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**Maier, Michaeleen Constance**

**CORRELATED HEMISPHERIC ASYMMETRY IN THE SENSORY AND ESP  
PROCESSING OF EMOTIONAL AND NONEMOTIONAL VIDEOTAPES**

*City University of New York*

PH.D. 1983

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**CORRELATED HEMISPHERIC ASYMMETRY IN THE SENSORY AND ESP  
PROCESSING OF EMOTIONAL AND NONEMOTIONAL VIDEOTAPES**

by

**MICHAELEEN MAHER**

A dissertation submitted to the Graduate Faculty  
in Psychology in partial fulfillment of the  
requirements for the degree of Doctor of  
Philosophy, The City University of New York.

1983

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1983

This manuscript has been read and accepted for the Graduate Faculty in Psychology in satisfaction of the dissertation requirement for the degree of Doctor of Philosophy.

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The City University of New York

**Abstract****CORRELATED HEMISPHERIC ASYMMETRY IN THE SENSORY AND ESP  
PROCESSING OF EMOTIONAL AND NONEMOTIONAL VIDEOTAPES**

by

**Michaeleen Maher****Adviser: Professor Emeritus Gertrude Schmeidler**

EEG alpha was monitored from bilateral temporal-parietal sites while 10 male and 10 female dextrals attempted to use ESP to fathom the contents of two videotapes which were played, in random order, in a distant room. After each ESP session, subjects reported their mentations. Subsequently EEG alpha was monitored while subjects viewed the videotapes (again randomly sequenced) on a TV monitor. One of the videotapes contained material with emotion inducing properties, while the other videotape was generally devoid of emotional content. An ANOVA showed a marginally significant effect of greater relative right hemispheric processing for males when viewing the emotional as compared to the nonemotional videotape, while females' data showed nonsignificant tendencies toward the converse hemispheric activation pattern. Trends in the ESP data were similar to those in the sensory data. A repeated measures ANOVA for males' and females' sensory and ESP data showed a significant tape x hemisphere x sex

interaction ( $p < .05$ ).

Although when subjects attempted to match their mentations to the videotapes, results were at chance, one of two outside blind judges exhibited extrachance accuracy in matching the mentation reports to the videotapes ( $p < .015$ , two-tailed).

Differences in individuals' mean laterality indices for processing the two videotapes in the sensory condition were suggestively correlated with their respective differences in processing the two videotapes in the ESP condition ( $p < .07$ , two-tailed). A separate correlation for nine subjects whose mentations were correctly matched to the videotapes by all three judges (the subjects themselves and both outside judges) was both significant ( $p < .03$ , two-tailed) and significantly higher than the asymmetry correlation for the subjects whose mentations had shown a mixed pattern of judging, or whose mentations had been incorrectly matched to the videotapes by all judges. The data demonstrate converging lines of evidence for conscious and unconscious ESP.

Eysenck's theory which predicts that extraverts should produce significantly more alpha than introverts because of characteristically lower levels of arousal than introverts, was supported by significant positive correlations between extraversion and alpha abundance. Subjects' extraversion, however, did not correlate with their psi success.

In memory of my mother and father,

CONSTANCE LOVELAND MAHER

A self-educated woman who authored a novel, Veronica  
and the biography of an Indian guru, Ocean in a Teacup

and

CAPTAIN EUGENE HUGH MAHER

An Annapolis graduate, who became a "cold water expert"  
in arctic navigation. As the Commanding Officer of our  
Little America bases in Antarctica, he wintered over with  
many scientists during the International Geophysical Year.

a k a s

"Connie" and "Pat"

Both of whom followed my experiments with enthusiasm, but  
neither of whom lived to see the fruition of this project.

### Acknowledgments

The experiment is over. I am both happy and sad --glad to be free of the thousands of carnivorous details, but feeling some pangs of withdrawal from what has been, for some time, the central and most pressing focus of my life. I am left deeply indebted to a number of persons, without whose generous assistance or gifted expertise, this project would surely have floundered.

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Professor Howard Ehrlichman, who didn't believe in my ESP hypothesis, did believe, more importantly, in my prerogative to test it scientifically. His laboratory, his wise and timely counsel, and his creative intelligence, did much to steer and channel this experimental vessel into the harbour of discovery.

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Jack Barrett and Dr. Marge Wiener were the very kind and expert guides who indoctrinated me into the mysteries of alpha monitoring (including polygraph calibration; brain tapes--"the music of the hemispheres"; ink spills; unfathomable integrators; and Grass electrode cream).

To my subjects and judges, who proved at least this once that psi is possible, I will always be grateful.

For Wendy Clark, who inspired The Love Tapes, and Hilary Harris, who created Organism, (the videotapes which helped it all to happen), I express my admiration and respect.

To my children, who remained loyal if neglected, I extend sincere apologies.

And I thank the five members of my Dissertation Defense Committee,

Professor Emeritus Gertrude Schmeidler  
Professor Howard Ehrlichman  
Professor Louis Gerstman  
Professor Florence Denmark  
Dr. Lawrence LeShan

. . . who accused me of being too conservative in presenting my results, and who demanded that I . . .

SPREAD MY WINGS AND FLY

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## INTRODUCTION

### Historical Background

#### Hemispheric Asymmetry of Function

Specialized functioning of the human cerebral hemispheres plays a major role in cognitive activity. This fact has been well documented since Marcel Dax, in 1836, first noted the coincidence between speech defects and lesions in the left half of the brain (Oppenheimer, 1977). Although the asymmetric functioning of the hemispheres has been extensively studied, it has been difficult to achieve a full theoretical perspective regarding the contribution each hemisphere makes to ongoing mentation. Problematical to a careful evaluation of the unique processing components of each hemisphere have been (1) difficulties in integrating the results of data obtained and analyzed by diverse techniques and methodologies; (2) individual and sex differences in the cognitive components of neural organization (Witelson, 1976; Charman, 1979; McGlone, 1980; Levy, 1981); (3) the effects of motivation, context, and psychological set in modifying or altering hemispheric response proclivities (Gruber and Segalowitz, 1977; Kinsbourne, 1970); (4) incomplete specification of parameters such as handedness and familial sinistrality and their role in the genetic

organization of the brain (Hardyck and Petrinovitch, 1977); (5) a general failure to interpret findings with a view toward the hierarchical ordering of cognitive events (i.e., with sufficient parsimony) (Luria, 1973; Sidtis, 1980); (6) a failure to experimentally address potentially relevant factors such as the activity vs. passivity dimensions of the task, and the discrete vs. continuous nature of the stimuli (Moore and Haynes, 1980); and (7) fundamental limitations inherent in any neuropsychological approach which is constrained to extrapolate the significance of brain events from observable human behaviors.

In spite of significant theoretical difficulties, however, some robust convergence in the data has allowed us to be reasonably certain of a few basic tenets of functional brain asymmetry. Within a model for which the classical prototype is the brain of a male dextral who has no familial history of sinistrality, the portrait which has emerged is that of a left hemisphere specialized for verbal, abstract, analytical processes, as well as tasks requiring temporal sequencing such as mathematical calculation, and a right hemisphere specialized for simultaneous gestalt abilities such as facial recognition, manipulospatiality, depth perception, recognizing rotated forms, performing on visual and tactile mazes, and other forms of holistic processing. We will briefly review some of the relevant early contributions to the field,

and discuss the major techniques which have been used to derive our still rudimentary model of biparous brain activity.

The first significant advances in the localization of brain function were made by Broca in 1861, who localized motor (expressive) speech in the posterior portion of the left inferior frontal gyrus; by Wernicke, in 1873, who localized speech comprehension in the posterior portion of the left superior temporal gyrus; and by Dejerine, in 1891, who demonstrated that loss of reading comprehension and writing depended on left unilateral lesions (Luria, 1973). In accord with the language related aspects of these early discoveries, subsequent investigation tended to focus on left hemisphere language functions. Man's unique ability to cognize information and communicate via complex grammatical coding was presumed to dominate cognition, and concepts like "dominant" or "major" emerged to describe the hemisphere thought to be the repository of all language skills. The holistic gnostic processes residing in the "subordinate" or "minor" hemisphere (usually the right) were generally ignored by early researchers in the field.

Data accumulated from several avenues of inquiry. Cerebral pathology, contributing as it did to the initial formulation of the concept of the lateralization of human brain function, continued to yield the major share of information. Perceptual deficits observed in soldiers

with lateralized brain wounds during World War I, and in patients undergoing surgery for lateralized tumors, were evaluated with regard to the site of pathology and the patient's handedness.

It had long been recognized that the primary neural locus for sensory and motor impulses resides in the contralateral hemisphere. This interesting fact was noticed by the early Greeks, who wrote in the Hippocratic Corpus (circa 400 B.C.) that wounds on one side of the head produce spasms on the opposite side of the body (Benton, 1964). Now the strong interdependence of handedness and contralateral specialization for verbal processes became evident. But that no perfect relationship existed, was revealed by the many cases of "crossed aphasias", (i.e., patients showing verbal impairment with brain injury ipsilateral to the preferred hand) (Luria, 1973). However, with nearly all right handers and approximately one-half of all left handers, the language hemisphere was consistently demonstrated to be the left.

As research progressed, hemispherectomy patients provided further insight into the cognitive deficits sustained by the loss to consciousness of either hemisphere (Smith, 1974). More recently, studies with split brained individuals (Sperry, 1968; 1974), whose corpus callosal connections have been severed in an attempt to control massive epileptogenic seizures, have immeasurably advanced our knowledge and provided the necessary impetus toward

the exploration of lateralized functioning with normal subjects. As the existence of pathology has obvious implications in denoting an abnormally functioning brain, research with normals is a very welcomed trend, and we will briefly review some of the pertinent findings.

Several techniques have been widely used with normals to investigate lateral differences in processing various types of stimuli. Tachistoscopic presentation of material to the right or left of a central fixation point for less than 200 ms (generally 150 ms or less are used), insures that the stimulus information will initially arrive in the hemisphere contralateral to the field of presentation. Kimura and Durnford (1974) found that a number of basic visual tasks, including perception of line orientation, stereoscopic depth perception; visual point location; and dot enumeration were more accurately performed when the stimuli were presented in the left field than when they were presented in the right field, suggesting right hemisphere specialization for these these types of tasks. In earlier research with the same technique, Kimura (1966) had found that letters were recognized better when presented in the right visual field, corroborating left hemisphere involvement in the identification of language components. Rizzolatti, Umilta, and Berlucchi (1971), using choice reaction time as a dependent variable, found a superiority of the right visual field when the stimulus was a letter and superiority of the left visual field when

the stimulus was an unknown face.

Dichotic listening, another technique which has proven successful in establishing hemispheric dominance for verbal and nonverbal material, has been widely employed. Unlike the visual system, the afferent fibers of the auditory system project from either cochlea to both hemispheres, with approximately a 60/40 split favoring the contralateral hemisphere. Dichotic stimulation, in which competing stimulus information is presented via headphones simultaneously to the two ears, is required to elicit reliable ear differences for specific material. Kimura (1964) used this technique to show a right ear advantage for the recall of digits and a left ear superiority for music. Darwin (1971) found a left ear superiority even for a "verbal" stimulus when the task to be performed was not linguistically significant, suggesting that response factors may influence which ear attends to a stimulus, and that the right hemisphere may be specialized for the processing of all nonlinguistic sound. Shankweiler and Studdert-Kennedy (1967) reported a right ear superiority for recall of consonant-vowel-consonant nonsense syllables of which only the initial stop consonant was different. Their results indicated that although consonants were identified better by the right ear, vowels were not. Darwin (1971) found an advantage for the right ear with fricative consonants only when the fricative was followed by a final syllable,

suggesting that stimulus conditions were important in determining the ear advantage, and that this effect could not be attributed wholly to response mechanisms.

Broadbent (1971) demonstrated that the left ear was more proficient than the right in the recall of passages of music presented dichotically. Environmental sounds have also been shown to be processed more accurately when presented to the left ear (Curry, 1967).

Tactual discrimination tasks have been used to ascertain hemispheric differences in processing various types of stimuli. Preilowski and Sperry (1972) found an unexpected minor hemisphere dominance for letter and word percepts with bilateral competitive input in the tactual mode when a verbal response was required. Dominance was reversed for the same task, however, when the response required was stimulus identification via pointing.

EEG asymmetry has also been employed as a measure of hemispheric differences in function. In evoked potential and bilateral EEG studies, relatively greater left hemisphere activation has been shown for verbal and mathematical tasks, while visuospatial tasks and musical tasks have elicited relatively greater right hemispheric participation. Bilateral alpha production is often used as a measure of hemispheric differences in activation. Shifts in the ratios of left/right hemispheric alpha production for specified tasks can be used to infer hemispheric specializations for the tasks.

The inference here is that the more quiescent a hemisphere, the more abundant will be its alpha production, and conversely, the more active the hemisphere, the less abundant will be the alpha it produces.

Galín and Ornstein (1972) recorded bilateral EEG from left and right temporal and parietal leads while subjects performed a battery of verbal and spatial tasks. With alpha power converted to a ratio of right over left, significant differences were demonstrated for both sets of leads in the form of higher ratios for verbal than for spatial tasks. McKee, Humphrey and McAdam (1973) recorded integrated alpha activity over each hemisphere while subjects performed three verbal and one musical task. Relatively greater alpha activity was found over the right hemisphere for all tasks, with verbal tasks eliciting smaller L/R ratios in correspondence with their level of difficulty. Self-generated covert mental activity has been shown to similarly engage the hemispheres. Ehrlichman and Wiener (1977) found hemispheric asymmetries on a wide range of self-generated tasks which differed along a continuum ranging from relatively greatest left hemisphere involvement in multiplication to relatively greatest right hemisphere involvement in meditation. Ehrlichman and Wiener proposed that the content dependent bipolar active verbal-non-verbal dimension might better be characterized by a process oriented unipolar presence-versus-absence of verbalization dimension.

The many studies with normal subjects using these various techniques have essentially corroborated early reports in the brain-damaged literature regarding the nature of hemispheric specialization. Whether the experimental differences noted have accrued from a difference in processing capacity (i.e., left hemisphere "sequential" vs right hemisphere "parallel" processing, as suggested by Cohen, 1972), or could best be characterized by differences between "primary process" and "secondary process" thinking (Bakan, 1971), or indeed represents an "active-generative" vs "passive-receptive" dimension, and a "presence vs absence of verbalization" dimension (Ehrlichman and Wiener, 1977), remains for future research to clarify. When reviewing reports of hemispheric specialization of cognitive function we would do well to remember that " . . . scientific description of isolated peripheral aspects of the process of consciousness, for example, particular features of speaking or writing, is no way to understand it," (Trevarthen, 1974). Penfield (1968), whose extensive work with electrical brain stimulation techniques is well known, put it a different way, " . . . a neurosurgeon very soon gains the impression that in dealing with the cerebral cortex he is still at a distance from the highest level of integration." Again, Sir John Eccles has repeatedly warned " . . . we should not pretend that consciousness is not a mystery." (Honorton, 1975).

### Lateralization Effects in Processing Human Emotion

Of late, the hemispheres have become increasingly implicated in the asymmetric processing of human emotion. The idea that the right hemisphere plays a special role in affective processing was first proposed by Hughlings Jackson (1879), who noted that language impaired patients continued to express emotion by varying the pitch, tempo and tone of their interjections. Early interest in the EEG correlates of human emotion led to a fruitless attempt by J. W. Theisen in 1943 to relate changes in the EEG to forms of emotional arousal. Using frontal and occipital leads, he found no significant differences in intra-individual variation in the character of brain potentials when subjects shifted from relaxation to emotional excitement as compared to a control period in which subjects showed no evidence of excitement. Although of historical interest, the focus of Theisen's research, as well as his methodological approach render his findings inapplicable to the concept of possible asymmetry in the hemispheric processing of human emotion. And more recently, evidence for a relative right hemispheric involvement in human emotional responsivity has accumulated from widely divergent methodologies. Because this literature is of particular interest to the present study, we will survey some of the relevant findings in some detail.

Greater relative right hemispheric participation in emotional processing was indicated in the data of

Schwartz, Davidson and Maer (1975), who reported that significantly fewer right eye movements and more left eye movements resulted when subjects were asked affectively laden questions. Although many investigators have employed an eye movement paradigm to infer hemispheric differences in activation, this work remains controversial and has been succinctly criticized by Ehrlichman and Weinberger (1978).

Using dichotic listening procedures, Carmon and Nachson (1973) presented all possible pairings of nine nonverbal sounds (the crying, laughing, and shrieking of an adult male; an adult female; and a child) simultaneously to the two ears. Subjects responded nonverbally, by pointing to the correct pictorial representation of the emotional voices on a cartoon display. They were instructed to report the right ear stimuli with their right hands and the left ear stimuli with their left hands. A slight but significant left ear superiority for the identification of these nonverbal voices was demonstrated. However, while the authors discuss their avoidance of requiring subjects to make a verbal response in order to preclude any bias favoring the right ear, they nevertheless fail to address the possible manipulospatial bias favoring left ear/left hand responding, which may have been introduced into the experiment by requiring a manual identification (Gazzaniga and Le Doux, 1973). King and Kimura (1972) also found a left ear superiority

for the identification of emotional human sounds in a study which required subjects to match the dichotically presented voices with delayed binaural presentations of four different stimuli. The results of these authors would appear to support the idea that the initial conditions of perception determine the type of information stored in the memory trace (Belmore, 1981). Haggard and Parkinson (1971) presented emotionally intonated sentences monaurally, masked by dichotically presented babbling sounds. They found a slight left ear superiority for the identification of the intonation carried by the sentences, when subjects subsequently chose among alternatives indicated on a verbal response sheet.

With tachistoscopic presentation to the right or left visual fields, and a same/different paradigm, Ley and Bryden (1979) found a clearly superior left visual field accuracy (suggesting a right hemisphere advantage) when subjects judged the emotional expressions of cartoon line drawings which depicted the very happy, neutral and very sad faces of a man, woman and child. The authors argue that their results support a specific involvement in emotion by the right hemisphere because the left visual field effect was much larger for the emotional stimuli than it was for the neutral ones. Suberi and McKeever (1977), also found significantly faster reaction time responses when 72 females recognized emotional faces presented in the left, as opposed to the right visual

field. Also in this study, significantly less left visual field superiority was demonstrated when subjects recognized nonemotional faces, although the left visual field retained a significant advantage when compared to the right visual field. The results of these studies offer encouraging support to the authors' hypotheses of a right hemisphere involvement in emotional processing, because they suggest that the right hemisphere advantage accruing from the emotional component of the task was effectively discriminated from the right hemisphere advantage for facial recognition per se (Rizzolatti, Umiltà and Berlucchi, 1971; Geffen, Bradshaw and Wallace, 1971; Hilliard, 1973; Patterson and Bradshaw, 1975; Klein, Moscovitch and Vigna, 1976; Moscovitch, Scullion and Christie, 1976). In another experiment examining forced choice reaction time for recognizing stimuli comprised of emotional faces; neutral faces; emotional words; and neutral words, Hansch and Pirozzolo (1980) found that only the facial emotion condition produced a significant visual field advantage in favor of the left visual field.

Safer and Leventhal (1977), in a particularly interesting study, examined the salience of tone of voice as opposed to content cues when subjects rated spoken passages heard in either their right or left ears. Positive, negative and neutral content cues were crossed with positive, negative and neutral tone cues to make nine tone and content combinations. In this study, 29 of

36 subjects who listened with the left ear were primarily influenced by the emotional tone conveyed by the stimulus passages in making their ratings, while 21 of 36 subjects primarily used content cues to make judgements after listening with their right ears (a result significant at  $p < .01$ ). McKeever and Dixon (1981) using manual reaction time with tachistoscopic presentation required discriminations of two memorized faces from 64 subjects divided into groups according to sex and type of discrimination instructions employed. Stimuli memorized with highly negative affective imagery instructions (extreme sadness was suggested) were predicted to show left visual field superiorities in women, while stimuli memorized with neutral imagery instructions (a composed feeling was suggested) were not. Males were expected to show left visual field superiorities for discrimination of the faces, regardless of the instructional set employed, because of males' presumed right hemisphere dominance for visual spatial functions. Females confirmed the authors' predictions, while males did not. However, post experimental semantic differential ratings of the perceived emotionality of the memorized faces (regardless of set) revealed that, common to both sexes, left visual field superiority prevailed for the faces rated as emotional. The authors concluded that "...right hemispheric memory storage of faces can be induced in females through affective imagery and in both sexes via idiosyncratically

perceived emotionality in the face stimuli", and that  
"..this effect of affectivity cannot be attributed to  
visual-spatial dominance of the right hemisphere".

Dimond and Farrington (1977) measured changes in heart rate in 21 normals while showing three films to either the left or right hemisphere with the use of a contact lens device which restricted input to the hemifields of a single hemisphere. Because response to the stimulus (i.e., filmic material) is likely to be attenuated when viewed on the second occasion, the authors did not attempt to compare responses from both visual fields in the same subject. The three films were shown to provoke different levels of emotion, as measured by heart rate changes. A Tom and Jerry cartoon provoked an elevated response when shown to the left hemisphere as opposed to the right, while the film of a surgical operation showed an enhanced response from the right hemisphere. A travel film showed no significant differences in reaction between the hemispheres. Subjects subsequent ratings of the films as humorous, pleasant, unpleasant, or horrific revealed that the Tom and Jerry cartoon and the surgical operation film were both rated as more horrific and unpleasant after being viewed by the right hemisphere. According to the authors, the genuinely enhanced response from the right hemisphere triggered by the unpleasant surgical film suggests that "..this kind of emotional experience is more sensitively received" by the right hemisphere and lends

"credence to the view that the right hemisphere plays a special role in what is commonly regarded as 'emotion'."

More recently, Ross and Mesulam (1979), and Ross (1981) have presented clinicoanatomic evidence suggesting that the affective components of language, including prosody and emotional gesturing, are functionally organized in the right hemisphere. Earlier observations by Larsen, et al. (1978), who demonstrated that increases in regional blood flow during automatic speech take place in both classical left and homologous right hemisphere areas, provide support for Ross and Mesulam's contention that "...the functional-anatomic organization of affective language processes in the right hemisphere mirrors that of propositional language in the left hemisphere." This author concurs that the data from these experiments strongly supports the notion of right hemisphere specialization for human emotional responsivity, and this potentially fruitful area deserves much further scrutiny.

#### Lateralization Effects in FSP Processing

Research in the lateralized functioning of the hemispheres has generated considerable interest and some research in lateralized aspects of extrasensory functioning. The idea that the right or nonverbal hemisphere plays a special role in processing extrasensory material has been entertained by many psi theorists. This concept was originally advanced by Myers (1885), who drew attention

to similar difficulties in communication evidenced both by patients suffering from agraphia or aphasia, and subjects engaged in automatic writing. Myers believed that, in both cases, the right hemisphere took over and was primarily responsible for receiving and mediating the cognitive material. Similarly, Ehrenwald (1977) has noted the striking correspondence between the drawings of telepathic percipients and those of left hemisphere damaged patients, and suggested that the telepathic subject, like the patient suffering from optic agnosia, uses his right rather than his dominant left hemisphere for comprehending and organizing the stimulus material.

Braud and Braud (1975; Braud, 1975; 1978) in assessing evidence on the different proclivities of the hemispheres have postulated the existence of a psi-conductive syndrome, affiliated with right hemispheric functioning, and a psi-antagonistic syndrome, associated with left hemispheric functioning. Physiological concomitants of the psi-conductive syndrome would include reduced EMG activity; low frequency, high amplitude EEG (alpha, alphoid, theta); reduced heart rate, blood pressure and GSR activity; increased BSR; reduced oxygen consumption; reduced breathing rate and reduced blood lactate level. Psychological characteristics of the psi-conductive syndrome would encompass diffuse attending; paralogical thought processes; decreased boundary perception; dominance of the sensory over the formal; and decreased negative emotionality such as anger,

or anxiety. Phenomenologically, the psi-conducive syndrome would manifest itself in a more inward focusing of attention; changed time sense; increased emphasis on the unity and relationships of things, and decreased analysis, interpretation and judgement. The psi-antagonistic syndrome would comprise the converse physiological characteristics and manifest itself psychologically in focused attending, logical thought processes, increased boundary perception, dominance of the formal over the sensory, and functional increases in verbal, mathematical, temporal, abstract, analytical, linear, digital, rational, and conscious processes. Normal body awareness, outwardly focussed attention, and emphasis on the individuality and uniqueness of things (as well as mundane experiences and "wandering mind") would phenomenologically accompany the psi-antagonistic syndrome.

Seeking empirical validation of this theory (1977), the authors manipulated left and right hemispheric functioning with a subject population of right handed male college students. In the psi-antagonistic condition, students listened to and performed mental operations during 23 minutes of tape recorded "analytical" material presented via stereo headphones. This was followed by a five minute psi impression period, where it was presumed that an active, analytical, interpretive set would interfere with effective psi functioning. The ESP task was the correct ranking of a color slide which had been randomly chosen

and viewed by a sensorially isolated agent during the psi impression period. A "hit" was considered a ranking among the top three for the target slide, out of a pool of six slides. In the psi-conducive condition, another group of right handed male students listened to a "non-analytical" tape which included music and natural environmental sounds. This tape was expected to induce a receptive, non-analytical, non-interpretive set which would facilitate psi functioning during the subsequent psi-impression period. A questionnaire assessing other state or subject variables which might themselves affect psi performance was also administered. Results were consistent with the experimenters' predictions. Data from the "right-hemisphere" group revealed scores that were significantly above chance, while data from the "left-hemisphere" group showed scores either at chance or significantly below chance. The two groups did not differ on any of the sixteen possibly confounding variables tapped by the questionnaire.

In another experimental attempt to link right hemisphere functioning with ESP success, Broughton (1976) found a left hand (right hemisphere) advantage in the correct selection of three dimensional telepathically sent target shapes when subjects' left hemispheres were presumably occupied with a distracting task. He reasoned that the right hemisphere of the brain was better at a receptive type of ESP, and that inhibition or "noise"

from the left hemisphere would best be kept out of the way by engaging it in an appropriate activity (in this case, reading aloud from law reports held in the subjects' right hands). Maher and Schmeidler (1977; Maher, Peratsakis and Schmeidler, 1979) took an opposing theoretical position. They argued that Broughton's use of three dimensional tactile shapes as ESP targets had disadvantaged potential left hemispheric ESP functioning, and proposed that, with appropriate verbal targets and a right hemisphere distracting task, the left hemisphere might also be capable of ESP success. In an experimental extension of this position, they found a significant right hand (left hemisphere) advantage in the correct ESP selection of verbal targets when subjects' right hemispheres were concurrently occupied with a competing task (locating and tracing visual motifs). Significant sex differences consistent with nonparapsychological findings in laterality research were also found, although these had not been the focus of the investigation. Significantly higher scores from males, while making right handed choices of words during pattern recognition ( $p < .006$ ), and also when these scores were pooled with scores in the mirror image of this condition (i.e., while making left handed choices of concrete target objects while solving syllogisms ( $p < .007$ ), indicated that males may have derived greater benefit from the procedures used to facilitate the specialized functioning of the hemispheres. Females' scores, while in the same

direction as the males', failed to achieve significance for either condition or for the two conditions pooled. This finding is consistent with research suggesting that hemispheric specialization may be more complete in males (Witelson, 1976; Trotman and Hammond, 1979; McGlone, 1980; Levy, 1981). Based on subjects' introspective comments, the authors determined that the left hemisphere task of solving syllogisms may have caused a psi-inhibitory mood of anxiety or apprehension in many of the subjects, and contributed to the failure of the visuospatial ESP task to elicit independent extrachance scoring, as had been expected.

A replication of the experimental procedure was attempted (Maher, Peratsakis and Schmeidler, 1979), using the same method save for two features. In the replication experiment, only male dextrals were used as subjects, in order to take advantage of the greater degree of specialization in males' hemispheric processing. A left hemisphere distracting task of looking up words in the dictionary and reading aloud their definitions (presumably a non-threatening task for the undergraduate students) was substituted for the anxiety arousing syllogisms. The replication, taken alone, failed to find significant evidence of psi scoring, but when scores from the seven male dextrals in the former experiment were combined with scores with the 24 male dextrals in the replication experiment, a significant difference was noted

between the conditions expected to facilitate psi processing and those expected to maximally impede such processing ( $p < .03$ , two-tailed). When females' scores from the first experiment were added to the analysis, and a similar comparison was made between maximally facilitated and maximally impeded conditions, the results suggested that the effects of the lateralization procedures were exhibited in the psi scores of females as well as males ( $p < .02$ , two-tailed). The authors supported their pooling of subjects over the two experiments by citing Tversky and Kahneman (1971), who have drawn attention to the paradoxical nature of the convention requiring independent statistical significance in a replication study, and have discussed the disturbing double standard accruing from this convention whereby ". . . the same data that would increase our confidence when viewed as part of the original study, shake our confidence when viewed as an independent study." Sampling theory predicts that a randomly selected sample may not, in fact, possess all of the essential characteristics of the population from which it is drawn. This in some cases may lead to an invalid rejection of the null hypothesis (Type I error), and in other cases may lead to the failure to confirm a genuine effect (Type II error). Pooling the results of all known studies of a given type should reduce the effects of sampling biases, and help to determine if significant

results from an experimental manipulation truly reflect genuine effects which can be generalized to the population as a whole.

Sex differences were independently found and reported by Broughton (1977). In a further attempt to explore brain hemisphere differences in psi functioning, Broughton had subjects respond to the onset of a 1 kHz tone (presented bilaterally via headphones), by pressing a button with either their right or left hands. Hand order was randomly determined for blocks of trials. In a different room, subjects' friends (acting as agents) either received a tone 250 ms before the subject did (ESP trials), or received the tone after the subject had already responded to it (control trials). Subjects and agents were told only that the experimenter was ". . . looking for a relationship between their scores, and that they should respond as quickly as possible." The first experiment produced no significant differences in mean reaction times as a function of hand or advance warning condition. However, a second experiment, in which he required subjects to read law extracts while awaiting the onset of the tones, showed a significant interaction between the right vs. left hands, and the advance vs. control conditions. This resulted from shorter left hand mean reaction times on trials when subjects' friends received advance warning than on control trials, and longer right hand mean reaction times on trials when

advance warning was given as compared with control trials. Separate analyses of variance revealed that the strength of the laterality interaction was derived from males' data, where the interaction was significant at  $p < .05$ . Females' data, when taken alone, did not show the laterality effect. Broughton tentatively speculated that reading the law extracts had disrupted a psi-inhibiting mechanism in the left hemisphere, thus allowing the psi-conducive right hemisphere (left hand) to respond more quickly on advance warning trials than on control trials. He reasoned that the left hemisphere (right hand) responses were delayed rather than primed during the advance warning trials because of the ". . . suggestion of psi-inhibition in the left hemisphere." Another plausible if equally tenuous explanation might be that reading the law extracts provided competition for right hand (left hemisphere) responses to the priming (psi) information. If the right hemisphere, which was free to process the psi information, primed the left hand rather than the right hand, the left hand's ready impulse to respond would have had to have been inhibited when the tone was received. Time might then have elapsed while the message to press the button was redirected through the left hemisphere (right hand) system, resulting in longer right hand mean reaction times on advance warning trials than on control trials, for males. Females, being more bilateralized in cerebral organization than males, neither gained nor lost an advantage in reaction time from

the laterality manipulation.

In summary, despite the paucity of cerebral lateralization studies in parapsychology, controversy attends the interpretation of the few reported results. However, it can be seen that researchers are successfully attempting to apply neuropsychological concepts to the investigation of psi processing.

#### Psychophysiological Detectors of Psi Processing

Evidence has suggested that psychophysiological changes are involved in psi performance and that such changes can themselves be used as detectors of a psi response (Mcarris, 1977). Such an approach offers several advantages. It may allow us to look more directly at a psi response during relatively early stages in its processing, before the subsequent degradation of the stimulus permits distortions to creep into the subject's conscious response. It should be pointed out, however, that by no means all parapsychological theorists view ESP experiences as the degraded form of a received signal. Particularly the observational theorists, Schmidt and Walker, view the psi source to be strongest at the level of the behavioral psi response, which constitutes the psi event subsequently triggered by observation of the psi feedback (Millar, 1978). The fact that psychophysiological responses can be recorded without requiring any observable behavioral response on the part of the

subject is a unique feature of the psychophysiological approach (Schouten, 1976). It permits the subject to maintain a state of relaxed inner attending and precludes the potentially disruptive changes in the subject's psychological state which may accompany the required behavioral actions. A variety of physiological indicators, including GSR, plethysmography and EEG have proved intermittently effective as detectors in such psi monitoring experiments.

Hettinger (1952), for example, found increased GSR activity in subjects whose remote agents were made to exercise or were otherwise stimulated, although details, in his experiment, are poorly reported. Tart (1961) found more active GSR responses in subjects during times when an isolated agent was receiving strong electric shocks than during control periods, while Sanjar (1969), and Beloff, Cowles and Rade (1970) were unsuccessful in attempts to correlate subjects' GSR activity with a remote agent's experiences. Rice (1970), on the other hand, found strong GSR evidence that subjects could respond to aversive stimuli experienced by remote agents, while Schouten (1976) has recently found significantly lower GSR reactions in subjects whose remote agents were presented with strong auditory signals as compared to control periods when agents were not stimulated.

Measuring both subjects' and agents' peripheral vasomotor activity with a plethysmograph during periods

when the agent performed mental arithmetic, as well as during rest periods, Figar (1959) reported a high proportion of coincident vascular reactions during both trial and rest periods. Although Figar's data were neither scored blind nor statistically analyzed, a later statistical scrutiny of the same data by West (1959) supported Figar's conclusions, and demonstrated that, in fact, the coincident responses between subject and agent were proportionally greater during the rest periods.

An effort to replicate Figar's findings was made by Dean, who substituted the task of reading names on cards for the mental arithmetic task which he found that his subjects sometimes disobeyed. In a series of experiments (Dean, 1962; 1965; 1966; 1968; Dean and Nash, 1967), target stimuli were administered to agents in a systematically varied way, and the plethysmographic responses of subjects were measured. Agents were presented with names of persons who were either emotionally relevant to the agent or to the subject, or who were unknown or neutral to both. Subjects' vasomotor activity was found to increase when names of emotional significance to either agent or subject were presented, but not when neutral names or blanks were presented. A variation of this experiment, with the agent located under 35 feet of water off the coast of Florida, and Dean (acting as subject) in Zurich, Switzerland, provided significantly larger vasoconstrictions for the names with emotional

meaning to Dean than for blank namecards on all three days of testing. Results were scored blind by the experimenter (Dean, 1969). Another short and long distance experiment with this procedure (Dean and Otani, 1971), used target stimuli comprised of the names of persons recently met with or talked to by Dean on the telephone while he was in Tokyo. These stimuli were contrasted with stimuli comprising names known only to the agent (Otani); names taken from the Tokyo telephone directory; and blank namecards. Although results gave positive evidence of differences in vasoconstriction when names Dean knew were compared to blanks in the series conducted while the subject and agent were both in Tokyo, results fell to chance in the series conducted after Dean had returned home to New Jersey. Although Dean had not expected any attenuation of the effect over distance, it is possible that by the time he had returned to New Jersey, the names of persons he had met in Tokyo had lost their emotional immediacy for him.

Attempts to examine the saliency of emotional target material have also been made by Esser, Etter and Chamberlain (1967), who reported evidence suggesting that telepathically transmitted names and sentences of emotional importance increased subjects' vasomotor activity. However, these authors reported no statistical analyses, and therefore conclusions cannot be drawn from their work. Haraldsson (1970) used Dean's procedure with 91 pairs of

subjects. A highly significant positive correlation was found between plethysmographic activity and the degree of emotional context that the names held for the percipients. In addition, a significant percipient-order effect was observed in the data. When pairs of subjects acted alternatively as percipients and agents, the primary percipients' scores tended toward psi-missing (i.e., significantly fewer vasoconstrictions), while the secondary percipients (who had formerly served as agents) showed more vasoconstrictive activity (psi-hitting) during times when emotionally charged names were being transmitted as opposed to control periods. In a recent replication of this work (Haraldsson, 1980), the percipient-order effect was confirmed. Subjects who had previously acted as agents showed significantly greater vasoconstrictions when names of emotional significance were viewed by remote agents than when agents viewed blank cards. Conversely, subjects who had not yet served as agents tended to score in the reverse direction.

Schouten (1976) compared plethysmographic reactions to names emotionally significant to the subject; emotionally significant to the agent; and emotionally significant to neither. The names were randomly ordered and presented for 10 seconds at intervals of 40 seconds, to remote agents. Subjects were not informed about the onset of the presentations of the names, nor about the time intervals which separated the sending periods. In fact,

subjects were led to believe that all stimuli would be presented at random moments. Although Schouten found significantly stronger plethysmographic activity during periods when names of emotive significance were being presented to agents, as compared to control periods, he also found a significant difference between the three pooled name conditions and the control periods. Therefore the effects of the different emotive values of the varying stimuli remain unclear. Significant evidence for a psi effect using emotionally charged names with a single subject has also been reported by Barry (1967), while Matrick (1955) reported significantly different vasoconstrictive responses in five subjects when remote agents viewed red cards, as opposed to when they viewed control cards.

Attempts have also been made to use various types of EEG data as detectors of psi experience. Tentative early work by the American Society for Psychical Research Committee (1959) found no significant changes in subjects' EEG profiles when remote agents were emotionally stimulated. Tart (1963) reported evidence of increased EEG complexity during times when either Tart himself received painful two second electric shocks, or when the current was passed through a resistor, as compared to control periods. An electronic period analyzer assessed the complexity levels. Subjects, who were asked to press a key when they felt the presence of a shock delivered to the experimenter, were unable to accurately respond to these events on a conscious

behavioral level.

Duane and Behrendt (1965) correlated alpha tracings in identical twins who were seated in separate, well-lit rooms, and instructed to open and close their eyes upon command. Out of 15 pairs of twins tested, two pairs exhibited what the authors refer to as "extrasensory induction", that is, ". . . the appearance without conventional elicitation of an alpha rhythm in one twin when it is being evoked under standard conditions in the other." In reporting their results, the authors mention that anxiety and apprehension about the testing procedure were "prominent characteristics" of the 13 pairs of twins who did not exhibit extrasensory induction. The successful pairs, on the other hand, had a prior knowledge of the biological sciences; were characterized as "intelligent, educated, and serene", and appeared to be at ease during the testing.

Average power and peak power recorded from occipital lobes significantly decreased during times when a remote strobe (generally observed by an agent) flashed at 16fps for 10 seconds as compared to periods when it did not flash (Marg and Puthoff, 1974). This alpha blocking effect was exhibited in a single subject, who was selected from among six others on the basis of success in pilot testing, and because of his monochromatic EEG spectrum. The subject did not exhibit extrachance accuracy when he attempted to consciously discriminate the strobe periods from the

control periods. In a replication experiment, which eliminated the agent and was entirely computer controlled, Kelly and Lenz (1976) obtained suggestive evidence that the EEG responded differently during the stimulus as opposed to the control conditions.

Averaged cortical evoked potential (EP) measures to telepathic stimulation were reported by Lloyd (1973), who presented two curves from a single subject as measures of psychic responsiveness similar to an auditory evoked potential. Millar (1976) employed a similar procedure with 20 subject pairs, but found no evidence of psi. Hearne (1977) tested whether the degree of emotional closeness between the agent and subject could affect the EP produced in response to a strobe lamp, when remote agents concurrently viewed photographs of the subjects. An analysis of variance revealed a difference in the amplitudes of the earliest of four peaks between experimental and control conditions, as well as a significant interaction between experimental conditions and the emotional closeness of the subject-agent pairs.

Contingent negative variation (CNV) was used by Levin and Kennedy (1975), who attempted to determine whether the CNV depended solely upon expectancy or was, in part, a function of the future motor activity to be performed. Subjects were instructed to press a key when a green light, but not a red light appeared several seconds after a warning signal. A random number generator (RNG)

selected which light was to appear immediately before it came on. Significantly more evidence of expectancy appeared in subjects' CNV's prior to the green light, but a sequel failed to confirm the promising results exhibited in the initial data. Reasoning that differences in CNV might reasonably be found using subliminal stimuli to partially inform the subject whether or not a response would be required, Hartwell (1979), during the warning stimulus, projected either a smiling or frowning face; or a face with no mouth; at full or low contrast. Smiling faces cued subjects to respond; frowning faces cued them not to respond; and the face with no mouth presented at low contrast constituted the ESP portion of the experiment. A discriminant function discriminated between the two contingency conditions and this was applied to the ESP and subliminal perception trials. ESP results for the 10 subjects were at chance, but the method proved adequate to classify the subliminal information trials on the basis of the full information trials.

Some evidence that a subject's unconscious biological processes may be affected by the conscious "willing" of a remote agent has been contributed by Braud (1978), who, as himself experimenter-agent attempted to influence the GSR activity of subjects in a distant room. In two series, subjects' mean GSR amplitudes were significantly higher during periods when Braud attempted to psychokinetically influence them to increase, than they were in randomly

selected periods, when he wished their skin resistance activity would decrease.

A number of experimenters (Bruggmans, 1922; Woodruff and Dale, 1952; Wallwork, 1952; Otani, 1955; Research Committee of the American Society for Psychical Research, 1959; Tenny, 1962; Morris and Cohen, 1969; Honorton, 1969; Stanford and Stanford, 1969; Stanford and Lovin, 1970; Honorton and Carbone, 1971; Honorton, Davidson and Bindler, 1971; Lewis and Schmeidler, 1971; Stanford, 1971; Morris, Roll, Klein and Wheeler, 1972; Price, 1973; Stanford and Stevenson, 1973; Rao and Feola, 1973; Stanford and Palmer, 1975; Braud and Braud, 1974; 1981) have attempted to use psychophysiological measurements (primarily EEG alpha monitoring), not as psi detectors, but as correlates of psi experience, reasoning that biological conditions within the organism may significantly affect the ability to decode or process psi information. A thoroughly mixed pattern of results, however, has emerged from such studies. In the opinion of this reviewer, the inconsistent and contradictory findings thus far reported, would appear to render this a somewhat fruitless line of investigation. The psychophysiological concomitants, per se, of the "psi experience", (if any), remain obscure, and these studies will not be dealt with further here.

### Rationale

It is reasonable to suppose that ESP, whatever its mode of entry into the cognitive structure of the organism, is analyzed at the cortical level in accord with the organism's information processing capacities. The results of Maher and Schmeidler (1977; Maher, Peratsakis and Schmeidler, 1979); and to a lesser extent, those of Broughton (1976; 1977), support the idea that ESP, like other forms of perception, is mediated into consciousness via hemispheric mechanisms specialized for different modes of cognitive function. If this is true, then for the great majority of individuals, when the ESP stimulus contains properties which would appeal primarily to the abstract, analytical processing mechanisms specialized in the organism's left hemisphere, we would expect to see corresponding processing relatively lateralized to the left hemisphere. Conversely, if the properties of the stimulus contain a significant emotional component, right hemispheric activation should predominate if the organism is conventionally processing this form of cognitive material. It follows that a correspondence should be found between relative alpha production in a lateralized hemisphere (i.e., a hemisphere specialized for cognitive activity), between output when perceiving

a sensory stimulus, and output when extrasensorially perceiving the same stimulus. If reliable differences can be demonstrated in relative hemispheric activation for two sets of stimuli, such differences should also prevail during processing under sensorially isolated conditions, if ESP is occurring at all. A comparison of relative hemispheric activity under sensory and extrasensory conditions, then, when stimuli contain different potentials for brain activation, should help us to determine whether or not conventional cognitive processing takes place when the organism processes extrasensory material. A comparison of behavioral response measures with such hemispheric patterns of activity will shed further light on the cognitive resources available to the organism during extrasensory functioning.

If hemispheric activation during extrasensory perception of different forms of cognitive material significantly correlates with activation during sensory perception of the same material, we may conclude that, in both cases, initial reception of the information has taken place within the organism. If appropriate behavioral responses to the extrasensory input do not occur, we may assign responsibility for this failure to factors intervening between the initial reception of the information, and its subsequent arrival in conscious awareness. Such factors may include the degradation of the stimulus, or the modification of the stimulus by unconscious defense

mechanisms such as denial, or displacement, which often serve to distort or transform sensory information. If on the other hand, behavioral responses to the stimuli are appropriate (i.e., psi "hitting" on an ESP task), but significant correlations in relative hemispheric activation do not prevail, we must conclude that, whatever its properties, an ESP stimulus does not arrive in conscious awareness through conventional processing channels. Some support for the observational theories may be construed from this state of affairs.

The results of Braud and Braud suggest that an active generative left hemisphere "set" is not effective for ESP processing, while a passive receptive right hemisphere "set" is compatible with such processing. The results of Maher and Schmeidler; and Maher, Peratsakis and Schmeidler, suggest that a stimulus will induce either left hemispheric or right hemispheric functioning, depending on its properties. These two positions are not mutually exclusive. Indeed, the failure of holistic target objects in the Maher and Schmeidler experiment to elicit effective ESP processing when subjects were concurrently engaged in an active-generative, analytical "set" (i.e., solving syllogisms), may be taken as support for Braud and Braud's hypothesis. The results of Broughton, who appears to have elicited effective right hemispheric ESP processing with tactile-spatial stimuli while subjects were engaged in a left hemispheric task or "set", would

at first appear to disparage the notion that left hemispheric functioning precludes ESP success. However, an examination of Broughton's left hemispheric task, namely that of reading aloud from law reports held in subjects' right hands, reveals that it may not have involved any significant active-generative component. Subjects were not asked to paraphrase what they had read, and there is no particular reason to assume that the task entailed even comprehension of the verbal material. Rather, with many or most subjects, a passive mechanical left hemispheric phonetic coding may have prevailed, which in and of itself may not be antithetical to ESP success, when the properties of the stimulus do not compete for processing within the same hemisphere. Therefore, if a subject's "set" may contribute either positively or negatively to ESP success, it would seem prudent to attempt to induce a psi-positive, passive, relaxed, receptive "set" in all subjects, and to hold this variable constant while manipulating the effects of stimuli with right hemispheric and left hemispheric activation properties, in order to determine the nature of hemispheric functioning during the extrasensory processing of such stimuli.

Since emotion appears to have its own functional coordinates in the hemispheres of lateralized brains, stimuli with emotion inducing properties would appear to be ideally suited to the task of evoking greater relative

right hemispheric participation in ESP processing. Dimond and Farrington specifically elicited enhanced autonomic responses when filmic material with an emotional component was initially restricted to subjects' right hemispheres. Safer and Leventhal demonstrated that when subjects interpreted verbal passages heard with their left ears, emotional tone cues had greater saliency than did content cues in determining their ratings of the passages.

Several other factors suggest that material with an emotional component would be especially appropriate for use in extrasensory stimulation studies. Emotion has figured heavily as a theme in spontaneous psychic experiences since earliest times. When, in 1889, under the direction of Henry Sidgwick, a systematic study of spontaneous case material was initiated by the Society for Psychical Research in London, it was determined that "emotionally charged situations predominated in hallucinatory experiences involving present situations" (Rhine, 1977). The few modern studies attempting to address spontaneous case material with the application of statistical techniques, (Schmeidler, 1966; Moss and Schmeidler, 1968; Maher and Schmeidler, 1975) have reported emotional elements present both in characterizations put forth by the percipients, and in the reactions of sensitives who were brought to the locales and asked to convey their impressions. It seems reasonable to expect, therefore, that emotional elements present in

stimulus material may be transmitted in an extrasensory modality, and may effectively bias the activation of the brain toward relatively greater right hemispheric participation during the processing of such material.

Nonemotional material has also proven effective as free response target material in studies of extrasensory perception. Targ and Putoff (1977), in a series of remote viewing experiments, have reported substantial success in triggering significant extrachance correspondences in the mentation reports of subjects whose remote agents attended to the architectural design features of public buildings, airports, etc. It is not unreasonable to suppose that an analytical, left hemispheric mode of processing prevailed in such agents, whose duty it was to swiftly survey, categorize, and recognizably depict suitable features of the scene, which would later be used for comparison with subjects' extrasensory mentation reports. Because this type of stimulus material, devoid of emotional content, has proven effective in stimulating extrasensory awareness, we may assume that there is nothing particular about the psi experience that must needs embody an emotional component. And in deference to the demonstrated ability of such material to evoke corresponding mentation in the conscious minds of remote subjects, we may conclude that architectural themes are well suited to the task of inducing nonemotional mentation in an extrasensory

modality.

Although the many attempts to correlate the psi experience with specific psychophysiological variables have produced contradictory findings, electrophysiological recordings have been more effective when applied as indicators or "detectors" of an unconscious psi response. Given stimuli that can elicit hemispheric asynchrony during sensory processing, corresponding differences in hemispheric activation during attempted ESP processing may themselves be used as evidence for psi processing, even in the absence of appropriate behavioral responses to the psi information. Evidence for a significant correlation between sensory and extrasensory lateralized brain functioning will clarify our understanding of the processing mechanisms available to the organism during extrasensory functioning.

## Hypotheses

### Hemispheric Specialization and ESP Processing

The primary aim of this project was to determine if systematic variations in extrasensory stimulus input would induce corresponding variations in asymmetrical output in hemispheres lateralized for cognitive function. Specifically, we hypothesized that (1) stimulus input with an emotional component would induce relatively greater right hemispheric activation than would stimulus input comprised of nonemotional, analytical material during both sensory and ESP processing conditions, and (2) individuals' differences for the lateralized sensory processing of emotional and nonemotional stimulus sets would correlate significantly with their differences in the lateralized ESP processing of the same stimulus sets.

### Sex Differences in Hemispheric Organization

Because theory predicts that the female brain differs in cognitive organization from that of the male, females were expected to exhibit significantly less hemispheric activation in the predicted directions than would males. Females' data, however, were expected to

exhibit trends in the predicted directions for processing emotional and nonemotional material in the sensory and ESP conditions.

#### ESP Judging

It was hypothesized that significant extrachance correspondences would be exhibited in the data of subjects and/or blind judges who rated the subjects' psi protocols. The extrachance correspondences, if present, would constitute conventional objective evidence for psi.

#### Hemispheric Responses and ESP Judging

Correlations between individuals' sensory and ESP laterality differences for processing the emotional and nonemotional material were expected to be higher for subjects who showed evidence of psi processing in the judging procedure, than for subjects who did not show such evidence.

#### Extraversion and Psi Success

Extraversion was expected to correlate positively with psi success.

## METHOD

### Subjects and Experimenters

Subjects were 20 adult dextrals who espoused an open, accepting attitude toward the possibility of ESP success. Ages ranged between 18 and 45. There were 10 males and 10 females. Two experimenters, one female (M.M.) and one male (K.R.), recruited subjects; administered tests; and monitored the laboratory equipment.

### Design

A within-subjects design was employed, with each subject having four task conditions. In the two primary ESP conditions, subjects attempted to use ESP to perceive the contents of two videotapes, which were played in random order, in a distant room. One tape contained material with emotion inducing properties, and was expected to bias the activation of subjects' cerebral hemispheres toward relatively greater right hemispheric participation in processing than would the other videotape, which contained material generally devoid of emotional content. EEG data from three pilot subjects had indicated that the hemispheric activation propensities of the two videotapes were in the requisite direction when

dextrals viewed the tapes sensorially. Integrated EEG was monitored from temporal-parietal sites (referenced to a common vertex) in both left and right hemispheres during the extrasensory viewing periods. After each viewing period, subjects gave mentation reports which were tape recorded for later analysis by outside blind judges. In two subsequent sensory conditions, EEG data were similarly recorded while subjects viewed the same videotapes (again randomly sequenced) on a TV monitor. Additional EEG data were collected while subjects performed two-minute alternately sequenced laterality tests (drawing a person and writing a letter) as a check on subjects' laterality profiles. Indices of integrated alpha production (amplitude x time), filtered from subjects' taped EEG activity, allowed a subsequent comparison to be made between relative hemispheric engagement while occupied in the laterality tasks, and while viewing the two different videotapes in the sensory and extrasensory conditions.

#### Equipment

The experiment was performed in the EEG laboratory located on the sixth floor of the Graduate Center of the City University of New York. The laboratory houses an Industrial acoustics chamber (series 1200), which is 8' x 15', with 1' thick walls; electromagnetic shielding, and a one-way vision screen. Standard intercom and

cassette tape-recording equipment for recording the speech of subjects was employed. In addition, the chamber contains a comfortable reclining chair, which was utilized for both the sensory and extrasensory perception of the target material. A 3/4" videocassette deck and monitor were installed in the chamber for use in the experiment. Outside the chamber, the laboratory contains a Beckman Type R polygraph and a Vetter 8-channel Model C8 FM cassette tape recorder for recording EEG directly onto cassette tapes. Beckman silver-silver chloride disk electrodes were affixed with Grass electrode cream to bilateral temporal-parietal sites (midway between T<sub>3</sub> and P<sub>3</sub>; and T<sub>4</sub> and P<sub>4</sub>) referenced to a central vertex (C<sub>z</sub>). Electrode resistances were always less than 2K. A ground electrode was placed in the center of the forehead. For this experiment, integrated alpha production was averaged over 15 second intervals, providing a series of approximately 60 raw scores for each hemisphere in each of the four conditions of the study. A separate room, located beyond the stairwell adjacent to the laboratory, was equipped with an additional 3/4" videocassette deck and monitor, for presentation of the videotaped target material during the extrasensory conditions.

### Materials

Four videocassettes were prepared--two for use in the sensory conditions, and two for use in the extrasensory

conditions. Each hour-length cassette contained a pairing of the emotional and nonemotional videotaped material. Two cassettes contained the emotional material first and the nonemotional material second, while two contained the nonemotional material first and the emotional material second. A ten-minute interval of blank tape separated the two stimulus presentations, each of which was about 18 minutes in length. A one-minute interval of blank tape was contained at the head of each cassette. Separate pairings of the cassettes were used for the sensory and extrasensory conditions. The sensory conditions utilized two cassettes (whose jackets were labeled Sensory-A and Sensory-B). One cassette contained the emotional material first and the nonemotional material second, while the other cassette contained the nonemotional material first and the emotional material second. The ESP conditions similarly utilized two cassettes (whose jackets were labeled ESP-A and ESP-B), each containing the emotional and nonemotional material. As with the sensory cassettes, one of the two ESP cassettes contained the emotional material first and the nonemotional material second, while the other cassette contained the nonemotional material first and the emotional material second.

A fifth hour-length cassette was prepared as a control tape for subjects to view during the extrasensory viewing conditions. Its snowy image simulated the image

on a TV screen after a station has gone off the air. This image was used as a focusing device, and encouraged subjects to maintain proper head and body orientation, and to keep their eyes opened during the ESP viewing periods.

Subjects' extraversion was evaluated with a shortened version of the Eysenck Personality Questionnaire (EPQ). The short form of the Annette Handedness Questionnaire assessed subjects' handedness preferences for 12 skills, and inquired into familial characteristics of handedness. Subjects' eye dominance (eye preference when sighting through a portable telescope) and thumb dominance (left or right thumb supremacy when interlocking fingers with clasped hands) were ascertained by the experimenters. A relaxation procedure, modified from Masters and Houston (1972), was administered to subjects prior to each ESP viewing period.

### Stimuli

Both videotaped presentations were the conceptions of artists, who graciously lent tapes to the author for use in the experiment. The tape which was expected to induce relatively greater right hemispheric involvement during processing contains a series of interviews with seven males and females who, often falteringly but sometimes eloquently, discuss their varying attitudes toward love and loving. The extemporaneous dissertations

are generally sad, intimate, and emotionally evocative. Introspective reports from viewers indicate that the material incites sympathy, is emotionally compelling, and is often profoundly depressing. The interviews take place in real time, and the tape contains no within-sequence editing. The accompanying music track carries a ballad, I'm in the Mood for Love, which weaves plaintively throughout the monologues. The camera angle is static and uniform, and confined to the head. The tape (which for experimental purposes was designated the Love Tape) is monochromatic, or black and white.

The alternate color tape, which was expected to induce relatively less right hemispheric engagement during processing, is primarily intellectual in its appeal, and features an analytical dissection of its subject matter, New York City, which is depicted as a giant, automated organism. This presentation (designated The City Tape) contains numerous aerial and landscape views of the metropolis, with its pulsing arteries of traffic and distant figures scurrying out of subway exits. Such macrocosmic scenes are contrasted with highly magnified microcosmic views, such as red blood cells moving as if purposefully through capillaries. The tape contains many sequences where fast motion cinematography is utilized to make visual statements indigenous to the artist's thesis. Enormous architectural structures, for example, are demolished and re-erected in

the blink of a time-lapsed eye. The tape spans an imaginary daily cycle in the life of the city organism. The material is highly edited; camera angles are constantly shifting and changing; and the accompanying sound track is electronic or voice automated.

In the search for appropriate free response stimuli to be used as target material in an ESP experiment, perhaps the primary condition that must be met is that the targets must be as dissimilar as possible. In this respect, the present stimulus videotapes seemed ideal. The two tapes could reasonably be distinguished in terms of at least 10 conceptual categories. These were:

- (1) black and white vs color;
- (2) intimate vs remote, aloof;
- (3) animate vs inanimate;
- (4) real time vs altered time;
- (5) close up faces vs distant figures;
- (6) inside vs outside;
- (7) concrete vs abstract, analytical;
- (8) feeling vs thinking;
- (9) soft round shapes vs hard angular shapes;
- (10) viewer's perspective static vs viewer's perspective shifting.

Although any attempt at conceptual dichotomization would inevitably include some overlap, with respect to their basic dissimilarity, the limitations of the tapes seemed quite tolerable. A more problematical requirement of the stimulus sets for this experiment, was that they also appeal primarily to different specialized processing mechanisms in the hemispheres. It was recognized that any videotape would necessarily include a visuospatial

component. When watching TV one is, after all, looking at a screen on which things are moving around. Theoretically, then, a built-in bias could be expected to favor relative right hemispheric processing. Given that processing might be relatively lateralized to the right hemisphere, the question became, would the emotional approach of the Love Tape thesis engage the right hemisphere relatively more (with respect to the left) than would the abstract, intellectual approach of the City Tape thesis? It was "relative" right hemispheric differences in processing that were important here, rather than any right vs left differences per se. Both tapes contained speech and both contained music. In the Love Tape, the speech was faltering, prosodic and emotionally meaningful, while the music was a poignant ballad. The City Tape, in contrast, contained automated speech which was crisp, terse, and robot-like, while the music was atonal and electronic. A further factor in the Love Tape which might be expected to compromise the right hemisphere, was the fact that, throughout the tape, the viewer watched faces. Facial processing (i.e., the brain's ability to holistically process and remember facial information), was among the first of the explicit specialized functions to be attributed to the right hemisphere. Therefore, despite the theoretically equivocal nature of any form of continuous, multiplex processing, it was hypothesized that the sum of the parts

of the Love Tape stimulus would bias subjects' right hemispheres toward relatively greater right hemispheric engagement than would the sum of the parts of the City Tape stimulus.

### Procedure

The experimenters met each subject at the laboratory at the appointed hour. After a brief tour of the facility, including the acoustics chamber, and the room where the ESP stimulus tapes were to be played, the subject filled out the handedness and extraversion questionnaires. After being settled comfortably in the acoustics chamber, the subject had the electrodes affixed, usually by both experimenters working simultaneously. Afterwards, the subject relaxed for a brief period, while polygraph checks were made, and then engaged for about two minutes either in composing an intellectual letter to a friend, or in drawing the picture of an imaginary person. Subsequently he (or she) performed the alternate task. EEG data were collected while she (or he) was occupied in the tasks. After another brief rest period, the control cassette was inserted into the video deck, and a snowy image lit up the TV monitor. The background video white noise was adjusted to a comfortable level; the ambient room light was turned off; and the experimenters exited, sealing off the chamber. Tape recorded instructions were then played for the subject over the two-way intercom. He (or she)

was thanked for participating in the experiment; given general instructions on mobility and eye fixation; and encouraged to feel that ESP success was indeed possible. A relaxation procedure followed, and, after a final countdown, the subject was instructed to ". . . begin viewing now." Meanwhile M.M. monitored the polygraph equipment while K.R., at an explicit cue during the relaxation instructions, went to the ESP projection room down the hall. The toss of a coin determined which of the two ESP cassettes was to be taken from a drawer and placed in the video deck. (Prior to each subject's arrival, M.M. had used a coin toss to determine whether or not to switch the jacket labels on the two ESP cassettes. The cassettes were identical, but their jackets were labeled ESP-A and ESP-B. This procedure kept K.R. blind as to the order of the stimulus presentations within each cassette.) After putting the selected cassette in the deck, and turning the monitor on, K.R. started a pocket stop watch, and returned to the laboratory before the relaxation instructions had ended. The one-minute blank lead-in at the head of each cassette insured that he remained blind as to the order of the videotaped presentations for each subject. K.R. performed the duties of time-keeper during the experiment, and advised M.M. when the first stimulus presentation had begun, whereupon M.M. began recording the subject's EEG. K.R. also operated the intercom system, switching it from

two-way to one-way during the ESP viewing periods. When K.R. gave a signal that the first videotaped presentation was over, the EEG recording was turned off, and the two-way intercom turned back on. The subject was then asked to report her (or his) mentation during the ESP viewing period. Reports varied in length from about 2 1/2 minutes to about 7 1/2 minutes, and were tape recorded for later analysis by outside blind judges. When the subject, after several promptings, could remember nothing additional about what had been going through his (or her) mind during the viewing period, M.M. gave extemporaneous relaxation instructions (the length of which varied inversely according to the length of the mentation report), and a countdown for the second ESP viewing period began. KR as timekeeper again gave the signal marking the start of the second videotaped presentation, and switched off the two-way intercom. When the second tape was over, the subject provided a second mentation report, and then was allowed a rest period of approximately 10 minutes. The acoustics chamber door was opened, and the room light turned on. The subject was offered a glass of water; smoked if she (or he) chose; and/or chatted with the experimenters. Because it was deemed necessary for the subject to view the forthcoming sensory videotapes without comparing them with his (or) her prior mentation reports, a mild ruse was adopted. The two sensory cassettes (labeled Sensory-A and Sensory-B) were procured from a table behind

the subject. Experimenter M.M. explained that the next phase of the experiment involved trying to see how the subject's brain normally behaved when he or she was watching TV. It was suggested that each of the two videocassettes held "a couple of different videotapes", and it really mattered very little which cassette was used. Therefore the subject was invited to select either cassette for her (or his) own "viewing pleasure". The subject was thus left with the impression (although it was not explicitly stated), that the two cassettes contained four different videotapes which were unrelated to the FSP videotapes. The control cassette was then removed from the deck, and the subject selected cassette was inserted. When turned on, the one-minute blank lead-in at the head of the tape provided adequate time for M.M. to exit from the chamber and to turn on the EEG recorder as the first sensory presentation began. The intercom was turned to one-way, and EEG data were recorded during each of the two sensory viewing periods, which were separated by a 10 minute rest interval. During this interval, the subject again smoked if he (or she) wished, and conversed with the experimenters. Eye dominance and thumb dominance were tested by K.R. during the rest interval. After the second tape was over, the polygraph, tape recorder, and intercom were turned off and M.M. entered the acoustics chamber, sealing the door behind her. After apologizing for the ruse, M.M. explained to

the subject that the two tapes she (or he) had just viewed were, in fact, the same tapes that were played during the two ESP viewing periods, but that the order in which the tapes had been played was, as yet, unknown to anyone. The subject reviewed his (or her) mentation reports, and made a decision about which tape she (or he) believed had been playing during each of the ESP viewing periods. M.M. recorded the subject's decision and opened the door of the acoustics chamber. Meanwhile, K.R. went down the hall to the ESP projection room and determined, by rewinding the tape, the order in which the tapes had been played. When he returned, he announced the tape order, which was recorded. The subject was debriefed about the explicit nature of the experiment; his (or her) electrodes were removed; and she (or he) exited from the laboratory.

#### EEG Analyses

Each subject's EEG activity was collected on one side only of two 120 minute portable cassettes (60 minutes per side). One cassette held the EEG from the laterality profile tests and the two ESP mentation periods, while the other cassette held the EEG from the sensory viewings of the two videotapes. A 50 uv 10 Hz oscillator generated sine wave signal was recorded for approximately two minutes at the head of each subject's initial cassette, for use as a reference signal. The reference signal was

placed on the tape after the FM recording channels had been calibrated so that the oscillator signal registered a meter reading of zero decibels on each of the recording channels used to collect the EEG data. The conversion of the taped EEG to a digitalized output was accomplished with a custom built filtering and integration EEG analyzer. Each of the two integration channels (one of which was to process EEG from the left hemisphere and one of which was to process EEG from the right hemisphere) was set so that the reference oscillator signal summed to 650 arbitrary units for every 15 seconds of recording. Raw EEG from the left and right hemispheres was then filtered for 8-13 Hz (alpha) activity and an averaged integration measure (amplitude x time) of the rectified waveform was digitally displayed for each hemisphere for every 15 seconds of recording. Digitalized output was therefore displayed separately for each hemisphere with reference to the same arbitrary reference signal. Artifacts in the EEG recording were identified through a blind inspection of the polygraph records, and any epoch containing an artifact was eliminated from the digitalized output by means of the corresponding footage numbers. Records were relatively artifact free. Minor variations in the lengths and in the onsets of the tapes on the different cassettes, as well as the need to exclude the titles at the beginning of the tapes required that four additional epochs (one minute) at the head and tail of each data set be excluded from the

analysis.

### Blind Judging

To study the process of judging extrasensory material, a three-fold procedure was employed with two outside blind judges. The mentation report recordings (collected on portable cassettes) were transcribed and randomized. Judges were asked initially to compare each of the mentation reports (a total of 40 reports were presented) with both the Love Tape and the City Tape, and to make a global determination about which tape had been playing during the ESP period corresponding to each mentation report. In this first phase of the judging process, judges believed that there was an equal probability that either tape had been played for any given report (N=40). After the scoring had been collected, judges were given subjects' paired mentation transcriptions, in the order of their having been rendered, and asked to make a second determination about which tape had played during the corresponding ESP periods (N=20). This process invariably necessitated some change in the judges' former ratings (which they were asked to ignore), because now the judges understood that both tapes had been played for each subject, one during the primary ESP period, and the other during the secondary ESP period. After the second batch of scores were collected, judges were given a list of the 10 bipolar descriptor continuums

described earlier, with instructions to use these categorical aids to study the mentation reports. After rating each report along every continuum, and scrutinizing the overall configuration of each report's ratings, judges made a third or final decision about which tape they believed had been playing during each of the subject's PSP periods.

#### Judging Confidence

Blind judges' ratings of correspondence between subjects' mentation protocols and the videotapes also allowed for an index of confidence. In assigning each subject's mentation report to one of the two videotapes, each judge also made a slash mark on a confidence line labeled "zero" percent confidence to "100" percent confidence, to indicate their confidence in the accuracy of their mentation report/videotape matches. Judges' mean confidence in judging the two reports of each subject were derived (in mean millimeters), in order to determine if judging confidence bore any relationship to success in correctly matching the mentation reports to the videotapes.

## RESULTS AND DISCUSSION

### Blind Judging

There were 20 sets of mentation reports--two reports having been provided by each of the twenty subjects. Due to the forced choice nature of the mentation judging, which required that subjects and judges assign one of the paired reports to the Love Tape, and one to the City Tape, the two reports from each subject were considered as a single set (i.e., for all reports,  $N=20$ ). However, since in the initial phase of judging, judges received the 40 mentation reports in random order, and were asked to assign each report either to the Love Tape or to the City Tape, for this initial judging phase,  $N=40$ .

Results for subjects' blind matching of their own mentation reports to the videotapes were at chance, with 12 of the 20 subjects (six males and six females) correctly matching their reports to the tapes. Results for the two outside blind judges are presented in Table 1.

It can be seen from the table that one of the judges improved in accuracy over the three-fold process of judging, while the other judge improved from the first to the second step of the procedure, but maintained the

same level of accuracy (although individual judgments changed) for the final judging.

Table 1

Proportion of ESP Mentation Reports Correctly Matched to Videotapes by Two Judges in Three Trials\*

	<u>Trial 1</u>	<u>Trial 2</u>	<u>Trial 3</u>
Judge A	.525	.65	.80
Judge B	.475	.65	.65
	(N=40)	(N=20)	(N=20)

\*Chance=.5

A Z-score analysis evaluating the number of correctly matched reports for Judge A's final judging yields a  $Z=2.47$ , corrected for continuity ( $p < .015$ , two-tailed). Judge B's final scoring yields a nonsignificant  $Z=1.12$ , corrected for continuity.

To determine if there were significantly more correctly matched than incorrectly matched mentations when subjects and judges scoring was combined, the 10 tandem reports which individual subjects and both judges had correctly matched were contrasted with the three reports which subjects and both judges had incorrectly matched. The binomial expansion gives  $p < .09$ , two-tailed (corrected for continuity), a difference which is suggestive and favors the hypothesis of psi.

Table 2 contains subjects' order and judging data.

Table 2

## Order of Testing and Judging Results for 20 Subjects\*

<u>Subjects</u>	<u>Draw/Write</u>		<u>FSP Order</u>		<u>Sensory Order</u>		<u>FSP Report</u>		<u>Final Judging</u>		
									<u>A</u>	<u>B</u>	<u>S</u>
1	D	W	L	C	L	C	L	C	H	M	H
2	D	W	L	C	C	L	C	L	M	M	M
3	W	D	C	L	L	C	C	L	H	H	H
4	W	D	C	L	C	L	C	L	H	H	H
5	W	D	C	L	C	L	L	C	H	M	M
6	D	W	C	L	L	C	L	C	M	H	M
7	D	W	C	L	L	C	C	L	H	H	H
8	W	D	L	C	C	L	C	L	M	M	M
9	D	W	C	L	L	C	C	L	H	H	H
10	W	D	L	C	C	L	L	C	H	H	H
11	D	W	L	C	C	L	L	C	H	H	H
12	D	W	L	C	L	C	C	L	H	H	M
13	W	D	L	C	C	L	C	L	H	H	M
14	D	W	L	C	C	L	L	C	H	H	H
15	D	W	L	C	C	L	C	L	H	M	M
16	W	D	C	L	C	L	C	L	H	H	H
17	D	W	L	C	C	L	L	C	H	H	H
18	D	W	C	L	C	L	L	C	M	M	M
19	W	D	C	L	L	C	C	L	H	M	H
20	W	D	L	C	L	C	L	C	H	H	H

\* D = Draw a Person; W = Write a Letter; L = Love Tape;  
 C = City Tape; A = Judge A; B = Judge B; S = Subject;  
 H = Hit; M = Miss; Subjects 1-10 = Males; 11-20 = Females

The results of the judging of the ESP mentation reports, while supporting the psi hypothesis, make it clear that we are dealing with a subtle, enigmatic phenomenon, which has provided us with but meagre disconfirmation of the null hypothesis.

The improvement in judging during the three-fold process of evaluating subjects' mentations is a curious trend which appears to merit further research. Although judging was precisely at chance for the initial global categorization of the 40 mentation reports, both judges improved in accuracy after they had received subjects' tandem reports. After working through the second judging procedure, Judge A anecdotally remarked that it seemed to her as if some of the subjects were "Love Tape types", while others were "City Tape types". Apparently, having the subjects' dual mentations allowed for a finer discrimination of the extrasensorially relevant aspects of the reports.

Judge A also expressed enthusiasm for the third aspect of the judging procedure, which required that judges analytically review the mentations and quantitatively assess each with respect to the presence or absence of various descriptive characteristics. Prior to receiving feedback for her judging, Judge A declared that she felt "excited" about the quantitative procedure, and felt that it had helped her to evaluate reports that she had previously considered problematical. Judge B,

on the other hand, found the analytical procedure "tedious" and "time-consuming". She reported that she had found it very difficult to apply some of the scales to the mentation reports, and that she hadn't felt that the procedure, which required her to "weight things less intuitively" would produce the best results.

Judge A's scoring improved after using the analytical procedure, while Judge B's did not. Whether Judge A's improvement in judging accrued as a result of the procedure, or simply as a function of the additional time spent mulling over the mentation reports remains for future research to clarify. It is perhaps significant that Judge A's timesheet indicated that she had spent a total of 20 hours assessing the mentation material, as compared with a total of 14 hours spent on the project by Judge B.

#### Judging Confidence

Spearman rho analyses were applied to the combined Love Tape and City Tape final judging confidence means for each of the judges separately. The success of Judge A's matches was negatively correlated with her confidence in the matches at a marginally suggestive level of significance ( $p < .11$ , two-tailed). Judge B's final matches were not suggestively correlated either positively or negatively with her confidence in the matches.

Chi square analyses further examined judging

confidence for correct and incorrect matches when the ESP target was the Love Tape, and when the ESP target was the City Tape. The chi square analyses were performed separately on the data from each of the three stages of the judging process. Of the twelve such analyses, only one was even weakly suggestive. Judge A exhibited suggestively lower confidence on hits than on misses, but only when the City Tape was the target, during the final judging of the mentation material ( $p < .10$ , two-tailed).

The weak suggestion of a negative correlation between judging confidence and judging success in Judge A's Spearman rho analysis thus resolves into lower confidence on hits than on misses for only one of the targets, during only one of the three judging procedures. It may therefore be ascribed to chance, and we may conclude that judging confidence showed no significant relationship to judging success.

The failure of judges' confidence to correlate positively with judges' success in rating the mentation reports is consistent with the notion that ESP operates as a marginal stimulus, very close to the threshold of randomness. Whatever prompted the extrachance accuracy exhibited in the judging protocols, apparently had little to do with judges' conscious conviction. Yet the improvement in judging suggests that, however subtle, judges were responding to the effects of the psi stimulus.

### Extraversion

Extraversion scores ranged from 12 to 19. The mean for the 20 subjects was 15.45, while the mean for the 19 subjects who had provided useable EEG data (see "Missing Data", p. 71) was 15.63. Extraversion scores for the 19 subjects who had provided useable EEG data were employed when making contrasts with such data. Otherwise, extraversion scores for all 20 subjects were utilized.

Spearman rho analyses were performed to determine if subjects' extraversion correlated with subjects' or judges' success in the correct matching of the mentation reports to the videotapes. Subjects' extraversion did not significantly correlate with their own success in matching the mentation reports to the videotapes. Nor was Judge A's success in judging the mentation material related to subjects' extraversion. Judge B's success, however, was significantly negatively correlated with subjects' extraversion ( $r = -.4586$ ;  $p < .04$ , two-tailed). Separate sex correlations demonstrated that Judge B's significant negative correlation derived mainly from females' data ( $r = -.5751$ ,  $p < .08$ , two-tailed). Although extraversion in males tended to be negatively correlated with Judge B's success in matching the mentation reports to the videotapes ( $r = -.3218$ ), the correlation was substantially lower ( $p < .36$ , two-tailed).

Judge B's significant negative correlation

between success in judging subjects' mentations and subjects' extraversion is difficult to explain. If we knew that Judge B herself would score low on the EPQ (i.e., was herself introverted), we might speculate that she felt more comfortable with, and thus better able to evaluate, the internal mentations of personality types (especially women) which were similar to her own. However, we do not have the datum (i.e., Judge B's EPQ score), which would allow us to entertain this hypothesis, and the question must remain an open one. It is also quite possible that the explanation lies in an experimenter-wise  $\alpha$  value (i.e., the significant results which can be expected by chance due to multiple analyses).

#### Alpha Production and Extraversion

There was a trend in this study for subjects' extraversion to have been positively correlated with their alpha production in both the left and right hemispheres. Spearman rho correlation coefficients and significance values are presented in Table 3.

The serendipitous finding that subjects' extraversion correlated positively with their integrated alpha abundance may be taken as support for Eysenck's arousability hypothesis. While not bearing directly upon the issue of extrasensory processing, Eysenck's work has been of considerable interest to ESP researchers,

some of whom have found a positive relationship between extraversion and psi success. Eysenck, in fact, was the keynote speaker at the recent Centenary Jubilee Convention held jointly by the Society for Psychical Research and the Parapsychological Association at Trinity College in Cambridge. Therefore these unanticipated findings, which bear upon his theory, will be presented.

Table 3

## Extraversion and Mean Alpha Production (N=19)

	Left Hemisphere		Right Hemisphere	
	r	p*	r	p
Write	+.4874	<.02	+.4068	<.08
Draw	+.3173	<.19	+.4404	<.06
Sensory Love	+.4537	<.05	+.4555	<.05
Sensory City	+.3137	<.19	+.3190	<.18
ESP Love	+.3040	<.21	+.2694	<.26
ESP City	+.2579	<.29	+.1994	<.41

\* p-values are two-tailed

According to Eysenck's theory, extraverts and introverts can be distinguished in terms of cortical inhibition (Eysenck, 1957; 1967). Extraverts, who are characterized by lower levels of arousal than are introverts, would be expected to produce relatively more alpha in general than would introverts. Although research addressing Eysenck's predictions has been somewhat

contradictory, Savage (1964) found a positive correlation between alpha amplitude and extraversion, as did Gale, Coles and Blaydon (1969). Gale, et al. departed from earlier research by measuring EEG potentials with subjects' eyes opened. More recently, Stelmack, Achorn and Michaud (1977) demonstrated an enhanced level of cortical response (as measured by auditory evoked responses) for introverts as compared to extraverts, but only when employing low frequency as opposed to high frequency auditory stimulation. Further support for Fvsenck's predictions may be inferred from the recent results of Venturini, de Pascales, Imperiali, and San Martini (1981), who found that the alpha attenuation response to acoustical stimulation differed for two groups of Italian undergraduates, with extraverts demonstrating habituation to the auditory stimulus while introverts did not.

It may be observed in Table 3 that somewhat lower correlations between alpha abundance and extraversion prevailed in the ESP conditions than in other conditions. The results of Stelmack, et al. and Venturini, et al. might have led us to expect greater differences in alpha abundance along the extraversion-introversion continuum (e.g. higher correlations) in the ESP conditions, which contained minimal sensory stimulation, as opposed to the sensory conditions, where the videotapes were viewed, or where the subjects engaged

in drawing and writing tasks. But perhaps our "stimulus hungry" extraverts became comparatively more cortically aroused and relatively alpha attenuated in the FSP conditions due to their greater need for involvement with, and immersion in, the imagery production requirements of the FSP task.

Therefore, although extraversion was not positively correlated with psi success, Eysenck's non-parapsychological theory, which predicts a positive correlation between alpha production and extraversion, finds confirmation in these data.

#### Handedness

All subjects described themselves as right handed, and indicated on the handedness inventory that they performed at least seven of 12 common tasks with their right hands. For males, the mean number of tasks performed with the right hand was 10.7, while for females it was 11. Four of the twenty subjects had one left handed parent, and at least 6 of the subjects had one left handed sibling. Three subjects had children who were left handed. Fifteen of the twenty subjects spontaneously used their right eyes when asked to sight something through a portable telescope. Twelve subjects were right thumb dominant in the hand clasp test. When allowance is made for selection, none of these measures showed interesting relations to EEG or FSP scores.

### EEG Analyses (Missing Data)

Noise artifacts rendered one female subject's EEG recording during the sensory viewing of the City Tape unuseable. EEG information from only five out of a possible 66 epochs could be redeemed, which sampled only the first 1 1/4 minutes of viewing. Consequently, EEG data from her four experimental conditions, as well as EEG data from her laterality profile tests, were excluded from the analysis.

### EEG Laterality Profile Tests

An analysis of variance (ANOVA) contrasted hemispheric activation differences for the 19 remaining subjects while drawing a person and writing a letter for about two minutes each. This showed that subjects, as a group, were appropriately lateralized for these tasks. The F-test for the hemisphere x task interaction was significant at  $F=12.336$ ;  $df=1,17$ ;  $p<.003$ . It should be noted, however, that three subjects (two females and one male) showed crossed lateralization tendencies for the tasks. Table 4 presents group means.

Table 4

Mean Left Hemisphere (LH) and Right Hemisphere (RH)  
Alpha Raw Scores for Two Laterality Tests (N=19)

	LH	RH
DRAW	63.86	58.66
WRITE	57.36	63.75

It can be seen from the table that the subjects produced less mean integrated alpha in the right hemisphere while drawing than they did in the left hemisphere, indicating relatively greater right hemispheric involvement in the drawing task. Conversely, subjects while writing exhibited less alpha in the left hemisphere than they did in the right hemisphere, indicating the left hemispheric activation propensities of the writing task.

Separate ANOVAS contrasted hemispheric task differences for the 10 males (task x hemisphere interaction significant at  $p < .004$ ); and for the nine females (task x hemisphere interaction suggestive at  $p < .07$ ).

#### FPG ANOVA Analyses of Sensory and FSP Data

Indices of left and right hemisphere alpha production assessed subjects' lateralization tendencies during the sensory and extrasensory sessions for the two videotapes. Subjects' mean left and right hemisphere alpha raw scores for the sensory viewing of the two videotapes are presented in Table 5. Table 6 presents the corollary scores for the FSP viewing of the target material.

An ANOVA with repeated measures on subjects' mean indices of left hemisphere and right hemisphere alpha production across the sensory and FSP conditions revealed that significantly more alpha was generated during the FSP conditions as compared with the sensory conditions.

Table 5

Mean Left Hemisphere (LH) and Right Hemisphere (RH)  
Alpha Raw Scores during the Sensory Sessions  
of the Love Tape and the City Tape

Males	SENSORY LOVE		SENSORY CITY	
	LH	RH	LH	RH
1	113.800	118.691	122.545	127.303
2	77.391	72.016	65.556	62.444
3	83.574	60.537	95.500	78.266
4	57.667	44.325	38.557	29.992
5	116.500	101.774	93.759	80.500
6	38.859	31.000	32.852	24.151
7	149.415	137.569	127.891	120.271
8	51.597	50.677	48.323	49.419
9	78.491	88.053	96.778	103.667
10	154.717	146.348	109.140	113.667
<b>Females</b>				
11	48.017	40.448	54.732	36.134
12	115.745	108.727	124.933	122.733
13	166.922	126.187	176.295	125.254
14	77.500	65.200	48.930	40.816
15	68.746	70.907	71.567	67.000
16	218.655	225.190	209.377	215.459
17	53.531	32.000	47.797	39.636
18	97.517	86.833	109.517	95.900
19	299.717	338.317	288.125	305.094

Table 6

Mean Left Hemisphere (LH) and Right Hemisphere (RH)  
Alpha Raw Scores for the ESP Sessions  
of the Love Tape and the City Tape

Males	ESP LOVE		ESP CITY	
	LH	RH	LH	RH
1	141.391	154.031	125.828	146.707
2	69.723	67.936	68.659	69.878
3	105.618	78.800	101.508	80.984
4	38.429	33.804	34.159	30.421
5	127.425	107.885	124.476	108.063
6	33.238	25.381	37.109	28.691
7	132.136	140.390	110.046	111.446
8	91.906	97.656	119.690	134.345
9	105.898	121.847	104.156	98.391
10	177.714	143.444	144.127	131.400
<b>Females</b>				
11	54.790	43.468	60.627	42.568
12	196.091	152.091	232.600	153.260
13	154.783	119.667	173.938	130.688
14	55.262	53.172	73.464	65.804
15	82.898	96.602	80.397	89.793
16	260.105	324.632	267.812	334.234
17	42.339	30.125	45.600	34.600
18	104.776	89.267	112.492	95.147
19	341.831	345.483	323.238	340.056

The repeated measures ANOVA of the sensory and ESP data is presented in Table 7.

Table 7

Repeated Measures Analysis of Variance of Alpha Raw Scores for the Sensory and ESP Sessions of the Love Tape and the City Tape

SOURCE	SS	DF	MS	F	P
Sex	68208.125	1	68208.125	1.613	.222
Unit	718954.000	17	42285.527		
State	11318.801	1	11318.801	9.409	.010**
Sex x State	767.982	1	767.982	.571	.461
State x Unit	22883.984	17	1346.117		
Tape	199.704	1	199.704	.710	.412
Sex x Tape	499.635	1	499.635	1.777	.201
Tape x Unit	4779.395	17	281.141		
Side	1369.287	1	1369.287	2.030	.173
Sex x Side	51.012	1	51.012	.076	.5+
Side x Unit	11469.578	17	674.691		
State x Tape	389.545	1	389.545	2.487	.134
Sex x State x Tape	86.445	1	86.445	.552	.468
State x Tape x Unit	2662.524	17	156.619		
State x Side	12.180	1	12.180	.05	.5+
Sex x State x Side	1.436	1	1.436	.006	.5+
State x Side x Unit	4162.934	17	244.878		
Tape x Side	6.113	1	6.113	.252	.5+
Sex x Tape x Side	112.038	1	112.038	4.622	.047*
Tape x Side x Unit	412.096	17	24.241		
State x Tape x Side	3.263	1	3.263	.118	.5+
Sex x State x Tape x Side	.561	1	.561	.02	.5+
State x Tape x Side x Unit	471.174	17	27.716		
Total	848721.250	151	5620.668		

\*\*  $p < .01$

\*  $p < .05$

It can be seen, from the significant tape x hemisphere x sex interaction in Table 7 that, for the complete body of data, males' hemispheres reacted differently to the videotapes than did females'. Males' and females' mean alpha indices for the Love Tape and the City Tape are presented separately for each hemisphere for the sensory and ESP conditions in Table 8.

Table 8

Group Means for the Sensory and ESP Sessions  
of the Love Tape and the City Tape

		SENSORY		ESP	
		<u>Love</u>	<u>City</u>	<u>Love</u>	<u>City</u>
Males	LH	92.20	83.09	102.35	96.98
	RH	85.10	78.97	97.12	94.03
Females	LH	127.37	125.70	143.65	152.24
	RH	121.53	116.45	139.39	142.91

Judging from the means presented in Table 8, we might suspect that subjects' right hemispheres generally produced less alpha than did their left hemispheres, regardless of which tape was being played. This trend, however, fell short of significance ( $p < .18$ ). An inspection of males' means reveals that the Love Tape sessions produced higher group means in both the left and right hemispheres than did the City Tape sessions (in both the sensory and ESP conditions). Subsequent analysis showed

this slight effect of tape to be nonsignificant ( $p < .20$ ). Within this general framework of alpha activity, we observe that the difference between the abundance of alpha in males' left and right hemispheres is actually greater for the Love Tape sessions than it is for the City Tape sessions. The indication is, therefore, that for males, the Love Tape was relatively more right hemispheric in its processing demands than was the City Tape, as had been expected.

Females' data show a converse pattern (hence the significant interaction). For females, the difference in left hemisphere and right hemisphere alpha abundance was greater during the City Tape sessions, than it was during the Love Tape sessions. Judging from these data, females appear to have exhibited relatively greater right hemispheric involvement when processing the City Tape, than they did when processing the Love Tape, contrary to expectation. Females' data, it may be recalled, had been expected to exhibit relatively greater right hemispheric processing for the Love Tape than for the City Tape, but to a significantly lesser extent than would males' data, because of males' greater degree of hemispheric specialization in brain organization.

To determine if the sensory viewing of the videotapes (irrespective of the ESP data) exhibited significant differences in hemispheric processing as functions of sex

and videotapes, an ANOVA was performed on the males' and females' data from the sensory condition only. Here the F-test of the sex x tape x hemisphere interaction was only suggestive ( $F=3.19$ ;  $df=1,17$ ;  $p<.1$ ).

Alpha production differences were similarly examined by an ANOVA on the males' and females' data from the FSP condition. Although the same trends appear in the FSP means, the F-test of the sex x tape x hemisphere interaction was substantially lower ( $F=1.75$ ;  $df=1,17$ ;  $p<.21$ ). It is apparent that it required the play of both data sets to achieve the significant sex x tape x hemisphere interaction exhibited in the combined sensory and FSP data.

Males' and females' data were subsequently analyzed separately to determine if the trends present in the combined data were present in the separate data sets. An ANOVA contrasting tape and hemisphere differences across the sensory and FSP conditions for the males showed a suggestive main effect difference of condition (i.e., greater overall alpha abundance in the FSP condition as opposed to the sensory condition). The F-test for the main effect of condition was  $F=3.87$ ,  $df=1,9$ ;  $p<.09$ . The males' tape x hemisphere interaction was not significant ( $F=1.30$ ;  $df=1,9$ ;  $p<.29$ ). However, an ANOVA on the males' sensory data showed a tape x hemisphere interaction which was marginally significant ( $F=4.66$ ;  $df=1,9$ ;  $p<.059$ ). Males' FSP tape x hemisphere

interaction was not significant.

Females' alpha scores, subjected to similar analyses showed a suggestive tape x hemisphere interaction across the sensory and ESP conditions ( $F=3.78$ ;  $df=1,8$ ;  $p<.09$ ), but neither the sensory nor the ESP data, when analyzed separately, showed even suggestive tape x hemisphere interactions. The increase in overall alpha abundance from the sensory to the ESP condition proved to be suggestive in the females' data ( $F=4.47$ ;  $df=1,8$ ;  $p<.068$ ), as it had been in the males'.

A summary chart of the significance values for the F-tests in the nine ANOVA analyses is presented in Table 9. To summarize the results of the various ANOVA analyses we can see from the F-test probability values presented in Table 9 that the weak trend toward higher overall (both left hemisphere and right hemisphere) alpha levels in females as opposed to males (main effect for sex), was a stable feature of the ESP data as well as the sensory data. Relevant to this very slight effect are other reported findings of greater EEG power in females than in males (Flor-Henry, 1982), and greater mean alpha frequency in females than in males (Deakin and Exley, 1979). It would obviously require a larger subject pool to determine whether or not the present suggestion of support for these authors' findings was due merely to the fact that since levels of alpha production are stable traits of individuals, our sample



happened by chance to comprise more superlative female alpha producers than it did males.

The significant main effect difference of state, (i.e., the production of significantly more left hemisphere and right hemisphere alpha in the ESP as opposed to the sensory condition) is suggestively reflected in both males' and females' separate data analyses. This demonstrates that the significant increase in alpha abundance from the sensory to the ESP conditions were derived about equally from males' and females' mean alpha indices. This effect most probably resulted from the nature of the ESP task, which required subjects to mentate internally, while focusing their eyes upon a pattern of blurry moving dots. Aural input during the ESP condition was also monotonous (television white noise), and the general lack of any cognitive sensory stimulation during the ESP period may well account entirely for the significant increase in overall alpha production during the ESP condition. This result is compatible with the results of other research relating stimulus complexity to lower amplitude EEG (Berlyne and McDonnell, 1965; Gale et al., 1971). In addition, Walker (1980) recently found lower levels of alpha when subjects watched a TV excerpt than when they looked at a blank TV screen and had an imaginal experience. It is also plausible that the relaxation instructions given prior to the ESP periods induced a quasi-hypnotic state

in many subjects, leading to increased alpha production. Another possible contributor to the state differences found in the present experiment might have been that despite the fact that subjects were instructed to keep their eyes opened during the ESP mentation periods, some subjects may have closed their eyes for periods of time, resulting in higher alpha production levels during the ESP as opposed to the sensory conditions. One of the subjects, in fact, reported falling asleep briefly during his first ESP mentation period. His alpha production levels however, did not differ even suggestively from those in his second ESP mentation period, where he claimed to have been feeling refreshed and alert.

The significance values for the main effect differences of tape, that is, the possible production of significantly more overall alpha during one tape, as opposed to the other, show a slight trend toward relatively greater combined left hemisphere and right hemisphere alpha production during the Love Tape as compared with the City Tape for both males and females in the sensory condition ( $p < .15$ ), an effect contributed primarily by the males' data. The suggestive state x tape interaction in the females' sensory and ESP ANOVA ( $p < .08$ ) reflects the fact that although females, like males, tended to produce more combined left hemisphere and right hemisphere alpha in the sensory condition when watching the Love Tape than when watching the City Tape,

they produced less overall alpha when the Love Tape was playing in the ESP condition than when the City Tape was playing. When the interaction is looked at as a main effect for tape in the females' separate sensory and ESP analyses, we observe that the sensory differences are negligible ( $p < .47$ ), while the ESP differences are somewhat more interesting ( $p < .11$ ). But since the suggestive interaction therefore contracts into weakly consistent alpha production differences for tape in only one condition, it may comfortably be ascribed to chance factors.

Unlike females, males during the ESP condition tended to produce somewhat more alpha in both hemispheres when the Love Tape was playing than when the City Tape was playing, as they had in the sensory condition. However, the males' and females' tape x sex interaction ( $p < .12$ ) in the ESP condition is derived from males' data which, by themselves reflect no suggestive alpha production differences for tape during the ESP viewing periods. We may assume, then, that chance factors in the patterning of the data contributed to the weak suggestion of overall alpha production sex differences for tape in the ESP condition.

The suggestive main effect hemisphere differences in the males' sensory ANOVA ( $p < .07$ ), and in the combined males' and females' sensory ANOVA ( $p < .07$ ), are due to the general trend toward greater relative right hemispheric

participation in processing both of the videotapes. This tendency was exhibited in the mean alpha production of eight of the 10 males and six of the nine females while viewing the Love Tape, and six of the 10 males and six of the nine females while viewing the City Tape.

The marginally significant finding of a hemisphere effect for tape in the males' sensory data ( $p < .06$ ) suggests that the Love Tape did contain properties which distinguished its hemispheric activation potential from the City Tape, but only for males. Whether males' relatively greater right hemispheric activation levels accrued from the emotional components communicated in the videotaped monologues, or from specialized right hemispheric facial perception and processing mechanisms activated by viewing a series of "talking heads", cannot be resolved by these data.

To explore this issue, we would want to couple The Love Tape with a tape which contained a series of males and females discussing abstract, analytical subjects, and we would also want to increase substantially the number of male subjects. We would either eliminate females, or utilize their data heuristically. If significantly greater relative right hemisphere activity prevails for the Love Tape, as opposed to the analytical tape, we may conclude that the emotional components present in the Love Tape have been effectively discriminated from the facial processing components,

and that perceived emotionality in the faces or monologues has added an increment of function to males' right hemispheric processing activity.

The significant tape x hemisphere x sex interaction ( $p < .05$ ), in the males' and females' combined sensory and ESP data, resulted (as discussed earlier) from the fact that for males, the Love Tape was relatively more right hemispheric in its activation propensities than was the City Tape, while for females, the City Tape was relatively more right hemispheric than was the Love Tape. Consistent with this finding are the marginally significant males' sensory tape x hemisphere interaction (discussed above), and the suggestive females' sensory and ESP tape x hemisphere interaction ( $p < .09$ ). However, females' nonsignificant tape x hemisphere interactions in the separate sensory and ESP analyses ( $p < .35$ ; and  $p < .28$ , respectively), as well as the failure of males' ESP data to exhibit a tape x hemisphere effect, cast doubt on the repeatability of a phenomenon such as that indicated by the significant tape x hemisphere x sex interaction in the combined sensory and ESP data.

In short, the unacceptably weak results of the EEG ANOVA analyses cannot provide either support or disconfirmation for the author's hypothesis of congruence in the asymmetrical processing of sensory and ESP information.

### EEG Correlational Analyses

To determine if the hypothesis of congruence in the asymmetrical processing of sensory and ESP information would be confirmed by individuals' laterality patterns (if not by robust group differences in the lateralized processing of the two videotapes), a correlational analysis was performed. Laterality means were derived for each subject from laterality indices computed for every 15 second interval of viewing in the two sensory (i.e., Sensory Love; Sensory City) and two extrasensory (i.e., ESP Love; ESP City) conditions. The amount of alpha produced by the right hemisphere was subtracted from the amount of alpha produced by the left hemisphere, and the resulting difference was divided by the amount of alpha produced by both hemispheres during the same interval. Thus, left hemisphere and right hemisphere alpha raw scores were collapsed into a single laterality index for every 15 second epoch of each session. Treatment means were then derived for each subject for each of the four treatment sessions. With this method, a relatively higher mean was indicative of greater relative right hemispheric participation in processing. For example, if an individual showed a higher laterality mean for Sensory Love than he or she had shown for Sensory City, this indicated that the individual had displayed greater relative right hemispheric participation in processing the Love Tape as compared to the City Tape. Subjects' laterality means are presented in Table 10.

Table 10

Mean Laterality Indices for the Sensory and ESP Sessions  
of the Love Tape and the City Tape\*

Males	SENSORY LOVE	SENSORY CITY	SENSORY DIF	ESP LOVE	ESP CITY	ESP DIF
1	-.019	-.019	-.001	-.044	-.076	+.032
2	+.038	+.025	+.013	+.015	-.009	+.024
3	+.169	+.096	+.073	+.148	+.115	+.033
4	+.131	+.127	+.004	+.066	+.055	+.011
5	+.073	+.080	-.007	+.084	+.067	+.017
6	+.110	+.156	-.046	+.140	+.130	+.010
7	+.043	+.027	+.016	-.029	-.018	-.011
8	+.013	-.009	+.022	-.032	-.064	+.032
9	-.054	-.038	-.016	-.055	+.038	-.093
10	+.031	-.016	+.047	+.100	+.045	+.055
<b>Females</b>						
11	+.089	+.205	-.116	+.106	+.173	-.067
12	+.024	+.003	+.021	+.108	+.199	-.091
13	+.138	+.170	-.032	+.127	+.142	-.015
14	+.086	+.093	-.007	+.008	+.047	-.039
15	.000	+.031	-.031	-.051	-.043	-.008
16	-.017	-.011	-.006	-.106	-.108	+.002
17	+.246	+.125	+.121	+.176	+.154	+.022
18	+.057	+.056	+.001	+.077	+.067	+.010
19	-.058	-.028	-.030	-.004	-.024	+.020

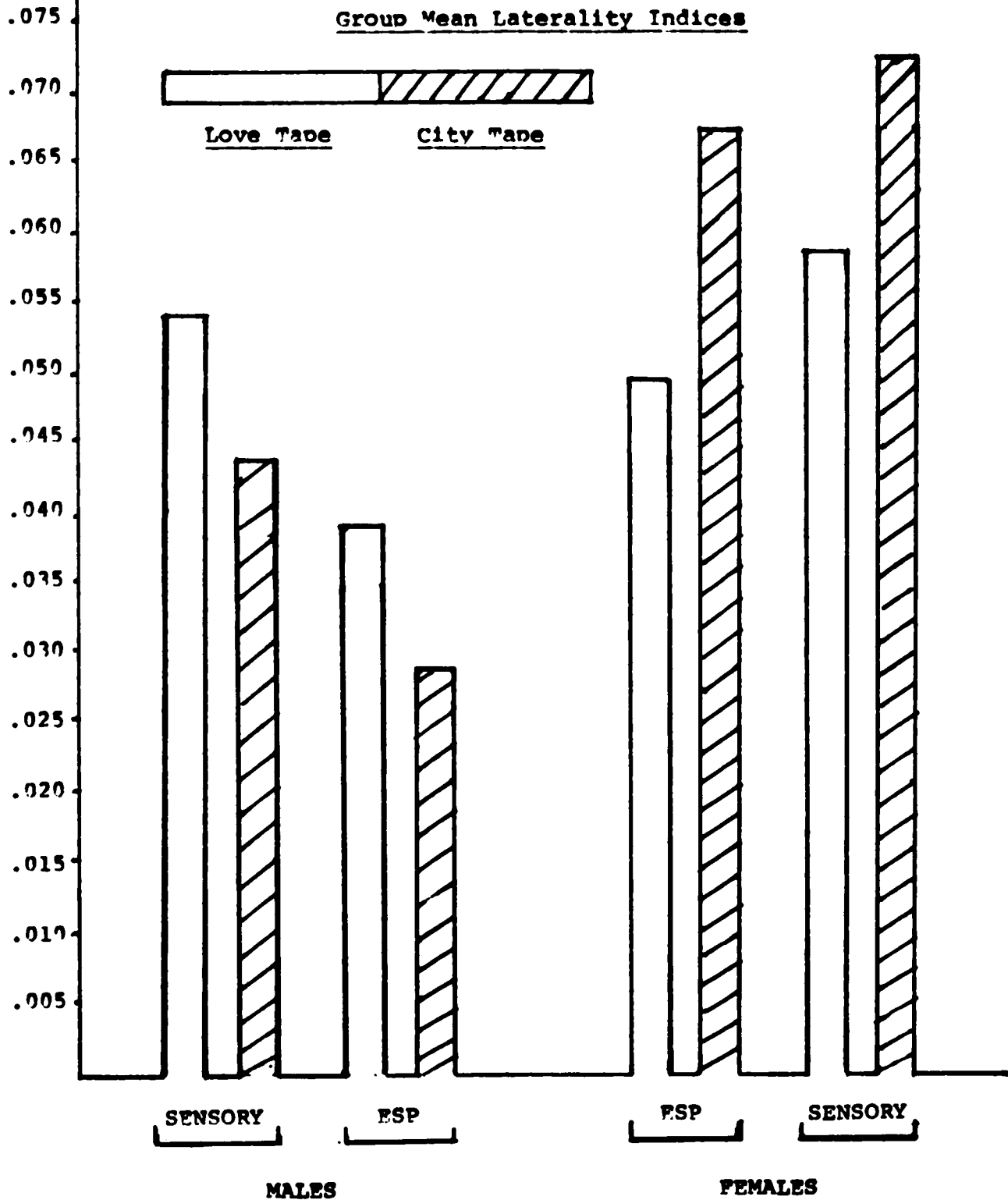
\*Data are rounded to three decimal places, although seven decimal places were used for computation.

In order to correlate individuals' hemispheric activity patterns in the sensory and ESP conditions, each subject's mean laterality index for the City Tape was subtracted from her (or his) mean laterality index for the Love Tape in the sensory condition, and again in the ESP condition. The resulting difference scores were then correlated for the 19 subjects with a Pearson  $r$ . The correlation coefficient of the differences was  $r=.4327$ ;  $df=17$ ;  $p<.07$ , two-tailed. Figure 1 presents group means separately for males and females.

Separate product moment correlation coefficients were then derived for (1) the group of subjects whose ESP mentations had provided the best evidence of psi, based on the consensus judging, and (2) all other subjects. It will be recalled that the tandem mentation reports of 10 of the 20 subjects were correctly matched to the videotapes by each of the respective subjects and by both outside blind judges. However, one of the subjects whose mentation reports had received correct consensus judging, was the female whose inadequate EEG data had been eliminated from the EEG analyses. For the nine remaining subjects in the sample of "best" subjects, then, the correlation coefficient was  $r=.7149$ ;  $df=7$ ;  $p<.03$  two-tailed. The data of the 10 subjects whose reports had received incorrect judgments from at least one of the three judges yielded  $r=-.1384$  (ns). The difference between the two coefficients was significant at  $p<.1$ , two-tailed.

Figure 1

Group Mean Laterality Indices



These data imply that congruence is a meaningful concept when applied to hemispheric specialization effects during sensory and ESP processing. They support the author's hypothesis of congruence in the asymmetrical processing of cognitive material during sensory and ESP perception. What is particularly encouraging about the ESP results in this experiment, is that they appear to provide two independent but converging lines of evidence for extrasensory processing. Not only were consciously reported memories of attempted ESP mentations matched to ESP stimulus videotapes more accurately than chance would predict (in the absence of any extrasensory processing), but also subjects' differences in unconscious patterns of relative hemispheric engagement while actually viewing the two videotapes correlated positively with their hemispheric differences in unconscious brain activity while attempting to respond to the videotapes extrasensorially. When we select the subjects whose mentations gave the best evidence for psi processing (i.e., subjects whose mentations were correctly matched to the videotapes by three independent judges), we find that their independently significant positive brain correlation is also significantly higher (the directional hypothesis, here, gives a  $p < .05$ ) than that of the subjects whose remembered mentations showed a mixed pattern of judging, or whose mentations were incorrectly matched to the videotapes by all three judges. Brain data for

the unsuccessfully judged subjects, in fact, gave a negative correlation which was close to pure chance. Therefore we observe that the individuals who gave the best evidence for psi processing in the mental domain of consciously remembered perceptions, are the same individuals who provided the best physiological evidence for psi processing in the physical domain of unconscious hemispheric activity.

## THEORETICAL SPECULATIONS

Confidence in the presents results can, of course, only come with replication. Based on these data, we may speculate that psi operates concurrently, and perhaps even synonymously, in both physicalistic and mentalistic spheres. The ultimate mind-body question, however, cannot even be speculatively addressed by the present experimental results. Whether the remote videotaped stimulus was cognized dualistically by a nonphysical mind and/or by a nonconscious body; or whether it was cognized monistically by a physically conscious mind-body, cannot be resolved by these data.

For example, if we are dualists and favor a mentalistic interpretation, we might imagine a remote videotape stimulus which interacts with pure "mind", inspiring mentation which bears more than a random similarity to the distant stimulus. The stream of mentation induces its corresponding pattern of brain activity which again proves to bear more than a random similarity to the pattern of brain activity induced by an actual viewing of the stimulus. The ESP mentation induced brain activity is similar to the sensorially induced brain activity merely because similar mentations cause similar patterns of brain activity. Therefore the videotape

stimulus did not "cause" the brain activity. It was caused by the similar mentation which was caused by the videotape stimulus. This interpretation allows us to believe that ESP is a purely mentalistic phenomenon.

Conversely, if we prefer a physicalistic interpretation, we may imagine a sensorially starved physical organism which orients to a distant stimulus, and inter-relates or perhaps "resonates" with its field. Because the interaction is only partial or intermittent, the pattern of brain response bears only similarity (i.e., is not isomorphic) to the pattern of activity induced by an actual viewing of the stimulus. In conjunction with the remote stimulus, the congruent hemispheric activation or resonance induces epiphenomenal mentation which proves to resemble the actual stimulus more than it resembles an alternate stimulus. With this interpretation we may surmise that a mindless body has imperfectly reacted to the ESP stimulus, and that its attendant mentation represents a further distortion of what the physical organism has experienced. Thus an ESP brain response which might potentially have been isomorphic to its sensory equivalent becomes imperfect or distorted due to the organism's inevitable lapses in attending; innate extrasensory acuity; fluctuating extrasensory thresholds, etc.

Or we may wish instead to embrace some form of mind-body parallelism, and construe that neither mind nor body has acted on the other, but rather that both have

responded to the distant stimulus, each with its own modus operandi.

Adopting yet another philosophical position, we may assert that the mind and body are but different forms of a unitary consciousness which has both physical and mental counterparts. The psi percept, by engaging consciousness, has simultaneously pervaded its mental and physical dimensions. Evidence for psi processing from remembered mentations is mirrored in evidence for psi processing from brain activation because both aspects of evidence reflect the experiencing of the percept. The thoughts provide a continuous account through time, of the dynamic spatial interaction in the brain. Both the neural events and the remembered thoughts define what was, in essence, a fundamentally unitary perception.

Although the results of the present experiment lend support to the idea that psi, at acceptable levels of significance, is operating in some individuals rather than all individuals, there are other interpretations of the data which should be considered.

The observational theories offer a model wherein the observation of psi feedback retrokinetically affects the past, causing the psi event to have happened. To examine the model in terms of the present experiment, we need to determine who the crucial observer of the psi feedback would have been. Individual subjects in the experiment received feedback for their own judgements,

but most never learned of the collective results of the experiment, nor of any extrasensory effects in their own brain activity. The two outside blind judges received global feedback (significance values for their respective judging), but never learned which mentations had been matched correctly and which hadn't. Judges never received knowledge of congruence effects in brain activity as it related to individual mentations. The significant difference in hemispheric congruence between successfully judged subjects and unsuccessfully judged subjects, was reported to one of the judges, but not to the judge whose scoring was independently significant.

Perhaps, as experimenter, my overall knowledge of the significant results would make me a likely candidate for the crucial observer role. Although I observed results on computer printouts which had previously been viewed by someone else, the results were initially viewed by someone for whom they were relatively meaningless. However, it should be noted that when I first looked at the EEG results, I was anticipating robust laterality effects along the emotional/nonemotional continuum, with sex differences further defining the effect. The explicit correlational test for individuals' hemispheric congruence was suggested to me after the data had been collected, but before any EEG data had been analyzed. It was devised by someone who had not viewed the data, and who, in any event, did not believe that a significant ESP effect

would be found. If, as a "blind" experimenter, I retro-kinetically influenced my subjects' unconscious brain activity by viewing the significant results, we must conclude that I influenced it primarily in a direction that was unanticipated but desirable for the successful outcome of the experiment. The impersonal character of such a potential influence leads me to believe that an experimenter-observer of the data plays less than a masterful role in the internal dynamic of a psi event. Perhaps rather than influencing the past, the collapse of the probability vector by the psi observation, merely defines the probable outcome, so that it may be studied.

Yet it is plausible that the true form of the psi event is four dimensional, and like all quantum truths it exists in space-time, and has a probability function like a wave-form. It may be useless to inquire which part of the "psi-form" arrives in the brain and which doesn't, as if the wave carried along psi-particles from the distant stimulus to the human participant in the experiment. As with wave-particles in quantum mechanics, we may not be permitted to know exactly where the psi is at any given instant. If an experiment has been successful, perhaps we can only assume (with less than full confidence), that psi has once again demonstrated a significant tendency to be in the appropriate place at the appropriate time. Indeed the extrachance component in a psi experiment, may

at once be refracted into all of the composite facets of the experiment. In the present case, for example, we had to depend on probabilistic functions which involved the judges and individual subject-judges, in order to arrive at the ultimate test of the hypothesis (i.e., the test between the hemispheric correlation coefficients of the successfully judged subjects and the unsuccessfully judged ones).

The present results do not preclude, and it should perhaps be considered as a possibility, that psi requires a living brain through which to operate. The mentation reports, for example, may not have "contained" or "carried" any psi. Judges may have displayed what were essentially innate probabilistic tendencies to exhibit various levels of psi on this, or any occasion. If so, they may have been predisposed to correctly judge the mentations of subjects who displayed the greatest amount of correlated brain activity. The correct judgments and the correlated brain activity may have coincided because of the implicit probabilistic constraints imposed on the experiment by its conceptualization.

It may be parsimonious, in fact, to characterize FSP as simply those subtle, but natively inexplicable anomalies of randomness which are likely to be exhibited in ESP data. ESP researchers propose hypotheses in an attempt to understand the potential anomalies, and too often predict correspondences which bear fruit in the consummate

pattern of statistical improbabilities. But the failure to replicate significant findings (a problem no less severe in ESP research than in the behavioral sciences generally), has made it difficult to tie the exhibited anomalies to predictable cause and effect relationships. But the wealth of scientific ESP research--rigorously conducted with blind experimenters and blind judging procedures (which are not conventionally employed in current experimental research), suggests that if ESP researchers are typically committing Type I errors, such errors occur far more often than our present mathematical models would predict.

If psi is a normally distributed individual and collective function of consciousness, which can exert a macrophysical "psi-form" effect on the entire play of the experimental data, sufficient psi talent is likely to be found in any random sampling of ESP enthusiasts to skew the experimental results in favor of the hypothesis under consideration. Nor does this mean that the hypothesis is untrue. Its truth or falsity may simply be irrelevant to the outcome of the experiment. With this model, the "psi-form", energized by the collective consciousness of the participants, is utilized in the confirmation of the hypothesis. Its confirmation is a demonstration that the participants are using psi. Its confirmation is the psi.

## APPENDIX A

Laterality Test Instructions

## DRAW A PERSON

As soon as I tell you to begin, what I'd like you to do is to draw a picture of a person--the best picture you can. I'd like it to be the picture of a whole person, including arms, legs, etc.--the works. You'll have a couple of minutes to make the picture, so you don't have to rush, and it's important that, once we begin, you keep on drawing until I tell you to stop. Do you have any questions? O.K., you can begin drawing now.

## WRITE A LETTER

When I tell you to begin, what I'd like you to do is to write a letter to a friend, discussing the advantages or disadvantages of a broad liberal arts education as a preparation for entering the job market. Cite all of the convincing reasons you can think of for believing as you do, and try to persuade your friend to adopt your point of view. Once we get started, it's important to keep on writing until I tell you to stop. Do you have any questions? O.K., you can begin writing now.

## APPENDIX B

Preliminary Instructions

First of all, let me say that we very much appreciate your coming in here today, to take part in this experiment.

This is an ESP experiment, and what we'd like you to do is to use ESP to imagine what's being played on a TV set in another room.

During the experiment, you'll be looking at the TV set right in front of you, which will remain on, but it won't have any picture. The TV set in the other room is set up directly behind the one you're looking at, so that were you able to see it, it would be about 20 feet behind the one you're looking at, and placed so that it's consistent with your line of vision.

There will be two ESP viewing periods, each lasting for about 20 minutes. After each viewing period, you'll have an opportunity to tell us what's been passing through your mind. But its important, during the viewing periods themselves, that you remain awake, but not talk or move around, and that you keep your eyes open, and on the screen in front of you.

Although we would like you to remain quiet during the viewing periods, should any emergency arise, you can

of course, always contact us through the intercom microphone, which will remain on throughout the experiment. You have only to speak in a normal tone of voice in order for us to hear you outside in the lab.

After the ESP viewing periods are over, we'll be showing you a couple of other videotapes, in order to see how your particular brain behaves when it's actually watching a TV image. Again, during these viewing periods, we'd like you to keep your eyes on the screen, and not do any talking.

We still don't know very much about the way ESP works but generally it seems that a relaxed, open attitude is best for ESP success. That is, if the person can get into a mood of wanting ESP to happen, and sort of letting it happen but at the same time not tensing up or trying too hard to make it happen--this sort of relaxed, egoless attitude, seems to be best for these kinds of experiments. In order to help you to relax, I'm going to give you some progressive relaxation instructions, after which we'll begin the first ESP viewing period. Do you have any questions?

O.K., now what I'd like you to do is to make yourself comfortable in the chair, just as if you were about to watch TV at home. Uncross your legs and arms (if they're crossed), and make yourself very comfortable, relaxing just as fully as you can. Take a few deep breaths, and pay attention to your breathing as you listen very closely and discover that you can relax still more.

## APPENDIX C

Relaxation Instructions

I want you to imagine now that a wave of relaxation is coming in through the soles of your feet. As this wave of deep relaxation moves into your feet, just let your feet go limp and relaxed a little bit at a time, so that your toes and your feet now feel loose and limp--all tension and strain is slipping away and out of your body. And imagine now that the wave of relaxation is climbing up into your ankles, so that your ankles feel loose and relaxed, as it moves up into your calves, and your knees are now going very, very limp as I continue to describe the progress of this deep relaxation to you. And now the limp feeling is moving into your thighs, and on up into your pelvic area, relaxing, relaxing, feeling more and more relaxed. And the wave is passing into the abdomen now, and on up into the chest, all tension and anxiety slipping away. And this wave of relaxation is moving along now into your shoulders, and they're getting limp and relaxed as the wave passes down into your arms--and your arms and hands feel limp, and your fingers feel limp and loose and your whole body now feels so relaxed--just as limp and loose as an old rag doll appears to be, and now you feel the wave of relaxation passing from your

shoulders up into your neck, so that the neck feels so relaxed, and it climbs on up into your chin, and the jaws and mouth feel so relaxed and your lips and tongue feel so loose and limp and the wave of relaxation climbs up over your cheeks and up into your eyes--all strain and tension slipping away, out and away from your whole body. You can close your eyes for a moment now and feel that relaxation as it moves up into your skull, so that you can feel your brain relaxing, feeling very deeply, deeply relaxed and free as you listen very closely to what I have to say to you, and you will want to listen extremely closely, please, breathing deeply and remaining very relaxed and becoming aware only of what I am saying to you.

## APPENDIX D

Final Instructions

And you will want to open your eyes now, and keep them open as you continue to look at the screen in front of you. Very soon the TV set in the other room will be playing a videotape, and you will permit your brain to receive information from this videotape as you gaze at the screen in front of you. You will be able to imagine this videotape vividly and effortlessly, and you will be able to remain awake and relaxed throughout the viewing period. You will be able to remember and report to us afterward whatever has been going through your mind, and you can just let your brain do the work for you without making any special effort. You will be able to keep your eyes open and on the screen and you will remain very receptive to the videotape that is being played. And now, relax even further as I count backwards from ten until one, and then I will give you the signal to begin viewing. Ten. . . nine. . . eight. . . seven. . . six. . . five. . . four. . . three. . . two. . . one. . . you may begin viewing now.

**APPENDIX E**

**Judging Instructions**

Form A. Subject \_\_\_\_\_ Judge \_\_\_\_\_

Either the Love Tape or the City Tape was playing during the FSP period corresponding to this mentation report. Please make a slash on the Confidence Line extending from 100% confidence that the Love Tape was playing (extreme left) to 100% confidence that the City Tape was playing (extreme right). Your slash must fall either to the right or to the left of the 0% confidence point. This is intended to be a loose, global judgment. Also check the box of your choice.

100%  
Confidence

0%  
Confidence

100%  
Confidence



THE LOVE TAPE

THE CITY TAPE



Was there anything special about this particular mentation report that made you feel that it related to one or the other videotape?



Form B (Cont.) Subject \_\_\_\_\_ Judge \_\_\_\_\_

Was there anything about report # \_\_\_\_\_ and/or  
report # \_\_\_\_\_ that was particularly salient in deter-  
mining your ratings? If so, please comment below. Turn  
paper and write on back if necessary.

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# \_\_\_\_\_

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# \_\_\_\_\_





Form D (Cont.) Subject \_\_\_\_\_ Judge \_\_\_\_\_

Was there anything about report # \_\_\_\_\_ and/or  
report # \_\_\_\_\_ that was particularly salient in deter-  
mining your ratings? If so, please comment below. Turn  
paper and write on back if necessary.

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# \_\_\_\_\_

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# \_\_\_\_\_

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