</td>
</tr>
<tr>
<td>MCSD</td>
<td>18 6.17</td>
<td>2.00  10.00</td>
<td>2.26</td>
</tr>
</tbody>
</table>

Mean= Arithmetic average, Min= Minimum score, Max= Maximum score, SD= Standard Deviation
Table 2. Intercorrelations between self report questionnaires.

<table>
<thead>
<tr>
<th></th>
<th>Level</th>
<th>OSBES</th>
<th>Mag. Id</th>
<th>IBAB</th>
<th>PSMS</th>
<th>ABS</th>
<th>SOC+</th>
<th>SOC-</th>
<th>JAREL 1</th>
<th>JAREL 2</th>
<th>JAREL3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level</td>
<td></td>
<td>0.48^^</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OSBES</td>
<td>Mag. Id</td>
<td>0.51^^</td>
<td>0.38*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IBAB</td>
<td></td>
<td>0.42**</td>
<td>0.52^^</td>
<td>0.44^</td>
<td>0.38*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PSMS</td>
<td></td>
<td>-0.00</td>
<td>0.22</td>
<td>0.11</td>
<td>0.02</td>
<td>0.54^^</td>
<td>-0.12</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ABS</td>
<td></td>
<td>0.42^^</td>
<td>0.42**</td>
<td>0.72^^</td>
<td>0.54*</td>
<td>0.26</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SOC+</td>
<td></td>
<td>-0.12</td>
<td>-0.36*</td>
<td>-0.27</td>
<td>-0.34*</td>
<td>-0.56^^</td>
<td>-0.19</td>
<td>-0.64^^</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SOC-</td>
<td></td>
<td>-0.19</td>
<td>-0.82^^</td>
<td>-0.19</td>
<td>-0.38*</td>
<td>-0.37*</td>
<td>-0.34*</td>
<td>-0.50^^</td>
<td>0.58^^</td>
<td></td>
<td></td>
</tr>
<tr>
<td>JAREL1</td>
<td></td>
<td>-0.07</td>
<td>0.68^^</td>
<td>-0.06</td>
<td>0.20</td>
<td>0.35*</td>
<td>0.17</td>
<td>0.59^^</td>
<td>-0.51^^</td>
<td>-0.84^^</td>
<td></td>
</tr>
<tr>
<td>JAREL2</td>
<td></td>
<td>-0.12</td>
<td>-0.23</td>
<td>-0.09</td>
<td>-0.39*</td>
<td>-0.66^^</td>
<td>-0.22</td>
<td>-0.72^^</td>
<td>0.72^^</td>
<td>0.48^</td>
<td>-0.43^</td>
</tr>
<tr>
<td>JAREL3</td>
<td></td>
<td>-0.19</td>
<td>-0.82^^</td>
<td>-0.19</td>
<td>-0.38*</td>
<td>-0.37*</td>
<td>-0.34*</td>
<td>-0.50^^</td>
<td>0.58^^</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MCSD</td>
<td></td>
<td>0.13</td>
<td>0.21</td>
<td>0.08</td>
<td>0.27</td>
<td>0.27</td>
<td>0.14</td>
<td>0.34*</td>
<td>-0.17</td>
<td>-0.11</td>
<td>0.27</td>
</tr>
</tbody>
</table>

*: p<.05; **: p<.01; ^^: p<.005; ^^^: p<.001. Level: levels of experience of and belief in ESP; OSBES: mean rating on the Openness to Spiritual Beliefs and Experiences Questionnaire; IBAB: mean % accuracy SE on self report portion of IBAB; PSMS: total score on Positive States of Mind Scale; ABS: Total score on Tellegen Absorption Scale; SOC+: total score on Sense of Coherence positive scale; SOC-: total score on Sense of Coherence negative scale; JAREL1: total score on JAREL factor 1; JAREL2: total score on JAREL factor 2; JAREL3: total score on JAREL factor 3; MCSD: total score on Marlow-Crowne Social Desirability Scale.

Following these analyses, a simultaneous multiple regression model using casewise deletion of missing data was empirically derived to predict level of belief and experience in ESP from the self-report questionnaire data, to determine the sources of unique variance contributing to the variable “Level”. The model was initially defined with all questionnaire summary scores entered as predictors of the variable “Level”. It should be noted here that the overall OSBES score was recalculated with the items inquiring about belief in and experience of ESP removed, as these items served as the basis for the determination of each subject’s “Level” score.

The regression equation was empirically derived as follows: on each iteration, the variable with the lowest absolute value beta score was removed until all variables included in the model yielded significant (p<.05) beta weights (final beta weights and...
partial correlations shown in table 3). The resulting model accounted for 30.9% of the observed variance in belief in/experience of ESP (adjusted $r^2 = .309$, $F (3,35)=6.6635$ $p<.001$), with the variables OSBES, SOC+, and JAREL factor 2 (negative beta) composing the model.

Table 3.

<table>
<thead>
<tr>
<th>Measure</th>
<th>Beta</th>
<th>Partial Correlation</th>
<th>R-square</th>
<th>t (35)</th>
<th>p-level</th>
</tr>
</thead>
<tbody>
<tr>
<td>OSBE</td>
<td>1.06</td>
<td>0.599</td>
<td>0.683</td>
<td>4.435</td>
<td>0.000</td>
</tr>
<tr>
<td>SOC+</td>
<td>0.43</td>
<td>0.471</td>
<td>0.446</td>
<td>3.161</td>
<td>0.003</td>
</tr>
<tr>
<td>JAREL2</td>
<td>-1.13</td>
<td>-0.721</td>
<td>0.694</td>
<td>-6.167</td>
<td>0.000</td>
</tr>
</tbody>
</table>

OSBE: Average score on Openness to Spiritual Beliefs and Experiences Scale (without "belief" and "experience" items); SOC+: Sense of Coherence Scale, negative scale; JAREL2: JAREL factor 2 score.

Precognition Performance by Belief and Task Format

A t-test comparing hit rates for those reporting very low levels of belief in and experience of ESP (n=17) and those reporting very high levels of belief in ESP (n=11) (excluding the “moderate belief/experience” group) across both task formats (average precognition performance, regardless of format) showed no significant difference in task performance ($t= -0.5123$, $p= 0.61$) (“low” belief group mean= 20.79%; “high” belief group mean= 22.09%). Furthermore, there was no significant correlation between the variable “Level” and percentage of “hits” across both precognition tasks ($r=.071$, $n= 36$, $p=.68$) indicating that the “sheep-goat” effect was not replicated in this sample.

A second t-test comparing hit rates across format type (traditional versus novelty enhanced) also showed no significant difference ($t= 0.0976$, $p= 0.92$; “novel” format
mean = 20.0\%, “Traditional” format mean = 21.0\%) indicating that task presentation
variables had no significant effect on overall hit rates in this sample.

A repeated measures ANOVA yielded no significant differences in the number of
“normal” versus “+1” hits between subjects reporting low, moderate or high levels of
belief in and experience of ESP (F(2, 33) = .14122, p = .87) indicating that TTI (Tart, 1977)
did not significantly differ between individuals reporting differing levels of belief and
experience of ESP in this sample (See table 4 for normal and +1 hit means by group).

Table 4.

<table>
<thead>
<tr>
<th></th>
<th>Hit type</th>
<th>N</th>
<th>Mean</th>
<th>Std. Err.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low bel/exp. group</td>
<td>Normal Hits</td>
<td>17</td>
<td>20.64%</td>
<td>1.59</td>
</tr>
<tr>
<td></td>
<td>+1 Hits</td>
<td>17</td>
<td>18.44%</td>
<td>1.72</td>
</tr>
<tr>
<td>Mod. Bel/exp. group</td>
<td>Normal Hits</td>
<td>8</td>
<td>19.69%</td>
<td>2.32</td>
</tr>
<tr>
<td></td>
<td>+1 Hits</td>
<td>8</td>
<td>20.07%</td>
<td>2.50</td>
</tr>
<tr>
<td>High bel/exp. Group</td>
<td>Normal Hits</td>
<td>11</td>
<td>21.82%</td>
<td>1.98</td>
</tr>
<tr>
<td></td>
<td>+1 Hits</td>
<td>11</td>
<td>20.12%</td>
<td>2.13</td>
</tr>
</tbody>
</table>

A second repeated measures ANOVA yielded a significant interaction effect for
“normal” hits vs. “+1” and “−1” hits differentially for the novelty enhanced versus
traditional precognition task formats (F(2, 60) = 3.2735, p = .04). The source of this effect
appears to be the lower proportion of “−1” hits (choosing the target that was the correct
choice on the previous trial) in the traditional format, a response pattern consistent with
the internal probability schema known as “the gamblers fallacy” (see fig. 3). The
interaction of this effect with reported belief in and experience of ESP was not
statistically significant in this sample ($F(4, 66)=.73998, p=.56811$) (see fig. 4). All groups showed approximately the same number of “normal”, “+1” and “-1” hits.

Figure 3.

![Graph showing Precognition Task Format By Hit Type](image)

**Precognition Task Format By Hit Type**
(a.k.a. “evidence for the gambler's fallacy”)

$F(2, 60)=3.27, p=.04$
Repeated Measures ANOVA

![Graph showing Type of Hit by Level of Belief and Experience](image)

**Type of Hit by Level of Belief and Experience**

$F(4, 66)=.74, p=.57$
Repeated Measures MANOVA

![Figure 4.](image)
Post Precognition Task Questionnaires

Traditional Format Responses. On the questionnaire administered following the traditional format of the computerized forced-choice precognition task, on the whole, individuals: 1) attributed their performance to luck more than ESP, 2) were fairly indifferent to their performance, 3) felt they were able to concentrate on the task well, 4) largely cited “guessing” as their primary approach to the task, and 5) reported relative disinterest in the task (See table 5 for supportive descriptive statistics).

Table 5.

Descriptive Statistics for Questions Following Traditional Format Precog. Task

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Mean</th>
<th>Median</th>
<th>Lower Quart.</th>
<th>Upper Quart.</th>
<th>SD</th>
<th>Skewness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Luck vs. ESP</td>
<td>40</td>
<td>2.03</td>
<td>2.0</td>
<td>1.0</td>
<td>3.0</td>
<td>1.29</td>
<td>1.31</td>
</tr>
<tr>
<td>Emotional Response</td>
<td>40</td>
<td>4.03</td>
<td>4.0</td>
<td>3.0</td>
<td>4.0</td>
<td>1.46</td>
<td>0.58</td>
</tr>
<tr>
<td>Concentration (reverse</td>
<td>40</td>
<td>2.48</td>
<td>2.0</td>
<td>1.0</td>
<td>3.0</td>
<td>1.38</td>
<td>0.74</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Guessing vs. Intuition</td>
<td>40</td>
<td>2.70</td>
<td>2.0</td>
<td>1.0</td>
<td>4.0</td>
<td>1.74</td>
<td>0.58</td>
</tr>
<tr>
<td>Interest in task</td>
<td>40</td>
<td>3.20</td>
<td>3.0</td>
<td>2.0</td>
<td>4.0</td>
<td>1.80</td>
<td>0.71</td>
</tr>
</tbody>
</table>

Novelty Enhanced Format Responses. On the questionnaire administered following the novelty enhanced format of the computerized forced-choice precognition task, on the whole, individuals: 1) tended to attribute their performance to “pure luck”, 2) were fairly indifferent to their performance, 3) felt they were able to concentrate on the task well, 4) again, largely cited “guessing” as their primary approach to the task, and 5) reported moderate interest in the task (see table 6 for descriptives).
Table 6.
Descriptive Statistics for Questions Following Novelty Enhanced Format Precog. Task

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Mean</th>
<th>Median</th>
<th>Lower Quart.</th>
<th>Upper Quart.</th>
<th>SD</th>
<th>Skewness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Luck vs. ESP</td>
<td>40</td>
<td>2.03</td>
<td>1.0</td>
<td>1.0</td>
<td>3.0</td>
<td>1.35</td>
<td>1.01</td>
</tr>
<tr>
<td>Emotional Response</td>
<td>40</td>
<td>3.98</td>
<td>4.0</td>
<td>3.0</td>
<td>5.0</td>
<td>1.58</td>
<td>-0.29</td>
</tr>
<tr>
<td>Concentration (reverse scored)</td>
<td>40</td>
<td>2.70</td>
<td>2.0</td>
<td>2.0</td>
<td>4.0</td>
<td>1.54</td>
<td>0.93</td>
</tr>
<tr>
<td>Guessing vs. Intuition</td>
<td>40</td>
<td>2.80</td>
<td>2.5</td>
<td>1.0</td>
<td>4.5</td>
<td>1.68</td>
<td>0.43</td>
</tr>
<tr>
<td>Interest in task</td>
<td>40</td>
<td>3.83</td>
<td>4.0</td>
<td>2.0</td>
<td>5.0</td>
<td>1.72</td>
<td>0.16</td>
</tr>
</tbody>
</table>

Group Differences. Given that the data for these questionnaires did not meet the assumption of a normal distribution, a Kruskal-Wallis ANOVA by ranks was used to test for differences in responses by group (“Level” = 1, 2, or 3). These comparisons revealed that individuals reporting low or moderate belief/experience were significantly more likely to attribute their performance to “Pure Luck” than those reporting high belief/experience on both the traditional (H (2, N= 40) =6.226408 p =.04), and novelty enhanced format (H (2, N= 40) =16.18636 p =.0003), to cite “just guessing” as their primary approach to both the traditional and novelty enhanced tasks than those reporting high levels of belief/experience, who were more likely to make ratings suggesting the use of intuition (H (2, N= 40) =9.973729 p =.007; and H (2, N= 40) =17.19200 p =.0002, respectively). Interestingly, interest in the task was only significantly associated with level of belief/experience in its traditional format (H (2, N= 40) =10.68192 p =.005). No other significant differences between the groups were revealed for these questions (See table 7 for descriptives by group and format).
Table 7.
Descriptive Statistics for Post Precognition Task Questionnaires by Group and Task Format

<table>
<thead>
<tr>
<th>Low bel/exp. Group</th>
<th>N</th>
<th>Mean</th>
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<td>4.00</td>
<td>5.00</td>
<td>1.36</td>
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Biofield Detection Performance by Belief and Administration Format

A t-test for independent samples yielded no significant differences in overall biofield detection performance between subjects reporting very high levels of belief in ESP (n=13, mean= 56.22%) and those reporting very low levels of belief (n=17, mean= 53.92%) (t= -1.112, df=28, p= 0.28) (excluding those reporting “moderate” levels of belief and experience). Furthermore, there was no significant correlation between the variable “Level” and overall BP (r= .186, n=38, p= .27); indicating that belief and experience of ESP did not significantly affect biofield awareness (BA).

A second t-test for dependent samples yielded no significant difference in biofield detection performance between block (n= 39, mean= 53.54%, SD=6.42) and serial (n= 39, mean= 54.83%, SD= 6.36) administrations of the IBAB (t= -0.8857, df=76, p= 0.38) indicating that administration format had no significant impact on the behavioral performance (BP) of the subjects in this sample.

Serial Position Effects in Precognition and Biofield Detection

A repeated measures MANOVA showed no significant differences in precognition performance by trial number between the novelty enhanced and traditional
presentation of the computerized forced-choice task ($F(19, 532)=1.0126, p=.44$) indicating that task format did not significantly impact trial by trial task accuracy on the precognition task in this sample (see fig. 5).

Figure 5.

A second repeated measures MANOVA showed no significant differences in overall biofield detection performance by trial number between the block and serial administrations of the IBAB ($F(9, 288)=1.3458, p=.21$) indicating that format of task administration had no significant impact on overall biofield detection accuracy in this sample (see fig. 6).
Figure 6.

The effect of the differences in task presentation on the “decline effect” (e.g., Rhine, 1969) could not be assessed for either of these tasks, as no systematic decline in hit rates across successive trials of either task in either format was observed in this sample (see fig. 5 & 6 above for illustration of this point).

Biofield Awareness

Subjective Estimates of Performance. Overall IBAB average SE of BP for this sample ranged from 1.43% to 71.43% (see table 8 for descriptives) with a mean of 38.75% and a substantial SD of 20.39%. Whereas actual overall BP ranged from 45.83% to 65.83% with a mean accuracy of 54.61% and a much smaller SD of 5.31% (See table 8 for descriptives).
Due to the apparent correlation between the means and variances of these variables, a Wilcoxon Matched Pairs test was used to assess the significance of the difference between SE and actual BP, which revealed that the difference was statistically significant (T=103.0, Z= 3.88, p=.0001) indicating significantly lower SE than BP. This finding replicates the findings of Nelson & Schwarz (in press).

Also, replicating findings regarding SE, single sample t-tests showed SE of performance on several individual tasks, as well as overall SE were significantly below chance expectation (see table 8 for t statistics and p-values).

Interestingly, there was no significant correlation between SE and BP (r= .112, n= 38, p= .50). However, a significant correlation was found between subject’s self ratings of “energy sensitivity” on a 0 to 10 scale and their SE (r=.66, n=40, p=.0001) as well as their overall BP on the IBAB (r= .3517, n=36, p=. 04), replicating the same finding in Nelson & Schwartz (in press).

**Behavioral Performance.** Since IBAB administration format (Block vs. Serial) did not significantly impact task performance in this sample (see above), the BP figures of the two administrations were combined for these analyses (total trials per task = 20). Single sample t-tests were performed for each of the tasks as well as for overall BP. These revealed that only “local” (i.e., hand detection and ear detection) effects were significantly above chance expectation in this sample, being the sole sources of the finding that the “overall” performance figure was statistically significantly above chance.
expectation. Thus, BP on the distant tasks failed to replicate the findings of Nelson & Schwartz (in press) (see table 9 for t-statistic results).

Table 8.
N, Means, Minimum, Maximum, SD, and single sample t scores for actual BP accuracy on the IBAB.

<table>
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<tr>
<th></th>
<th>N</th>
<th>Mean</th>
<th>Min</th>
<th>Max</th>
<th>SD</th>
<th>t value</th>
<th>df</th>
<th>p-value</th>
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<td>100.00</td>
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<td>2.87</td>
<td>39</td>
<td>0.006**</td>
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<td>40</td>
<td>51.75</td>
<td>35.00</td>
<td>70.00</td>
<td>10.47</td>
<td>1.05</td>
<td>39</td>
<td>0.297</td>
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<td>Ear Detection</td>
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<td>14.74</td>
<td>6.59</td>
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<td>0.000^^</td>
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<tr>
<td>Staring Sensing</td>
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<td>20.00</td>
<td>65.00</td>
<td>9.60</td>
<td>-0.16</td>
<td>39</td>
<td>0.870</td>
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<tr>
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<td>38</td>
<td>0.113</td>
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<td>12.62</td>
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<td>0.798</td>
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<td>65.83</td>
<td>5.31</td>
<td>5.35</td>
<td>37</td>
<td>0.000^^</td>
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*: p<.05; **: p<.01; ^^: p<.005; ^^^: p<.001.

However, Nelson & Schwartz also report that individual differences in BP were somewhat uniform across tasks. The sample in that study was split into four groups based upon average IBAB performance: Poor (<51; n=42), average (51-60; n=62), good (61-70; n=42), and excellent (>71; n=19).

Using the same categories to organize individual differences in BP for the current sample yields: poor (<51; n=11), average (51-60; n=23), good (61-70; n=5), and excellent (>71; n=0). With a notable absence of any participants in this sample performing in the "excellent" category, this finding was only marginally replicated here (see fig. 8).

While no decline effect was observed for the Block and Serial administrations separately (see fig. 6), when the two formats are combined, the effect of trial number on
accuracy across all tasks tends toward significance (F(9, 288)=1.6846, p=.09). This small effect is likely due to the elevated BP accuracy on trial 1 (see fig. 7)

Figure 7.

![IBAB BP Proportion Correct by Trial Number](image1)

Repeated Measures ANOVA
F(9, 288)=1.68, p=.092

Figure 8.

![IBAB BP by Task Type for Poor, Average, and Good Performers](image2)
Electrocortical Correlates of Belief in and Experience of ESP

Results for electrocortical findings will be presented by first addressing those findings from the current study that are relevant to the findings of Pizzagali, et al. (2000), who reported finding frontal asymmetry differences related to extreme belief in the paranormal. Therefore, any significant effects relating to frontal asymmetry ($\ln[\text{right}] - \ln[\text{left}]$) for each pair of electrodes recording frontal region EEG (FP2-1, F4-3, F8-7) will be reported first by frequency band beginning with the Beta 2 (18.-24 Hz) as this is the band in which the above cited finding reported differences. Results for the other frequency bands will follow (from lowest to highest). Where significant differences in asymmetry between groups are revealed, follow-up analyses for that frequency band will be reported to more clearly delineate the differences between the hemispheres.

Following this, similar analyses will be reported for IBA tasks in which above chance-expectation BP was observed. No analysis of electrocortical correlates of either distal IBA tasks, or precognition performance will be carried out, as neither overall nor individual group performance on these tasks was significantly above chance.

It should be noted that while Pizzagali, et al. reported on a sample of only female subjects, the current study included males and females. Therefore, sex was included as a between groups factor for all analyses. Also, it should be noted that the factor “eyes” (reflecting eyes closed versus eyes open recording conditions) was tested here a priori for each frequency band analyzed. Only where a significant interaction with sex or level of belief/experience was observed in this a priori comparison was this factor retained for further analysis. If no significant interaction with these variables was present, the data
were collapsed across eyes open and eyes closed conditions and the means from this 8
minute block were used for all further analyses for that frequency band (for an example
of this approach, see Reid, Duke, & Allen, 1998)

Belief, Sex, and Asymmetry in the Beta 2 Band. Pizzagali et al. (2000) reported
differences in asymmetry primarily related to the Beta 2 frequency band (18.5-21 Hz, in
that report), reporting a greater number of source dipoles in this frequency band in the
right hemispheres of extreme believers in ESP. The current data set analyzed Beta 2 with
a slightly wider frequency range (18-24 Hz) which included the frequency band described
by Pizzagali et al.

A 2 (sex) X 3 (“Level”) X 2 (eyes) X 3 (site: frontal polar, mid frontal, lateral
frontal) repeated measures multivariate analysis of variance (MANOVA) revealed that
the factor “eyes” did not significantly interact with either grouping variable in isolation.
However, a significant interaction was found for “eyes” X site X “Level” (F(4,
46)=2.6117, p=.048) with individuals reporting moderate levels of belief/experience of
ESP showing significantly lower asymmetry scores at frontal polar and lateral frontal
electrode site pairs than at mid-frontal in the eyes open condition than in the eyes closed
condition. Those reporting low belief/experience showed a relatively higher asymmetry
scores in the eyes open condition and a relatively lower asymmetry score in the eyes
closed condition. The relative asymmetry scores did not change significantly for those
reporting high belief/experience between eyes closed and eyes open conditions (see fig.
9).
A follow-up analysis was conducted to attempt to decompose the above interaction into hemispheric power differences between frontal polar regions as opposed to the less specific asymmetry scores in which it manifested. To this end, a 3 (“Level”) X 2 (eyes) X 2 (FP1 vs. FP2) repeated measures analysis of variance (ANOVA) was computed. This analysis yielded a significant main effect for electrode ($F(1, 28)=7.6295$, $p=0.010$), with FP1 showing greater log transformed absolute power (mean= 3.71, St. Err.= 0.068) than FP2 (Mean= 3.54, St. Err.= 0.060) for all groups and both recording conditions, and a significant interaction of recording condition (eyes) by electrode ($F(1, 28)=3.9869$, $p=0.055$) with FP1 showing differentially greater power in the eyes open condition relative to the eyes closed condition (see fig. 10). The eyes X electrode X “Level” interaction was not significant ($p>0.30$).

A second follow-up analysis was conducted to attempt to decompose the above interaction into hemispheric power between lateral frontal regions as opposed to the less specific asymmetry scores. A 3 (“Level”) X 2 (eyes) X 2 (F7 vs. F8) repeated measures ANOVA was computed to test for interactions of Beta 2 power at each electrode with recording condition and group. This analysis yielded no significant main effects (all $p’s>0.30$) and no significant interaction effect for eyes X site X Level ($F(2, 30)=1.7667$, $p=0.19$). Thus, the eyes X electrode pair X “Level” interaction effect reported above appears to be statistically irreducible from its original terms for this electrode pair.
Figure 9.

Beta 2 Asymmetry Scores by Eyes Closed vs. Eyes Open by Electrode Pair and "Level"
F(4, 46)=2.61, p=.047
Repeated Measure ANOVA

Eyes Closed
Pair F4-F3 F8-F7
FP2-FP1

Eyes Open
Pair F4-F3 F8-F7
FP2-FP1

Low Bel./Exp. Moderate Bel./Exp. High Bel./Exp.

Figure 10.

In(Beta 2) Absolute Power
"Eyes" by Recording Site Interaction
F(1, 28)=3.99, p=.056
Repeated Measures ANOVA

Recording Site
FP1 FP2

0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
5.5
6.0
6.5
7.0
7.5
8.0
8.5
9.0
9.5
10.0

Eyes Closed
Eyes Open

O
□
Delta (1-4 Hz) Band. A 2 (sex) X 3 (level of belief/experience) X 2 (eyes) X 3 electrode pair (Fp2-1, F4-3, F8-7) repeated measures multivariate analysis of variance (MANOVA) revealed that the eyes factor did not interact significantly with either grouping variable, or more importantly, by either group X pair interaction in this frequency band. Therefore, data were collapsed across the eyes open and eyes closed conditions and a 2 (sex) X 3 (“level”) X 3 (electrode pair) repeated measures MANOVA was computed. This analysis yielded a significant asymmetry score by “Level” by electrode pair interaction (F(4, 50)=2.5666, p=.049) with those reporting moderate and high levels of belief/experience showing a lower asymmetry score for delta power between the F8 - 7 electrode pair, with more similar scores to the other groups between the other electrode pairs (see fig. 11).

A significant interaction was also observed for asymmetry score by sex by electrode pair (F(2, 50)=3.8812, p=.03) with males showing differentially lower asymmetry scores for electrode pair F8 – 7 (see fig. 12). The higher order electrode pair X sex X “Level” interaction was not significant (F(4, 50)=1.0428, p=.39)

A follow up 2 (sex) X 3 (Level) X 2 (F7 vs. F8) ANOVA revealed no significant interaction for lateral frontal Delta power by sex (F(1, 28)=2.1828, p=.15), or “Level” (F(2, 28)=1.3164, p=.28).
Figure 11.

Omega asymmetry by electrode pair & Level of Belief / Experience
F(4, 50)=2.57, p=.049
Repeated Measures MANOVA

Electrode Pair
- Fp2 - Fp1
- F4 - F3
- F8 - F7

- Low Bel./Exp.
- Moderate Bel./Exp.
- High Bel./Exp.

Figure 12.

Delta asymmetry by Electrode Pair & Sex
F(2, 50)=3.88, p=.027
Repeated Measures MANOVA

Electrode Pair
- Fp2 - Fp1
- F4 - F3
- F8 - F7

- Females
- Males
**Theta (4-8 Hz) Band.** A 2 (sex) X 3 (level of belief/experience) X 2 (eyes) X 3 electrode pair (Fp2-1, F4-3, F8-7) repeated measures multivariate analysis of variance (MANOVA) revealed that the eyes factor did not interact significantly with the grouping variable “Level”, but did marginally interact with sex (F(1, 24)=3.9026, p=.06), with males and females showing equal eyes closed theta asymmetry scores, but males showing lower eyes open theta asymmetry scores (see fig. 13). More importantly, the eyes factor did not significantly interact with either group X electrode pair interaction in this frequency band (Sex X Eyes X Pair: F(2, 48)=1.0315, p=.36; “Level X Eyes X Pair: F(4, 48)=1.3009, p=.28).

Therefore, data were collapsed across the eyes open and eyes closed conditions and a 2 (sex) X 3 (“level”) X 3 (electrode pair) repeated measures MANOVA was computed. This analysis yielded no significant effect of sex (F(1, 24)=.12472, p=.73) on theta power asymmetry across these sites, but did show a trend (F(2, 24)=2.5112, p=.10) for “Level” with those reporting moderate belief/experience showing somewhat lower theta asymmetry scores across all electrode pairs (see fig. 14). No significant electrode pair by sex (F(2, 48)=.05860, p=.94) or pair by “Level” (F(4, 48)=1.9113, p=.12) interaction was found and the pair X sex X “Level” interaction was not significant (F(4, 48)=.23360, p=.92).
Figure 13.

Theta Asym. Score (ln(right)-ln(left))
"Eyes" by Sex Interaction
F(1, 24)=3.90, p=.059
Repeated Measures ANOVA

"Eyes" by Sex interaction

Females
Males

Figure 14.

Overall Theta Asym. Score (ln(right)-ln(left))
Main Effect for "Level"
F(2, 24)=2.51, p=.10
Repeated Measures ANOVA

Alpha (8-13 Hz) Band. A 2 (sex) X 3 (level of belief/experience) X 2 (eyes) X 3 electrode pair (Fp2-1, F4-3, F8-7) repeated measures multivariate analysis of variance
(MANOVA) revealed that the eyes factor did not interact significantly with the grouping variable “sex” in this sample (F(1, 24)=.00626, p=.94). However, a significant interaction of the “eyes” factor with “Level” was found (F(2, 24)=4.9284, p=.02), with those individuals reporting moderate belief/experience showing decreased asymmetry scores across all sites in the eyes open condition relative to the other two groups (see fig. 15). No other effect in this model was significant (all p’s >.10). Specifically, there were no significant “eyes” by electrode pair interactions (all p’s >.20)

Therefore, data were collapsed across the eyes open and eyes closed conditions and a 2 (sex) X 3 (“level”) X 3 (electrode pair) repeated measures MANOVA was computed. This analysis showed no significant interaction of sex or “Level” with electrode pair (all p’s >.20)

Figure 15.
**Low Beta (13-15 Hz) band.** A 2 (sex) X 3 (level of belief/experience) X 2 (eyes) X 3 electrode pair (Fp2-1, F4-3, F8-7) multivariate analysis of variance (MANOVA) revealed that the eyes factor did not interact significantly with the grouping variable sex in this sample (F(1, 24)=.20622, p=.65). However, a marginally significant interaction of the “eyes” factor with “Level” was found (F(2, 24)=3.0452, p=.07), again, with those individuals reporting moderate belief/experience showing decreased asymmetry scores across all sites in the eyes open condition relative to the other two groups. This effect apparently extending from the above described (see fig. 15) stronger effect in the neighboring lower frequency band of alpha.

Additionally, a marginally significant (F(4, 48)=2.4581, p=.06) interaction was revealed in this analysis between “eyes”, electrode pair (frontal polar, mid frontal, and lateral frontal), and “Level” (see fig. 16), which resembles the pattern of interaction observed in the Beta 2 frequency band, with individuals reporting moderate levels of belief/experience of ESP showing significantly lower asymmetry scores at frontal polar and lateral frontal electrode site pairs than at mid-frontal pair, in the eyes open condition compared with the eyes closed condition. However, in the current effect, the relative asymmetry scores did not change significantly for those reporting very low or high belief/experience between eyes closed and eyes open conditions (see fig. 9 for comparison).

A follow up analysis was conducted via a 3 (“Level”) X 2 hemisphere (Low Beta absolute power at F8 & F7) X “eyes” (eyes closed vs. eyes open) repeated measures ANOVA to delineate the source of the difference in asymmetry scores. An interaction
Effect, tending toward significance ($F(2, 31)=2.5817$, $p=.09$) was shown for “eyes” X “hemisphere” X “Level” indicating a differentially greater decrease in Low Beta absolute power between eyes closed and eyes open conditions for those reporting moderate levels of belief/experience at recording site F8 (right hemisphere) relative to the other two groups (see fig. 17).

Figure 16.

![Graph showing Low Beta (13-15 Hz) Asymmetry Scores for “Eyes” by Electrode Pair by “Level”](image)
Beta 1 (15-18 Hz) Band. A 2 (sex) X 3 (level of belief/experience) X 2 (eyes) X 3 electrode pair (Fp2-1, F4-3, F8-7) repeated measures multivariate analysis of variance (MANOVA) revealed that the eyes factor did not interact significantly with the grouping variables sex or “Level” ([F(1, 23)=0.05815, p=.81] and [F(2, 23)=1.8959, p=.17], respectively). More importantly, the eyes factor did not significantly interact with any group X electrode pair effect in this frequency band (all p’s >.10). However, a non-significant trend (F(4, 46)=1.9207, p=.12) for the same pattern of interaction was shown in this frequency band for “eyes” X electrode pair X “Level” that was shown for Alpha, Low Beta and Beta 2, with those reporting moderate levels of belief/experience exhibiting relatively lower asymmetry scores for pairs FP2-1 and F8-7 differentially in
the eyes open condition (see fig. 18). However, as noted above, this interaction effect did not reach statistical significance in this frequency band.

Therefore, data were collapsed across the eyes open and eyes closed conditions and a 2 (sex) X 3 (“level”) X 3 (electrode pair) repeated measures MANOVA was computed. This analysis revealed a significant \( F(2, 23)=3.6573, p=.04 \) group difference for “Level” in asymmetry scores across all electrode pairs, with those reporting high levels of belief/experience having higher overall asymmetry scores (see fig. 19). No grouping variable by site interaction was significant (all p’s >.40).

Data were then collapsed across electrode pair for log transformed absolute power in the Beta 1 frequency band (15-18 Hz) and a 3 (“Level”) X 2 (hemisphere) repeated measures ANOVA was computed. This analysis showed a highly significant main effect for hemisphere \( (F(1, 26)=87.918, p=.0000) \), with right hemisphere showing significantly higher log transformed Beta 1 power than the left hemisphere across all subjects. The “Level” X hemisphere interaction tended toward significance \( (F(2, 26)=2.6970, p=.09) \) with those reporting high levels of belief/experience showing differentially higher right hemisphere log transformed Beta 1 absolute power in relation to the other 2 groups (see fig 20).
Figure 18.

Beta 1 Asym. Score (ln[right]-ln[left])
Eyes by Pair by "Level" Interaction
F(4, 46)=1.92, p=.12
Repeated Measures MANOVA

Figure 19.

Mean Asymmetry Scores in Beta 1 (15-18 Hz)
by "Level"
F(2, 23)=3.66, p=.04
Repeated Measures ANOVA
Electrocortical Correlates of Close Range IBA BP.

Analysis Plan and Group Definition. Although there were no specific a priori hypotheses associated with electrocortical correlates of IBA BP, as an exploratory investigation, electrocortical correlates of performance on the IBA tasks was carried out. Given that the only IBA tasks showing significantly above chance expected performance for this sample were the “close range” tasks, these are the only tasks for which electrocortical correlates of performance will be sought. As in the section above, the “eyes” factor will first be considered for each frequency band, and only in cases where there is a significant interaction of “eyes” by “group” by electrode pair will this
factor be retained for further analysis, otherwise data will be collapsed across eyes open and eyes closed conditions and analyses will proceed from that point.

For the following analyses, participants were divided into groups based upon their averaged performance on the IBA “close” tasks (hand detection and ear detection) in such a way as to arrive at reasonably equal group sizes. Thus, the “poor” performers are defined as those whose average performance on the “hand detection” and “ear detection” tasks showed less than 55% accuracy (n=13), the “average” performers are those whose performance on these tasks was in the range of 56% - 65% (n=15), and the “good” performers are those whose average performance on these tasks was above 66% (n=12).

**Delta Band.** The preliminary 3 (group) X 2 (eyes) X 3 (pair) repeated measures MANOVA revealed a marginally significant interaction of “group” and “eyes”, with high performers exhibiting very little change across the recording conditions, and the other two groups shifting to either higher asymmetry scores (poor performers) or lower asymmetry scores (average performers) in the eyes open condition (F(2, 28)=3.1040, p=.06) (see fig. 21). But no significant interaction effect for “eyes” X “group” X electrode pair (F(4, 56)=.52274, p=.72), therefore data were collapsed across eyes open and eyes closed conditions for the following analyses.

A 3 (group) X 3 (electrode pair) ANOVA revealed a significant main effect for “group” showing a nearly linear inverse relationship between performance and asymmetry score across all sites (F(2, 28)=3.3274, p=.05) (see fig. 22), as well as a significant “group” X electrode pair interaction effect (F(4, 56)=4.0246, p=.006) (see fig.
23) with “good” performers showing differentially lower asymmetry scores at the F8-7 electrode pair than the other pairs, and the other groups at that pair.

A follow-up analysis was conducted to assess the difference observed in the above interaction effect for statistical significance. A 3 (group) X 2 (electrode; F8 delta power vs. F7 delta power) ANOVA revealed a significant electrode by group interaction indicating relatively higher log-transformed absolute delta power at F7 in the “good” performer group than the other two groups, with all groups having similar levels of F8 delta power (see fig. 24). This finding indicates that resting baseline log-transformed absolute delta power predicts performance on IBA close range BP.

Figure 21.
Figure 22.

Mean Delta Asymmetry Scores
Main Effect for Performance
F(2, 28)=3.33, p=.05
Repeated Measures ANOVA

Figure 23.

Delta Asymmetry Scores by Electrode Pair
and Performance Group
F(4, 55)=4.02, p=.006
Repeated Measures ANOVA
**Theta Band.** The preliminary 3 (group) X 2 (eyes) X 3 (pair) repeated measures MANOVA revealed no significant interaction of “group” and “eyes” (F(2, 27)=.73750, p=.49) or “eyes” X “group” X electrode pair (F(4, 54)=.41035, p=.80), therefore data were collapsed across eyes open and eyes closed conditions for the following analyses.

A 3 (group) X 3 (electrode pair) repeated measures ANOVA was computed, revealing a significant group X pair interaction effect (F(4, 54)=3.4772, p=.01) (see fig. 25), with the “good” performers showing differentially lower F8-7 asymmetry scores relative to the other groups and other sites.

A follow-up 3 (group) X 2 (electrode site; F7 vs. F8) repeated measures ANOVA was computed to assess the statistical significance of the observed difference in terms of log-transformed absolute power. This analysis revealed that the observed difference was not statistically significant in isolation (F(2, 33)=.88966, p=.42).
Figure 25.  

**Alpha Band.** The preliminary 3 (group) X 2 (eyes) X 3 (pair) repeated measures MANOVA revealed no significant interaction of “group” and “eyes” (F(2, 27)=.26868, p=.77) or “eyes” X “group” X electrode pair (F(4, 54)=.94894, p=.44), therefore data were collapsed across eyes open and eyes closed conditions for the following analyses.

A 3 (group) X 3 (electrode pair) repeated measures ANOVA was computed, revealing no significant main effect for group (F(2, 27)=.99491, p=.38), and no significant group X pair interaction effect for this frequency band (F(4, 54)=1.4444, p=.23).

**Low Beta Band.** The preliminary 3 (group) X 2 (eyes) X 3 (pair) repeated measures MANOVA revealed no significant interaction of “group” and “eyes” (F(2, 26)=.58225, p=.56) or “eyes” X “group” X electrode pair (F(4, 52)=1.7802, p=.15),
therefore data were collapsed across eyes open and eyes closed conditions for the following analyses.

A 3 (group) X 3 (electrode pair) repeated measures ANOVA was computed, revealing no significant main effect for group (F(2, 27)=.27874, p=.76), and no significant group X pair interaction effect for this frequency band (F(4, 54)=.57463, p=.68).

Beta 1 Band. The preliminary 3 (group) X 2 (eyes) X 3 (pair) repeated measures MANOVA revealed no significant interaction of “group” and “eyes” (F(2, 26)=.10282, p=.90) or “eyes” X “group” X electrode pair (F(4, 52)=.80954, p=.52), therefore data were collapsed across eyes open and eyes closed conditions for the following analyses.

A 3 (group) X 3 (electrode pair) repeated measures ANOVA was computed, revealing no significant main effect for group (F(2, 26)=.01360, p=.99), and no significant group X pair interaction effect for this frequency band (F(4, 52)=.71, p=.59095).

Beta 2 Band. The preliminary 3 (group) X 2 (eyes) X 3 (pair) repeated measures MANOVA revealed no significant interaction of “group” and “eyes” (F(2, 26)=.10282, p=.90) or “eyes” X “group” X electrode pair (F(4, 52)=.80954, p=.52), therefore data were collapsed across eyes open and eyes closed conditions for the following analyses.

A 3 (group) X 3 (electrode pair) repeated measures ANOVA was computed, revealing no significant main effect for group (F(2, 27)=.33289, p=.72), and no
significant group X pair interaction effect for this frequency band (F(4, 54)=1.0060, p=.41).
DISCUSSION

The findings of this investigation will be discussed in the following order. First, the personality correlates of self-reported level of belief in and experience of ESP will be discussed and interpreted. Following this will be a discussion of the “sheep-goat effect” and “serial position effect”, along with some considerations in the interpretation of the current findings regarding these effects and their relationships to behavioral performance (BP) on the IBA tasks. Then, an examination of considerations for interpreting behavioral performance (BP) on the multimodal biofield detection task (IBAB BP) will be carried out. Following this, a discussion and interpretation of the observed electrocortical correlates of belief in and experience of ESP will be given, followed by an interpretation of electrocortical correlates of the IBA BP for close range tasks and suggestions for future research. It is to the first of these topics that we will now turn our attention.

**Personality Correlates of Belief/Experience of ESP.**

*Questionnaire Measures.* Several of the questionnaires administered to this sample showed significant correlations with the variable “Level”, however, there were also significant intercorrelations between the questionnaires, making it difficult to determine which personality variables actually showed the strongest unique associations with the variable of interest (see table 2 for all intercorrelations). Therefore, as described in the results section, a multiple regression equation was derived to determine which personality variables accounted for the most unique variance in belief/experience of ESP,
with the variables OSBES, SOC+, and JAREL factor 2 (negative beta weight) composing the model following a process of successive statistical elimination.

The qualities indicated by the questionnaire summary scores surviving this process suggest that the personality characteristics with the greatest unique contribution to the observed variance in belief in/experience of ESP are those relating to a general openness to other types of “Spiritual” beliefs and experiences (OSBES), who have feelings and experiences of consistency, predictability, clarity, and meaningfulness in life, and who experience an increased sense of connectedness to those around them (SOC+). Also of significant contribution to the observed variance were lower levels of cynicism and rigidity (JAREL factor 2) in those with higher self-reported levels of belief in/experience of ESP.

These findings are somewhat at odds with the current literature on the topic which portrays belief in ESP as a risk factor for significant psychopathology (e.g., Pizzagali, et al., 2000). While the contributions to variance in belief/experience of ESP by SOC+ and the negative loading of the JAREL’s factor 2 suggest a population that is generally well adjusted and positively oriented, more surprising is the notable absence of the Magical Ideation Scale (Eckblad & Chapman, 1983) from the regression equation described above. This scale showed a substantial correlation with the variable “Level” (r=.51, p>.001), but nonetheless failed to account for a significant amount of unique variance in the regression equation. It is possible that the result above is due to the correlation between this measure and the OSBES (r=.38, p<.05), and that the OSBES simply tapped the construct underlying belief in ESP more clearly, given its inclusion of other
“spiritual” phenomenon (i.e., belief in God, angels, ghosts, and the healing potential of prayer).

That is, it is possible that while belief in ESP may be a reliable indicator of other forms of “magical thinking”, it maybe a better indicator of the presence of other, less pathonomic and more widely held beliefs of a religious and spiritual nature than it is of the sort of bizarre mentation tapped by the magical ideation scale (e.g., “I have worried that people on other planets may be influencing what’s happening on earth.”, and “I have had the momentary feeling that someone’s place has been taken by a look-alike.”). This may explain why the more focused OSBES, which taps this former set of beliefs and experiences accounts for more unique variance in belief/experience of ESP.

Sheep-goat, serial position effects and IBA.

The Sheep Goat Effect. While the current study failed to demonstrate a difference in precognition performance or IBA between individuals reporting high vs. low belief in ESP, thus failing to replicate the “sheep-goat effect” (Lawrence, 1993) and the related set of findings from Nelson & Schwartz (In press), a small set of other findings from the latter report were confirmed. These findings will be discussed in a later section. Prior to the undertaking of that discussion, some general issues relevant to the failure of this investigation to demonstrate the “sheep-goat” effect will be examined.

The effect reported by Lawrence (1993), while robust across studies, had a very small ($r=.02$) trial by trial effect size. The current investigator was somewhat naively optimistic in hypothesizing that such a small effect would be detected with a sample size
such as this one (N=40). This naivety may be attributed in part to the observation of a similar effect in earlier reports of IBA (e.g., Schwartz et al., 1999; Nelson & Schwartz, *in press*), which the present investigator apparently conflated with psi performance.

Contrary to this conflation, the results of the current investigation support the hypothesis that IBA and psi performance do not necessarily covary, given that the correlation between overall IBA BP and overall precognition performance ($r= -.0074$, $n=34$, $p=.97$) was virtually nonexistent. This lack of relationship supports future consideration of these phenomena as separate entities. Additional support for this distinction comes from the lack of any significant "serial position" or "decline" effect (e.g., Rhine, 1969) across the precognition trials, whereas a small, nonsignificant trend was shown for this effect across IBA BP trials.

*Serial Position Effects and Task Administration Format.* A brief consideration will now be given to the observed absence of any significant difference in overall hit rates between the two administration formats of the precognition task. The hypothesized mechanism of this expected difference was based on an attenuation the "decline effect", reported consistently in the ESP literature. Since this effect of declining hit rates on successive trials was not observed in *either* task format, this hypothesis, while considered here to not have been confirmed, remains essentially untested since the phenomenon that novelty enhancement was expected to attenuate was not observed. It is unclear why the current investigation failed to observe such a widely cited finding, though it is possible
that the discomfort inherent in the recording procedure discussed below may be relevant here.

Considerations in the Interpretation of IBA BP. Several factors should be taken into account regarding the current lack of replication of many of the previously reported IBA BP findings. The primary concerns in comparing the current findings with those reported previously on this topic are those dealing with differences in sample selection, composition and size. Secondary concerns are related to testing conditions and differences between testing conditions for IBA BP in this study versus Nelson & Schwartz (in press) and the previous reports germane to the topic (e.g., Schwartz et al., 1999).

Of the primary concerns regarding the sample for this study, the first of these is related to sample selection differences between the current investigation and previous research on IBA. Specifically, the sample for this study was recruited from a more heterogeneous population than the previous samples reported on in papers examining the levels of BP accuracy in biofield awareness (e.g., Nelson & Schwartz, in press; Schwartz & Russek, 1999).

These earlier studies, while drawing from the undergraduate population, generally involved upper classmen who were self-selected for participation at multiple levels since the samples were drawn from upper division Psychology courses with highly specific subject matter (Psychology 357, The Psychology of Religion and Spirituality and Psychology 456, Advanced Health Psychology), and were further self selected from these
pools, in that participation in the investigation was not a course requirement and alternative assignments could be completed in lieu of study participation. This difference in sample selection between the current and previous reports regarding IBA could easily have inadvertently selected for some set of personality traits or other individual differences related to IBA that were not assessed in any of these studies.

Another factor related to the sample included in the current investigation is that it was only 24% of the size of the sample reported on in Nelson & Schwartz (n=40 vs. n=165). This brings into question whether there was sufficient statistical power in the current sample to detect the effects reported in the previous investigations.

In addition to the above considerations of sample selection, composition and size, one must consider the degree of discomfort that subjects may have experienced in wearing an EEG recording cap for approximately 2.5 hours while performing the tasks. Since these caps are made of stretch lycra and are designed to fit snugly enough to prevent significant electrode displacement, wearing one for this duration could (and anecdotally, did) produce significant discomfort for the subjects despite the use of electrode cushions at particularly snug recording sites (e.g., FP1 & FP2). It is not difficult to conceive that this discomfort may have had some impact on IBA BP, which is an admittedly subtle task to begin with. Thus, it is possible that, as often happens in the course of scientific inquiry, the phenomenon under observation may have been significantly impacted by the means required to make certain observations.

As a final area of consideration in interpreting IBA BP accuracy in this study, one should consider differences in testing conditions as they relate to possible experimenter
effects. The previous studies reporting on IBA BP have used subjects from classes who recruited a friend or acquaintance as their subject, who then served the role of experimenter with the student serving as subject. This was typically carried out in their home environment, or the home of the friend they recruited. In this study, the experimenter and subject were unknown to each other prior to the experimental encounter and the testing situation was at a university campus laboratory rather than a home-like environment where participants would likely have felt more at ease.

Also, in relation to experimenter effects, the participants serving as experimenter/subjects in the previous investigations administered the behavioral portion of the IBAB only once each, making it a relatively interesting and novel experience. In the current study, there were 2 experimenters (1 male, 1 female) who each administered the IBAB behavioral portion twice for each subject (once in block format and once in serial format), with a total number of administrations per experimenter somewhere near 40. It is reasonable to propose that this task may have lost some of its initial novelty and become significantly less engaging for the experimenters over the course of the study (which, per experimenter report was certainly true).

Further, the experimenter/subjects in the previous studies on IBA reported a range of belief in ESP as well as varying degrees of “Energy Sensitivity”, whereas the experimenters in the current study both reported “moderate” levels of both belief in ESP and “energy sensitivity”. It is possible that this factor may have had some impact on subject’s performance.
However, in spite of the above described considerations, certain observations were replicated from the observations reported in Nelson & Schwartz (in press). The first of these that will be discussed here was the observation that there was a significant difference in BP on “local” vs. “distal” IBA tasks, with participants performing much better on tasks involving “local biofield stimulation” than on those involving “distal biofield stimulation”. This is taken here, as in Nelson & Schwartz (in press) to underline the likelihood of the involvement of an energetic component in BP, possibly a combination of thermal, sonic, or electromagnetic signals such as that described by Schwartz, Nelson, Russek, et al. (1996) who demonstrated the measurement of electrostatic body motion effects as well as an “antenna-receiver” effect, in which the human electrostatic field was shown to be differentially sensitive to the movement of another human generated field over a number of movements and distances.

The second observation from this investigation replicating the findings of Nelson & Schwartz was that while there was no correlation found between participant’s subjective estimates (SE) of their IBA BP on each task, or overall, as was observed in Nelson & Schwartz; the current sample did show a significant correlation between their ratings of their overall “energy sensitivity” (on a 0 – 10 scale) and their overall IBAB BP accuracy. This implies that these individuals were at least somewhat consciously aware of, and could report within some degree of accuracy, their actual level of overall IBA.

Given the above considerations, the fact that the findings reviewed here were replicated encourages the view that these observations are relatively robust, holding up under considerably variable testing conditions.
Electrocortical findings

Interpretation. Electrocortical findings should be interpreted here according to the partial correlations between PET derived cortical perfusion estimates (a generally accepted indicator of cortical activity) and the frequencies of the electrical activity of the sites recording EEG on the scalp above those cortical areas reported by Cook, O’Hara, Uijtdehaage, Mandelkern, & Leuchter (1998). They reported partial correlation coefficients with Positron Emission Tomography (PET) derived estimates of cortical perfusion for 6 different processing methods of EEG. The figures reported in the current report correspond to their “absolute power, linked ears reference” index. A brief description of these partial correlations will be given here to familiarize the reader with these relationships.

For the Delta range (1-4 Hz), they indicate a partial correlation with cortical perfusion of -.05 to -.15, which is significant at the p<.01 level. For the Theta range (4-8 Hz), they report a partial correlation of 0.0, which is immaterial for the current report, as no significant effects were found for the Theta range in the current study. For the Alpha range (8-13 Hz) they reported partial correlations in the range of -.22 to -.3, the largest relationship reported. For the Low Beta range (13-15 Hz), they reported partial correlations in the range of -.20 to -.23. For the Beta 1 range (15-18 Hz), partial correlations ranged from -.21 to -.23. For the Beta 2 range (18-24 Hz) the partial correlations toward the lower end of the frequency band are near -.13, and then fall into a non-significant relationship (r< .08, p> .05) at the higher end of the frequency band.
Hence, absolute power, as reported here is generally negatively correlated with PET perfusion. The primary difference of interpretation between the frequency bands is the degree of this negative relationship. In light of these facts, for the current findings, it should be kept in mind that beginning with the Alpha band, as the frequency of the band under discussion increases, an increase in power within that band does not necessarily indicate greater neuronal or cortical activity, but rather, still greater dormancy, just to a lesser intensity than one would interpret increasing Alpha power to indicate. This manner of interpretation essentially extends the usual interpretation of Alpha power (less Alpha = more cortical activity; more Alpha = less cortical activity) into the higher frequency bands, simply with a lesser magnitude of that relationship as frequency increases (see Cook, et al., 1998). The reader should keep this in mind while reviewing the results presented below.

As mentioned in the Methods and Materials section of the current report, Absolute power is usually computed as $\mu V^2$ from the individual epoch and those values are averaged across the recording time. In the present analyses, Absolute power is expressed as $\mu V$ from the individual epoch and those values were averaged across the recording blocks, this value was then squared to arrive at Absolute power ($\mu V^2$). Thus, since the squared sum does not equal the sum of squares, the values presented here are not subject to the potential distortion that can result from summing the squared values of epochs that may contain significant outliers. This should be kept in mind while reviewing the magnitude of the effects summarized and interpreted below.
Electrocortical correlates of Belief/Experience of ESP.

Beta 2 (18-24 Hz) findings. A few separate interesting electrocortical correlates of belief in/ experience of ESP were uncovered, in part, replicating the theme of the electrocortical observations reported by Pizzagali, et al. (2000). Overall, the findings fall into descriptive patterns across the frequency bands for each group, with apparently more differences across groups than frequency band, as might be expected given the discussion on interpretation given above. Therefore, following the discussion of the Beta 2 frequency band, which is related to previous research, the other findings will be discussed organized by findings for each group, rather than each frequency band, in order to offer greater coherence to the discussion.

Consistent with the findings of Pizzagali, et al. (2000), who reported increased right hemisphere source dipoles in the Beta 2 band in subjects reporting extremely high belief in ESP during an eyes closed recording condition; those individuals in the current study reporting the highest levels of belief in and experience of ESP showed higher eyes closed asymmetry scores for the Beta 2 band (see fig. 9), indicating relatively higher right sided absolute power in this band with eyes closed.

However, in the eyes open condition, this pattern only held for 2 of the three electrode pairs (FP2-1, and F4-3). In this recording condition, the group reporting the lowest levels of belief/experience evidenced higher Beta 2 asymmetry scores in the F8-7 electrode pair. Closer examination of this particular electrode pair for the low belief/experience group across eyes open and eyes closed condition shows that their asymmetry score changes sign (from negative to positive) for this pair between the two
conditions, this change of sign, though less dramatic, is also observed for this group in
Alpha asymmetry scores (see fig. 12).

The moderate belief/experience group also shows this pattern for F8-7, but in the
*opposite direction*, going from a mildly positive asymmetry score with eyes closed
(~.075), to a strongly negative asymmetry score in the eyes open condition (~ -.3).

The high belief/experience group does not show this characteristic, with
asymmetry remaining positive and stable across eyes open and eyes closed conditions
(ranging from 0 to ~ .10) indicating relatively greater right frontal Beta 2 absolute
power.

While these patterns are interesting, and certainly seem to replicate some aspects
of previously reported research, given the small magnitude of the partial correlation
between absolute power, linked ears referenced Beta 2 frequency band activity discussed
above, the findings are not as informative regarding actual cortical activity as one might
hope. Follow up analyses showed that none of the differences reported for this band
between conditions or groups were statistically significant in isolation, (all p’s >.30) and
that the interaction effect; that is, the differentially different asymmetry scores for the
sites was the primary source of the finding.

That differential difference, though, tells us relatively little about actual
processing capacity being utilized, or the amount of cortical activity present, given the
small magnitude of the unique association of this frequency range to the “gold standard”
measure of activity, PET derived perfusion. With that said, what *can* be concluded from
these differences is that during the eyes open condition, those reporting moderate
belief/experience show greater right frontal polar and lateral frontal hemispheric activity (increased right hemisphere power), while retaining a fairly balanced level of activity at the mid-frontal electrode pair. The former of these (right frontal activity) has been associated with negative affect, and to a certain extent, withdrawal rather than approach tendencies (see Coan & Allen, 2004).

However, those reporting high levels of belief/experience retain (and those reporting low belief/experience, adopt) greater relative left hemisphere activity (relatively higher right hemisphere power) in all frontal regions (polar, mid, and lateral), indicating slightly greater trait tendencies toward approach behaviors and positive affect.

**Group Differences**

Group differences across frequency bands will be discussed rather than differences within the frequency bands primarily due to the similarity of findings for each group across the frequency bands, and the similarity of interpretation required by the metric (absolute power, linked ears) used in this study (see Cook, et al, 1998).

*The High Belief/Experience Group.* This group exhibited asymmetry scores that ranged between -0.015 and 0.15 in all of the frequency bands analyzed and for all electrode pairs. This pattern of hemispheric balance indicates no significant differences in right vs. left hemisphere activity for the frontal recording sites. However, when absolute power was analyzed by site rather than electrode pair, this group tended to have the highest levels of absolute power both in Low Beta, and Beta 1, (see fig. 17 & 20,
respectively) indicating relatively lower cortical activity in the frontal lobes, and therefore, relative resting frontal disinhibition across both hemispheres. This pattern of relatively equal frontal disinhibition is consistent with the findings of Pizzagali et al. (2000) who reported decreased levels of hemispheric Omega complexity asymmetry in their high belief sample. However, with no significant asymmetry of frontal activity, one would expect no specific resting tendency toward positive or negative affect (e.g., Coan & Allen, 2004).

This expectation is at odds with certain findings reported by Pizzagali, et al., who reported that individuals reporting high levels of belief in ESP displayed a tendency toward negative affect via the trait version of the Positive and Negative Affective Scales (PANAS). However, it is completely consistent with the current sample’s responses to questionnaires administered in this study that had an affective component. Specifically, the positive states of mind scale (PSMS) failed to show any significant correlation with the linear grouping variable “Level” (see table 2). In spite of showing a significant correlation of this variable with the “Magical ideation” scale (Eckblad & Chapman, 1983), a correlation which Pizzagali, et al. also reported.

It is possible that the participant’s responses to affective items may have been influenced by their interactions with experimenters who considered these persons to be “at risk” for significant psychopathology in the Pizzagali, et al. study; and conversely uninfluenced by interactions with experimenters who considered them to be “potentially talented” in the current study. However, this is mere speculation.
The Moderate Belief/Experience ("Agnostic") Group. Electrocortical findings for the moderate belief/experience group indicate a tendency toward an affective state shift upon the transition from the eyes closed recording condition; where they tended to show near zero frontal asymmetry scores, to the eyes open recording condition; where their frontal polar and lateral frontal asymmetry scores tended to become significantly more negative than their eyes open counterparts. The direction of the affective shift in this "agnostic group" appears to be one toward a tendency to withdrawal from the environment (greater relative right hemisphere activity/ greater relative left hemisphere power, or possibly decreased right power; see Coan & Allen, 2004).

Inconsistent with this interpretation, though, is the observation that this group did not typically show this pattern of asymmetry shift at the mid frontal electrode pair, which is a commonly reported site for asymmetry scores related to affective experience (Coan & Allen, 2004). Furthermore, it is odd that this difference was apparent only in the upper frequency bands (Low Beta, Beta 1, and Beta 2) (see figs. 18, 20 & 10, respectively, noting that though the interaction was not statistically significant for the Beta 1 band \( p=.120 \), the pattern remained identical, though to a lesser magnitude than that of Beta 2) where the relationship to cortical activity is less robust than in the alpha band where the effect was also present. Though it should be noted that the pattern extended into this band (see fig. 15), the interaction by electrode pair failed to reach significance \( (p>.20) \).

This frequency range would lead one to suspect that a muscle tension artifact may be responsible for the observed differences. While this remains a possibility given that the FP2-1 and F8-7 pairs are certainly prone to muscle tension, it seems unlikely that
such an artifact would be asymmetrical and systematic enough to produce an asymmetrical effect, in the same direction, across the entire group, defined based on an "agnostic" stance toward ESP, differentially from other groups (n=8 for this interaction, all frequency bands) without appearing as an outlier to visual inspection.

In spite of the above described inconsistencies, the best interpretation currently appears to be that the "agnostic brain" underwent an affective state shift at the transition from eyes closed to eyes open recording. While mere speculation, one could suppose that this shift might possibly due to performance anxiety concerning the upcoming tasks. This experience would be less likely to occur in those high on belief/experience, or those low on belief/experience, based on their a priori beliefs and experiences regarding the task and their expectations regarding their performance on it.

The Low Belief/Experience Group. This group shows yet another pattern of changes between eyes closed and eyes open recording conditions across the frequency bands. In the lower (Delta and Alpha) bands for which significant effects were found, this group showed generally positive asymmetry scores. In the Delta range, their asymmetry scores remained above 0.0 across eyes closed and eyes open recording, with little variation. In the Alpha range, their asymmetry scores during eyes closed recording were slightly below 0.0 (~-.015), but during eyes open recording, their asymmetry scores became more positive (~+.035), indicating increased relative right hemisphere power, and thus, relatively greater left hemisphere activity, which has been generally associated
with a greater tendency toward approach behaviors and generally more positive affect (Coan & Allen, 2004).

*Overview.* It seems that since the groups reporting low belief/experience, and those reporting high belief/experience, actually appear to have more cortical markers in common (primary of these being positive asymmetry scores) these markers may indicate that the factor accounting for the apparently deviant cortical patterns observed in the moderate belief/experience group is that of *consistency* between belief and experience. The current sample did not allow for a proper statistical test of the impact of this factor in regards to electrocortical interactions as markers due to a gross violation of the assumption of homogeneity of variances that would have been present in the comparison secondary to the fact that there were only 8 subjects with inconsistent beliefs and experiences in the total sample, thus requiring the use of nonparametric statistics, which cannot analyze interaction effects such as those which would likely uncover the pattern of differences due to this factor.

So, within the limits of the analyses that were able to be completed, the overarching difference between groups does not actually appear to be between those with high levels and low levels of belief and experience of ESP, these groups showed patterns of frontal activity that was far more similar than different across the frequency bands. The group deviating in terms of frontal activity patterns appears to be the “agnostic group”, or those who are undecided on the phenomenon of ESP.
In retrospect, it makes sense that those who are convinced of a set of beliefs about a thing might react in rather similar ways to one another in comparison to those who are uncertain. In the case outlined above, it would appear that the quality of being convinced of one’s position with regard to ESP allowed the low and high belief experience groups to remain relatively unaffected by the increased salience of their situation that occurred upon opening their eyes in the laboratory. For those who doubted, one way or the other, this increased salience appears to have triggered somewhat of a negative affective shift, plausibly related to feelings of anxiety or apprehension about the experimental situation and the topic of the investigation.

Other literature in the area of frontal hemispheric asymmetry relates increased left frontal activity, as was seen in both the high and low belief groups in this study to a coping strategy known as “repressive-defensive” coping (e.g., Kline, Allen, & Schwartz, 1998). This coping style has been associated with decreased self-reported and other-reported levels of psychopathology, among other things (Kline, Knapp-Kline, Schwartz, & Russek, 2001). The patterns of frontal asymmetry activity change upon eyes open recording in the high and low belief groups in the current study indicated the possibility that the psychological defensiveness that is typically associated with strong beliefs in general may have become more active in these subjects upon eyes open recording.

Post-hoc analyses clearly showed a correlation between alpha asymmetry across all 3 electrode pairs and the report of a strong belief (including disbelief) in that direction (FP2-1: r = .57; FP4-3: r = .57; F8-7: r = .40 all p’s < .05). However, a classical defensiveness measure, the Marlow-Crowne Social Desirability Scale failed to show a U-
shaped association with the presence of a strongly stated belief or disbelief (high or low self reported belief/experience of ESP; see fig. 26), so this interpretation is not as strongly supported as that of an activation tendency in these groups upon eyes open recording.

Figure 26.

Electrocortical Correlates of IBA BP

Overview and Interpretation. As was the case for the previous electrocortical findings, the current findings are best discussed in terms of group differences across frequency bands rather than differences within the frequency bands themselves. The analyses of resting baseline recordings of frontal EEG activity with reference to performance on the close-range IBA tasks revealed an interesting pattern of results for the lower frequency bands which extended (as a pattern) into the higher frequency bands (see fig. 27).
Figure 27.

This figure shows that the groups differed most greatly in asymmetry scores in the lower frequencies of Delta and Theta, and then, as frequency increases, the group differences become progressively smaller, in terms of asymmetry scores, until at the frequency range of Beta 1 (15-18 Hz) the differences between groups are near zero. Following this, the asymmetry scores again begin to diverge at the Beta 2 range (18-24 Hz).

These group differences were only statistically significant through the Theta (4-8 Hz) frequency range (see figs. 21-25). However, the overall pattern of differences in activity across the frequency bands shown in fig. 27 suggests that a relationship may exist between performance and frontal asymmetry that extends beyond this range of activity.

Given the guidelines for interpretation provided above via Cook et al. (1998), on the surface, one could interpret the observed pattern as indicating that the near-zero
asymmetry scores across the frequency bands of the high performers on the close-range IBA tasks indicate relatively equal activity of the frontal lobes, while the other two groups showed relatively increased left cortical activity in the frontal lobes (since increased right power indicates relatively lower levels of right activity). This pattern would then suggest that those who occupied a relatively neutral, (asymmetry near zero) as opposed to a positive (higher asymmetry score) affective state during the baseline EEG recordings later tended to perform better on the close range IBA tasks, indicating greater IBA sensitivity.

However, it is curious that the source of this overall “hemispheric balance” in asymmetry in the high performing group appears to be a differentially low asymmetry score for the F8-7 pair in high performers, though this difference in isolation was only actually statistically significant within the delta band. In this case, the asymmetry seemed to be due to relatively greater delta power at F7, with F8 delta power more closely resembling that of the other groups (see figs. 24 & 25). This indicates that the left lateral frontal region in the high performers was relatively more dormant than it was in the other two groups, which is somewhat inconsistent with the interpretation above, depicting overall greater “hemispheric balance” in this group. The relatively greater dormancy at this one site, with such similar activity at the other sites suggests the absence of some function, rather than the even distribution of activity that the overall asymmetry score suggests.

A consideration of the cortical area beneath the recording site F7 brings one’s attention to the frontal region known as “Broca’s area”. This cortical region is known to
be involved with language functioning, as individuals sustaining a lesion to this area often lose the capacity for speech production. Since these were “resting baseline” recordings, no participant was engaged in an overtly verbal task, however, the levels of activity present in the baseline recordings of the other groups may suggest the presence of normal levels of subvocal verbal behavior, or ongoing “self talk”. It is therefore possible that the high performance IBA BP group was simply not engaging in this degree of verbal cognition, thus producing a relative dormancy of this cortical region.

Though mere speculation at this point, it is possible that the absence of this type of cognitive activity may be associated with individuals who are more disposed to sensory focus than thought focus in terms of their dominant “style of experience”, leading to greater levels of sensory sensitivity, which might be necessary in order to perform well on such a subtle task as even close-range IBA.

**Suggestions for Future Research**

Future research in this area should take several of the findings from the current study into account. First is the basic finding that more unique variance in belief in ESP was accounted for by a measure (the OSBES) that tapped other “religio-spiritual” beliefs and experiences than a measure of bizarre mentation, suggesting a risk factor for schizophrenia-spectrum disorders. Other questionnaire findings support the dissociation of this belief from pathology, such as the associations with decreased levels of cynicism and rigidity, and higher levels of positive “coherence” in the lives of those reporting higher levels of belief and experience of ESP.
The second basic finding from the current investigation that future research might take into account comes from the electrocortical correlates of belief in ESP. Specifically, this is the finding that those low in belief and those high on belief showed far more similar than different patterns of cortical activity. The group showing the largest differences in this investigation were those in the "agnostic" group.

The third basic finding from the current investigation that future research in this area should take into account is that "talent" for IBA and "talent" for ESP tasks are not necessarily the same phenomenon. The clear lack of correlation between performance on these tasks clearly points to this conclusion.

Finally, future research may do well to further investigate the possibility that performance on such a task as the close-range IBA tasks (and potentially the far-range tasks as well) is related to decreased levels of "self talk", as a marker of a more "sensory focused" experiential style. These variables will likely prove to be valuable predictors of such performance in future studies. In relation to this question, there is some possibility that anterior vs. posterior differences in asymmetry scores may be informative in assessing predispositions to good vs. poor performance on this sort of task. While these questions were not addressed presently, they should be considered in future research in this area.

Additionally, there are some lessons that can be learned from the failures of the current investigation. Some things that might have lead to a more accurate replication of the previous work on IBA in the current investigation follow.
The first of these is that it might have been a good idea to recruit subjects in pairs, to more closely resemble the conditions of the first studies reporting on IBA. Instead of having experimenters administer the task approximately 40 times each, it might have been better to recruit pairs of friends or acquaintances, and have each one play the role of administer and responder. In this scenario, the experimenter would have simply been responsible for administrative and technical tasks related directly to data acquisition, rather than these duties as well as task administration.

Also, it might have been a better idea to conduct data collection from the subjects on two occasions, rather than one. The order of task administration format could have been counterbalanced between the sessions to prevent ordering or practice effects, just as it was here, but it may have decreased the discomfort of the participants, as they would have to wear the electrode cap for only half as long, and therefore may have increased their comfort levels allowing for greater relaxation and possibly increased sensitivity. Another way to accomplish this end might have been to use a less restrictive method of electrode placement, such as a gel-cap, or individual electrode fixation, while there are additional complications to using these methods of electrode attachment, they would have afforded a greater degree of participant comfort than the stretch lycra cap employed in the current investigation.
APPENDIX A
Instructions for Integrative Biofield Awareness Battery (IBAB)

Hand Detection:
Instruct the subject to sit with their hands “palm up” resting to the outside of each knee with their eyes closed (this is extremely important, a blindfold with cotton balls is actually preferable). When they have done this, you (the experimenter) will say:

“I am going to place my hand over one of your hands, When I ask you to, I would like you to tell me which of your hands my hand is over.”

According to the randomization scheme, you will place your dominant hand (“handedness” hand) approximately 6-8 inches above the hand of your subject. Facing them directly, you will look at their nose and say:

“Which of your hands do you feel my hand over?” Keep your hand in place until a response is given.

Record the “actual” and the “response” on the data sheet provided. DO NOT PROVIDE FEEDBACK UNTIL THE END OF ALL TRIALS OF ALL TASKS.

Block Administration:
Complete 10 trials of this task in succession before proceeding to the next task

Serial Administration:
After each trial of this task, proceed to the next task until you have completed 10 trials of each task.

Face / Stomach Discrimination
Have the subject stand up with eyes remaining closed (or blindfolded) with their hands at their sides, say:

“Now I am going to focus on either your face or your stomach, When I ask you, I would like you to tell me which area I am focusing on.”

Standing approximately 3 feet in front of the subject, you should focus on either their face or stomach (as determined by the coin flip for randomization). While maintaining focus on the face or stomach you will ask:

“Am I focusing on your face or your stomach?” Hold your focus until a response is given.

Record the “actual” and the “response” on the data sheet provided. DO NOT PROVIDE FEEDBACK UNTIL THE END OF ALL TRIALS OF ALL TASKS.

Block Administration:
Complete 10 trials of this task in succession before proceeding to the next task

Serial Administration:
After each trial of this task, proceed to the next task until you have completed 10 trials of each task.

**Ear Detection:**

Have the subject sit back down (eyes remaining closed or blindfolded) and say:

"Now I am going to stand behind you and hold my hand near one of your ears, when I ask you, I would like you to tell me which of your ears my hand is near."

Move behind the subject and place your dominant hand approximately 6-8 inches from the subject’s left or right ear (as determined by coin flip and the randomization scheme). While looking directly at the center of the back of the subject’s head, say:

"Which of your ears am I holding my hand near?" Keep your hand in place until a response is given.

Record the "actual" and the "response" on the data sheet provided. DO NOT PROVIDE FEEDBACK UNTIL THE END OF ALL TRIALS OF ALL TASKS.

**Block Administration:**

Complete 10 trials of this task in succession before proceeding to the next task.

**Serial Administration:**

After each trial of this task, proceed to the next task until you have completed 10 trials of each task.

**Staring Sensing:**

Have the subject remain seated, say:

"When I ask you, I would like you to tell me whether I am staring at you or not."

After checking the randomization scheme, you will either stare at the subject or close your eyes (as determined by the randomization scheme). After fixing your gaze or closing your eyes, ask:

"Am I staring at you?" Continue to stare or keep your eyes closed until a response is given.

Record the "actual" and the "response" on the data sheet provided. DO NOT PROVIDE FEEDBACK UNTIL THE END OF ALL TRIALS OF ALL TASKS.

**Block Administration:**

Complete 10 trials of this task in succession before proceeding to the next task.

**Serial Administration:**

After each trial of this task, proceed to the next task until you have completed 10 trials of each task.

**Head / Back Discrimination:**

Have the subject stand up again and say:
“Now I am going to stand behind you and focus on either the back of your head or the small of your back, when I ask you, I would like you to tell me which of these areas I am focusing on.”

Move behind the subject, approximately 3 feet away. As determined by the randomization scheme, focus on either the center of the back of the subject’s head, or the small of the subject’s back (the area just above where the middle belt loop would be on a pair of jeans). Then say:

“Am I focusing on your head or back?” Hold your focus until a response is given.

Record the “actual” and the “response” on the data sheet provided. DO NOT PROVIDE FEEDBACK UNTIL THE END OF ALL TRIALS OF ALL TASKS.

**Block Administration:**
Complete 10 trials of this task in succession before proceeding to the next task

**Serial Administration:**
After each trial of this task, proceed to the next task until you have completed 10 trials of each task.

**Movement Anticipation Sensing:**
The subject may open their eyes (or remove the blindfold) for this task. Say:

“I am going to stand here (a place about 3 feet away) close my eyes and begin to move one of my hands (prior to this, your hands should be hanging at your sides). When I ask you, I would like you to tell me which hand I am going to move.”

Now, according to the randomization scheme, you should “move” (but take a week to do it; i.e., DO NOT ACTUALLY MOVE YOUR HAND!!) either your left or right hand and say:

“Which of my hands will move?” Continue to “take a week to do it” until a response is given.

Record the “actual” and the “response” on the data sheet provided. DO NOT PROVIDE FEEDBACK UNTIL THE END OF ALL TRIALS OF ALL TASKS.

**Block Administration:**
Complete 10 trials of this task in succession before proceeding to the next task

**Serial Administration:**
After each trial of this task, proceed to the next task until you have completed 10 trials of each task.
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