

**CONCEPTUALIZING TRANSLIMINALITY AS FUNCTIONAL
REGULATION OF INTERACTION AMONG BRAIN REGIONS**

BY

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STATEMENT

This thesis contains no material which has been accepted for the award of any other degree or diploma in any university, and, to the best of my knowledge, contains no material previously published or written by another person, except where due references have been given in the text.

I give consent to this copy of my thesis, when deposited in the Barr Smith Library, being made available for loan and photocopying.

Signed,

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DEDICATION AND ACKNOWLEDGMENTS

This thesis is dedicated to my loving parents, Michael G. and Alice R. Houran. It was completed due the collective support and encouragement of many individuals. First and foremost, my family sacrificed much in the way of time and attention during its preparation. My son was especially affected, as he is well aware that he missed out on an amazing trip to Scotland! Drs. Michael A. Thalbourne (University of Adelaide), Peter S. Delin (University of Adelaide), and Larry F. Hughes (Southern Illinois University School of Medicine) were tremendously gracious in sharing their expertise with me and for serving as the supervisors of this work. They provided me the freedom to express my ideas, and the focus to explore them. Several people also deserve acknowledgment for stimulating discussions on some of the ideas presented in this thesis—A. G. Alias, Peter Brugger, M. Alan Kuzler, and Rense Lange. Furthermore, Diane D. Ashe, V. K. Kumar, Nicole E. Lavertue, and Richard Wiseman kindly assisted me in collecting data for several studies, while Susan E. Crawley and Lance Storm re-analyzed some of their own data for inclusion in this work. Appreciation is also extended to the anonymous reviewers of the six publications that derived from this thesis. Finally, I am extremely grateful to the BIAL Foundation (Portugal) who funded this research (Bursary # 03/00).

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ABSTRACT

Transliminality refers to the tendency of psychological material to cross thresholds into or out of consciousness. This thesis examines transliminality in several contexts. Since Chapter 1 shows that its major correlates are syncretic cognitions (the fusion of perceptual qualities in subjective experience), Chapter 2 presents a cognitive regulation hypothesis that specifies transliminality as disinhibition between brain hemispheres, as well as among frontal cortical loops, temporal-limbic structures, and primary or secondary sensory areas and/or sensory association cortices. Chapter 3 shows that transliminality taps the same boundary construct as Hartmann's Boundary Questionnaire (BQ) and that the BQ's experiential-syncretic factors are most predictive of transliminality. The boundary construct is significantly related to apparitional experiences, a phenomenon that likely derives from syncretic and somatization processes. However, a relationship between bilaterality and transliminality was not confirmed. Chapter 4 replicates positive associations among apparitional experiences, transliminality, and paranormal belief, and it establishes that these variables positively correlate with somatic-hypochondriacal tendencies. Chapter 5 tested the predictive validity of these relationships *in vivo* by studying participants' experiences at an alleged 'haunted' site. Patterns of participants' anomalous experiences and their scores on psychological measures hinted that syncretic and symbolic cognition were operating. Transliminality was positively associated with both types of cognition, which parallel established attentional mechanisms. This suggests that transliminality is a form of cognitive disinhibition involving lower sensory thresholds. Chapter 6 tests this idea via a quasi-experimental test of vibratactile sensitivity. High- and low-transliminality groups (HT & LT) completed threshold testing while listening to competing auditory stimuli of varying intensity and complexity. The HT group exhibited lower sensory thresholds and quicker performance times than the LT group. Further, introducing a high-intensity stimulus increased the thresholds of the HT group. This group also reported more aberrations in memory. These findings suggest that high transliminality reflects disrupted attentional or regulatory processes. In Chapter 7 it is concluded that a cognitive regulation model is a parsimonious explanation for the cumulative pattern of results in the literature and in the research reported here.

CHAPTER 1: DEVELOPMENT AND EMPIRICAL MEASUREMENT OF TRANSLIMINALITY¹

1.1 PROLOGUE

SHAMANS, MYSTICS, PSYCHICS, AND HYSTERIC. Historically, many cultures worldwide have shown special interest in individuals like these who have the apparent ability to integrate or dissociate affect, imagery, ideation, and perception (Ember & Ember, 1988; Kottack, 1987). Psychiatrist Jean Shinoda Bolen (1989) has even been credited with discovering inklings of the ‘permeable mental boundaries’ concept in the Greek ‘trickster figure,’ Hermes (see: Hansen, 2001, pp. 48-51). The field of psychology has a similar tradition of recognizing and attempting to conceptualize mental boundaries. Some of these efforts were strictly theoretical, while others were applied. This introductory chapter reviews the most salient of these efforts in relation to the topic of this thesis—*transliminality*. It will become clear that the notion of transliminality as the “hypothesised tendency for psychological material to cross (*trans*) thresholds (*limines*) into or out of consciousness” (Thalbourne & Houran, 2000, p. 853) is a recent example of psychology’s long-standing interest in understanding mental boundaries as a perceptual-personality variable.

This chapter reviews the studies in anomalistic psychology that have refined the idea of transliminality as a construct incorporating the “subliminal mind” (subconscious or unconscious), the “supraliminal mind” (conscious awareness or activity), and

¹ Part of this chapter was published as (Appendix L):
Houran, J., Thalbourne, M. A., & Lange, R. (2003). Methodological note: Erratum and comment on the use of Revised Transliminality Scale. *Consciousness and Cognition*, 12, 140-144.

sensitivity to the external environment (sensation and perception). It will be seen that the concept of transliminality attempts to systematically and empirically integrate boundaries on various levels within the individual—from the psychophysiological level to the behavioral. In this respect, it is argued that transliminality describes a process of regulating the hierarchical structure of human emotion, cognition, and perception. The chapter concludes by presenting the results of Rasch (1960/1980) scaling analyses by Lange, Thalbourne, Houran, and Storm (2000) that are the foundation for the current measurement and operational definition of transliminality.

1.2 THE CONCEPT OF MENTAL BOUNDARIES IN HISTORICAL PERSPECTIVE

Edwin Boring (1963) credited Herbart, and before him Leibnitz, with popularizing the notion of thresholds in psychological phenomena. Sensory thresholds were an established topic of psychophysics, but towards the end of the nineteenth century the idea came about that our everyday empirical consciousness lay above a threshold of some sort and that below that consciousness and that threshold was an aspect of the mind with its own characteristics.

Noted psychologist Frederic Myers called this region the subliminal consciousness (Myers, 1903; Thalbourne, Bartemucci, Delin, Fox & Nofi, 1997), and William James acknowledged this label while also referring to it as the “extramarginal” or “ultramarginal” region:

I cannot but think that the most important step forward that has occurred in psychology since I have been a student of that science is the discovery, first made in 1886, that, in certain subjects at least, there is not only the consciousness of the ordinary field, with its usual centre and margin, but an addition thereto in the shape of a set of memories, thoughts, and feelings which are extra-marginal and outside of the primary

consciousness altogether, but yet must be classed as conscious facts of some sort, able to reveal their presence by unmistakable signs. I call this the most important step forward because, unlike the other advances which psychology has made, this discovery has revealed to us an entirely unsuspected peculiarity in the constitution of human nature (James, 1902/1982, p. 233).

James did not give a name to this process, but he asserted that unconscious-conscious boundaries influenced higher order cognitive functions when he divided people into “tough minded empiricists” and “tender minded rationalists” (James, 1907). Two years later Usher and Burt (1909) spoke of “transliminal” leakage between the subliminal and the supraliminal consciousness with respect to ostensible extrasensory perception; a notion nearly identical to Virtanen’s (1990) conclusion that anomalous/ paranormal experiences reflect physiological processes associated with the movement of information from non-awareness to awareness during various states of consciousness. Usher and Burt’s idea of transliminal leakage may have been partly inspired by the early writers in abnormal psychology who readily explained phenomena like apparitions as manifestations released from the human psyche (De Boismont, 1853). In a 1919 address to the Society for Psychical Research (SPR), Carl G. Jung likewise conceived of some parapsychological manifestations as exteriorized, i.e., psychologically projected, unconscious complexes.

The idea of boundaries between the unconscious and conscious became firmly rooted in psychological theory with Sigmund Freud. Freud’s ideas were greatly influenced by his training in neurology, where he observed a hierarchical ordering of neurological structures. For example, just as the onset of some neural firings can inhibit other neural firings, so can personality domains be considered as inhibiting or setting

boundaries to the demands of other personality domains. Consequently, Freud's psychodynamic theories emphasize the relationship of personality structures to levels of unconscious, preconscious, and conscious awareness:

Every mental process...first exists in an unconscious state or phase, and only develops out of this into a conscious phase, much as a photograph is first a negative and then becomes a picture through the printing of the positive. But not every negative is made into a positive, and it is just as little necessary that every unconscious mental process should convert itself into a conscious one. It may be best expressed as follows: Each single process belongs in the first place to the unconscious psychical system; from this system it can under certain conditions proceed further into the conscious system (Freud, 1933, pp. 305-306).

Freud discussed boundaries only a few times, especially when he speaks of the stimulus barrier or "reitzschutz" — a protective shield against stimulation. He referred to the entire ego as initially a body-ego derived from the body surface (Freud, 1923). Many of Freud's followers explored boundaries in more detail, such as Federn (1952). There is also an entire literature on "ego boundaries" that definitely follows from Freud's early speculations. In the psychoanalytic literature, solid ego boundaries are considered a kind of ideal, and the emphasis is on defects and weaknesses in ego boundaries that lead to psychosis or other pathological conditions. This is quite different from the view of thin and thick boundaries as a value-free personality dimension, which is developed below. Moreover, ego-type boundaries may be further divided into a hierarchy, with each section of this hierarchy regulating different aspects of 'ego' functioning.

In particular, there is independent evidence (Peredery, Persinger, Blomme, & Parker, 1992) that the human brain is organized into three anatomically separate, evolutionary structures identified by MacLean (1973, 1990) that can be thought of as different small minds, each with its own sense of time and space, kind of intelligence,

subjectivity, function, and chemistry. This hierarchy of mental structures is known as MacLean's Triune Brain Theory. According to this theory, each of these three evolutionary small minds continually sends messages to the others to form one 'triune brain' that operates as a whole:

1. *The Reptilian Complex (R-Complex)*. Evolutionarily the oldest part of the human brain, the R-Complex comprises the basal ganglia, corpus striatum, olfactory striatum, globus pallidus, and satellite collections of gray matter. In animals such as reptiles, the brain stem and cerebellum dominate. For this reason it is commonly referred to as the "reptilian brain." It is rigid, obsessive, ritualistic, and filled with "ancestral memories" (corresponding to what Sri Aurobindo called the "mechanical mind" and perhaps tangentially to Jung's notion of the "collective unconscious"). In humans, this part of the brain is programmed for survival through the regulation of behavioral patterns that are mainly innate (MacLean, 1973, 1990). This brain controls muscles, balance and autonomic functions, such as breathing and heartbeat.
2. *The Limbic System*. As therapsids evolved into mammals, neurological modifications created a group of structures referred to by MacLean (1973, 1990) as the paleomammalian brain, or limbic system. This consists of the amygdala, hippocampus, parahippocampal gyrus, septum, cingulate gyrus, thalamic nuclei and related structures. It corresponds to the brain of most mammals, and especially the early ones. The limbic system is concerned with emotions and instincts, feeding, the flight or fight response, and sexual behavior. As MacLean (1973, 1990) observes, everything in this emotional system is either "agreeable or disagreeable," since survival depends on avoidance of pain and repetition of pleasure. When this part of the brain is stimulated with a mild electrical current various emotions and anomalous perceptions are produced. The limbic system appears to be the primary seat of emotion,

attention, and affective (emotionally-charged) memories. It helps determine valence (whether you feel positively or negatively towards something, in Buddhism referred to as *vedana*, “feeling”) and salience (what captures your attention), unpredictability, and creative behavior. It has vast interconnections with the neocortex (see below), so that the brain’s functions are neither purely limbic nor purely cortical but a mixture of both.

3. *The Neocortex*. Recent mammals exhibit a third layer of neural tissue, the neocortex, which reaches its greatest extension in humans. The higher cognitive functions that distinguish humankind from other animals reside in the cortex. MacLean (1973, 1990) refers to the neocortex as the mother of invention and the father of abstract thought. In humans, the neocortex takes up two-thirds of the total brain mass. Although all animals also have a neocortex, it is relatively small with few if any folds (indicating surface area, complexity, and development).

It has been previously assumed that the highest level of the brain, the neocortex, dominates the other, lower levels. However, MacLean (1973, 1990) has shown that this is not the case. Rather, the physically lower limbic system, which rules emotions, can take over the higher mental functions when required or under certain psychological states (e.g., stimulation of temporal lobe, absorption in fantasy-like mentation, psychophysiological stress, trauma, etc). It is interesting to note that many esoteric spiritual traditions taught the same idea of three planes of consciousness and even three different brains. G. I. Gurdjieff, for example, referred to Man as a “three-brained being” (see Needleman & Baker, 1996). There was one brain for spirit, one for soul, and one for the body. Similar ideas can be found in *Kabbalah*, in Platonism, and elsewhere, with the association spirit-head (the actual brain), soul-heart, and the body in the belly. This enters

upon the chakra paradigm, i.e., the idea that points along the body or spine correspond to nodes of consciousness, relating in an ascending manner, from gross to subtle.

Not unlike MacLean's triune brain model, Kurt Lewin, in the 1930s, diagrammed the mind as a number of regions acting on one another, separated by divisions of various thickness (Lewin, 1936). French psychoanalyst Anzieu has similarly worked clinically with the concept of the "ego skin" (*moi pau*) as an "envelope for the ego," (Anzieu, 1987). Unfortunately, clinical psychoanalysts have generally made no attempts to quantify these boundary measures. One notable exception is the work of Blatt and Ritzler (1974) using the Rorschach test. Specifically, based on developmental cognitive and psychoanalytic theory, three types of thought disorder on the Rorschach (contaminations, confabulations, and fabulized combinations) were conceptualized as indicating different degrees of disruption of boundaries. Blatt and Ritzler examined eleven groups of 10 patients each who illustrated each of the types of boundary disruptions on a wide range of psychological test data and reports of clinical course. Consistent and significant differences were found between level of thought disorder based on degrees of boundary disruption and impairments of complex cognitive functions, deterioration of reality testing, indications of difficulty with affect modulation, distorted human representations on the Rorschach, involvement in interpersonal relationships, and the response to therapeutic intervention. The researchers concluded that degrees of boundary disruption appear to be useful criteria for assessing the extent of pathology, particularly within the psychotic range.

Peter Landis has studied ego boundaries in detail and developed some ingenious tests for ego and interpersonal boundaries (Landis, 1970). All of these measures can be

related to thin versus thick boundaries. Fisher and Cleveland (1968) have worked extensively with two measures, "Barrier," and "Penetration," based on the Rorschach test. Theoretically, "Barrier" ought to be closely related to thick boundaries and "Penetration" to thin boundaries. However, empirically, this is not the case. The "Barrier" and "penetration" measures turn out not to be opposites (Fisher & Cleveland, 1968), and further, neither seem closely related to thick and thin boundaries (Fisher, 1992, unpublished manuscript). Rokeach (1960), in his work on the "open and closed mind," was clearly dealing with an aspect of boundaries, as were Adorno and his colleagues in their classical work on the "authoritarian personality" (Adorno, Frenkel-Brunswik, Levinson, & Sanford, 1950). The "closed mind" and the "authoritarian personality" definitely describe aspects of people with very 'thick' mental boundaries.

This relatively dichotomous conceptualization of 'thick' versus 'thin' mental boundaries may be relevant to different styles of organizing mental contents. In different ways, Mednick (1962), Spence (1964) and Broadbent (1971) distinguish between a conscious, logical, hierarchical style of conceptual organization, on the one hand, and a preconscious, connotative, parallel processing style of conceptual organization on the other. Each style may serve important defensive as well as adaptive purposes. By being neat, explicit, and well organized, people with thick boundaries can reduce the chances of different concepts becoming confused with each other; perhaps at the cost of not seeing novel connections between them (Mednick, 1962). Thick boundaries can be used defensively to avoid seeing connections between related ideas. While thin boundaries between concepts permit novel and creative associations between normally unrelated ideas, thin boundaries may be implicated in confused and autistic thinking. In this

regard, a cognitive style, category width, (Gardner, Holzman, Klein, Linton, & Spence, 1959) has to do with the number of diverse objects a person can tolerate as belonging to the same category or group. To consider two different things as belonging to the same group, the conceptual boundaries between them must be relaxed. Thus, thin and thick boundaries have been seen as representing an important and pervasive personality dimension. Others since have spoken of transliminal (“across the threshold”) processes in terms of the regulation or promotion of imagination and creativity (Rugg, 1963; MacKinnon, 1971).

Werner (1948) further modeled this dimension of thin versus thick mental boundaries in terms of developmental psychology. He marked one dimension of development as that moving from a syncretic level to a discrete one. That is, an individual moves from a “state of relative globality and lack of differentiation to a state of increasing differentiation” (Werner, 1957/1978, p. 109). Syncretic cognition entails a dedifferentiation (or fusion) of perceptual qualities in subjective experience. Werner offered examples such as: *physiognomic perception*, entailing the fusion of perception and feeling; *synesthesia*, entailing the fusion of sensory modalities; and *eidetic imagery*, entailing the fusion of imagery and perception (i.e., structural eidetic imagery). He addressed these syncretic experiences within the framework of his organismic-developmental theory (Werner, 1948, 1957/1978), arguing for their ‘primitive,’ or developmentally-early status. As such, he suggested that these phenomena could be induced in nearly everyone (Werner, 1934/1978).

This ‘thin versus thick’ boundary dimension has arguably been studied most systematically by psychiatrist Ernest Hartmann. Hartmann (1991) theorizes that

“boundaries in the mind” affect important behavioral and cognitive variables. He has devised a standardized questionnaire measuring various types of cognitive boundaries and presents evidence indicating that persons with “thin” (permeable) boundaries are more likely to be highly hypnotizable, to experience anomalous events, and to experience certain forms of psychopathology. Moreover, like his early predecessors, Hartmann envisioned mental boundaries as a hierarchical concept. His standardized questionnaire taps several levels of boundaries that he proposes to comprise a comprehensive conceptualization of the boundary construct (see Table 1.1). Hartmann’s measure and theoretical rationale are reviewed in more detail in a later chapter.

Table 1.1: Hartmann’s Classification of Boundaries

Perceptual boundaries
Between sensory inputs
Sensory focus or “bandwidth”
Around perceptual entities
Boundaries related to thoughts and feelings
Between two thoughts or two feelings
Between thought and feeling
Around thoughts and feelings (free association)
Boundaries between states of awareness or states of consciousness
Sleep-dream-wake boundaries
Between sleep and waking
Between dreaming and waking
In and around the dream
Daydreaming
Boundaries related to play
Boundaries related to memory
Early memories
Recent memories and memory organization
Personal past
Future plans
Boundaries around oneself (body boundaries)
Barriers against stimuli
The skin as a boundary
Posture and musculature as boundaries
Personal space
Interpersonal boundaries
Boundaries between conscious and unconscious and between id, ego, and superego
Defense mechanisms as boundaries
Boundaries related to identity
Sexual identity

Age identity: Between adult and child
Constancy of identity
Group boundaries
Boundaries in organizing one's life
Boundaries in environmental preferences
Boundaries in opinion and judgments
Boundaries in decision-making and action

Psychology's tradition of recognizing and attempting to understand mental boundaries has ranged from mechanisms regulating unconscious-conscious processing to models of consciousness and subsequent behavior that rely upon a systems perspective. Psychology's sub-discipline of anomalistic psychology aims to understand the mechanisms of consciousness by examining extraordinary phenomena of behavior and experience. Its areas of interest include psychological correlates of paranormal ideations, reality monitoring and dissociative states, mechanisms regulating hallucinations and delusions, false memories, altered states of consciousness, and mystical experience. It was from this field that the concept of mental boundaries was defined in terms of transliminality by parapsychologist Michael A. Thalbourne. The next section reviews the theoretical and empirical development of the transliminality construct.

1.3 EVOLUTION OF TRANSLIMINALITY AND ITS MEASUREMENT

Writing on the psychology of mystical experience and quite unaware of previous usages of the word "transliminal," Thalbourne (1991) formally proposed the concept of *transliminality* and defined it as, "an openness or receptiveness to impulses and experiences whose sources are in preconscious (or unconscious) processes" (p. 182). Persons manifesting low degrees would not be expected to experience eruptions from these regions of the mind (unless perhaps under certain arousal states), whereas medium

to high degrees of transliminality would be expected to elicit anomalous experiences of a psychic, mystic, creative, and even psychotic nature. In essence, Thalbourne (1991) proposed that transliminality is the metaphorical sea within Joseph Campbell's famous quote, "The schizophrenic is drowning in the same waters in which the mystic is swimming with delight" (cited in Lee, 1985, p. 40).

Thalbourne pursued this idea further, inspired by the work of Claridge, Pryor, and Watkins (1990) on ten outstandingly creative authors who were diagnosed with psychosis. These researchers found that psychotic authors exhibited an interest in matters paranormal and mystical. Using a sample of 241 university students, Thalbourne and Delin (1994) found that persons who endorsed Paranormal Ideations (belief and alleged experience) as measured by the Australian Sheep-Goat Scale (Thalbourne & Delin, 1993) scored higher on creative personality as measured by four items constructed for that study and five from Torrance's (1971) Creative Motivation Inventory. They also scored higher on Mystical Experience (Thalbourne, 1991), Magical Ideation (Eckblad & Chapman, 1983), and a history of Manic-like and Depressive Experience (Thalbourne, Delin, & Bassett, 1994). In addition to a positive correlation between paranormal belief and these variables, Thalbourne and Delin (1994) also found that these six variables were all significantly associated with each other. Principal components analysis (a form of factor analysis) confirmed the suspicion that there was a single factor underlying the six psychological variables.

Thalbourne and Delin (1994, p. 23) interpreted this underlying factor as transliminality, and the six above-mentioned variables were classed as core constituents of transliminality because they correlated significantly and positively with each other.

The defining feature of this study was that it conceptualized transliminality as reflecting individual differences in the selectiveness with which the barrier mechanism between subliminal and supraliminal minds operates. Accordingly, the definition of transliminality was elaborated as, “a largely involuntary susceptibility to, and awareness of, large volumes of inwardly generated psychological phenomena of an ideational and affective kind” (Thalbourne & Delin, 1994, p. 25). Interestingly, those who scored high on the single factor of transliminality tended to report religious experience, an interest in dream-interpretation, proneness to hallucination, and a willingness to participate in further psychological studies.

Thus, in the same year, 1991, Thalbourne and Delin (1999) conducted a follow-up study of a subsample of 116 of their participants (mostly students), on the topics of religiosity, mystical experience, and dream recall. Transliminality was found to correlate to various degrees with each of these three variables. That is, those who scored higher on the transliminality factor were more likely: to report mystical experience; to be religious (as measured by Haraldsson’s Religiosity Scale published in 1981); to interpret their dreams frequently; and to have a current religious affiliation. Thalbourne and Delin (1995) later found evidence for the same association for the “attitude to dream-interpretation” item on the Minnesota Multiphasic Personality Inventory (MMPI: Dahlstrom, Welsh, & Dahlstrom, 1972) that reads, “A person should try to understand their dreams and be guided by or take warnings from them.”

Thalbourne, Bartemucci, Delin, Fox, and Nofi (1997) administered the same six measures as Thalbourne and Delin (1994) above, in this case to 370 students and individuals from the general population, and factor analyzed the responses. They

replicated the finding of a single factor, except that on this occasion Depressive Experience failed to load on this factor. Nevertheless, the single factor was identified as transliminality.

This same study also examined the relationship between transliminality and a number of other psychological variables. While transliminality was not (contrary to predictions) significantly related to (i) repression-sensitization (a variable concerning style of handling anxiety: Byrne, Barry, & Nelson, 1963), (ii) three tests of verbal creativity (Torrance, 1966/1974), non-verbal intelligence as measured by Raven's (1965) Progressive Matrices, or (iii) a lie scale (Eysenck & Eysenck, 1991), it was significantly related to schizotypal personality, which is related to magical ideation and is thought to be an attenuated form of schizophrenia (Claridge & Broks, 1984). Transliminality was additionally related to: Eysenck's three scales of "psychoticism," "extroversion," and "neuroticism" (Eysenck & Eysenck, 1991); fantasy-proneness (Myers, 1983); absorption ("the ability to become totally absorbed in the object of attention," Tellegen & Atkinson, 1974); hyperesthesia ("hypersensitivity to environmental stimulation," Thalbourne, 1996b); and frequency of panic attacks. Schizotypal personality, fantasy-proneness, absorption, and hyperesthesia correlated with overall transliminality, as well as with all five of its constituent variables. The same held true for religiosity, frequency of dream-interpretation, and attitude to dream-interpretation. Therefore, these variables were candidates for being classed as constituent variables themselves.

Thalbourne et al.'s (1997) study revealed important insights, as transliminality now appeared to also involve variables that had little to do with the subliminal inputs into the supraliminal. First, active fantasy-proneness was involved which would seem to

consist of a seed idea in the supraliminal mind arousing material from the subliminal mind and by various creative processes shaping it into a theme. Consequently, transliminality seemed to involve a two-way, subliminal-supraliminal process. Secondly, hyperesthesia was involved, which has to do with thresholds of the perceptual system's interaction with the outside world. Thus, perception also seemed to have a transliminal component. The definition of transliminality was therefore revised to "susceptibility to, and awareness of, large volumes of imagery, ideation and affect — these phenomena being generated by subliminal, supraliminal and/or external input" (Thalbourne et al., 1997, p. 327). This definition led to a highly simplified diagram of the processes at work (see Figure 1.1).

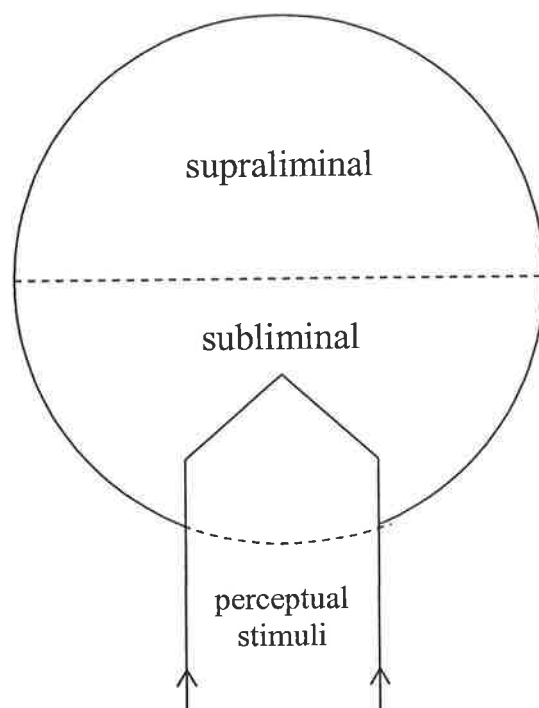


Figure 1.1: The transliminality model of Thalbourne [SOURCE: Thalbourne, 2000d].

In Figure 1.1, Thalbourne (2000d, p. 8) explains that, “the broken lines represent thresholds, and the position of sensory input is meant to reflect the notion that, firstly, such input may not reach a level of conscious representation but may remain subliminal, and also that it is influenced by subconscious processes before being presented to supraliminal consciousness.”

The formal definition of transliminality did not change during this period, but a new study (Thalbourne & Fox, 1999) on the Kundalini experience offered insights that would later be incorporated into a preliminary cognitive model of transliminality.

Kundalini is a concept derived from Eastern thought. According to *A Glossary of Terms Used in Parapsychology* (2nd ed., rev.), it is:

A Sankrit term variously translated, but most commonly as life-force, and sometimes, simply, as the energy, often used as a theoretical construct to explain a syndrome of various psychophysiological and other phenomena which are described as energy-like sensations starting usually at the base of the spine and then progressing rapidly with a powerful surge, upwards through the body to the crown of the head; the experience is said to lead to higher and more desirable states of consciousness, such as mystical consciousness, along with manifestation of paranormal phenomena (Thalbourne, 2003, pp. 63-64).

Thalbourne and Fox (1999) devised a scale to measure apparent Kundalini experiences and administered it along with the five traditional constituents of transliminality to a sample of 115 individuals, predominantly from the general population. The Kundalini Scale showed a significant positive correlation with transliminality and with four out of the five constituents, as measured by a factor score. Thalbourne’s co-author later speculated that Kundalini is the basis of transliminality (Bronwyn Fox, personal communication), leading to, among other things, more

paranormal and mystical experience. The association between Kundalini and transliminality was replicated in a later study (Thalbourne, 2001), thereby underscoring the merit of Fox's idea.

Thalbourne (1998) administered a questionnaire containing the basic transliminality variables (Belief in, and alleged Experience of, the Paranormal, Creative Personality, Mystical Experience, Magical Ideation, and Manic Experience) to a sample of 301 psychology students, along with two measures of the tendency for elements of consciousness to split-off, i.e., dissociate. Dissociative tendencies were measured by the Dissociative Experiences Scale (Bernstein & Putnam, 1986) and Riley's (1988) Questionnaire of Experience of Dissociation. In addition, the Launay-Slade (1981) Hallucination Scale was used to measure an individual's tendency to hallucinate, amongst other psychological variables. Principal components analysis confirmed the original factor of transliminality and this was expanded to include absorption, fantasy-proneness, hyperesthesia, and a positive attitude towards dream-interpretation. These variables correlated not only with each and every one of the original variables, but also with each other.

These nine variables, by way of a factor score and its correlations with the individual scale-items, provided the material for a 29-item true/false Transliminality Scale (Form B) (Thalbourne, 1998, see Appendix A). In accordance with the size of the factor loadings, this scale includes five items each taken from the Absorption Scale and the Inventory of Childhood Memories and Imaginings, four items each from the Magical Ideation and the Belief in the Paranormal variables, three each from Mystical Experience and from Hyperesthesia, two from Creative Personality and Manic Experience, and one

(the only one) from Dream Interpretation. According to Thalbourne (2000d), scores on this scale tended to range from across the full spectrum of 0 to 29 and approximated a normal distribution. Cronbach's coefficient alpha for internal reliability is about 0.87, which exceeds Kline's (1986) criterion of ≥ 0.70 for satisfactory internal consistency. While Kline's (1986) minimum coefficient alpha is suitable for research purposes, it is not generally regarded as suitable for clinical purposes. This caveat should be kept in mind throughout the remainder of this thesis.

As a historical footnote to the development of the Transliminality Scale, Thalbourne (2000d, p. 10) reported that he and his research associate, Peter S. Delin, devised a preliminary Transliminality Scale (now called Form A) based on the constituents and correlates of transliminality. This approach was later abandoned on statistical grounds in favor of Form B, although the two forms correlated 0.89.

1.3 CORRELATES OF THE TRANSLIMINALITY SCALE AND THEIR IMPLICATIONS

1.3.1 PSYCHOLOGICAL CORRELATES

There has been a steady stream of recent literature examining potential correlates of Thalbourne's (1998) Transliminality Scale. A major aim of this research concerns establishing the construct validity of the scale by determining how scores on the test related to a number of anticipated attitudinal and behavioral phenomena.

For example, Thalbourne (1998) found that transliminality correlated significantly and positively with scores on: a shortened version of the Unusual Experiences subscale of the Oxford-Liverpool Inventory of Feelings and Experiences (O-LIFE: Claridge, 1997a);

schizotypal personality; scores on both dissociation scales; proneness to hallucination; reading about Eastern religions (but not Bible reading); Eysenck's psychoticism scale (suggesting unconventionality rather than psychosis); frequent dream interpretation; religiosity; belief in life after death; vivid religious or spiritual experience; and a history of depression. A marginally significant correlation was obtained with extroversion, but not neuroticism (which was a failed replication), and not with scores on the Eysenck lie scale. Furthermore, and as expected, the Transliminality Scale correlated highly with all thirteen paranormal/experience items, even though only 14% of the items on the Transliminality Scale concerned paranormal themes.

A spin-off study from Thalbourne (1998) examined the levels of transliminality in relation to belief in various types of afterlife (Thalbourne, 1998-1999). Reincarnationists turned out to be the most transliminal, and significantly more so than the low-scoring extinctionists (non-survivalists). Reincarnationists (or eclectics, who believe in both reincarnation and immortality) were the highest, and the extinctionists generally the lowest, on a whole range of transliminality-relevant variables such as proneness to hallucination, dissociation, magical ideation, schizotypal personality, and hyperesthesia, as well as belief in the paranormal, mystical experience, fantasy-proneness, absorption, and attitude towards dream-interpretation. There were no differences between groups on creative personality, mania, depression, or manic-depressiveness. Scores on Eysenck's neuroticism variable also showed no differences across the different groups of afterlife believers. This might suggest that reincarnationists (and believers in other varieties of an afterlife) do not have lower psychological well-being than extinctionists, but rather, analogous to the reasoning of McCreery and

Claridge (1995), believers could be “happy transliminals”—persons who are functional despite, or perhaps even in part because of, their “anomalous experiences” (p. 142).

To better understand what mental contents were involved in the minds of highly transliminal individuals, Thalbourne and Houran (2000) administered to large general-population samples in both Australia ($N = 138$) and the US ($N = 135$) the Transliminality Scale, the Mental Experience Inventory (MEI: Kumar & Pekala, 1992), and (in the case of 100 US participants) Lange and Houran’s (1999a) Rasch-scaled version of MacDonald’s (1970) AT-20 scale of tolerance of ambiguity. The MEI contains eight subscales:

1. *Belief in Psychic-Related and Unusual Events* (e.g., believing in life after death, witchcraft/sorcery).
2. *Paranormal and Unusual Experiences* (e.g., trying channeling, using the Ouija board, having an out-of-body experience, communicating with the dead).
3. *Paranormal Experience II* (specifically paranormal and anomalous experiences).
4. *The Sense of Being High* (feeling intense emotions, getting high off one’s own thoughts).
5. *Daydreaming* (enjoying fantasizing, having unusual thoughts).
6. *Sense of Mental Potency* (believing in mind as a source of tremendous power).
7. *Introspection* (enjoying analyzing oneself, understanding mind).
8. *Altered States of Consciousness* (getting lost in one’s own thoughts,

awareness taking on a dream-like quality).

In both countries scores on transliminality showed high positive correlations with scores on paranormal belief and experience, sense of being high, daydreaming and fantasizing, sense of mental potency, introspection (as predicted by Thalbourne & Delin, 1994), and altered consciousness. These results are consistent with the idea that there is more abundant content in the minds of persons scoring high on transliminality. This does not mean that transliminal experience always has positively-toned or pleasant content. For example, transliminality also correlated with a large number of individual items of the MEI, including “I need to alter my state of consciousness,” and “I sometimes think that I’m ‘crazy’.” As the research into transliminality was inspired by the exceptional human experiences of creative artists reported by Claridge et al. (1990), this “negative” aspect to transliminal processes might shed some light on unusual suicide patterns in groups of creative individuals (Prete & Miotto, 1999; Stack, 2001). Transliminality did not, however, correlate significantly with tolerance of ambiguity. This study motivated another revision in the definition of transliminality. This time transliminality was broadly defined as “a hypothesised tendency for psychological material to cross thresholds into or out of consciousness” (Thalbourne & Houran, 2000, p. 853).

A recent conceptual replication study (Thalbourne, 2001) involving 125 university students confirmed many previous results and presented new findings, as well. Participants completed the Australian Sheep Goat Scale; the Rasch version (Lange, Irwin, & Houran, 2000) of Tobacyk’s Revised Paranormal Belief Scale (1988), which measures New Age Philosophy and Traditional Paranormal Beliefs; an augmented form of the Kundalini experience scale (Thalbourne & Fox, 1999); an experimental 13-item measure

of Determinism/Free Will; a number of single-item questions aimed specifically at transliminality; and the Anomalous Experiences Inventory (AEI: Kumar, Pekala, & Gallagher, 1994), which was constructed from the MEI (Gallagher, Kumar, & Pekala, 1994). The AEI has five subscales:

1. *Anomalous/ Paranormal Experiences* (e.g., “At times my consciousness feels expanded beyond my body,” “At times I have felt possessed by an outside force,” “I have had a psychic experience”).
2. *Anomalous Paranormal Beliefs* (e.g., “I believe that mind can control matter,” “I believe that many paranormal occurrences are real”).
3. *Anomalous/ Paranormal Abilities* (e.g., “I am able to move or influence objects with the force of my mind alone,” “I am able to communicate with supernatural forces”).
4. *Fear of the Anomalous/ Paranormal* (e.g., “Hearing about the paranormal or psychic experiences is scary,” “I am afraid of having an altered-state experience”).
5. *Drug Use* (e.g., “I have tried mind-altering substances,” “I have smoked marijuana”).

Results indicated that high transliminality was strongly related to anomalous/paranormal experience, belief, ability, the Australian Sheep-Goat Scale and New Age Philosophy. There were also positive relationships with other variables: a strong correlation with the Kundalini scale and a weak one with the number of drugs reportedly used. Transliminality was not related to fear of the anomalous/paranormal, nor to the free will scale (although three of the items on this scale were positive correlates,

suggesting a relationship between transliminality and belief in determinism). This latter finding is bolstered by the fact that transliminality showed a moderate association with Traditional Paranormal Beliefs. Highly transliminal individuals also endorsed the following statement more often, "I have had the experience in which life appeared to be simply a play, or like a dream in the mind of the Creator," a finding that replicated Thalbourne and Delin (1994). High transliminals also more often endorsed the statements that "Sometimes the world overwhelms me and I have to retreat into myself to recover," "I have trouble getting to sleep at least two nights a week," and "I have been prescribed medication for a psychological condition." Finally, the high transliminals were more likely to volunteer for further experimentation and to seek feedback about their results on the questionnaire. This is not unexpected, as one of the statements contributing to high scores on the AEI belief subscale of anomalous/paranormal belief is, "I want to understand the further reaches of my mind."

Thalbourne's (2001) study suggested three things. First, high transliminality seems to involve a high psychological productivity that leads the experient to want to explore further meaning of these productions (whether they be dreams, emotions, or thoughts). Second, it seems that high transliminality can be aversive under certain circumstances. It is not clear whether this is due to an absence of potentially positive productions such as psi, creativity, and mystical experience, or whether the high transliminal simply cannot cope psychologically with the productions, be they positive or negative. Either scenario would explain the relationship between transliminality and the use of illicit drugs. That is, using drugs may be a way of enhancing or maintaining the state of high transliminality or it be a method of self-medication in which high

transliminals hope to escape aversive (or even a bombardment of positive) mental productions. Third and finally, transliminality consistently correlated with unusual *experiential* phenomena and paranormal beliefs that coincide with these phenomena. This argues for the conclusion that transliminality is heavily tapping into Werner's (1948) notion of syncretic cognition, discussed earlier in this chapter. That is, transliminality seems to fundamentally involve a "breakdown of modularity" in sensory processing.

Other studies unwittingly provide data relevant to the issue of whether the mechanisms of transliminality go beyond mere sensory processing and instead involve higher order functions. For example, the tendency to find meaning and patterns in random events and coincidences is one of the most powerful driving forces underlying the experiences of psychosis and profound creativeness (for a detailed review: see Brugger, 2001). This observation is best expressed in the words of a schizophrenic nurse, who in retrospect, described her first psychotic episode:

Every single thing "means" something. This kind of symbolic thinking is exhaustive...I have a sense that everything is more vivid and important; the incoming stimuli are almost more than I can bear. There is a connection to everything that happens—no coincidences. I feel tremendously creative (Brundage, 1983, p. 584).

The propensity to see connections between seemingly unrelated objects or ideas most closely links psychosis to creativity. Indeed, with respect to the detection of subjectively meaningful patterns, apophenia (seeing patterns in random information) and creativity may even be conceived of as two sides of the same coin. One must remember, however, that the term detection as used here does not refer to a process of mere identification, to finding the solution to a perceptual puzzle. Rather, the assumption of meaningfulness in randomness always evokes a subjective interpretation of spatial or temporal

configurations. The creative arts acknowledge and take advantage of this purely subjective aspect of perceiving. They have always been inspired by chance and randomness to create works of art (Holoczek & von Mengden, 1992; Janson, 1968) whose meaningfulness is left to the interpretation of its viewers. In light of this foundation, the correlations between transliminality and variables such as vividness of visual imagery and forms of creativity are pertinent to theory-building.

Thalbourne and Delin (1994) made much of creativity in relation to transliminality, which motivated further studies. Thalbourne (2000b) administered to 50 students the Transliminality Scale; the 86-item Barron-Welsh Art Scale in which the subject expresses like or dislike of simple or complex figures, liking of the latter being said to indicate creativity (Welsh & Barron, 1963); and an item-corrected version of the 9-item Creative Personality Scale together with a short interview to see whether the participant had recently engaged in any of a range of creative activities, such as drawing, drama, poetry-writing, creative writing, music, and some combination of these tested for by a single-category item. Transliminality did not correlate with the Barron-Welsh Art Scale, but it did correlate with the 7-item version of the Creative Personality Scale (two items of which are included in the Transliminality Scale). Moreover, the Creative Personality Scale correlated significantly with the writing of poetry and marginally with the writing of other literature. However, independent correlational evidence reported by Thalbourne (1998, p. 405) provides additional validation for the Creative Personality Scale. Thus, based on the cumulative findings, it is reasonable to conclude that there is a slight tendency for transliminality to correlate with certain forms of creativity.

As Brod (1997, p. 290) pointed out, an experiment by Shaw and Conway (1990)

is relevant here. These researchers examined differences in which high- and low-creative participants (as defined by Torrance, 1966/1974) used conscious and non-conscious clues to solve anagrams. Using a tachistoscope to present visual stimuli, high- and low-creative participants solved anagrams in three conditions: conscious, non-conscious (individual thresholds being determined), and control (no clues). They found that high-creative individuals had significantly faster threshold times, and used more non-conscious clues and non-consciously primed conditions than did low-creatives. It seems that individual differences relating to creativity may strongly influence the processing of non-consciously perceived information. High-creatives used information the origin of which they were unaware, while low-creatives did not use such information.

Recent research by Crawley, French, and Yesson (2002) corroborates aspects of this idea. These authors conducted a test of subliminal visual perception disguised as a computerized ESP 'card-guessing' task. They hypothesized that participants scoring high on the Transliminality Scale would outperform those with low scores when given subliminal primes or 'clues' to the correct choice of card, but not in the absence of primes. As predicted, higher transliminality scores were associated with a greater number of correct selections of the target-card on the primed trials, but not on the unprimed trials. In addition, a positive correlation was obtained between transliminality scores and detection accuracy as given by d' -prime but no correlation with the beta measure of response bias, suggesting that transliminality was associated with greater sensitivity to priming (cues) and not response bias.

In a follow-up study, the 50 psychology students from Thalbourne's (2000b) creativity study were administered a questionnaire measure of vividness of visual

imagery (Marks, 1996). It was thought that because high transliminals are more likely to experience hallucinations (Thalbourne & Delin, 1994; Thalbourne, 1998) as measured by both single items and by the Launay-Slade (1981) Hallucination Scale, it was reasonable to hypothesize that they are also more likely to experience vivid visual imagery. However, the correlation, while positive, was very low and non-significant. It is important to note that methodological problems identified in the paper may have contributed to the negative results.

Complementing these characteristics are several personality variables that were found to correlate with transliminality. Storm and Thalbourne (1998-1999) administered the Transliminality Scale with an updated version of the Cattell 16 Personality Factors questionnaire (16 PF: Russell & Karol, 1994), and three belief questions to a sample of 93 participants of mostly students. Out of 25 statistical correlations, 8 were significant: highly transliminal persons were more warm (Factor A), less conforming (Factor G), more imaginative (Factor M), more receptive, open-minded, and intuitive (as shown by the Global Factor Tough-Mindedness), more unrestrained, and more likely to follow urges (according to the Global Factor Self Control). They were also more likely to predict that success was possible in the context of a paranormal experiment in which they were about to participate, as well as to attribute to themselves the ability to succeed in the experiment. These results are broadly consistent with previous studies concerning transliminality, with possibly, extroversion, psychoticism (in the sense of unconventionality), and belief in the paranormal. However, contrary to predictions, neither the global factor Extroversion nor the global factor Anxiety correlated with transliminality. Two follow-up studies by Storm (Storm & Thalbourne, 2001a; Storm,

2002) largely replicated these patterns with Cattell's 16 PF test.

The accumulated evidence from the Transliminality Scale literature profiles high transliminals as individuals who:

1. Have marked dissociative and hallucinatory tendencies.
2. Have schizotypal tendencies, with overtones of Eysenckian psychoticism and to some extent extroversion.
3. Have propensities to think abstractly, be intuitive and open-minded, and to some extent follow their urges and exhibit warmth towards others.
4. Endorse unconventional thinking and a broad range of paranormal and religious-oriented beliefs.
5. Report a correspondingly wide variety of anomalous experiences, including Kundalini, altered states of consciousness, and paranormal and mystical experiences.
6. Have productive mental activity over a range of mental events, including the sense of being high, sense of mental potency, daydreaming, and introspection.
7. Have enhanced forms of some types of creativity and report slightly higher levels of vividness of visual imagery.
8. Have to some extent more frequent illicit drug use.
9. Have tendencies to want to learn more about the limits of their own minds and to participate in future psychological studies.

These characteristics would appear to promote an attitude known as "openness to experience," and preliminary research by Thalbourne (2000b) supports this interpretation.

In this study of 40 participants, scores on the Transliminality Scale showed a small but significant and positive correlation with openness to experience, as measured by the so-called Quickscales (John Brebner, personal communication). This is an unpublished 30-item short version of the larger NEO PI-R personality inventory (Costa & McCrae, 1992), which includes an Openness to Experience (OE) factor (see: McCrae, 1994; McCrae & Costa, 1997; Zingrone, Alvarado, & Dalton, 1998-1999).

Based on a wealth of anecdotal and empirical data (for reviews, see: Irwin, 1999; Kumar & Pekala, 2001), it can also be argued that this psychological profile earmarks high transliminals as potentially exceptional subjects in experimental tests for psi. Accordingly, there is another set of studies that have pursued applied parapsychological applications of the Transliminality Scale. These studies are reviewed next, as they may help inform a cognitive model of transliminal processes.

1.3.2 PARAPSYCHOLOGICAL CORRELATES

Extrasensory (ESP) experience is often thought to originate in unconscious regions (Irwin, 1999, p. 44). As noted parapsychologist Louisa Rhine (1975) has said:

Ever since psi was recognized as originating in unconscious mental levels, it has seemed likely that the greatest barrier to its free operation is the difficulty of converting unconscious knowledge into conscious form...[W]hen the person is awake, ESP information from the unconscious seems to be hindered by the difficulty of crossing the conscious threshold (p. 97)

The same could be said for so-called psychokinesis (PK), the apparent phenomenon of mind interacting directly with physical objects or systems. For example, it is a popular hypothesis that dramatic poltergeist-like disturbances and other physical effects are brought about as a result of such emotions as repressed aggression or tension in the

unconscious, or particularly the subconscious, minds of the focal person (Roll, 1977; Bonocini & Martelli, 1983). Aside from speculation, there is an empirical basis for expecting transliminality to correlate with outcome on psi tests.

As reviewed above, transliminality strongly correlates with various measures of paranormal belief and experience, and research on stated belief in the paranormal led to the discovery of the so-called *Sheep-Goat effect*. This effect is a classic in parapsychology, which derives from the work of Gertrude Schmeidler (1943, 1952, 1959; Schmeidler & McConnell, 1958). Schmeidler characterized believers in the possibility of ESP in the context of the experiment at hand as “sheep” and disbelievers in the possibility of ESP in the context of the experiment at hand as “goats.” She reported that sheep demonstrated a tendency to score significantly above mean chance expectation on ESP tests and for goats to score significantly below chance level. This effect is one of the more successfully replicated relationships in experimental ESP research (Palmer, 1977), even though the overall effect size (.03) is very small (Lawrence, 1993). Used in a wider sense, the sheep-goat variable reflects the broad continuum of belief-disbelief in the paranormal and the attitudes and behaviors that coincide with this continuum (for an interesting typology of believers, see Irwin, 1997). This perspective, which goes beyond merely dichotomizing samples such as in the work of Schmeidler, generally assumes linear relationships between belief in the paranormal and its correlates. Thus, as a strong correlate of the sheep-goat variable, transliminality might predict parapsychological performance.

Three studies along these lines are worth noting, even though they did not utilize the formal Transliminality Scale (Thalbourne, 1998, Form B). For instance, Thalbourne

(1996a) first tested the hypothesized relationship between transliminality and psi using a brief 10-trial test of precognition (predicting a future outcome), called the Beloff Consumers' Choice test. Measures of the three psychopathological constituents of transliminality were not available to Thalbourne at that time, so he included measures of religiosity, frequency of dream-interpretation, and fantasy proneness; the two former variables have since been found to correlate with transliminality (Thalbourne & Delin, 1999; Thalbourne et al., 1997) while the third variable has become a constituent of the construct (Thalbourne, 1998). Transliminality was measured as a normalized z-score. Ninety-nine students were tested, but the outcome was non-significant.

In a different task based on the idea of telepathy, Sanders, Thalbourne, and Delin (2000) had one person (called a sender) attempt to mentally transmit to another person (called the receiver) in an adjacent room one of four different emotional states (excitement, serenity, anger, or fear). The outcome was more encouraging. A normalized z-score measure of the sender's transliminality (using the sheep-goat variable, absorption, and fantasy-proneness) correlated significantly ($r = 0.35, p \leq .001$) with scores on the telepathic task.

Finally, at least one independent investigation was published that incorporated transliminality-relevant variables into the research design. Adrian Parker and colleagues (Parker, Frederiksen, & Johansson, 1997) obtained a good measure of success in a recent ganzfeld experiment of psi (see also Parker, Grams, & Pettersson, 1998). Parker followed this up with another ganzfeld study that used Form A of the Transliminality Scale, which was translated into Swedish (at the time Form B was not available). Despite a number of post hoc analyses, Parker did not obtain an overall significant correlation with

transliminality.

As of this writing, Lance Storm has published the only laboratory studies relating putative parapsychological outcomes with scores on the 29-item Transliminality Scale. Storm (Storm & Thalbourne, 1998-1999, 2001a) achieved positive results in his psi experiment that made an unorthodox use of the Chinese book of divination, the *I Ching*. This book contains 64 readings, accessed by the throw of three coins six times to produce a hexagram. Participants pre-selected 16 (25%) of the total number of hexagrams in the hope that one of them would come up in the actual throw (termed a “hit”). As predicted by these authors, highly transliminal participants were significantly more likely to succeed in scoring a hit.

In a methodologically improved second study, Storm and Thalbourne (2001b) attempted to replicate these initial findings. Hit rate was again significantly above chance, but this time none of the parapsychological correlations with transliminality were statistically significant. In a third study with the *I Ching* using only 43 participants, Storm (2002) again failed to confirm a relationship between transliminality and ostensibly paranormal effects. This same paper reported a meta-analysis of his three studies ($N = 243$), which yielded a small, perhaps marginally significant effect of transliminality on hexagram hitting ($r = .10, p = .068$).

1.3 TOP-DOWN PURIFICATION OF THE TRANSLIMINALITY SCALE

1.3.1 RATIONALE FOR A RE-ANALYSIS OF THE TRANSLIMINALITY SCALE

From a classical test theory perspective, the 29-item Transliminality Scale

appears to be a psychometrically sound instrument. For instance, the core constituents that defined the factor structure of the scale replicated across independent samples (Kline, 2000), the scale has high internal consistency (0.87) and test-retest reliability (0.88 over an average of seven weeks: Thalbourne, 2000b) by generally accepted standards (Kline, 1986), and attesting to its basic construct validity, scores on the Transliminality Scale consistently correlate as expected with a number of relevant psychological, and in some cases parapsychological, variables.

Unfortunately, these data do not adequately substantiate the measurement properties of the Transliminality Scale. In particular, its development relied heavily on items' correlations with their common factor, a technique that has known methodological drawbacks (Comrey, 1978; Lange, Irwin, & Houran, 2000; Panter, Swygert, Dahlstrom, & Tanaka, 1997), and the use of factor scores does not alleviate this problem (Michell, 1990). Therefore, Lange, Thalbourne et al. (2000) re-analyzed the scale using the "top-down purification" process described in Lange, Irwin et al., (2000). This method combines Rasch scaling, and the removal of age and gender bias at the test and item levels. The unidimensionality of the resulting scale can then be tested by competitive tests of one-factor vs. two-factor Rasch formulations. In addition to providing interval level measures, item-purification also is likely to yield scales with fewer items, thereby enhancing the practical usefulness of the resulting instrument (DeVellis, 1991).

1.3.2 RASCH SCALING

While the transliminality research reviewed above yielded a clear pattern of results, the indices that were used are essentially weighted counts of "positive" answers. As is the case in general, such indices cannot be relied on to produce measures that are

additive (Michell, 1990; Wright & Stone, 1979) and unbiased. Following the earlier lead provided by research in educational testing (Lord & Novick, 1968; Rasch, 1960/1980), the psychological literature now increasingly recognizes that classical test theory often fails in these respects, as it does not explain how respondents' answers can be understood as a function of the latent variable addressed by the items (for recent statements of this issue, see: Embretson & Herschberger, 1999; van der Linden & Hambleton, 1997; Wright & Mok, 2000).

Rasch scaling explicitly addresses these issues as it assumes that the probability (P) with which a person i endorses some item j depends *solely* on (a) this person's position on an underlying latent variable θ (in this case, transliminality) as expressed in theoretical units called "logits" (Hambleton, Swaminathan, & Rogers, 1991; Wright & Stone, 1979), and (b) the location δ_j of this item's characteristic curve (ICC) on this latent variable. The ICC is assumed to follow a logistic function, which is centered on the point δ_j . Thus, the likelihood that a person with transliminality level θ will endorse this item is given by the conditional probability:

$$P(\theta | \delta_j) = (1 + e^{-\theta + \delta_j})^{-1} \quad (1)$$

Naturally, neither the locations of the items on the latent variable, nor those of the respondents, are known beforehand. Therefore, these locations must be estimated from the data using specialized software such as Bigsteps (Linacre & Wright, 1997). To simplify the following discussion it is assumed that the items being scaled are unidimensional, but multidimensional extensions are addressed in a later section. Regardless of the number of dimensions involved, it is assumed that the items defining a particular factor are "locally independent," i.e., the responses for all respondents *with the*

same θ should not contain any statistical dependencies. Local independence allows the positions of the items and those of the respondents to be estimated separately and independently of each other (Wright & Stone, 1979). As a result, one can distinguish between the reliability of the estimation of the item parameters δ and that of the estimates of respondents' locations on the latent variable (R). The latter type of reliability corresponds most closely to the notion of internal consistency (e.g., KR-20) in classical test theory, but R tends to be lower than its classical counterpart. Rasch scaling recognizes, however, that the standard error of estimate (SE) varies with the measures' location. Therefore, in addition to providing a sum score to logit conversion table, Bigsteps also computes the SE associated with each respondent's Rasch measure. These SE s tend to increase for extremely high or low scoring individuals, which means the reliability of measurement decreases at these extreme levels.

Rasch scaling further provides information concerning the items' fit to the modeling assumptions. This fit is quantified both in term of the items' *infit* (i.e., the fit relative to items at nearby locations) and their *outfit* (i.e., the fit relative to items at more distant locations). The items' infit and outfit indices used in Lange, Thalbourne et al.'s (2000) research have an average theoretical model value of 1.0, and values in the range 0.7 to 1.3 are generally deemed acceptable (Linacre & Wright, 1997). It is a major advantage of the Rasch model that the estimation of the δ_j parameters is essentially "population free" because such estimates depend little on the particular sample in which they were obtained. Most importantly, whereas classical methods essentially produce ordinal scales of measurement, Rasch models yield measures at an *interval* level.

1.3.3 DIFFERENTIAL ITEM FUNCTIONING

Local independence entails that, except for randomness, a person's level of transliminality should be the only factor that determines whether this person will endorse a particular item. In particular, extraneous factors such as gender or age should have no effect on the responses once transliminality is taken into account. Formally, the preceding implies that the conditional probabilities of the following type should hold for each item j in the test:

$$P(\theta|\delta_j, E) = P(\theta|\delta_j, \bar{E}), \quad (2)$$

where θ is defined as before and where E denotes one of the values of a binary variable such as gender or age (e.g., obtained by classifying the respondents as either "younger," or "older"), and \bar{E} denotes E 's complementary value. To the extent that Equation 2 is violated for a particular item, this item is said to exhibit Differential Item Functioning (DIF) as related to E . As such, DIF is a specific violation of the assumption of local independence. While Equation 2 is couched in the language of Item Response Theory (IRT) and Rasch (1960/1980) modeling, it is noted that similar considerations apply within the framework of classical test theory.

While several statistical methods to assess DIF have been developed (for a comprehensive review see, Clauser & Mazor, 1998), Lange, Thalbourne, et al.'s (2000) research used the SIBTEST method proposed by Shealy and Stout (1993). According to this approach, items show DIF because they unintentionally assess other dimensions in addition to the one under consideration, thereby introducing systematic error into the resulting person measures. The SIBTEST software (Stout & Roussos, 1996) quantifies

DIF in terms of the β statistic which estimates the group differences in the probabilities on the left and right-hand sides of Equation 2 across θ . SIBTEST also provides statistical tests to determine whether the obtained β values differ significantly from 0. Simulation studies (Shealy & Stout, 1993) indicate that SIBTEST possesses good Type I error control, while providing acceptable power in detecting DIF when relatively small samples are used. Like most other practical approaches to DIF analysis, SIBTEST is effective mainly in detecting uniform differential item functioning. The biasing variables of primary interest in the present research are the respondents' ages and gender.

It is further noted that the item-level distortion introduced by DIF may combine to introduce systematic biases into the measure derived from the entire test. These cases are referred to as Differential Test Functioning (DTF). In the present context, DTF manifests itself in differently shaped item sum to Rasch measure translations as computed by Bigsteps for different age and gender groups. DIF does not necessarily produce DTF, as it is possible that the DIF in one or more items may cancel (Ackermann, 1992, 1996; Waller, Thompson, & Wenk, 2000). For such cancellation to occur reliably, it is required that all items are always administered and that subjects' response records contain no missing data. Such limitations can be avoided by eliminating *all* biased items, i.e., even when keeping such items does not produce DTF.

As this point is sometimes misunderstood, it should be emphasized that the absence of DIF does *not* imply that men and women, or older and younger respondents, should have similar group means. Instead, since DIF introduces systematic errors into the estimates of respondents' Rasch locations, the removal of such bias can actually *increase* group mean differences.

1.3.4 MULTIDIMENSIONALITY

While the assumption of unidimensionality is supported by a satisfactory item fit (Hattie, 1985; Linacre, 1998), explicit dimensionality tests are provided by Stout's DIMTEST (Nandakumar & Stout, 1993) and the powerful ConQuest software (Wu, Adams, & Wilson, 1998). ConQuest has the advantage of being able to fit multidimensional as well as unidimensional Rasch models and it provides chi-square indices to facilitate competitive model testing. Both of these features will be exploited here. It should be pointed out, however, that most item sets are multidimensional to some extent (Hattie, 1985; Linacre, 1998) and that multidimensionality is fueled by DIF (Stout, 1990; Lange, Irwin et al., 2000). Therefore, the re-assessment of the Transliminality Scale additionally relied on ConQuest's direct estimates of the correlation between the Rasch factors to evaluate the actual impact of any statistically significant multidimensionality.

1.3.5 METHOD

1.3.5.1 Dataset

The Transliminality Scale data (items and total scores) were obtained from 318 individuals (126 men and 189 women) with a mean age of 35.8 yrs. ($SD = 13.75$; $Md = 36.00$ yrs., range: 17 to 84 yrs). These persons had participated in either the experiment of Storm and Thalbourne (1998-1999), or the Thalbourne and Houran (2000) study.

1.3.6 RESULTS

1.3.6.1 Preliminary Analyses

Statistical tests for the presence of age and gender related DIF were obtained via SIBTEST (Stout & Roussos, 1996). As is indicated by the crossed entries in Figure 1.2, seven items show statistically significant gender DIF (all $p \leq .05$). Specifically, the β values for items 1, 14, 23, 24, and 27 are all significantly positive ($\beta_1 = 0.17$, $\beta_{14} = 0.14$, $\beta_{23} = 0.13$, $\beta_{24} = 0.16$, $\beta_{27} = 0.11$), indicating that women are more likely to endorse these items than comparable men (i.e., men who endorsed a similar number of items). By contrast, men are more likely to endorse items 10 and 28 than comparable women, resulting in negative β values ($\beta_{10} = -0.21$ and $\beta_{28} = -0.19$).

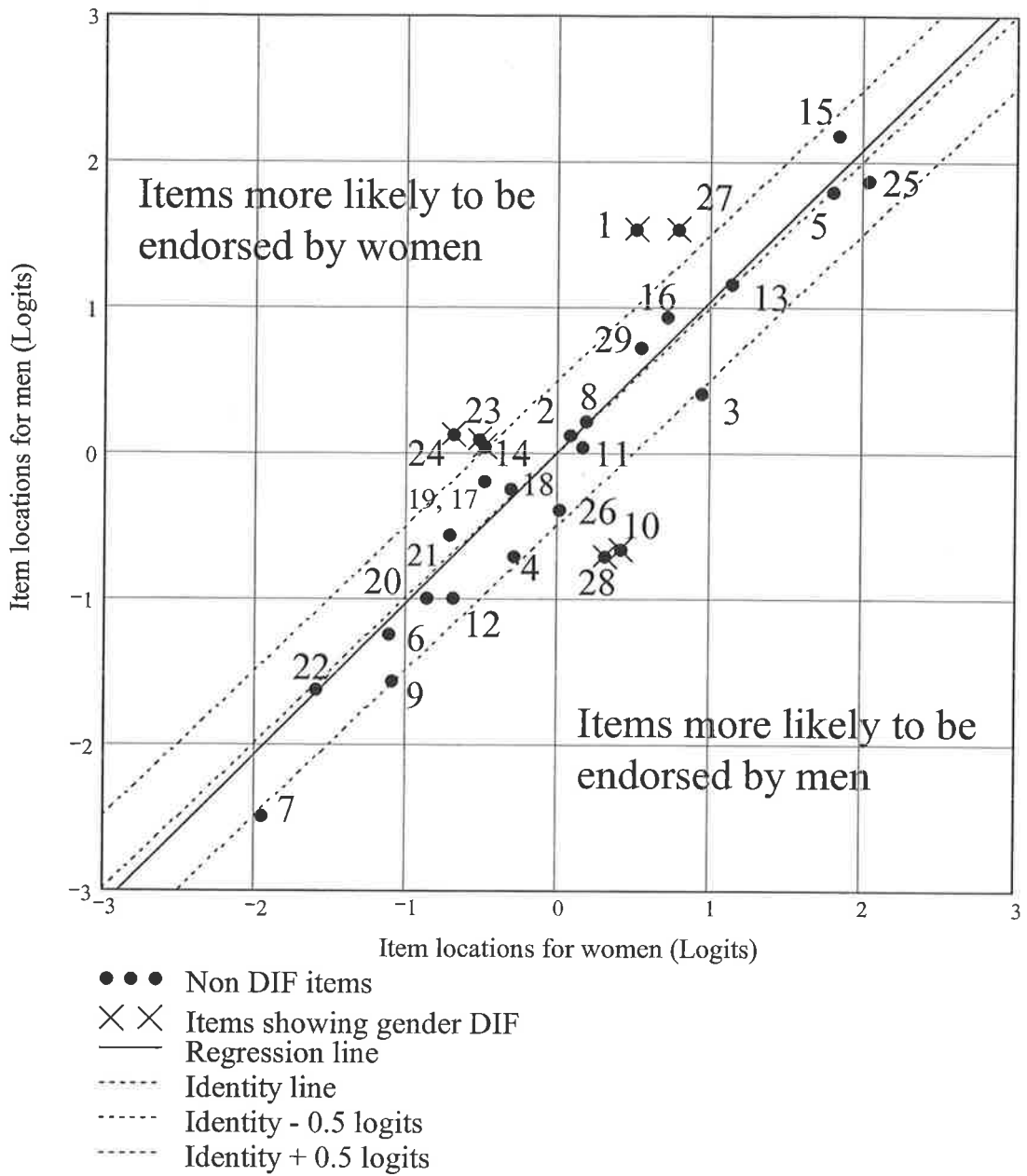


Figure 1.2: Item locations for male respondents vs. item locations for female respondents before item purification [SOURCE: Lange, Thalbourne et al., 2000].

Additionally, the crossed entries in Figure 1.3 show that eight items show significant age DIF ($p \leq .05$). In particular, the negative weights $\beta_9 = -0.12$, $\beta_{11} = -0.15$, and $\beta_{21} = -0.10$ imply that younger respondents are more likely to endorse items 9, 11, and 21 than comparable older respondents. By contrast, older respondents are more likely to endorse items 14, 15, 17, 23, and 24 than comparable younger respondents as the β weights for these items (0.19, 0.14, 0.13, 0.12, and 0.16, respectively) are significantly positive.

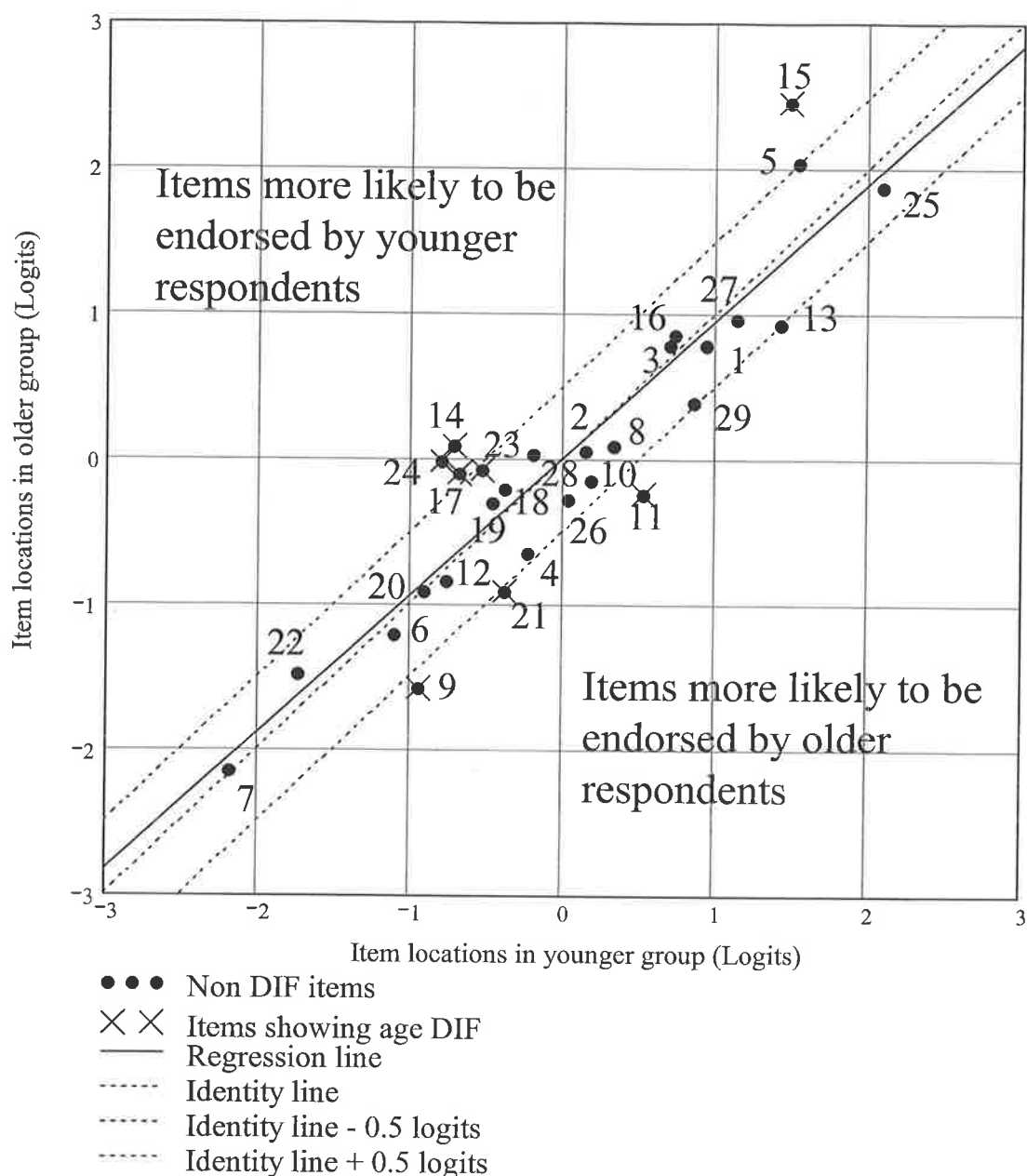


Figure 1.3. Item locations for younger respondents vs. item locations for older respondents before item purification [SOURCE: Lange, Thalbourne et al., 2000].

Unfortunately, even when all marked items in Figures 1.2 and 1.3 are removed, DIF remains because the β values of some other items now become statistically significant. For this reason a substantive interpretation of the DIF findings is postponed

until a later section.

Table 1.2: Summary of Rasch Scaling Analyses (Lange, Thalbourne et al., 2000)

	Original (29 items)	Purified (17 items)	Excluded (12 items)
<u>Classic Test Theory</u>			
KR-20 reliability	0.89	0.85	0.75
<u>Rasch</u>			
Overall reliability <i>R</i>	0.88	0.82	0.72
Item separation	2.68	2.14	1.61
Range – item infit	0.81 – 1.31	0.88 – 1.28	0.82 – 1.29
Range – item outfit	0.66 – 1.47	0.72 – 1.25	0.56 – 1.58
Items shown in table(s)	2 + 4	2	4

As the KR-20 reliability is 0.89, the scale defined by the 29 items may appear acceptable from a classical test theory perspective. This impression is misleading, however, as Table 1.2 reveals serious problems with the 29-item formulation from a Rasch perspective. In particular, some of the items' infit and outfit statistics fall outside the acceptable range of 0.7 to 1.3. Together with the statistically significant age and gender DIF, this finding implies that the 29 items do not define a scale with satisfactory properties of measurement.

1.3.6.2 The "Purified" scale

The preceding sections imply that at least some of the items showing age or gender DIF will have to be eliminated to arrive at an unbiased measure of transliminality. As pointed out earlier, this cannot be done simply by removing the biased items, as this is likely to introduce DIF or misfit in the remaining items. Also, it is neither possible nor

desirable to consider all possible ways of dividing a given set of items into biased and unbiased subsets. Experience (Lange, Irwin, et al., 2000) indicates however that the search for non-biased subsets can be speeded up by an iterative top-down “purification” approach (the term originates in Lord, 1980) in which the biased item with the poorest Rasch fit is removed first. This procedure is repeated until an unbiased and scaleable subset of items is identified. The rejected items are then tentatively reintroduced to check whether the final selection remains stable.

Table 1.3: Item Locations, Point-Biserial Correlations, and Significance of the β Values in DIF Tests by Gender and Age for the 17 Purified Items (Lange, Thalbourne et al., 2000)

Item	Item Location (δ_j in logits)	Point Biserial	Infit	Outfit	Gender β^1	Age β^2
2. At times I perform certain little rituals to ward off negative influences	0.05	0.32	1.16	1.18	0.00	0.01
3. I have experienced an altered state of consciousness in which I felt that I became cosmically enlightened	0.73	0.52	0.89	0.76	-0.08*	-0.05
4. At the present time, I am very good at make-believe and imagining	-0.53	0.31	1.16	1.25	-0.07	0.04
5. I have felt that I had received special wisdom, to be communicated to the rest of humanity	1.87	0.47	0.90	0.77	0.03	-0.07**
8. I have sometimes sensed an evil presence around me, although I could not see it	0.16	0.48	0.96	0.93	0.05	0.03
9. My thoughts have sometimes come so quickly that I couldn't write them all down fast enough	-1.41	0.34	1.07	1.13	-0.05	0.10**
12. It is sometimes possible for me to be completely immersed in nature or in art and to feel as if my whole state of consciousness has somehow temporarily been altered	-0.91	0.49	0.89	0.79	-0.06	-0.01
13. Often I have a day when indoor lights seem so bright that they bother my eyes	1.17	0.24	1.28	1.17	0.01	0.04
16. I have experienced an altered state of consciousness which I believe utterly transformed (in a positive manner) the way I looked at myself	0.80	0.50	0.91	0.94	0.08*	-0.05
18. I think that I really know what some people mean they talk about mystical experiences	-0.36	0.52	0.89	0.87	0.05	-0.07*
19. I have gone through times when smells seemed stronger and more overwhelming than usual	-0.45	0.39	1.06	1.08	0.06	-0.07
20. I can clearly feel again in my imagination such things as: the feeling of a gentle breeze, warm sand under bare feet, the softness of fur, cool grass, the warmth of the sun and the smell of freshly cut grass	-1.03	0.40	1.00	1.14	0.01	-0.02
21. A person should try to understand their dreams and be guided by or take warnings from them	-0.76	0.43	0.99	0.95	0.04	0.08*
22. While listening to music, I often have feeling of oneness with the music and of being in another place or time, or recall memory	-1.77	0.39	1.02	0.79	0.02	-0.05
25. For several days at a time I have had such a heightened awareness of sights and sounds that I cannot shut them out	2.05	0.46	0.88	0.72	-0.03	0.00
26. I sometimes have a feeling of gaining or losing energy when certain people look at me or touch me	-0.19	0.52	0.89	0.80	-0.06	0.04
29. When listening to organ music or other powerful music, I sometimes feel as if I am being lifted up into the air	0.59	0.45	0.99	0.96	0.06	0.07*

* .10 < p < .20 ** .05 < p < .10 (all other p > .20)

Note. ¹A positive value indicates that women's ($N = 190$) likelihood of endorsing the item is greater than that of comparable men ($N = 123$). ²A negative β value indicates the opposite effect.

Table 1.3 shows that this procedure excluded 12 items, leaving a subset of 17 purified transliminality items with an overall Rasch reliability of 0.82. Before addressing bias issues, note that all items show acceptable infit (Column 3, range: 0.88 – 1.28) and outfit values (Column 4, range: 0.82 – 1.29), indicating that the items indeed define a Rasch hierarchy (measure). The average person measure was -0.11 logits with $SD = 1.50$, and the corresponding statistics for the item locations are 0.00 and 1.05, respectively.

By construction, none of the 17 items show age and gender DIF. In particular, Columns 5 and 6 in Table 2.3 indicate that none of the 34 β values are significant at $p \leq .05$; in fact, 29 of the 34 DIF tests have Type I error levels in excess of 0.10. Presumably, the removal of biased items should yield a measure without DTF as well. To verify this assumption, four separate Bigsteps runs were performed to determine the sum score to Rasch transformations in the four (pairwise) age and gender groups. Lange, Thalbourne et al. (2000) subsequently plotted the person measures in logits against the sum of the 17 purified items for each group, together with the person measure derived over the entire sample (circles). It was found that the four lines virtually coincide with each other, as well as with the transformation derived over the entire sample. In other words, there was no evidence of any DTF due to age or gender.

The sum score to Rasch measure translations and their associated SE s are given in Table 1.4. In this table the available person logit measures were transformed to have a mean of 25 and a standard deviation of 5. It can be seen that the SE is lowest for values near the mean (e.g., a sum score of 8 yields a value of 24.9 with $SE = 2.7$) and higher for more extreme values (e.g., a sum score of 15 yields the value 32.5 with $SE = 4.0$). It is important to note that in practice all 29 items from the original Transliminality Scale are

administered, but only the 17 RTS items are scored. The excluded 12 items remain embedded in the instrument to maintain context and ensure that differential item functioning from their omission is not introduced (see: Houran, Thalbourne, & Lange, 2003).

Table 1.4: Sum Score to Rasch Conversion Table for the Revised Transliminality Scale ($M = 25, SD = 5$) and the Standard Errors of Estimate Associated with Each Rasch Measure (Lange, Thalbourne et al., 2000)

No. of Items Scored Positively	Rasch Transliminality Measure ^a	Rasch Standard Error of Estimate
0 ^b	13.7	7.2
1	15.9	5.3
2	18.3	3.9
3	19.9	3.3
4	21.1	3.0
5	22.1	2.9
6	23.1	2.8
7	24.0	2.7
8	24.9	2.7
9	25.7	2.7
10	26.6	2.7
11	27.5	2.8
12	28.5	2.9
13	29.6	3.1
14	30.9	3.4
15	32.5	4.0
16	35.0	5.3
17 ^b	37.3	7.3

Note. ^a This transliminality measure was obtained by estimating the person measures (θ) in logits based on the item locations shown (δ_j) in Table 2 via Bigsteps software, and applying the linear transformation $2.90*\theta + 25.30$. To obtain θ in the presence of missing data, apply the algorithm in Wright and Stone (1979, pp. 142-144) using the δ_j in Table 2.2, or anchor the items at these locations before running Bigsteps. As none of the items is biased, θ estimates based on subsets of items can be assumed to be unbiased also. ^b The transliminality measures in these rows, as well as their standard errors, represent estimates only.

1.3.6.3. Ancillary Analyses

While the purified transliminality test is considerably shorter than the original 29-

item version, the reliability of the scale suffered little. Specifically, Table 1.2 indicates that the overall Rasch reliability of the original 29-item scale is 0.88, whereas the reliability of the 17-item version is still 0.82. This small decrease in the reliability coefficient strongly suggests that the purification process succeeded in eliminating those items that contributed disproportionately to the (systematic) errors of measurement as associated with our respondents' age and gender. A number of questions remain, however. For instance, one might ask whether the purified scale is indeed unidimensional, and, if so, whether it measures the same latent variable as the original 29-item version. Additionally, it was investigated how the measures derived from the two versions differed when age and gender are taken into account.

Dimensionality. The unidimensionality of the purified scale can be tested by treating all 17 items as a single Rasch factor, and determining its fit relative to a suitable multidimensional Rasch model. For this purpose, Lange, Thalbourne et al. (2000) defined the items with "lowest" item locations (i.e., 4, 9, 12, 18, 19, 20, 21, and 22) as one factor, and assigned those with the "highest" locations (i.e., 2, 3, 5, 8, 13, 16, 25, 26, and 29) to a second factor. (Note: The items' locations are listed in Column 1 of Table 1.2). Both the one-factor model and the two-factor model as defined above were fitted using the ConQuest software (Wu et al., 1998). Although the two-factor formulation proved superior to the one-factor formulation ($\chi^2(3) = 8.62, p \leq .05$), the "low" and the "high" factors in the two-factor model showed an extremely high correlation ($r = 0.91$). Accordingly, it was concluded that the items are essentially unidimensional and that a single factor model captures a sufficient portion of the latent variable to remain viable (for a discussion of this issue, see e.g., Hattie, 1985; Linacre, 1998; Nandakumar & Stout,

1993).

Next, to determine whether the purified scale addresses a materially different latent dimension than the original 29 items, the 12 rejected items (i.e., 1, 6, 7, 10, 11, 14, 15, 17, 23, 24, 27, and 28) and the 17 purified items were treated as two separate Rasch factors. Perhaps not surprising given the DIF in the rejected items (cf. Stout, 1990; Lange, Irwin et al., 2000), this two factor model showed a superior fit ($\chi^2(3) = 21.23, p \leq .001$) relative to a model that treated all 29 items as a single factor. However, the correlation between the two factors was extremely high ($r = 0.94$). Thus, again there is little reason to adopt a two-factor model. It was concluded therefore that the purified 17-item scale addresses approximately the same latent dimension as the original 29 items.

DTF. Since over 40% of the items were excluded mainly due to DIF, it was expected that the Rasch measures produced by the original 29-item version of the transliminality scale should show bias at the test level (DTF) relative to the unbiased 17-item version. To test this prediction, a Gender (Men vs. Women) x Age (Young vs. Old) x Test Form (29 vs. 17 Items) Analysis of Variance (ANOVA) was performed with repeated measures over the last factor. To arrive at commensurate measures, both Rasch measures were transformed so as to have $M = 25$ and $SD = 5$.

As expected, a significant Gender x Test Form interaction effect was found ($F(1, 311) = 6.13, p \leq .05$). This interaction reflects the fact that men scored about 0.2 SD lower on the original 29-item test than women ($M = 24.5$ vs. $25.4; t(313) = -1.71, p \leq .05$), whereas the 17 item version showed no such gender effect ($M = 24.7$ vs. $25.3; t(313) = -1.05, p > .10$). In other words, the removal of DIF produced a net decrease in the gender effect. Additionally, transliminality decreased with age, and this decrease is

stronger for the 17-item form ($M_{\text{Young}} = 25.3$ vs. $M_{\text{Old}} = 24.6$) than for the 29-item form ($M_{\text{Young}} = 25.1$ vs. $M_{\text{Old}} = 24.9$). Whereas none of the pairwise age comparisons are significant (all $p > .10$), the Age x Test Form interaction reaches statistical significance ($F(1, 311) = 7.59, p \leq .01$). Thus, in contrast to gender, the removal of age related DIF actually slightly *accentuated* the average transliminality differences between the two levels of this independent variable.

None of the other effects in the ANOVA reached statistical significance (all $p > .17$).

1.3.7 DISCUSSION

The Rasch (1960/1980) methodology permits the transliminality construct to be measured in a superior fashion. Specifically, top-down purification of Thalbourne's (1998) original 29-item Transliminality Scale yielded a 17-item subset that is called the Revised Transliminality Scale (RTS). This subset consists of items that span magical ideation, mystical experience, absorption, hyperaesthesia, manic experience, dream interpretation, and fantasy proneness, but it is important to note that the subset is in fact unidimensional. In other words, as argued by Thalbourne (1991; Thalbourne & Delin, 1994), these groups of cognitive and emotional phenomena share the same underlying dimension. Moreover, this conclusion cannot be attributed to obvious confounding variables. The RTS contains no detectable age or gender bias, while providing measures at an interval-level with acceptable reliability and scaling properties. Also, the finding that the RTS is Rasch scalable is consistent with the notion that transliminality entails a number of thresholds.

With sufficiently large sample sizes composed of a large subset of subgroups

(men, women, younger vs. older respondents), top-down purification provides a powerful new tool for the development and revision of other instruments in various areas of assessment (cf. Lange, Irwin et al., 2000; Lange, Irwin, & Houran, 2001; Lange & Thalbourne, 2002; Lange, Thalbourne, Houran, & Lester, 2000; McCutcheon, Lange, & Houran, 2002). Its specific advantages are that research findings based on purified instruments cannot be attributed to item or test bias; moreover, the Rasch approach used during the purification process ensures the scalability of the items and provides measures and error estimates that are more realistic than those obtained in a classical test theory framework. These psychometric properties are especially important in applications that make strong data assumptions, including structural modeling (e.g., Lange & Houran, 1998, 1999b) and nonlinear dynamics (Lange & Houran, 2000).

1.4 EPILOGUE

The concept of transliminality was constructed and refined through a systematic series of studies that aimed to identify core constituents derived from shared, underlying processes. The empirical orientation of transliminality research led to several revisions of its operational definition and measurement.

Initially, it was conceived of as “an openness or receptiveness to impulses and experiences whose sources are in preconscious (or unconscious) processes” (Thalbourne, 1991, p. 182). Later, Thalbourne and Delin (1994) elaborated this to “a largely involuntary susceptibility to, and awareness of, large volumes of inwardly generated psychological phenomena of an ideational and affective kind” (p. 25). When Thalbourne et al.’s (1997) analyses suggested that the mechanisms underlying the core constituents involved the interaction of three factors: the subliminal (subconscious or unconscious),

the supraliminal (conscious awareness or activity), and the external environment (perception), the definition evolved to read, “susceptibility to, and awareness of, large volumes of imagery, ideation, and affect—these phenomena being generated by subliminal, supraliminal, and/or external input” (p. 327). Finally, the definition of transliminality was revised one final time to be broader in scope and implication, namely “the hypothesised tendency for psychological material to cross thresholds into or out of consciousness” (Thalbourne & Houran, 2000, p. 853).

Along with these revised conceptualizations of transliminality came corresponding alterations in its measurement. Transliminality was first measured by a factor score (e.g., Thalbourne & Delin, 1994; Thalbourne et al., 1997), then by selected transliminality-relevant variables as a normalized z-score (Thalbourne, 1996; Sanders et al., 2000), and most recently by Thalbourne’s (1998) 29-item “true/false” Transliminality Scale (Form B). The construct validity of this scale was bolstered by numerous studies that examined the relationship of its scores to a number of expected psychological variables. The ensuing profile of a highly transliminal individual implied that the transliminal state could be perceived as both pleasant or aversive, and that the mental experience of high transliminals was related to—and perhaps subsequently motivated—specific philosophies, attitudes, and behaviors. The picture of the high transliminal also suggested practical applications for subject selection in tests of psi, although the available data on parapsychological success rate and transliminality are inconsistent.

Stronger support for the validity of the Transliminality Scale and its theoretical implications came from Rasch (1960/1980) analyses by Lange, Thalbourne et al. (2000). This research validated a single dimension underlying seven psychological domains: (i)

Hyperesthesia, (ii) (fleeting) Hypomanic or Manic Experience, (iii) Fantasy-Proneness, (iv) Absorption, (v) Positive (and perhaps obsessional) Attitude Towards Dream Interpretation, (vi) Mystical Experience, and (vii) Magical Ideation. While the current definition of transliminality still applies to this dimension, it should be noted that twelve items representing amongst other variables Creative Personality and Belief in the Paranormal were omitted from the scoring of the test due to differential item functioning, i.e., age- or gender-related response biases in relation to the other items. The remaining seventeen items, pertaining to the seven psychological concepts identified above, conformed to a Rasch (1960/1980) probabilistic hierarchy of items, which is independent of age-and gender-related response biases. This scale, which has internal-level measurement properties, is called the Revised Transliminality Scale (RTS: Lange, Thalbourne et al., 2000).

It is interesting that the RTS primarily identifies *experiential* phenomena that are consistent with Werner's (1948, 1957/1978) notion of syncretic cognition, i.e., a dedifferentiation in perceptual qualities in subjective experience. The consequent perceptions might promote certain attitudes and behaviors, which would be regarded as behavioral expressions of a highly transliminal mind and/or some type of higher-order processing of those contents. The overall pattern of findings reviewed in this chapter suggests that the cognitive mechanisms responsible for transliminality involve at least looser gating or functional regulation among primary sensory and secondary sensory areas and/or sensory association cortices.

Validation studies are required to confirm these basic findings with the psychometrically superior RTS. Chapter 2 will therefore present re-analyses of some of

this previous literature, as well as new data with the Revised Transliminality Scale. The findings will then be used as the basis for a cognitive regulation model of transliminality.

CHAPTER 2:
A PRELIMINARY COGNITIVE MODEL OF
TRANSLIMINALITY BASED ON CORRELATES OF
THE REVISED TRANSLIMINALITY SCALE (RTS)

2.1 PROLOGUE

Chapter 1 presented a profile of individuals who score highly on the original Transliminality Scale (Form B: Thalbourne, 1998). While that profile was based on a multitude of convergent studies, it must be noted that the original Transliminality Scale had significant age and gender biases. These confounds could have skewed previous research findings, because it has been shown (Lange, Irwin et al., 2000) that item bias can affect the results obtained from familiar statistical techniques such as factor analysis and correlational analysis. Therefore, this chapter summarizes a series of re-analyses of previous collected data that were re-scored according to the new Rasch scheme that defines the RTS (Lange, Thalbourne, et al., 2000). In addition, the results of new studies with the RTS are reviewed. The accumulated body of results will then be used to propose a preliminary cognitive model of transliminality. The chapter concludes by addressing the research composing this thesis that was conducted in order to test aspects of this cognitive model.

2.2 A NEW LOOK AT OLD DATA: RE-ANALYSES OF STUDIES PERTINENT TO MODELING TRANSLIMINALITY

2.2.1 PSYCHOLOGICAL CORRELATES

Tests of difference (Hinkle, Wiersma, & Jurs, 1988, p. 279) reported by Lange, Thalbourne et al. (2000, p. 611) between scores on the RTS and scores on the Cattell 16 PF personality test (Russell & Karol, 1994) indicated that the magnitudes of the correlations significantly changed from those obtained with the original 29-item Transliminality Scale. However, the correlations remained in the predicted directions and were still statistically significant. These correlations and other correlations reported in Lange, Thalbourne et al. (2000, p. 613), as well as newly calculated correlations are given in Table 2.1.

Table 2.1: Re-analyzed correlations[†] between the Revised Transliminality Scale (RTS) and Salient Psychological Variables

PSYCHOLOGICAL VARIABLE	CORRELATION WITH RTS	REFERENCE
Cattell's 16PF		
A (warmth)	.20*	Lange, Thalbourne, Houran & Storm (2000)
G (rule-consciousness)	-.20*	“
M (abstractedness)	.36*	“
Q1 (openness to change)	.22*	“
TM (tough-mindedness)	-.32*	“
SC (self-control)	-.21*	“
Creativity	.42**	Thalbourne (2000a), reanalysis
Three-item dream recall scale	.17 ^{†, a}	Thalbourne & Delin (1999)
Lucid dreaming (Australian sample)	.37**	Thalbourne & Houran (2000), further analysis
Lucid dreaming (US sample)	.34**	“
Hood's Mysticism Scale	.66 ^{†, **}	Thalbourne & Delin (1999)
Mystical Experience Ratings	.51 ^{†, **}	“
Absorption (corrected for item overlap)	.72 ^{†, **}	Thalbourne (1998)
Anomalous Experiences Inventory		
Paranormal Experience	.65**	Thalbourne (2001)
Paranormal Belief	.58**	“

Paranormal Ability	.61**	“
Drug Use (number of drugs used)	.29**	“
Rasch-Tobacyk’s Revised Paranormal Belief Scale		
New Age Philosophy	.47**	“
Traditional Paranormal Beliefs	.37**	“
Mental Experience Inventory		
Paranormal Belief (Australian sample)	.54**	Thalbourne & Houran (2000), further analysis
Paranormal Belief (US sample)	.59**	“
Paranormal Experience (Australian sample)	.75**	“
Paranormal Experience (US sample)	.77**	“
Paranormal Belief (Australian sample)	.54**	“
Paranormal Belief (US sample)	.59**	“
Sense of being high (Australia)	.57**	“
“ (USA)	.57**	“
Daydreaming (Australia)	.57**	“
“ (USA)	.46**	“
Sense of mental potency (Australia)	.68**	“
“ (USA)	.43**	“
Introspection (Australia)	.71**	“
“ (USA)	.60**	“

Note: † Spearman rank-order correlations unless otherwise noted

‡ Pearson correlations as reported in the original sources

^a $p = .06$ (two-tailed), * $p \leq .05$, ** $p \leq .01$

This pattern of correlations based on the RTS supports the validity of the basic profile of high transliminals presented in Chapter 1. Note that here the correlations between transliminality and subjective paranormal experience, paranormal ability, and mystical experience are regarded as purely psychological variables rather than parapsychological findings. Since the concept of transliminality interests parapsychologists concerned with process-oriented research on psi functioning (see Chapter 1, Section 2.3.2), corrected correlations were also computed for Storm’s (Storm & Thalbourne, 1998-1999, 2001, 2002) *I Ching* experiment. The summary of these re-analyses is presented next.

2.2.2 PARAPSYCHOLOGICAL CORRELATES

Storm (Storm & Thalbourne, 1998-1999, 2001, 2002) used the Chinese book of divination, the *I Ching*, in a series of parapsychological studies. This book contains 64 readings, accessed by the throw of three coins six times to produce a so-called hexagram. Participants pre-selected 16 (25%) of the total number of hexagrams in the hope that one of them would come up in the actual series of throws (a “hit”). Storm’s results with the Transliminality Scale across three studies provided inconsistent evidence that transliminality was related to hit rate on the *I Ching*, and hence was inconclusive in establishing a link between transliminality and putative psi. Re-analyses based on the RTS might indicate whether Storm’s inconsistent findings were due in part to psychometric problems with the original Transliminality Scale.

Table 2.2: Pearson Correlations Between Revised Transliminality Scale and Hit Rate on *I Ching* Hexagrams (Storm, 2002)

VARIABLE	<i>r</i>	<i>p</i>	REFERENCE
Hitting on <i>I Ching</i> hexagrams	.26	.012	Storm & Thalbourne (1998-1999, <i>N</i> = 93)
Hitting on <i>I Ching</i> hexagrams	-.00	ns*	Storm & Thalbourne (2001, <i>N</i> = 207)
Hitting on <i>I Ching</i> hexagrams	-.01	ns*	Storm (2002, <i>N</i> = 43)
Hitting on <i>I Ching</i> hexagrams	.11	.038	Storm (meta-analysis, <i>N</i> = 243)

Note: * *p*-values are one-tailed as originally given in the articles

Table 2.2 shows that hit rate on the *I Ching* continues to show inconsistent effects with transliminality. In particular, only one of the three studies yielded a significant,

though somewhat low, positive correlation with hit rate on the test of psi. On the other hand, Storm's (2002, p. 54) meta-analysis of his collective *I Ching* data indicated that, overall, transliminality had a small positive but significant association with hit rate. A coefficient using the RTS substantiated this conclusion, but stronger evidence is clearly needed across a variety of psi tests in order to cross-validate this finding. Based on these results, the RTS may or may not have practical application in selecting participants for parapsychological research.

2.3 NEW STUDIES WITH THE REVISED TRANSLIMINALITY SCALE

2.3.1 TRANSLIMINALITY AND VARIETIES OF DREAM EXPERIENCE

During the peer-review process for the Lange, Thalbourne, et al. (2000) paper, one referee suggested that additional validity data needed to be included in the final paper. The editor concurred and agreed with the authors' suggestion that scores on the RTS should correlate positively with dreaming experience (a subject not addressed in previous studies to any great depth). As a result, Lange, Thalbourne, et al. (2000) replicated a study by Hicks, Bautista, and Hicks (1999b) in which these authors administered Hartmann's (1991) Boundary Questionnaire and the Spadafora and Hunt (1990) Dream Scale.

This dream scale has a Likert-style response format with five categories that are labeled "Never (or almost never)", "Seldom", "Occasionally", "Frequently", and "Always (or almost always)". These categories are assigned the values 1 through 5, respectively, and the rating for each type of dream is treated as a separate variable. The

dream scale measures the level of experience across seven types of dreams:

1. *Lucid Dreams* (“vivid dreams in which you realize that you are dreaming while you are still in the dream, and you may then find that you can control the dream while it continues”).
2. *Archetypal Dreams* (“dreams that carry a sense of awe and fascination and/or include encounters with strange and unusual beings, perhaps reminiscent of mythology and fairy tales”).
3. *Fantastic Nightmares* (“very vivid, upsetting dreams that you remember in detail upon awakening and can involve a wide range of negative emotions”).
4. *Pre-lucid Dreams* (“where one questions whether one is dreaming but cannot decide”).
5. *Control Dreams* (“where control not possible in waking life is deliberately exercised in the dream, with or without lucid awareness of dreaming”).
6. *Posttraumatic Nightmares* (“dreams repeating an actual past trauma”).
7. *Night Terrors* (“terrifying awakenings without any recall of dream content”).

Consistent with their predictions, Hicks et al. (1999b) found that those with “thin” boundaries reported significantly greater frequency of dreaming than those with “thick” boundaries as measured by Hartmann’s (1991) Boundary Questionnaire. As noted in Chapter One, the transliminality concept resembles in some ways Hartmann’s notion of boundaries. Hence, Lange, Thalbourne et al. (2000) predicted that the RTS should show

similar correlations with Spadafora and Hunt's (1990) Dream Scale. Accordingly, a one-tailed test was used.

Both questionnaires were administered in counterbalanced order to a convenience sample of 57 participants from the general population ($M_{age} = 39.2$ yrs., $SD = 13.8$, range = 21-72 yrs., 61% women). Table 2.3 shows that, as expected, the RTS showed significant and positive rank-order correlations with each of the seven dream types.

Table 2.3: Rank (Rho) and Partial Correlations (removing age and gender) Between Seven Dream Types Identified by Spadafora and Hunt (1990) and the Revised Transliminality Scale ($N = 57$) (Lange, Thalbourne et al., 2000)

<i>Type of Dream</i>	<i>Rho</i>	<i>Partial Correlation</i>
Archetypal	0.39**	0.38**
Control	0.43**	0.39**
Fantastic Nightmare	0.24 *	0.24 *
Posttraumatic Nightmare	0.48**	0.38**
Lucid	0.42**	0.55**
Pre-lucid	0.35**	0.34**
Night Terror	0.46**	0.32**

Note: * $p \leq .05$, ** $p \leq .01$ (one-tailed)

These results conceptually replicated those of Hicks et al. (1999b). Furthermore, it seems unlikely that the correlations are due to any confounding effects of age and gender, because their magnitudes remain largely the same when age and gender are partialled out (based on the standard product moment correlation, see Table 2.3). As such, the findings add to the accumulating evidence that the RTS is a useful predictor of certain mental phenomena.

2.3.2 TRANSLIMINALITY AND TEMPORAL LOBE LABILITY

Parallel areas of research suggest, however, that brain systems in addition to

primary sensory and secondary sensory areas and/or sensory association cortices are involved in transliminality. In particular, several authors have reported a link between temporal lobe lability (sensitivity of temporal lobe to stimulation) and temporal lobe dysfunction and subjective paranormal and mystical experiences (e.g., Neppe, 1983; Palmer & Neppe, 2003; Persinger, 1984; Persinger & Valliant, 1985). For example, Neppe (1983) found that normal persons reporting a large number of paranormal experiences also reported greater numbers of temporal lobe symptoms than those reporting no paranormal experiences. Other populations evidence similar effects. Specifically, there are positive correlations between reported numbers of paranormal experiences and endorsement of temporal lobe symptoms in university samples (Persinger, 1984; Persinger & Valliant, 1985), and recently, a clinical study by Palmer and Neppe (2003) demonstrated that patients who exhibited high numbers of temporal lobe symptoms also reported more paranormal experiences than patients who exhibited few or no temporal lobe symptoms. Interestingly, females exhibited a greater number of temporal lobe symptoms in the latter study. Furthermore, paranormal and mystical experiences can be induced experimentally through electromagnetic stimulation of the temporal lobes. Particularly dramatic examples of facilitated experiences are found in various reports by Persinger and colleagues (Cook & Persinger, 1997, 2001; Persinger, Tiller, & Koren, 2000; for a review see: Persinger & Koren, 2001b).

One interpretation of this impressive body of results is that temporal lobe lability facilitates epileptic-like and hallucinatory experiences, which are subsequently interpreted by experiencers to be paranormal or mystical in nature. As the primary seat of a rich complex of memory and fantasy, these themes are to be expected from temporal lobe

activity. One persistent observation is the propensity for temporal lobe-based experiences to be permeated by vague references to death and religious themes (Persinger, 1983); they occur in both nonparanormal and paranormal contexts. Indeed, it has long been known that temporal lobe epileptics are characterized by their obsession with religiosity and morbid themes (Bear & Fedio, 1977), particularly if a psychotic element is involved (Slater & Beard, 1963). There is independent reason to expect that temporal lobe lability contributes to transliminality by integrating information from primary and secondary sensory areas and/or sensory association cortices. Neppe (1990) noted that the temporal lobes, which constitute 40% of the cerebrum, are:

...well situated for their major physiologic function of integrating polymodal perceptual inputs of all kinds, including those from the ... sense organs. For example, smell, balance, hearing, and taste are processed by temporolimbic structures; and vision, ... touch, position sense, and pain by neighboring areas. In addition the temporal lobes are responsible for interpreting various aspects of affective, conative, and cognitive functions such as memory, learning, language interpretation, and sense of self... Thus, complex symptomatology results from firing within a temporal lobe or non-functional atrophic lesions of parts of a temporal lobe. This may be further complicated by alterations in states of consciousness (pp. 170-171).

To test the notion that temporal lobe lability facilitates or at least contributes to transliminality, Thalbourne, Crawley, and Houran (2003) administered the RTS and the Personal Philosophy Inventory (PPI; Persinger, 1984b) to 135 university students ($M_{age} = 22.7$ yrs, $SD = 6.5$, range = 17-50 yrs, 76% women) from Australia ($N = 20$) and the UK ($N = 115$). The PPI purports to measure the proposed continuum of temporal lobe lability within the general population and its putative associated phenomena (Makarec & Persinger, 1990; Persinger & Makarec, 1993). Neppe (1990, p. 177) noted, "There are already construct validity [data] for Persinger's temporal lobe scale; normal people who

report more subjective experiences similar to those stated by patients whose deep temporal lobes are stimulated surgically show enhanced EEG lability within the temporal lobes but not the occipital lobes (Makarec & Persinger, 1985, 1990).”

The PPI contains 140 “true/false” statements grouped into a large number of (sometimes overlapping) clusters measuring: (1) a control for acquiescence response bias (15 items); (2) the tendency to lie (reverse scored: 9 items); (3) paranormal experiences (4 items); (4) general temporal lobe epilepsy (30 items); (5) complex partial epileptic signs (16 items); (6) all signs involving temporal-lobe like factors (56 items); (7) exotic beliefs (9 items); (8) fear (6 items); (9) egocentrism (12 items); (10) rare (psychotic-like) statements (5 items); (11) perseveration (4 items); (12) limbic-motor statements (4 items); (13) automatic behaviours (3 items); (14) intense meaning (3 items); (15) hypergraphia, or writing (3 items); (16) visual imagery (3 items); (17) depersonalization (4 items); (18) auditory-vestibular experiences (4 items); (19) sense of presence (3 items); (20) suggestibility (3 items); (21) olfactory experiences (4 items); and (22) hypomania (3 items). All clusters are divided by the number of statements comprising them and multiplied by 100 so that the score of each participant could range from 0 to 100.

Pearson correlations (two-tailed) were calculated between the RTS and all of the clusters in the PPI. Seventeen out of the resulting twenty-three correlations were statistically significant (two-tailed) and in the predicted direction. Scores on the RTS correlated significantly though at a low level with acquiescence response bias (shared variance = 5%) and therefore an adjustment was made to two of the highest correlations, using partial correlation. The partial correlation for the correlation between RTS and the

general temporal lobe epilepsy scale decreased minimally from 0.72 to 0.70, while the partial correlation between transliminality and all signs involving temporal lobe factors likewise showed a minor decrease from 0.70 to 0.68. These changes suggest that acquiescence response bias had a negligible effect on the relevant correlations.

As predicted, scores on the RTS were positively and significantly correlated with the general temporal lobe epilepsy scale, number of complex partial epileptic signs (which is a part of the former), all signs involving temporal lobe factors, sense of presence, liberal (exotic) beliefs, depersonalisation, auditory-vestibular experiences, paranormal experiences, hypomania, intense meaning, olfactory experiences, perseveration, hypergraphia, rare (potentially psychotic-like) features, limbic motor processes, acquiescence response bias, and conservative religious beliefs. However, RTS scores did not significantly correlate with the lie scale, fear or phobia, egocentrism, automatic behaviours or suggestibility.

To better understand the association between temporal lobe signs and transliminality, Thalbourne et al. (2003) calculated Pearson correlations (two-tailed) between RTS scores and each of the 140 items on the PPI. Fifty-five correlations were significant at the .05 level or less. To control for Type I error, attention was focused on those 28 correlations that were significant at the $\leq .001$ level. The wording of these relevant items and their correlation coefficients are listed in Table 2.4.

Table 2.4: Pearson correlations ($p \leq .001$, two-tailed) between Revised Transliminality Scale and 28 items from the Personal Philosophy Inventory ($N = 135$) (Thalbourne, Crawley, & Houran, 2003)

ITEM NO.	ITEM	<i>r</i>
137.	Two or three times in my life, there have been a few brief moments when I felt very close to a Universal Consciousness.	.55
15.	I have had a vision.	.49
29.	While sitting quietly, I have had uplifting sensations as if I were driving quickly over a rolling road.	.44
60.	Sometimes I am so full of pep and energy that I feel superhuman.	.43
94.	Telepathy (ESP) is a real phenomenon.	.43
109.	I have had experiences when I felt as if I were somewhere else.	.43
88.	I often feel as if things are not real.	.42
38.	At least once in my life very late at night, I have felt the presence of another Being.	.42
20.	Sometimes I am sure that people can tell what I am thinking.	.41
17.	An inner voice has told me where to find something and it was actually there.	.41
104.	Although I am not sure, there is a good possibility that I have lived in a previous time.	.39
71.	My soul sometimes leaves my body.	.39
40.	When I have a tough decision to make, a sign will be given and I will know what to do.	.39
63.	Sometimes in the early morning hours between midnight and 4.00 A.M., my experiences are very meaningful.	.38
23.	There have been times when I have stared at an object and it appeared to become larger and larger.	.38
12.	Sometimes an event will occur that has special significance for me only.	.37
133.	I have been visited by Spiritual Beings.	.36
35.	I have had a religious experience that I know was real.	.36
101.	There is an Eternal and Infinite Force.	.35

76.	I have heard an inner voice call my name.	.35
25.	Once I start talking in an enjoyable setting, I have a hard time leaving.	.33
62.	When relaxed or just before falling asleep, I sometimes feel pleasant vibrations moving through my whole body.	.32
128.	Most people should be guided to insure their spiritual development.	.31
138.	My first religious or mystical experience occurred before I was a teenager.	.28
106.	Once in a while, I think of things too bad to talk about.	.28
103.	I have learned to meditate.	.28
97.	I sometimes feel a sensation or a bulge in my abdomen.	.28
82.	At least once a month, I experience intense smells that do not have an obvious source.	.27

A common theme appears among many, if not most, of the items in Table 2.4, which maybe tentatively identified as “spirituality.” Even the items concerning physical symptoms might be thought to be a part of the so-called Kundalini experience, which is another correlate of transliminality (Thalbourne, 2001; Thalbourne & Fox, 1999). Moreover, it is already known that transliminality is associated with non-sectarian religiosity (Thalbourne, 1998; Thalbourne & Delin, 1999).

2.3.3 TRANSLIMINALITY AND CHILDHOOD TRAUMA: A POTENTIAL DEVELOPMENTAL ANTECEDENT

The robust pattern of results above is consistent with the premise that transliminality involves aspects of temporal lobe lability. Thus, temporal-limbic activity may partly account for a heightened integration among thoughts, emotions, and sensory experience, as well as explain the domination of paranormal, mystical, or religious

themes in transliminal experience. The validity of this idea can be cross-checked by testing a prediction from this proposal. For example, if transliminality derives, in part, from activity in temporal-limbic structures (including the hippocampus, see Brugger, Dowdy, & Graves, 1994), then hypothesized developmental correlates of temporal lobe lability should similarly correlate with RTS scores.

Joseph (1998, 1999) noted that childhood trauma (prolonged and high levels of stress, fear, and arousal) facilitates abnormal neocortical and hippocampal activation and arousal, as well as corticosteroid and enkephalin secretion thereby inducing atrophy or seizures within the hippocampus. Microseizures within the amygdaloid-hippocampal structures and adjacent cortices, according to Persinger (1983), would elicit transliminal-like experiences. Therefore, one might predict that childhood trauma is a risk factor for higher levels of transliminality.

Thalbourne, Houran, and Crawley (submitted) pursued this hypothesis in an unpublished study. One hundred six undergraduate students ($M = 25.76$ yrs, $SD = 8.94$, range = 18-66 yrs., 86% women) recruited from various years of psychology classes at Adelaide University ($N = 20$) or Goldsmiths College, London ($N = 86$; one participant was excluded due to lack of credible responses) completed the RTS and the 30-item Survey of Traumatic Childhood Events (STCE: Council & Edwards, 1987).

The 30 items of the STCE assess both occurrence and frequency of intrafamilial sexual abuse, extrafamilial sexual abuse, intrafamilial physical abuse, loss related to a friend, loss related to the family, isolation, personal illness or accident, parental divorce/separation and adolescent abortion/miscarriage, assault, loss of the home, and robbery. Responses are scored on a five-point scale of frequency, with (A) none, (B) one,

(C) two to five, (D) six to ten, and (E) more than ten traumatic experiences.

There are no published psychometric data—only descriptive data (Irwin, 1992)—on the STCE, and research on the prevalence and adulthood sequelae of childhood has been criticized for the use of assessment instruments with unknown psychometric properties (Scher, Stein, Asmundson, McCreary, & Forde, 2001). For this reason, one researcher no longer uses the STCE even though it arguably covers the broadest range of traumatic events of any of the available childhood trauma questionnaires (Harvey J. Irwin, personal communication). In this latter respect, the STCE appeared to be the best instrument with which to test the basic hypothesis.

Thalbourne et al. (submitted) solicited other researchers for psychometric data on their STCE datasets to justify the use of this instrument. Only two researchers provided Cronbach alphas from their published data. Dorahy, Irwin, and Middleton (2002) administered the STCE to three distinct samples: i) individuals diagnosed with dissociative identity disorder ($N = 20$), ii) individuals diagnosed with clinical depression ($N = 20$), and iii) a control group of individuals from the general population ($N = 20$). The alphas for each sample were 0.72, 0.84, and 0.92, respectively. Furthermore, an overall alpha of 0.87 was obtained from a sample of 50 people, consisting of ten individuals diagnosed with dissociative identity disorder, ten with clinical depression, ten with posttraumatic stress disorder, nine with schizophrenia, and eleven from the general population (Study 4: Dorahy, 2001). Similarly, alpha for Thalbourne et al.'s (submitted) sample of 106 people was 0.71. In each of these cases, the internal reliability of the STCE has been satisfactory as judged by Kline's (1986) criterion of ≥ 0.70 .

Consistent with predictions from the temporal lability-transliminality hypothesis

proposed above, scores on the STCE correlated $r = 0.39$ ($p \leq .001$, two-tailed) with RTS scores. A partial correlation controlling for age and sex simultaneously was essentially the same value as the zero-order correlation (0.41 , $p \leq .001$). Thus, participants who reported experiencing a larger number of childhood traumatic experiences were more likely also to score high on the RTS. To determine which types of childhood trauma were predominantly accounting for this moderately strong finding, conservative Spearman rank-order correlations (two-tailed) were computed between RTS scores and all thirty STCE items. Nine correlations were found to be significant at $p \leq .05$, whereas only 1.5 would be expected by chance.

Table 2.5: Significant Spearman Rank-order Correlations (two-tailed) Between Individual Items from the Survey of Traumatic Childhood Events (STCE) and the Revised Transliminality Scale (RTS) (Thalbourne, Houran, & Crawley, submitted)

STCE ITEM	RTS	<i>p</i>
STCE 12 "Having your house destroyed or damaged (e.g., by flood, fire or earthquake)"	.19	.048
STCE 13 "Having your home robbed or vandalized"	.29	.003
STCE 15 "Being struck or beaten up by someone other than a family member (e.g., school bully, stranger)"	.24	.012
STCE 17 "Being struck or hit by your parents, other family members or caregivers"	.31	.001
STCE 18 "Being struck or hit by someone who wanted to injure you and requiring medical attention (broken bone, stitches, etc.)"	.24	.012
STCE 19 "Being yelled and screamed at by a parent, other family member or caregiver"	.24	.014
STCE 21 "Seeing one of your parents being physically abused or verbally berated by your parent(s)"	.24	.014
STCE 26 "Another person touched you in a sexual way when you did not want or expect this to happen"	.20	.036
STCE 28 "Another person made you or asked you to engage in a sexual activity when you did not want to"	.28	.004

Table 2.5 reveals that several correlations between RTS scores and specific forms

of childhood trauma had comparable effect sizes and were highly significant: “Having your home robbed or vandalized,” “Another person made you or asked you to engage in a sexual activity when you did not want to,” and “Being struck or hit by your parents, other family members or caregivers.” An important underlying theme to each of these items concerns the violation of an individual’s ego-boundaries, which is consistent with the finding that boundary structure as conceptualized by Hartmann is a concept related to transliminality (Hartmann, Harrison, & Zborowski, 2001). However, only the latter item (STCE #17) showed a robust effect when corrected for multiple tests.

2.4 TOWARDS A PSYCHOPHYSIOLOGICAL MODEL OF TRANSLIMINALITY

2.4.1 INITIAL SPECULATIONS

Houran and Thalbourne (2001a, 2001b) were the first to speculate about possible neuropsychological bases for transliminality. Motivated by Fox’s interpretation of the consistent correlation between the so-called Kundalini experience (energy surging up through the spine to the brain) and transliminality, the concept was initially conceptualized as arousal of the central and peripheral nervous systems (specifically the autonomic nervous system, which has been proposed as the physiological source for Freud’s unconscious mind, Miller & Houran, 1996; for parallel ideas, see Wade, 1996) that is subsequently processed by the neocortex based in part on contextual cues within the experient’s environment (Houran, 2000; Houran & Thalbourne, 2001a). Temporal-limbic activity would further color the ensuing perceptions and promote paranormal, mystical, or fantasy-oriented themes.

Stated alternatively, transliminality might be regarded as the degree of interconnectedness among the structures of the ‘triune brain:’the Reptilian Complex, the Limbic System, and the Neocortex (cf. Chapter 1, Section 1.2). It might be expected that increasing levels of transliminality would correspond to increasingly more interconnections among the triune brain systems. For example, the Rasch (1960/1980) hierarchical structure of the RTS defines the individual test items in terms of low, medium, and high levels of transliminality (cf. Chapter 1, Table 1.2). As a result, it is anticipated that test items defining high levels of transliminality would tend theoretically to incorporate the synthesis of more triune systems than test items defining lower levels of transliminality. No formal, systematic, studies have investigated this question. However, Conrad M. Swartz (columnist for the *Psychiatric Times*), who is a noted psychiatrist with considerable theoretical and applied expertise in neurophysiology, kindly provided an independent—though admittedly preliminary—assessment of this idea.

Unaware of the basic hypothesis, Dr. Swartz was given the items of the RTS in a random order and then asked to subsequently interpret its content in terms of triune brain theory. That is, what triune brain system or systems might best account for the phenomenology represented by each RTS item? His conclusions (Swartz, personal communication) are presented in Table 2.6.

Table 2.6: An Independent Interpretation of the Items from the RTS in Terms of Triune Brain Theory

RASCH HIERARCHY OF RTS ITEMS (lowest to highest levels of transliminality)	PSYCHIATRIC INTERPRETATION OF TRIUNE BRAIN SYSTEM INVOLVED
22. While listening to my favorite music, in addition to feeling calm, relaxed, happy, etc., I often have a feeling of oneness with the music, or of being in another place or time, or vividly remembering the past	mostly neocortex, some limbic
9. My thoughts have sometimes come so quickly that I couldn't write them all down fast enough	commonly neocortex (anxiety), rarely limbic (mania)
20. I can clearly feel in my imagination such things as the feeling of a gentle breeze, warm sand under bare feet, the softness of fur, cool grass, the warmth of the sun and the smell of freshly cut grass	mostly R-complex, some limbic
12. It is sometimes possible for me to be completely immersed in nature or in art and to feel as if my whole state of consciousness has somehow temporarily been altered	commonly neocortex, rarely limbic
21. A person should try to understand their dreams and be guided by or take warnings from them	neocortex
4. At the present time, I am very good at make-believe and imagining	neocortex
19. I have gone through times when smells seemed stronger and more overwhelming than usual	mostly neocortex, rarely limbic
18. I think that I really know what some people mean when they talk about mystical experiences	mostly neocortex, rarely limbic
26. I sometimes have a feeling of gaining or losing energy when certain people look at me or touch me	mostly neocortex, a little limbic
2. At times I perform certain rituals to ward off negative influences	neocortex
8. I have sometimes sensed an evil presence around me, although I could not see it	mostly neocortex (anxiety), rarely limbic (melancholia, mania)
29. When listening to organ music or other powerful music, I sometimes feel as if I am being lifted up into the air	combination neocortex and limbic, mostly R-complex
3. I have experienced an altered state of consciousness in which I felt that I became cosmically enlightened	limbic, neocortex
16. I have experienced an altered state of consciousness which I believe utterly transformed (in a positive manner) the way I looked at myself	mostly neocortex, rarely limbic
13. Often I have a day when indoor lights seem so bright that they bother my eyes	mostly R-complex, occasionally limbic
5. I have felt that I had received special wisdom, to be communicated to the rest of humanity	mostly neocortex (ego), rarely limbic (mania)
25. For several days at a time I have had such a heightened awareness of sights and sounds that I cannot shut them out	mostly limbic, some neocortex

It can be seen that test items from the RTS that define low levels of transliminality (top of column one) were generally interpreted as involving primarily one 'triune brain' system,

whereas aspects of higher levels of transliminality (bottom part of column one) were interpreted as involving generally more integration among the triune brain systems.

Swartz's informal assessments are obviously not definitive. However, when taken together with the validated experiential, attitudinal, and behavioral correlates of the RTS, as well as recent studies supporting a temporal-limbic component to transliminality, it seems reasonable to conceptualize transliminality as *a cognitive phenomenon reflecting functional regulation of interaction among frontal cortical loops, temporal-limbic structures, and primary or secondary sensory areas and/or sensory association cortices*. For simplicity, this hypothesis will be referred to from this point on as the "Cognitive Regulation Hypothesis."

The next section summarizes Thalbourne, Houran, Alias, and Brugger's (2001) synthesis of theoretical and empirical thinking concerning the etiology of such a hypothesized condition of functional interconnectedness.

2.4.2 A COGNITIVE REGULATION PARADIGM

Since transliminal experience resembles and positively correlates with schizotypal and schizophrenic-like experience (Thalbourne, 1998; Thalbourne et al., 1997), Houran and Thalbourne hypothesized that similar cognitive processes underlie both experiences (Thalbourne et al., 2001). Traditionally, schizotypal and schizophrenic-like experience have been characterized in part as a deficit in cognitive inhibition (for a review, see Williams & Beech, 1997). That is, schizophrenics' performance in selective attention tasks suggests weak or erratic functioning in the cognitive mechanism responsible for the active suppression (or gating) of irrelevant information from conscious awareness (Braff, Swerdlow, & Geyer, 1999; Frith, 1979; Lieb, Denz, Hess, Schuettler, Kornhuber, &

Schrieber, 1996; Perry, Geyer, & Braff, 1999; Swerdlow & Geyer, 1998). What the psychiatric field deems as poor sensory gating, Houran and Thalbourne (2001a, 2001b) conceptualized as a greater degree of functional interconnectedness or cognitive fluidity in the brains of highly transliminal persons—the gateways that normally operate to regulate processes involving frontal-subcortical loops and primary or secondary sensory areas and/or sensory association cortices are open to a greater extent.

It would be expected that this fluidity in cognitive regulation would have both sensory and behavioral expressions, as it is now widely believed that neuropsychological functions are not simply localized in specific cortical areas but rather are subserved by a mosaic of neuronal structures comprising cortical regions, subcortical structures, and their respective reciprocal connections (Damasio, 1994; McCarthy & Warrington, 1990; Shallice, 1988). Note here that interconnectedness is not synonymous with *integration*. Functional interconnectedness is necessary for psychological integration, but integration will be compromised (Nasrallah, 1985) when the interconnectedness is not selective (O’Kusky, Strauss, Kosaka, Wada, Li, Druhan, & Petrie, 1988; Witelson, 1985).

Modern-day behavioral scientists eschew the term “ego,” owing to its psychoanalytic origin, but “ego” and “ego strength” have been used purely to describe cognitive functions and personality characteristics (Alias, 1974, 2000; Perry, McDougall, & Viglione, 1995; Stone, 1980). Ego may be viewed as the central “magnetic sphere” of the psyche that integrates and coordinates the autonomous cognitive fragments consisting of “percept units” and (reactive and non-reactive) “thought units” (Alias, 1974), and ego strength as the centripetal, cohesive force with which the integration and coordination of the cognitive fragments are prosecuted (Alias, 2000). Kaplan and Sadock (1998) write,

“first described by Herman Nunberg in 1931, the synthetic function refers to the ego’s capacity to integrate diverse elements into an overall unity...[It] involves organizing, coordinating, and generalizing or simplifying large amounts of data” (p. 218). Freeman (1960) proposed that damage to the perceptual system of ego leads to a failure of its screening function. As a result the individual can no longer insulate a train of thought from extraneous sensory stimulation (i.e., deficient sensory gating: Braff et al., 1999; Perry et al., 1999; Swerdlow & Geyer, 1998). Percepts and images now compete for attention with already existing thoughts.

Alias (1974) hypothesized that a train of thought is an orderly linked chain made up of different autonomous units like amino acids in a protein molecule; the correct position of any unit, as well as the pace with which these units enter into consciousness for the organization of a stream of thought, is directed by the ego; this operation is largely automatic, instantaneous and without subjective awareness. If the ego is weak, as in schizotypy and schizophrenia, this arrangement becomes impaired and the “thought units” will “express” (themselves), their independent existence, often in a disordered fashion (loose associations) either individually, or more collectively, to a highly variable extent depending upon the degree of ego-weakening, anxiety level, learning (by conditioning), and the state of arousal.

Andreasen, Paradiso, and O’Leary (1998) have coined a term, “cognitive dysmetria,” meaning “difficulty in prioritizing...coordinating, and responding to information.” They postulated that a disruption in the circuitry among nodes located in the prefrontal regions, the thalamic nuclei, and the cerebellum produces cognitive dysmetria. This poor “mental coordination” is a fundamental cognitive deficit in

schizophrenia and can account for its broad diversity of symptoms (Andreasen et al., 1998). A similar pathophysiology was proposed in conjunction with the schizophrenia-like episodes of temporal lobe epilepsy. Again, a broad range of interictal symptoms, from the experience of supernormal states of awareness to a preoccupation with religious and cosmological ideas, was suggested to be a consequence of a hyperconnectivity between temporal-limbic structures and sensory association cortex (Bear, 1979). Cognitive dysmetria may also be viewed as an end-result of “ego-weakening” (Alias, 2000).

If mechanisms similar to those reviewed above are responsible for transliminality, then it is understandable why high transliminals may turn to illicit drug use to alleviate the subsequent experiences that can be disturbing in nature (Thalbourne, 2001).

2.4.3 GENERAL PREDICTIONS FROM A COGNITIVE REGULATION PARADIGM

Assuming that transliminality and schizotypy and schizophrenic-like experience share the cognitive mechanisms discussed above, then individuals scoring high on the RTS are expected to show tendencies for the spontaneous experience of loose associations (i.e., disinhibited “spreading activation” in semantic networks allows establishment of nonstandard, “uncommon,” “original” associations and ideas, such as found in people with strong schizotypal tendencies see: Brugger, 2001; Duchêne, Graves, & Brugger, 1998). On a sensory level, this same disinhibition (reduced inhibition) leads to lower thresholds. Consequently, the cognitive mechanisms that may underpin transliminality would entail a relative ease of switching between ideas and concepts.

Preliminary evidence suggests that this switching or association also involves sensory impressions and modalities as well. Specifically, Thalbourne (1996, Thalbourne

et al., 1997) found that transliminality correlated with alternative measures of hyperesthesia (heightened sensitivity to sensory stimulation). Therefore, the regulatory mechanisms hypothesized to account for transliminality are not limited to frontal-subcortical loops, but also seem to involve looser gating among primary or secondary sensory areas and/or sensory association cortices.

One prediction based on this model of transliminality is that high transliminals would be prone to experiencing *synesthesia*, which Marks (2000, p. 121) described as the situation where “an inducing stimulus produces, at the same time, two kinds of sensory response: the primary sensory experience that is normally associated with that stimulus and, anomalously, a secondary experience in another modality,” such as seeing a color in response to a sound. In addition, there are “weak” forms of synesthesia, which pertain to cross-sensory correspondences expressed through language, perceptual similarity, and perceptual interactions during information processing (Martino & Marks, 2001). This reasoning is consistent with Abraham’s (2000) conclusion that “synesthesia... probably reflects heightened connectivity between adjacent cerebral regions” (p. 1018). Moreover, Ramachandran and Hubbard (2001) recently presented a highly detailed model of synesthesia that was similarly based on the notion of hyperconnectivity among relevant brain regions.

The incidence of profound synesthesia is estimated to be approximately 1 in 2000 individuals, with a genetic component (Groffman, 1999). Consequently, synesthetes of the level validated and studied by Smilek, Dixon, Cudahy, and Merikle (2002), are extremely rare. However, some authors (e.g., da Costa, 1996; van Campen, 1999) argue that synesthetic-like experiences can include strong emotional components, and there is

evidence that imagery contextualizes emotion (Kunzendorf, Hartmann, Thomas, & Berensen, 1999-2000). That is, symbolic imagery stands for objects of emotion that are no longer present but are not necessarily unconscious. This speaks to the idea of weak synesthesia, which pertains to cross-sensory correspondences expressed through language, perceptual similarity, and perceptual interactions during information processing (Martino & Marks, 2001). Likewise, Werner (1934/1978) envisaged that synesthetic experience could be induced in anyone, given the right conditions.

Using two previously collected datasets (Thalbourne, 1998; Thalbourne et al., 1997), Thalbourne et al. (2001) were able to retrospectively correlate measures of transliminality with the seven-item Synesthesia Measure derived by Tellegen from the Absorption Scale (Tellegen & Atkinson, 1974). This brief measure arguably addresses forms of weak synesthesia and “pseudosynaesthesia,” including the use of artistic metaphor and perceiving synesthesia through drug use. In the first sample of 115 persons from the general population in Australia ($M_{\text{age}} = 39$, $SD = 11$, range = 18-73 yrs; 66% women), the Spearman rank-order correlation with a factor score measure of transliminality was $.47$ ($p \leq .001$, two-tailed). In the second sample of 242 university students ($M_{\text{age}} = 25$, $SD = 10$, range = 17-63 yrs; 72% women), the association between synesthesia and a measure of transliminality based on its nine original core constituents was $.57$ ($p \leq .001$, two-tailed). While encouraging, these findings naturally require replication with the RTS.

2.5 EPILOGUE

Re-analyses of previous data using the improved RTS essentially substantiated the profile of the highly transliminal person given in Chapter 1. These findings, combined

with the results of new studies using the RTS, suggest that transliminality might be best thought of as a cognitive phenomenon that brings about syncretic experience (Werner, 1948, 1957/1978) through the liberal regulation of interaction among frontal cortical loops, temporal-limbic structures, and primary or secondary sensory areas and/or sensory association cortices. This chapter further summarized and synthesized relevant theoretical and empirical work concerning the etiology of these regulatory processes.

Preliminary data consistent with predictions from this definition require replication with improved methodologies. Moreover, other patterns of correlations are expected with the RTS based on the Cognitive Regulation Hypothesis for transliminality presented in this chapter. Accordingly, the original research comprising this thesis involves the investigation of such relationships using (i) strict questionnaire designs to test for associations between transliminality and alternative measures of the boundary construct, sensitivity to internal bodily sensations, and tendencies for psychological material to cross thresholds out of consciousness; (ii) a field study that aims to validate the relation between syncretic experience and transliminality in a natural setting; and (iii) a controlled laboratory study that examines how the gating of sensory stimuli corresponds to increasing levels of transliminality. The concluding chapter of this thesis will discuss the results of these studies in tandem and relate them to the Cognitive Regulation Hypothesis for transliminality given above.

CHAPTER 3:
ENCOUNTER EXPERIENCES IN THE CONTEXT
OF MENTAL BOUNDARIES AND BILATERALITY:
A CONTRIBUTION TO THEORY-BUILDING²

3.1 PROLOGUE

The history of science is replete with examples of multiple discovery (Koestler, 1970), whereby in the same time-frame different investigators developed the same idea. Familiar examples are the independent discovery of differential calculus by Newton and Leibnitz, and the independent development of the idea of natural selection by Wallace and Darwin (Koestler, 1970; Reichenbach, 1959). Likewise, there are cases where at the same time (give or take) different investigators seem to be working in parallel areas that should perhaps have common ground.

As Thalbourne was refining his concept of transliminality, Ernest Hartmann (1991) independently constructed a 138-item *Boundary Questionnaire* (BQ). Hartmann Rosen, and Rand (1998) described this questionnaire as "...an instrument developed to measure personality differences in boundary structure; the concept of thick and thin boundaries involves the degree of separateness (thick boundaries) versus connection (thin

² Parts of this chapter were published as (Appendix L):

Houran, J., Ashe, D. D., & Thalbourne, M. A. (in press). Encounter experiences in the context of mental boundaries and bilaterality. *Journal of the Society for Psychical Research*.

Houran, J., & Thalbourne, M. A. (2002). Apparitions in the context of mental boundaries and bilaterality [published abstract, p. 427]. *Proceedings of the 4th Bial Foundation Symposium: Behind and Beyond the Brain* (April 4-6). Porto, Portugal.

Houran, J., Thalbourne, M. A., & Hartmann, E. (2003). Comparison of two alternative measures of the boundary construct. *Psychological Reports*, 96, 311-323.

boundaries) between a broad range of mental functions, processes, and entities...” (p. 32). This description can subsume the current definition of transliminality (see Chapter 2, Section 2.3), but the BQ is purportedly a broader instrument that was explicitly written to tap the twelve hypothesized domains or categories of boundaries (Hartmann, 1989, 1991; Hartmann, Harrison, Bevis, Hurwitz, Holevas, & Dawani, 1987) discussed in Chapter 1 (see Table 1.1).

Accordingly, this chapter reports and synthesizes the results of two studies. One study by Houran, Thalbourne, and Hartmann (2003) investigated how the construct of transliminality was related to the other hypothesized domains of the boundary construct defined by the BQ, especially the idea of “body boundaries.” This perspective is salient given Chapter 2’s theme that transliminality has fundamental roots in physiology—such as bilaterality (Houran & Thalbourne, 2001b). A second study by Houran, Ashe, and Thalbourne (in press) used the same dataset as Houran et al. (2003), but this time scores on the RTS and BQ were correlated with reports of hallucinatory-like experiences that have been hypothesized to derive from cognitive processes touched on in Chapter 2.

3.2 BACKGROUND AND HYPOTHESES

3.2.1 LEVELS OF THE BOUNDARY CONSTRUCT

The items of the RTS focus primarily on experiences. This contrasts with the BQ, where respondents are also asked to indicate their degree of endorsement of a number of attitudinal and philosophical statements. Following from Chapter 1, it can be argued that the RTS and select categories from the BQ (i.e., Sleep/Wake Dream, Unusual Experiences, Thoughts/Feelings/Moods, and Sensitivity) measure syncretic cognition while other domains of the boundary construct (e.g., Opinions About Organizations/

Relationships) tap more into the notion of symbolic cognition (Glicksohn, 1998). That is, certain domains of the BQ may reflect behavioral or other expressions of an integrative mode of processing syncretic cognitions. Based on this idea of different levels of the boundary construct and that these levels represent distinctly different modes of cognition, it was predicted that scores on the RTS would show differential correlations across the categories of the BQ. The inherent association between syncretic and symbolic cognition implies positive correlations between scores on the RTS and all categories of the BQ, but the RTS was expected to show stronger correlations with the four BQ categories above that are interpreted as expressions of syncretic cognition.

3.2.2 HANDEDNESS AND THE BOUNDARY CONSTRUCT

Recall from Chapter 1 that in listing the types of boundaries that should be considered, Hartmann (1991) included body boundaries (Boundaries Around Oneself). In preliminary support of this idea, Hicks, Bautista, and Hicks (1999a) studied 116 university students and found a significant tendency toward mixed-handedness (though still in the range of right-handedness) on the Briggs-Nebes (1975) Handedness Scale for persons categorized as having Thin boundaries. It is important to conceptually replicate this preliminary finding, as well as determine if similar patterns exist for the RTS. As is discussed below, handedness is a generally accepted index of the degree of bilaterality of linguistic function (Bryden, 1982). Further, there are data that suggest that the corpus callosum (a bundle of nerves that connects the two hemispheres so that neural messages may flow freely between them) is larger in those with greater bilaterality (O’Kusky et al., 1988; Witelson, 1985). Accordingly, a relationship between handedness and transliminality would help refine the Cognitive Regulation Hypothesis in Chapter 2.

3.2.3 TRANSLIMINALITY AND PERSINGER'S MODEL OF APPARITIONAL PHENOMENA

The combined effects of transliminality/boundary construct and handedness (degree of bilaterality) may help explain anomalous experiences known as apparitions. *Apparition*, from the Latin *apparere* (to appear), is an anomalous perception or appearance that does not refer to any obvious, natural objective cause, and may be perceived in any sensory mode. Many cultural and religious traditions interpret these perceptions as “ghosts” or “spirits” (Puhle, 2001), whereas the social and medical sciences speak of “hallucinations” and “ego-alien intrusions.”

According to Persinger (1974), most accounts of apparitions are post-mortem or bereavement experiences (Persinger, 1988), and they are usually reported within about three days of the death of a person known to the experient. However, these are not the only types of apparitional encounters. Many authors have noted that esoteric, religious, and folklore-type entities correlate and share many important features with reports of apparitions, haunts, and poltergeists (e.g., Evans, 1986, 1987, 2001; Hansen, 1988; Houran, 2000; Houran & Lange, 2001a; Puhle, 2001). Furthermore, experiences can involve a simple cognition or emotional feeling—such as in the case of “sensed presences.” Apparitions and sensed presences are therefore merely part of a broad spectrum of “encounter experiences.”

Notwithstanding that many medical and physical conditions are conducive to encounter experiences (Brasić, 1998), conceptualizing them as pathological is not consistent with their features (Irwin, 1999, pp. 243-259; Houran & Lange, 2001b) or with their prevalence in general populations worldwide (Haraldsson, 1985; Ross & Joshi, 1992). A different view is that encounter experiences are phenomena within the normal

range of transliminal or dissociative experience (Houran, 2000; Houran & Thalbourne, 2001a; Kumar & Pekala, 2001). For instance, one key hypothesis is that the sense of an invisible presence is the awareness of the right hemispheric homologue of the sense of self (Persinger, 1993; Persinger & Makarec, 1992). The sense of self would be generated by traditional left hemispheric, primarily linguistic, processes. According to the hypothesis of vectorial hemispheric function (Persinger 1993), stimuli that promote the intrusion of this right hemispheric equivalent into left hemispheric awareness increase the probability of the experience.

In support, Cook and Persinger (2001) noted that "...stimulation of the right temporoparietal region with frequency-modulated, weak (1 microT) magnetic field results in a reliable sensed presence in about 50% of randomly selected volunteers (about 12% respond in a sham field when sitting in the dark, quiet room)" (p. 447). Many laboratory validations of Persinger's hypothesis have been published (e.g., Cook & Persinger, 1997; Persinger et al., 2000; for a review see: Persinger & Koren, 2001b), but it is unclear how well these results generalize to *spontaneous* experiences of encounter experiences—which are clearly correlated with experiences of sensed presences (Houran & Thalbourne, 2001a; Persinger et al., 2000). For example, Persinger's hypothesis predicts that encounter experiences would typically be perceived to the left of the experient's body (cf. Tiller & Persinger, 2002). However, this does not seem to be the case in general (Brugger, 1994; Brugger, Regard, & Landis, 1996) or in the author's recent case study of a woman who reported repeated encounters with "sentient beings" (Houran & Thalbourne, 2001b).

This discrepancy might be explained in terms of an interconnectedness model of

transliminality that incorporates increased bilaterality. It follows from this idea that transliminal experiences—including a homologue of linguistic processes taking place primarily in the right hemisphere—would be more frequent in females, sinistrals (left-handers), and mixed-handers. Consequently, Persinger’s prediction of a relationship between encounter experiences and body-side may only apply to these groups given evidence that the corpus callosum is larger in sinistrals and mixed-handers (O’Kusky et al., 1988; Witelson, 1985), as well as Levy’s (1972, 1976) theory that females and sinistrals have developed a “verbal blueprint” which allows their linguistic skills to be represented to a greater degree bilaterally. This idea has not been tested, but Persinger and Koren (2001a) did publish a case study of a left-handed woman who reported intense, nightly “sensed presences” that were perceived along the left side of her body.

Persinger’s model for encounter experiences permeates the mainstream scientific literature, but his ideas are not without critics (see e.g., Cornell, 2001; Gauld, 2002; Rutowski, 1984; Wilkinson & Gauld, 1993). Furthermore, strongly psychological models argue that a perspective wider than interhemispheric functioning is needed in order to develop a comprehensive explanation for most encounter experiences. Considerations from this viewpoint are reviewed next.

3.2.4 TRANSLIMINALITY AND A PSYCHOLOGICAL APPROACH TO APPARITIONS

Early writers in abnormal psychology readily explained sensed presences and apparitions as manifestations of the psyche (e.g., De Boismont, 1853). This idea later became enriched with the principles of self and consciousness established by Jung and Jungian depth psychology (e.g., Jung, 1968; Jung & Franz, 1964). Jung explicitly argued that “spirits and gods” involved perceptions of archetypes. Even some proponents of

parapsychological models agree with this speculation. For instance, Evans (1986) noted that many reported entity experiences present attributes that are amenable to classification as archetypes of the Jungian type. Examples include the frequency with which subjects of extraterrestrial “abduction” experiences report themselves as drawn up into the alleged spacecraft through a glowing kind of tube, or the repeated observations of “Men in Black” and “women in white.” (p. 13). The concept of archetypes has been linked to the biological functions of the brain by the biogenetic structuralist perspectives (e.g., Laughlin, McManus, & d’Aquili, 1992), which considers these forms of perception and knowing to involve neurognostic structures. In this sense, encounter experiences are viewed as the byproduct of a confluence of variables and are a consequence of the operations of the brain in making sense of the world through the inevitable models of human nature that filter our perceptions (see e.g., d’Aquili & Newberg, 1999; Houran, 2000). Simply stated, encounter experiences may be natural manifestations of the mechanisms producing human consciousness.

The definition of transliminality is consistent with the view that consciousness involves the interacting components of a system (Winkelman, 1994, 2000). Systems perspectives described by Popper and Eccles (1977) characterize consciousness as a function that couples the individual organism, the individual’s social group, and the environment. Consciousness links physical things, subjective experiences and culture, objective knowledge, and products of the mind. For instance, Baars’ (1997) global workspace theory illustrates that in addition to awareness of the external world and internal imagery, consciousness incorporates a sense of presence, bodily sensations, personal memories, intentions, expectations, and beliefs.

This perspective complements Ellis (1986, 1995) who proposed that conscious processes involve an emotional intensity and processing in which an imaginative act based on memory and desire precedes the perceptual experience. In other words, the *efferent* (outgoing, produced by the brain) imaginative production of something precedes the *afferent* perceptual consciousness (incoming information perceived as external to the organism). Thus, there is a functional mixing or synthesis of internal and external stimuli. This “breakdown of modularity” (as termed by Baron-Cohen, Harrison, Goldstein, & Wyke, 1993) parallels the dedifferentiation of sensory experience (syncretic experience) as discussed by Werner (1948). High transliminals would appear to have greater access to such a syncretic mode of processing; that is, a greater degree of fusion among affect, imagery, cognition, and perception.

The question arises what psychological factors predispose individuals, and especially high transliminals, to experience syncretic cognitions in the form of entity experiences. Psychologists and parapsychologists agree that many encounter experiences are idioms of psychological distress whose contents partly reflect contextual variables relevant to the experient (for a review, see: Houran & Lange, 2001b). As such, encounter experiences may be adaptive perceptual metaphors that derive from the processing of a mosaic of internal and external information that floods an individual’s consciousness. These metaphoric vehicles might establish cross-references, such as a cross-modal linking of symbol and referent that fuses perceptual-spatial dynamics in meaningful patterns.

Based on this psychological view, it might be expected that reports of encounter experiences would be positively correlated with scores on the RTS and that encounter

experiences would be associated with a need for control over an individual's interpersonal and physical environments. Houran and Thalbourne (2001a) tested these ideas in a sample of 125 university students taken from Thalbourne (2001). Respondents completed the RTS, the Anomalous Experience Inventory (AEI: Kumar, Pekala, & Gallagher, 1994), which has three measures related to encounter experiences [i.e., Encounter subscale, Poltergeist subscale, and the individual item: "I have seen a ghost or apparition"], and finally the Rasch version of Tobacyk's (1988) Revised Paranormal Scale. This latter measure is described in more detail below, but it is noted here that this Rasch version purportedly measures two types of paranormal beliefs: New Age Philosophy (argued to measure perceived individual control over one's destiny via internally-oriented paranormal forces) and Traditional Paranormal Beliefs (argued to measure beliefs in determinism and externally-oriented supernatural forces).

The results generally confirmed Houran and Thalbourne's (2001a) predictions. Table 3.1 shows that each AEI measure of encounter experience was strongly associated with scores on the RTS.

Table 3.1: Pearson Correlations Between the RTS and Measures of Encounter Experiences (Houran & Thalbourne, 2001)

	Revised Transliminality Scale	Probability (<i>p</i>)
AEI's "I have seen a ghost or apparition"	0.61 [†]	≤ .001
AEI's Poltergeist subscale	0.51 [†]	≤ .001
AEI's Encounter Subscale	0.61 [†]	≤ .001

Note: [†]Statistically significant after adjusting alpha levels for multiple observations via the Bonferroni method.

Furthermore, statistical tests of difference (Hinkle et al., 1988, p. 279) revealed that *repeated* encounter experiences were more strongly correlated with paranormal beliefs reflecting person-oriented control issues than with paranormal beliefs reflecting externally-oriented paranormal influences (see Table 3.2). Thus, these results are broadly consistent with the psychological interpretation of encounter experiences discussed above.

Table 3.2: Tests of Difference on the Pearson Correlations Between the Rasch-Revised Paranormal Scale and AEI's Measures of Encounter Experiences (Houran, 2001)

	New Age Philosophy	Traditional Paranormal Beliefs	<i>t</i> (122)
"I have seen a ghost or apparition"	0.35***	0.22*	1.45
AEI Poltergeist subscale	0.54***	0.29***	3.07*
AEI Encounter subscale	0.62***	0.36***	2.91*

Notes: * $p \leq .05$, *** $p \leq .001$

3.2.5 HYPOTHESES

Based on the reasoning and data above, this study tested the following six

hypotheses:

1. Scores on the RTS positively and significantly correlate with total scores on the BQ, as well as show positive and significant associations with each of the twelve categories of boundaries from the BQ.
2. High scores on the RTS and BQ correspond to tendencies for increased bilaterality as measured by the Briggs-Nebes Handedness Scale (and alternatively, those with tendencies toward mixed-handedness score higher on the RTS and BQ).
3. Total scores on the RTS and BQ positively and significantly correlate with scores on a measure of encounter experiences.
4. Sinistrals and mixed-handed women, relative to a group of right-handed men, score significantly higher on the measure of encounter experiences.
5. Encounter experiences exhibit a significant trend to occur on the left-side of the body.
6. Total scores on the RTS, BQ, and Encounter Experiences correlate significantly higher with New Age Philosophy than Traditional Paranormal Beliefs.

3.3 HARTMANN'S BOUNDARY QUESTIONNAIRE

3.3.1 DESCRIPTION OF THE BOUNDARY QUESTIONNAIRE

Appendix B gives the full Boundary Questionnaire, but representative items from the twelve subscales or categories are listed in Table 3.3. The response format for each question (e.g., "I am very sensitive to other people's feelings") is anchored by '0'

(not at all) and '4' (very much so). Approximately two thirds of the items are phrased so that full endorsement (very much so) indicates a 'thin' boundary, and the remaining items are phrased so that 'very much so' indicates a thick boundary (e.g., "For me, things are black and white; there are no shades of grey"). To score the test, the answer-values of the thick 'items' are reversed, and all of the scaled answers are added to produce what Hartmann (1991) termed a *Sumbound* or total score.

Table 3.3: Representative Items from Hartmann's (1991) Boundary Questionnaire

Category 1: Sleep/Dream/Waking

1. When I awake in the morning, I am not sure whether I am really awake for a few minutes.
37. I spend a lot of time daydreaming, fantasizing, or in reverie.

Category 2: Unusual Experiences

61. At times I have felt as if I were coming apart.
100. I have had déjà vu experiences.

Category 3: Thoughts/Feelings/Moods

15. Sometimes I don't know whether I am thinking or feeling.
74. I can easily imagine myself to be an animal or what it might be like to be an animal.

Category 4: Childhood/Adolescence/Adult

4. I am very close to my childhood feelings.
40. I have definite plans for my future. I can lay out pretty well what I expect year by year for the next few years.

Category 5: Interpersonal

53. When I get involved with someone, we sometimes get too close.
103. I am a very open person.

Category 6: Sensitivity

6. I am very sensitive to other people's feelings.
42. I am unusually sensitive to loud noises and bright lights.

Category 7: Neat/Exact/Precise

19. I keep my desk and work table neat and well organized.
43. I am good at keeping accounts and keeping track of my money.

Category 8: Edges/Lines/Clothing

32. I like heavy, solid clothing.
44. I like stories that have a definite beginning, middle, and end.

Category 9: Opinions re: Children, etc.

33. Children and adults have a lot in common. They should give themselves a chance to be together without any strict roles.
56. I think a good teacher must remain in part a child.

Category 10: Organizations

10. In an organization, everyone should have a definite place and a specific role.
58. A good relationship is one in which everything is clearly defined and spelled out.

Category 11: Peoples/Nations/Groups

11. People of different nations are basically very much alike.
105. There are no sharp dividing lines between normal people, people with problems, and people who are considered psychotic or crazy.

Category 12: Beauty/Truth

36. Either you are telling the truth or you are lying; that's all there is to it.
76. When I am in a new situation, I try to find out precisely what is going on and what the rules are as soon as possible.

In a sample of 866 people, composed chiefly of college students and patients with sleep disorders, all the correlations of the Sumbound scores with BQ items were positive. The alpha reliability for the test was 0.93. Similarly all 138 items load positively on the first principal component, and the Armor theta reliability was 0.93. Agreement-set (the tendency to agree) was controlled by reversing the scoring direction of one third of the questions, so the uniformly positive loadings attest to the idea that there is a single, overarching principle underlying individuals' responses to all 138 questions. The Boundary Questionnaire also was found to have good test-retest reliability (0.77) in two samples (Kunzendorf, Hartmann, Cohen, & Cutler, 1997; Funkhouser, Wuermle, Cornu, & Bahro, 2001).

An exploratory factor-analysis was done on the correlations among the 138 questions using principal-components factor-extraction (Harrison, Hartmann, & Bevis, submitted; Hartmann 1991). Using Cattell's "scree" test, and subsequent interpretability, thirteen factors (accounting for 37.3% of the variance) were preserved for rotation using the Normal Varimax criterion. The 13th eigenvalue was 1.65. Items loading .25 or above on a given factor were regarded as belonging to a factor. The first twelve rotated factors were easily interpreted; the 13th was deemed uninterpretable, its eight items accounting for less than 1% of the total variance.

To determine the stability of the factor solution, Hartmann and his colleagues in an unpublished study refactor-analyzed the Boundary Questionnaire for the 364 college students in the original sample of 866, and they found an almost-identical factor-structure. Factor-loadings for this sub-sample were within .02 of those found for the total group. Even more recently, a new factor analysis for the data from 500 students

replicated the original results with an almost identical factor structure (Zborowski, Hartmann, & Newsom, submitted).

Boundary scores can be obtained for each of the individual categories and factors. However, the most commonly used measure has been the overall boundary score Sumbound, in which high scores signify ‘Thinness.’ In the first 1000 participants studied, the range has been 120-454, with a mean value of 271 ± 50 . For a recent review of the research with the Boundary Questionnaire, interested readers are referred to Hartmann, Harrison, and Zborowski (2001).

3.3.2 CORRELATES OF THE BQ

Because of the similarity between transliminality and the boundary concept, more detail on the background of the BQ is presented since its correlates may turn out to be correlates of the RTS as well.

Hartmann (1991) noted that women consistently score significantly “thinner” (one half of a standard deviation) than men, and older respondents score slightly “thicker” than younger respondents. However, no long-term studies have been done as yet to determine how boundaries develop and change over the years within a single person, and it is not clear how the factor structure of the BQ might change once the factor analytic findings are validated with the top-down purification methods outlined in Chapter 1. These caveats aside, a wealth of research has found consistent correlations between the BQ and various psychological and physiological variables. This literature, which bolsters the construct validity of the Sumbound measure, is reviewed next.

Significantly thinner boundaries compared to control groups have been found in art students (Beal, 1989; Hartmann, 1991), music students, and mixed groups of creative

persons (Beal, 1989), frequent dream recallers (Hartmann, 1991; Hartmann, Elkin, & Garg 1991), adults with nightmares (Galvin, 1993; Hartmann, 1991; Levin, Galin, & Zywiak 1991), adolescents with nightmares (Cowen & Levin, 1995), “lucid dreamers” (Galvin, 1993), male as well as female fashion models (Ryan, 2000), persons with unusual mystical experiences (Krippner, Wickramasekera, Wickramasekera, & Winstead, 1998), and persons with a diagnosis of Borderline Personality Disorder, Schizoid Personality Disorder, or Schizotypal Personality Disorder (Hartmann, 1991).

Interestingly, although art students have much thinner boundaries than average, research by Beal (1989) indicates that established artists have boundary scores in the normal range.

Groups that score significantly “thicker” than average on the BQ include naval officers, salespersons, lawyers, patients with a diagnosis of Obsessive-compulsive Personality Disorder, persons suffering from “alexithymia” (Hartmann, 1991), and patients (from two different sleep disorders centers) with a diagnosis of Sleep Apnea (Hartmann, 1992).

In addition to these behavioral variables, the BQ is related to a number of attitudinal and personality factors. The BQ shows some relationships with MMPI scales (Hartmann, 1991). In 299 research participants, relationships found were very consistent with what Hartmann had predicted on the basis of the definition of boundaries.

Sumbound scores correlated positively ($r = 0.32$) with the F (“atypical response”) Scale, and this appeared to be a valid relationship. Individuals scoring thinner on the Boundary Questionnaire did frequently report and discuss the unusual experiences described on the F scale, for instance, “I have a nightmare every few days.” Sumbound scores showed a

negative relationship ($r = -0.37$) with the K scale, which measures “defensiveness” (an aspect of thick boundaries). Sumbound scores also correlated positively ($r = 0.41$) with the Pa Scale (paranoia), which is not surprising, since it is accepted that the Pa Scale in normal groups measures a kind of sensitivity rather than blatant paranoia. Finally, Sumbound scores correlated positively ($r = 0.40$) with the Mf Scale in males — consistent with the view that thin boundaries involves the ability for males to be interpersonally sensitive, and to see feminine elements in themselves.

Significant positive correlations have been found between Sumbound scores and several measures of hypnotizability and suggestibility (Barrett, 1989; Rader, Kunzendorf, & Carrabino, 1996), as well as measures of creativity (Levin et al., 1991). Barrett (1989) reported a moderately strong correlation ($r = 0.67$) between Sumbound and Tellegen’s Absorption Scale. On the Rorschach test, subjects with thinner boundaries were found to have significantly higher boundary disturbance scores, and also significantly lower form quality scores (Levin, Gilmartin, & Lamontano, 1998-1999). Recent studies have also established a relationship between thin boundaries and a number of other measures relating to personality, including certain forms of anxiety. Hartmann and Zborowski (2001) reported an especially strong relationship between Sumbound and Insecure Attachment, measured on the Bell Object Relations and Reality Testing Inventory (Bell, Billington & Becker, 1986). Thin boundaries are also positively related to measures of connection-seeking, at least in women (Bevis, 1986). Similarly, there is a moderate correlation ($r = 0.51$) between thin boundaries and rated openness in an interview study (Zborowski et al., submitted). These results are consistent with McRae’s (1994) strong correlation ($r = 0.73$) between thinness of boundaries on the BQ (Sumbound) and

Openness to Experience.

Independent studies have investigated the Boundary Questionnaire in relation to the Meyers-Briggs Inventory. The most striking finding in these reports was a positive correlation (r 's between 0.40 to 0.50) between Sumbound and "Intuition," and a somewhat smaller correlation with "Feeling" (Barbuto & Plummer, 1998, 2000; Erhman & Oxford, 1995). This research complements other studies that report correlations between thin boundaries and a belief in or tendency to experience paranormal phenomena. For example, groups of people who characterize themselves as shamans or psychics score thin on the BQ (Krippner et al., 1998).

By and large, the predominance of literature on the BQ is in relation to dreaming. Not surprisingly, studies consistently indicate positive relationship between thinness of boundaries and amount of dream recall in various normal and clinical samples (Hartmann, 1991; Hartmann Elkin, & Garg, 1991; Hartmann et al., 1998; Kunzendorf, Hartmann, Cohen, & Cutler, 1997; Levin et al., 1998-1999; Schredl, Kleinferchner, & Gell, 1996; Schredl, Schafer, Hoffman, & Jacob, 1999), including adolescent populations (Cowen & Levin, 1995). Methodological limitations do not account for these findings. For example, dream recall was measured by a single question in most of these studies, but research based on the analysis of dream diaries obtained similar results (Schredl et al., 1996). Moreover, the relationship between dream recall and the BQ is robust even when all items on the BQ relating to dreams, daydreams, sleep, and waking are removed (Hartmann, 1991).

Dream recall shows a significant positive correlation not only with the overall BQ score SumBound, but with each of the twelve categories of boundaries. Also, a group of

frequent dream recallers (seven dreams or more per week) scores significantly higher on SumBound and on each of the twelve categories of the BQ than a group of persons who say they do not recall dreams (Hartmann, 1991; Hartmann et al., 1991). Further, the BQ is related to aspects of the content of dreams: dreams of subjects with thin boundaries are scored as more vivid, more dreamlike, more emotional, and having more interactions between characters (Hartmann et al., 1991, Hartmann, Rosen, & Grace, 1998). Schredl et al. (1996) reported similar findings on dream content. In another instance, Sumbound was positively correlated with the emotional intensity, bizarreness, and “morbid content” of dreams (Zborowski, McNamara, Hartmann, Murphy & Mattle, 1998).

There is also a relationship between boundaries and the Contextualizing Image (CI) score, which is a measure of the power of imagery in the dream. For instance, a person who has recently experienced trauma of any kind often has dreams such as “I was overwhelmed by a tidal wave.” The powerful tidal wave imagery is thought to contextualize or picture the underlying emotion of terror or vulnerability (Hartmann, 1996, 1998/2000). Epstein (1988) similarly proposes that the contents of dreams are obligatory associations with waking experience. CI scores have good inter-rater reliability, and have been found to be significantly higher in dreams than in daydreams (Hartmann et al., 1998), and higher in the dreams of people who have experienced trauma or abuse than those who have not (Hartmann, Zborowki, & Kunzendorf, 2001). Concerning boundaries, it was found that a group of students who scored thin on the BQ had significantly higher CI scores in their written “most recent dreams” than students who scored thick (Hartmann, Zborowski, McNamara, Rosen & Grace, 1999).

Apart from the relationship with dreaming, there are also some intriguing findings

suggesting associations between boundary functioning and other aspects of sleep and sleep disorders. Overall, there is a small but significant correlation between thinness of boundaries and length of sleep (Hartmann, 1991). Indeed, persons classically described as “short sleepers” — people who get along on 6 hours or less of sleep per night, do not catch up, and do not have any complaints of insomnia — appear to have many characteristics of people with thick boundaries, though the BQ was not available at the time of the sleep studies (Hartmann, Baekland, & Zwilling, 1972). Among people with sleep disorders, it has been observed that those who have frequent nightmares have unusually thin boundaries (Hartmann, 1991). This relationship has been studied and confirmed (Zborowski et al., 1998). However, persons who have a very different condition, night terrors—early night frightening awakenings without dreams—as well as those with sleepwalking (sometimes associated with night terrors) tend to have thick boundaries. Patients suffering from bruxism (tooth-grinding) tend to have thicker boundaries than average, as do patients with sleep apnea, already mentioned (Hartmann, 1991, 1992).

Preliminary studies also relate BQ scores to specific physiological measures. For example, Watson (1985) investigated phasic integrating potentials (PIPs), which are sharp spikes recorded in humans and animals, occurring chiefly during REM sleep—and in fact considered an index of the basic neurophysiology of REM sleep—but occasionally at other times as well. Watson found a moderate, positive correlation ($r = 0.52$) between the number of PIPs outside of REM sleep and thinness of boundaries. In other words, people with thinner boundaries in a psychological sense, also had thinner boundaries between REM and NREM sleep: the brain activity characteristic of REM sleep often

“escaped” into NREM sleep. Another small study investigated changes in skin temperature induced by imagining warm or cold scenes (sitting by a fire or holding an ice cube). Individuals who scored thin on the BQ showed a greater actual change in skin temperature in response to these conditions (Hartmann, 1991). Similarly, in a group of 78 students, those who scored thin on the BQ showed more and longer-lasting autonomic arousal (measured by skin conductance) to an arousal-producing stimulus than did other students (Levin & Fireman, 1993).

3.4 BRIGGS-NEBES HANDEDNESS SCALE

The Briggs-Nebes (1975) Handedness Scale is a 12-item pencil-and-paper measure (see Appendix C). In responding to the Briggs-Nebes Scale, for each of the twelve tasks (items) individuals are asked to indicate the consistency of their hand preference on a 5-point scale, using as anchors Always left (scored -2), Usually left (scored -1), No preference (scored 0), Usually right (scored +1), and Always right (scored +2). The responses to these items are summed algebraically to yield an over-all hand-preference score. Briggs and Nebes (1975) recommended that persons who score from -9 through -24 be classified as left-handed, persons who score from -8 through +8 be classified as mixed-handed, and persons who score from +9 through +24 be classified as right-handed.

3.5 REVISED PARANORMAL BELIEF SCALE (RPBS)

Tobacyk's (1988) RPBS consists of 26 statements that are to be rated on seven-point Likert-type scales (see Appendix D). It is arguably the most widely used measure of paranormal belief (Goulding & Parker, 2001), but it has been severely criticized on

conceptual and psychometric grounds (e.g., Hartman, 1999; Lawrence, 1995; Lawrence & De Cicco, 1997). However, Lange, Irwin et al. (2000) showed that the long-standing controversy surrounding the RPBS' factor structure was partly due to differential item functioning, i.e., sex and age bias. Once these psychometric issues were remedied via the Rasch (1960/1980) top-down purification method outlined in Chapter 1, Lange, Irwin et al. (2000) found that the RPBS comprised only two, moderately correlated belief subscales that appeared to reflect different types of control issues.

One subscale was interpreted as *New Age Philosophy* because these beliefs appeared to instill a greater sense of control over interpersonal and external events and therefore are beneficial to individuals (e.g., belief in psi, reincarnation, and astrology). The other subscale was interpreted as *Traditional Paranormal Beliefs*, since these beliefs seemed to be more culturally transmitted and beneficial in maintaining societal control via a belief in magic, determinism, and a mechanistic view of the world (e.g., the devil, Heaven and Hell, witchcraft; for a discussion of this issue see: Ember & Ember, 1988, p. 428).

This Rasch version of the RPBS has a mean of 25 ($SD = 5$) for both subscales. It is arguably the most psychometrically sound measure of paranormal belief, and several studies (Houran, Thalbourne, & Ashe, 2000; Houran & Lange, 2001c; Houran, Irwin, & Lange, 2001) provide initial support for the construct validity of the two Rasch subscales. It should be noted that Lange and Thalbourne (2002) recently found that the Australian Sheep-Goat Scale (Thalbourne & Delin, 1993) is Rasch scalable as well. Moreover, belief items tended to precede items referring to paranormal experiences in the ASGS' Rasch item hierarchy, while the items' fit patterns provided additional support for the existence

of Traditional Paranormal Beliefs and New Age Philosophy related factors.

3.6 MEASURE OF ENCOUNTER EXPERIENCES

This measure consists of eleven “true/false” items from the AEI (Kumar et al., 1994) that deal with encounter experiences. This measure is not one of the five original subscales of the AEI [i.e., Paranormal Belief, Paranormal Experience, Paranormal Ability, Fear of the Paranormal, Drug Use], but rather was constructed by Pekala, Kumar, and Marcano (1995, p. 323) for use in a study on shamanistic phenomena. The eleven items are:

1. I am able to communicate with supernatural forces
2. I have experienced other planes of existence beyond the physical
3. I have had an out of body experience
4. I have tried channeling or have been a medium
5. I have communicated with the dead
6. I have seen a ghost or apparition
7. At times, I have felt possessed by an outside force
8. I can leave my body and return at will
9. I have experienced or met an extraterrestrial
10. I am able to communicate with the dead
11. I have seen elves, fairies, and other types of little people

Note that this index concerns the number of different *varieties* of encounter experience, as opposed to the *frequency* of encounter experiences. Cronbach’s alpha measure of internal consistency for this measure in the present sample was 0.75. This compares favorably to Kline’s (1986) criterion of ≥ 0.70 for satisfactory reliability.

3.7 METHOD

3.7.1 PARTICIPANTS

Data derived from a convenience sample of 268 people ($M_{\text{age}} = 24.9$ yrs; $SD = 10.4$; range = 17-72 yrs; 72% women). The majority of participants were from the general

community, who obtained questionnaire packets distributed through local social service agencies. These respondents were employees, not clients of these agencies. However, approximately one-third of the participants were students from a community college who received extra credit for their participation. Diane D. Ashe, Ph.D. (Valencia Community College, Kissimmee, FL) facilitated the collection of the latter part of the dataset in order to substantially increase the sample size. Dr. Ashe, who has collaborated with the author on other research (e.g., Maltby, Houran, Lange, Ashe, & McCutcheon, 2002; Maltby, McCutcheon, Ashe, & Houran, 2001), was asked to participate since she had convenient access to a large number of potential respondents.

3.7.2 MEASURES

Four measures were used in the study:

- (i) Lange, Thalbourne, et al.'s (2000) RTS (Form B), described in detail in Chapter 1. See Appendix A.
- (ii) Hartmann's (1991) 138-item Boundary Questionnaire, which produces a total (Sumbound) score and individual scores across twelve separate domains of the boundary construct. High scores on Sumbound and the subscales reflect thinner boundaries. See Appendix B.
- (iii) Lange, Irwin et al.'s (2000) Rasch version of the RPBS (Tobacyk, 1988). This consists of 26 statements rated on a 7-point Likert scale. Two subscales are computed: New Age Philosophy (11 items) and Traditional Paranormal Beliefs (5 items). High scores on each subscale reflect higher levels of belief. See Appendix D.

- (iv) The Briggs-Nebes (1975) Handedness Scale, which asks participants to indicate the consistency of their hand preference on twelve different tasks using a 5-point scale. The responses are summed algebraically to yield an over-all hand-preference score. See Appendix C.
- (v) Pekala et al.'s (1995) measure of Encounter Experiences, which respondents answer "true/false" to eleven items derived from the AEI that reflect contact with supernatural entities. High scores indicate endorsement of more types of encounter experiences. In regard to these items, participants were further asked: "If you answered true to one or more of the experiences mentioned above (especially item #s 3, 6, 7, 9, & 11), please indicate if:
- i. The experience(s) tended to occur to the left of your body
 - ii. The experience(s) tended to occur to the right of your body
 - iii. The experience(s) did not show a preference for either side of your body or the experience(s) involved both sides of your body

3.7.3 PROCEDURE

Potential participants were approached in two ways. First, packets containing the questionnaires in counterbalanced order were distributed to employees at local social service agencies in Springfield, IL. Participants completed the questionnaires individually at their leisure and then returned the completed questionnaires to a designated spot at the agency for subsequent collection by the author. Second, additional packets of

questionnaires were administered and collected by Dr. Diane D. Ashe at Valencia Community College on behalf of the author. In this case, college students completed the questionnaires during class and received extra credit for their participation. Participation for all respondents was voluntary.

3.8 RESULTS

3.8.1 PRELIMINARIES

Table 3.4 gives the descriptive statistics (mean and standard deviation) for the measures. It is noteworthy that the participants scored on average well within the range for right-handedness and reported a low average number of encounter experiences.

Table 3.4: Descriptive Statistics on Research Measures for the Complete Sample ($N = 268$)

	<i>M</i>	<i>SD</i>
REVISED TRANSLIMINALITY SCALE	23.80	4.30
BOUNDARY QUESTIONNAIRE: SUMBOUND	258.15	48.10
Boundary Questionnaire categories		
Category 1: Sleep/Wake/Dream	17.42	10.09
Category 2: Unusual Experiences	23.75	10.55
Category 3: Thoughts/Feelings/Moods	27.70	8.16
Category 4: Childhood/Adolescence/Adulthood	9.84	3.94
Category 5: Interpersonal	23.80	5.71
Category 6: Sensitivity	11.37	3.85
Category 7: Neat/Exact/Precise	19.93	7.05
Category 8: Edges/Lines/Clothing	35.78	8.11
Category 9: Opinions about Children/Others	19.90	4.54
Category 10: Opinions about Organizations/Relationships	21.07	5.34
Category 11: Opinions about Peoples/Nations/Groups	30.98	6.88
Category 12: Opinions about Beauty/Truth	16.39	3.77
NEW AGE PHILOSOPHY	24.94	12.87
TRADITIONAL PARANORMAL BELIEFS	17.42	6.37
ENCOUNTER EXPERIENCES	.77	1.18
BRIGGS-NEBES HANDEDNESS SCALE	13.95	12.64

Table 3.5 presents the frequency distribution of the eleven types of encounter experiences considered here. By far, most participants endorsed the statement about seeing a “ghost or apparition” followed by the statement concerning out-of-body experiences (OBEs). Encounters with folklore-type entities and extraterrestrials, as well as voluntary OBEs, were the least endorsed experiences.

Table 3.5: Frequency Distribution for the Encounter Experiences ($N = 268$)

	<i>N</i>
I am able to communicate with supernatural forces	8
I have experienced other planes of existence beyond the physical	13
I have had an out of body experience	32
I have tried channeling or have been a medium	6
I have communicated with the dead	8
I have seen a ghost or apparition	113
At times, I have felt possessed by an outside force	15
I can leave my body and return at will	2
I have experienced or met an extraterrestrial	3
I am able to communicate with the dead	4
I have seen elves, fairies, and other types of little people	2

3.8.2 MAIN FINDINGS

3.8.2.1 Hypothesis 1

As predicted, RTS scores showed a strong positive correlation with BQ Sumbound scores, as well as low to moderate, positive correlations with each of the twelve categories from the BQ (see Table 3.6). These findings are robust as indicated by

a Bonferroni correction for multiple tests³.

Table 3.6: Pearson Correlations Between Transliminality, Sumbound Score, and Twelve Categories of the Boundary Questionnaire ($N = 268$)

	RTS
BOUNDARY QUESTIONNAIRE (SUMBOUND)	.66
Boundary Questionnaire categories	
Category 1: Sleep/Wake/Dream	.52
Category 2: Unusual Experiences	.57
Category 3: Thoughts/Feelings/Moods	.63
Category 4: Childhood/Adolescence/Adulthood	.23
Category 5: Interpersonal	.23
Category 6: Sensitivity	.31
Category 7: Neat/Exact/Precise	.28
Category 8: Edges/Lines/Clothing	.41
Category 9: Opinions about Children/Others	.17
Category 10: Opinions about Organizations/Relationships	.38
Category 11: Opinions about Peoples/Nations/Groups	.32
Category 12: Opinions about Beauty/Truth	.32

Note: All correlations are significant at $p \leq .001$ and robust with a Bonferroni correction for multiple observations.

The idea that the RTS would show differential relations to the twelve BQ categories also received support. In particular, the strongest correlations with transliminality concerned the categories of Sleep/Dream/Wake, Unusual Experiences, and Thoughts/Feelings/ Moods. The BQ category of Sensitivity, however, showed only the eighth largest correlation with the RTS. This did not fit with expectations.

Given the various effect sizes with the twelve BQ categories, a standard multiple

³ There is some controversy regarding the use of this correction, on the grounds that it is unnecessarily conservative. For the sake of conservatism, however, the author has decided to use it.

regression analysis was performed to assess the predictability of scores on the RTS from the twelve categories of the BQ. In a standard multiple regression all independent variables enter into the regression equation simultaneously. This is the recommended method when there are insufficient theoretical grounds for controlling the order of entry of variables (Tabachnick & Fidell, 1996).

The multiple correlation R for the regression was significantly different from zero, $R = .71$, $R^2 = .49$, $F(12, 240) = 19.94$, $p \leq .001$; that is, scores on the RTS were significantly related to the set of independent variables. Altogether, scores on the twelve categories of the BQ predicted 49% (or 47% adjusted, adjusted $R^2 = .47$) of the variability in the scores on the RTS. Only five of the twelve categories contributed significantly to the prediction of scores on the RTS, (given here are the beta coefficients and the squared semipartial correlations): Category 2: Unusual Experiences (beta = .19, $sr^2 = .01$), Category 3: Thoughts, Feelings, & Moods (beta = .36, $sr^2 = .04$), Category 6: Sensitivity (beta = .15, $sr^2 = .01$), Category 7: Neat, Exact, Precise (beta = -.16, $sr^2 = .01$), and Category 8: Edges, Lines, & Clothing (beta = .24, $sr^2 = .02$).

By way of explanation, sr^2 refers to the squared semipartial correlation. This coefficient represents the contribution of a given independent variable to R^2 when the contribution of other independent variables is removed from both the dependent variable and the particular independent variable. Thus, a semipartial correlation coefficient is a useful indicator of the unique contribution of the independent variable to the total variance of the dependent variable (Tabachnick & Fidell, 1996). In addition, given that the twelve categories of the Boundary Questionnaire intercorrelate, it is important to inspect so-called tolerance statistics (Tabachnick & Fidell, 1996) and ensure that

intercorrelations among predictor variables do not compromise the analyses. All tolerance statistics in the regression were well above zero (ranging from 0.31 to 0.74), so multicollinearity of the predictor variables therefore was of no practical concern (Darlington, 1990).

The correlational and regression findings validated the hypothesis that the RTS and the BQ share considerable variance, and this supports the convergent validity of the measures. Interestingly, the regression analysis presented a different picture than the correlational analysis concerning the relation between transliminality and other domains of the boundary construct as defined by the BQ. Again, Unusual Experiences and Thoughts/Feelings/Moods were significant predictors, but this time Sensitivity was validated as a significant predictor relative to the other domains. Most surprising was the fact that aspects of the BQ originally considered here as perhaps indicative of symbolic cognition—Neat/Exact/Precise and Edges/Lines/Clothing—entered the regression equation as well. Note that the individual contribution (sr^2) of any one of the individual predictor variables is quite small, but the collective effect of the twelve categories in predicting RTS scores is considerable.

3.8.2.2 Hypothesis 2

Using the BQ, Hicks et al. (1999a) reported a significant trend for those with Thin boundaries to be more skewed toward the range of mixed-handedness (though still in range of right-handedness), as compared to those with Thick boundaries. An attempt was made to replicate this finding with the RTS and BQ data. Hicks et al. (1999a) used Hartmann's (1991) scoring scheme to identify Thin versus Thick boundary respondents

(two *SDs* above or below the mean). The sample contained too few of such respondents, so Hartmann (2002, personal communication) suggested the use of the lowest and highest quarters of scorers on the BQ. This strategy was also used with the RTS. Mean handedness scores were subsequently compared for these Low versus High Transliminality groups and these Thick versus Thin Boundary Questionnaire groups.

The Low Transliminality ($N = 65$, $M = 12.5$, $SD = 14.7$) and High Transliminality ($N = 79$, $M = 14.5$, $SD = 10.7$) groups did not differ significantly in handedness scores [$t(142) = -.96$, *ns*]. Likewise, the mean handedness score for the Thin Boundary group ($N = 66$, $M = 12.9$, $SD = 12.9$) did not significantly differ [$t(128) = -.13$, *ns*] from the mean handedness score for the Thick Boundary group ($N = 64$, $M = 13.2$, $SD = 13.9$). As with Hicks et al. (1999), both of our High and Low boundaries groups scored well within the range of right-handedness, but contrary to these other authors, no evidence was found that the RTS or the BQ are related to body boundaries—at least in terms of a tendency towards mixed-handedness. Data that do not have the restrictions in range seen here, however, may yield different results.

To cross-check the above findings, the data of all the left-handed and mixed-handed women were combined into one group ($N = 30$), while the data of the right-handed men ($N = 61$) were combined into another. The left and mixed-handed women ($M = 24.6$, $SD = 4.5$) did not score significantly [$F(1, 89) = .16$, *ns*] higher on the RTS than the right-handed men ($M = 24.3$, $SD = 3.2$). Likewise, the left and mixed-handed women ($M = 260.5$, $SD = 30.4$) did not receive significantly higher [$F(1, 87) = .08$, *ns*] Sumbound scores than the right-handed men ($M = 263.2$, $SD = 44.9$).

3.8.2.3 Hypothesis 3

Consistent with expectations, scores on the measure of Encounter Experiences correlated .38 ($p \leq .001$, two-tailed) with the RTS and .28 ($p \leq .001$, two-tailed) with BQ Sumbound scores. Partial correlations controlling for age and gender simultaneously did not practically affect the magnitude or significance of these coefficients.

Another standard multiple regression analysis was performed to assess the predictability of scores on the measure of Encounter Experiences from the twelve categories of the BQ. The multiple correlation R for the regression was significantly different from zero, $R = .38$, $R^2 = .15$, $F(12, 240) = 3.42$, $p \leq .001$; that is, scores on the measure of Encounter Experiences were significantly related to the set of independent variables. Altogether, scores on the twelve categories of the BQ predicted 15% (or 10% adjusted, adjusted $R^2 = .10$) of the variability in the scores on Encounter Experiences. Only three of the twelve categories contributed significantly to the prediction: Unusual Experiences ($p \leq .05$, $\beta = .25$, $sr^2 = .019$), Sensitivity ($p \leq .05$, $\beta = .17$, $sr^2 = .018$), and Opinions Regarding Children ($p \leq .01$, $\beta = -.20$, $sr^2 = .030$). The validation of Unusual Experiences and Sensitivity as individual predictor variables provides statistical corroboration for the idea that encounter experiences are transliminal phenomena that represent the collective processing of internal and external stimuli. Indeed, sensitivity and unusual experiences are core constituents of the RTS.

3.8.2.4 Hypothesis 4

Scores on the measure of Encounter Experiences from the group of left-handed and mixed-handed women ($N = 30$) were compared to the scores from the group of right-

handed men ($N = 61$). An ANOVA revealed that the left-handed and mixed-handed women scored higher on reports of apparitions ($M = .73$, $SD = 1.26$) than the comparison group ($M = .67$, $SD = 1.14$), but this difference was not statistically significant [$F(1, 89) = .05$, $p = .82$]. Thus, Hypothesis 4 was not confirmed.

3.8.2.5 Hypothesis 5

Contrary to Persinger's model of encounter experiences, the experiences reported by this sample did not tend to occur on the left-side of the body. Of the 114 participants reporting apparitions, 97 indicated that their experience showed no preference for body side (i.e., occurred in front of the body or involved both sides of their body). Eight participants reported experiences that favored the right side of their body, while nine participants reported experiences that favored the left side.

3.8.2.6 Hypothesis 6

Consistent with previous studies (Houran & Thalbourne, 2001a; Krippner et al., 1998), RTS and Sumbound scores showed positive correlations with paranormal belief. However, Table 3.7 shows that the boundary construct is more strongly associated with a New Age Philosophy than with Traditional Paranormal Beliefs. Sumbound scores in fact showed no association with Traditional Paranormal Beliefs, suggesting that high scores on the BQ are only conducive to the development of beliefs that relate to person-oriented control issues.

Table 3.7: Pearson Correlations Between RTS scores, BQ Sumbound Scores, and Encounter Experiences and Paranormal Belief (New Age Philosophy vs. Traditional Beliefs) ($N = 268$)

	New Age Philosophy	Traditional Paranormal Beliefs	t (265)
Revised Transliminality Scale	.46***	.26***	5.33***
Boundary Questionnaire	.29***	.09	6.62***
Encounter Experiences	.45***	.37***	3.59***

Note: *** $p \leq .001$ (significant after Bonferroni correction)

Likewise, tests of difference (Hinkle et al., 1988, p. 279) indicated that encounter experiences were more strongly related to a New Age Philosophy than to Traditional Paranormal Beliefs. This finding replicates Houran and Thalbourne (2001a, cf. Houran, 2001).

3.9 EPILOGUE

3.9.1 IMPLICATIONS FOR THE BOUNDARY-THRESHOLD CONSTRUCT

The moderately high correlation between RTS and Sumbound scores is a preliminary validation that both measures are addressing a similar boundary-threshold construct. However, multiple regression analysis of Hartmann's twelve categories of boundaries in relation to transliminality indicated that only five domains contributed significantly to the prediction of scores on transliminality: Unusual Experiences, Thoughts/Feelings/Moods, Sensitivity, Neat/ Exact/Precise, and Edges/Lines/Clothing. These two latter categories seem incongruent at first glance, but the pattern of findings may be resolved given closer inspection. The negative loading of the category of

Neat/Exact/Precise on transliminality indicates that high transliminals tend to a small degree to prefer to keep their environments neat and organized. By contrast, the positive loading of Edges/Lines/Clothing suggests that high transliminals reject rigidity in ideation and feeling to a degree. This can be regarded as a form of openness to experience. Following the definition that transliminality represents psychological material crossing thresholds into and out of consciousness, this pattern might mean that high transliminals use organizational skills in an attempt to combat forgetfulness or to maintain control of syncretic cognitions. As reviewed in Chapter 2, transliminality involves fantasy proneness and is associated with “openness to experience.” Therefore, these two BQ domains may in fact both tap the concept of syncretic cognition.

Future research might establish that the remaining seven domains proposed by Hartmann (1991) are simply behavioral correlates of persons influenced by high levels of syncretic cognition, i.e., high transliminality or ‘thinner’ boundaries. Alternatively, drawing on Werner’s (1948) organismic-developmental theory, the other seven BQ domains might be manifestations of the higher level of cognitive processing called symbolic cognition. Here one can distinguish between symbol production and symbol comprehension. Symbolic cognition is intrinsically related to the state of consciousness of the individual, and involves the need to integrate abstract ideas with concrete forms.

It might now prove profitable to conceptualize the boundary construct as the systematic progression of syncretic cognition to symbolic cognition. Accordingly, the present results suggest that the experiential orientation of the RTS and the five previously mentioned domains of the BQ coincide with syncretic cognition, whereas the remaining seven categories of the BQ point toward attitudinal and behavioral aspects of symbolic

cognition. In other words, these latter categories might refer to attitudes and behaviors that are inspired by an integrative mode of processing syncretic cognitions. This would account for the consistently positive correlations between the RTS and the remaining seven categories of the BQ.

It would be possible to validate this idea with a considerably large dataset from healthy controls, creative artists, and a group characterized by psychopathology (such as schizophrenics). For example, there would be strong statistical evidence in line with these speculations if collective dimensionality analyses (Rasch, 1960/1980) substantiated that the test items from the RTS and the BQ categories of Unusual Experiences, Thoughts/Feelings/Moods, Sensitivity, Neat/ Exact/Precise, and Edges/Lines/Clothing all share similar item locations on a common Rasch scale, whereas the test items from the other seven domains of the BQ show item locations at a higher level in this same Rasch hierarchy. Then, on an applied level, groups that are hypothesized to have more access to a syncretic mode of cognition, such as individuals diagnosed with schizophrenia and those with creative personalities (Glicksohn, Alon, Perlmutter, & Purisman, 2000-2001; Thalbourne, 2000b), would be expected to score higher on the Rasch hierarchy than healthy controls. However, schizophrenics would be expected to score lower than the artists since this latter group apparently has access to a more mature (integrative) mode of thinking—symbolic cognition (Glicksohn et al., 2000-2001).

3.9.2 ORIGINS OF ENCOUNTER EXPERIENCES AND IMPLICATIONS FOR MODELING TRANSLIMINALITY

There is currently no method to discern the ontological reality of genuinely parapsychological experience, including entity encounters. However, this chapter

presented two competing conventional hypotheses for the experiences retrospectively reported by the participants: an interhemispheric model (Persinger, 1993, Persinger & Makarec, 1992) and a broad psychological “systems” model (see e.g., Evans, 1986; Houran & Thalbourne, 2001a).

Specific predictions from Persinger’s model were not confirmed. Like previous research (Brugger, 1994; Brugger et al., 1996; Houran & Thalbourne, 2001b), the encounter experiences did not show a trend towards occurring on the left-side of the body—even in a sample of individuals with theoretically greater interhemispheric representation of linguistic processes. These results are incongruent with the idea that encounter experiences represent the awareness of the right hemispheric equivalent of the sense of self, but they do seem consistent with studies that suggest hallucinatory-like phenomena involve the activities of both the right and left hemispheres (e.g., Crow, 1996; Nałçacı, Kalaycioglu, Çiçek, & Budanur, 2000; Nasrallah, 1985; Shapleske, Rossell, Simmons, David, & Woodruff, 2001).

There are several qualifications about these conclusions. First, it is questionable whether pencil-and-paper tests of physiological sensations, handedness and memories of encounter experiences have the same reliability and validity as the experimental procedures outlined by Persinger (Cook & Persinger, 1997; Persinger et al., 2001). Indeed, one confounding factor not addressed in this study was latency, or the length of time between participants’ actual experiences and their responses to the measures. For example, Alvarado and Zingrone (1997) found that recollections of near-death experiences (NDEs) do not become significantly embellished over time, but other NDE research contradicts these findings (Lange, Greyson, & Houran, 2002). Lastly, the

reliability of the measure of 'body side' in relation to encounter experiences could be questioned. Aside from possible errors in participants' responses due to latency effects, it can be argued that merely asking individuals about the 'body side' of their encounter experience does not index laterality/brain representation with the same accuracy as stimulus-visual field studies (in which laboratory subjects are asked to fixate on a point directly ahead of them), given that our participants' experiences—and thus their head and eye movements—were likely to be spontaneous and uncontrolled. For these reasons, this study is at best a rudimentary test of predictions that stem from Persinger's theoretical and empirical work. Methodologically superior studies could yield different results.

In contrast, a systems model of encounter experiences received some support. Replicating previous theoretical (Evans, 1986, 2001) and empirical work (Houran, 2001; Houran & Thalbourne, 2001a), scores on Encounter Experiences showed positive correlations with RTS and Sumbound scores. This substantiates the fact that such experiences derive in part from regions across thresholds. Furthermore, encounter experiences and RTS and Sumbound scores were more strongly related to paranormal beliefs concerning New Age Philosophy than to Traditional Beliefs. The implication is that encounter experiences coincide with beliefs that provide individuals with a sense of control and understanding of their holistic environment. The boundary-threshold construct, as defined by the RTS and BQ, appear to support such beliefs. Here, the ambiguity of transliminal experiences (syncretic cognitions) might motivate the individual to apply paranormal labels in an attempt to regulate anxiety over not having an explanation for anomalous experiences (Houran & Williams, 1998, Houran & Lange, 1998, 1999, 2000). On the other hand, Chapters 1 and 2 cited evidence that was

consistent with the idea that transliminality is associated with psi functioning. Thus, a mixture of psychological and parapsychological perceptions may reinforce a New Age Philosophy.

Assuming that encounter experiences are on some level transliminal phenomena, these data inform aspects of the Cognitive Regulation Hypothesis in Chapter 2. Most important in this respect is the finding that sinistrals and mixed-handed women did not score higher on encounter experiences than right-handed men. In fact, increased bilaterality as measured by the Briggs-Nebes (1975) Handedness Scale had no effect on RTS or Sumbound scores. Aside from not supporting Persinger's hypothesis for apparitions, these results argue for the conclusion that bilaterality is not required for high transliminality. That is, transliminality apparently is not dependent upon a greater share of information across the right and left hemispheres via a larger corpus callosum (O'Kusky et al., 1988; Witelson, 1985). By contrast, the consistent influence of the threshold-boundary construct on encounter experiences that appear to be syncretic manifestations of sensory, cognitive, and emotional material is consistent with the Cognitive Regulation Hypothesis.

Again, interconnectedness does not imply integration. In relation to the themes of this discussion, Nasrallah (1985) proposed that "defective interhemispheric integration...may lead to disinhibition of the awareness by the left hemisphere (in most cases) that is being "influenced" by an unknown "external force" which is in fact the right hemisphere." Crow (1996) similarly argued that schizophrenia is a disorder of the interaction between the hemispheres, and that there is a failure to establish unequivocal dominance by either the left or the right hemisphere. In fact, the dorsolateral prefrontal

cortex appears to be crucial for gating of distracting information during delay tasks (Chao & Knight, 1995). Frontal lobe dysfunction and/or unusual anatomical asymmetries in the schizophrenic brain are well documented (e.g., Crow, 1996; Early, Posner, Reiman, & Raichle, 1989; Gur, 1999; Nasrallah, 1985; Woods, 1998). Consequently, disharmony in hemispheric functions may underlie the pathophysiology of schizophrenia (Crow, 1996; Nasrallah, 1985), as well as contribute to the origins of the transliminal encounter experiences reported by the participants in this study.

CHAPTER 4:
TRANSLIMINALITY AND PARANORMAL IDEATION
RELATIVE TO HYPOCHONDRIASIS AND THE
SOMATIZATION SYNDROME⁴

4.1 PROLOGUE

The convergent validity portion of the study in Chapter 3 indicated that the BQ categories concerning experiential-syncretic phenomena (including sensitivity) were most predictive of RTS scores. However, transliminality was also related to aspects of the BQ that involved “looser” ego-boundaries. Building on these findings, it is expected that RTS scores will be subsequently associated with psychological phenomena that appear to incorporate both increased sensitivity and a weaker ego-structure. Recent research is reviewed in this chapter that argues for such a model of hypochondriasis and the somatization syndrome. This literature serves as the basis for expecting positive correlations between RTS scores and several popular measures of these psychological conditions. The chapter concludes by discussing the results of the statistical analyses in light of the Cognitive Regulation Hypothesis.

4.2 BACKGROUND AND HYPOTHESES

4.2.1 COGNITIVE ASPECTS OF HYPOCHONDRIASIS AND THE SOMATIZATION SYNDROME

Somatization and somatoform disorders are one of the most common problems in primary care. Following the results of Escobar, Rubio-Stipec, Canonio, and Karno

⁴ Part of this chapter was published as (Appendix L):
Houran, J., Kumar, V. K., Thalbourne, M. A., & Lavertue, N. E. (2002). Haunted by somatic tendencies: Spirit infestation as psychogenic illness. *Mental Health, Religion, & Culture*, 5, 119-133.

(1989), 4% of the participants in that study suffered from a somatization syndrome that was characterized by multiple somatic complaints not due to a physical condition. The symptoms led participants to visits to doctors and had serious consequences for social functioning. Up to 40% of patients on neurology wards (Ewald, Rogne, Ewald, & Fink, 1994) and 26% of patients in family medicine clinics (Kirmayer & Robbins, 1991) have somatization symptoms. Recent research indicates that somatization symptoms and hypochondriacal features are also found within the general population (Rief, Hessel, & Braehler, 2001).

The diagnosis of somatization disorder, however, covers only a small subgroup of these patients. Therefore, Escobar and colleagues (Escobar, Burnam, Karno, Forsythe, & Golding, 1987; Escobar et al., 1989) proposed a group of patients with abridged somatization disorder or Somatic Symptom Index (SSI)-4/6. This patient group was characterized by at least four symptoms for men and six symptoms for women out of the list of 35 somatization symptoms relevant for somatization disorder according to the *Diagnostic and Statistical Manual of Mental Disorders* (3rd ed., rev: *DSM-III-R*; American Psychiatric Association, 1987). The SSI-4/6 criteria, however, may be overinclusive and are empirically not well based. The same holds true for multisomatoform disorder (Kroenke, Spitzer, de Gruy, Hahn, Linzer, Williams, Brody, & Davies, 1997). Hiller, Rief, and Fichter (1995) proposed an empirically derived approach that favors a cutoff at 7 or 8 somatoform symptoms out of the list of 35 symptoms proposed for *DSM-III-R* somatization disorder.

Rief, Shaw, and Fichter (1998, p. 587) proposed the term *somatization syndrome* for these patients with multiple somatic symptoms not due to a physical condition. This

group is also characterized by high levels of psychopathological distress (Hiller, Zaudig, & Mombour, 1995; Katon, Lin, von Korff, Russo, Lipscomb, & Bush, 1991) and seems to represent better the health care relevance of somatization syndromes than somatization disorder. Although the classification between somatization disorder according to the *DSM-IV* (4th ed., American Psychiatric Association, 1994) and *International Classification of Diseases-10 (ICD)*: World Health Organization, 1992) differs substantially, the less strictly defined somatization syndrome included all patients with somatization disorder according to both classification approaches (Rief, Heusser, Mayrhuber, Stelzer, Hiller, & Fichter, 1996).

In most articles concerning the disorder, psychological factors are considered to play an important role for the exacerbation and the course of the disorder. However, the knowledge about these pathogenetic psychological and biological processes is limited. Most of the existing literature about this topic refers to patients with hypochondriasis, although these results may not hold for patients with somatization syndrome but without hypochondriasis. *Hypochondriasis* refers to a disorder characterized by an unrealistic belief that one has a disease, despite medical opinion to the contrary. Barsky, Wyshak, and Klerman (1990) described a cognitive style of somatosensory amplification as the core aspect of a cognitive-behavioral model for hypochondriasis and demonstrated significant differences between hypochondriacal and control participants on the Somatosensory Amplification Scale. In another study, Barsky, Coeytaux, Sarnie, and Cleary (1993) demonstrated that hypochondriacal patients believed good health to be relatively symptom free and considered symptoms to be equal to sickness.

Aimed at contributing to a cognitive model of hypochondriasis and the

somatization disorder, Rief, Hiller, and Margraf (1998) administered the Screening for Somatization Symptoms (SOMS-2), the Whiteley Index measure of hypochondriacal tendencies, and the Cognitions About Body and Health Questionnaire (assessing body perception, illness behavior, and health) to 225 participants. These instruments are described in detail below. The research sample included patients with a somatization syndrome, patients with somatization syndrome and additional hypochondriasis, patients with hypochondriasis, patients with mental disorders (clinical control group), and nonclinical controls.

These authors found that various types of cognitions appear to be broadly characteristic of all groups of somatizers and hypochondriacs. Examples of such features are a catastrophizing interpretation of body perceptions (e.g., “bodily complaints are always a sign of disease” and “red blotches on the skin are a threatening sign of skin cancer”) or the description of usually ignored autonomic body sensations (“when I take a bath, I often feel how my heart is beating”). These are nonspecific, general attributes of somatization.

Rief, Hiller et al.’s (1998) results concerning the catastrophizing interpretation of bodily complaints by hypochondriac and somatizing patients were similar to those of Barsky et al. (1993); hypochondriacal patients believed good health to be relatively symptom free, thus they had a very restrictive concept of health. Frequent but typically undangerous symptoms were more easily interpreted as signs of disease (Hitchcock & Mathews, 1992; Salkovskis, 1989). Robbins and Kirmayer (1991) demonstrated that such attributional styles for bodily sensations could predict the illness behavior in the future. These cognitions could also amplify the effect of selective attention to body symptoms

(Kirmayer, Robbins, & Paris, 1994). A catastrophizing cognitive style was also correlated with low subjective coping skills (Wickramasekera, 1995). This may contribute to a personal belief of being powerless, which is a risk factor for distress and disability (Cope, David, & Mann, 1994).

Persons with somatization syndrome and hypochondriasis are typically aware of what happens in their bodies. Whereas bodily sensations of healthy controls are processed in an automatic manner, this automaticity may be distorted in patients with multiple somatization symptoms or hypochondriasis so that information processing of minor bodily complaints is conscious and capacity demanding (Rief, Hiller et al., 1998). This may be correlated with selective attention to body processes. Selective attention to minor bodily sensations may lead to an amplified perception or somatosensory amplification, as Barsky (1992) pointed out.

An important cognitive aspect of patients with somatization syndrome is a self-concept of being weak, of not being able to tolerate physical effort, and of not being able to imagine that physical exercise could be useful (Rief, Hiller et al., 1998). Indeed, patients displaying either somatization syndrome or hypochondriasis report significantly more bodily weakness, and it seems reasonable that this perception might contribute to or be a precursor for the concept of poor “ego strength” discussed in Chapter 2. Further, these aspects of illness behavior may be acquired already in childhood. Livingston, Witt, and Smith (1995) found that children of patients with somatization disorder had elevated rates of doctor visits. Somatizers were also more likely than other groups to report parental physical illnesses as well as physical illness of themselves in childhood (Craig, Boardman, Mills, Daly-Jones, & Drake, 1993).

The specific cognitive sets of patients with somatization syndrome or hypochondriasis were not correlated with variables of health-seeking behavior, such as consuming only healthy food, avoiding pollution, and looking for places with fresh air (Rief, Hiller et al., 1998). This result confirmed an earlier study of Kellner, Abbott, Winslow, and Pathak (1987) who found that patients with hypochondriasis did not take better precautions with their health. A further confirmation came from Lecci, Karoly, Ruhlman, and Lanyon (1996) who found that hypochondriacal tendencies (as measured by the Whitely Index) could not be predicted by general health goals (such as “maintain exercise routine,” “quit smoking,” or “eat healthier food”); however, more symptom-specific health goals (such as “manage chronic illness” or “manage stress”) were predictors for higher hypochondriacal scores.

Patients suffering from somatization and additional hypochondriasis were further characterized by the highest mean scores on most cognitive dimensions measured by Rief, Hiller et al. (1998). The mean scores of the combined somatization and hypochondriasis groups were significantly higher than those for “pure” somatization or “pure” hypochondriasis patients for the variables of autonomic sensations and bodily weakness. Consistent with the general observation, the comorbid group tended to show the most severe cognitive dysfunction.

Rief, Hiller et al.’s (1998) results may contribute to a cognitive-behavioral and psychophysiological formulation of somatization syndrome, as has already been done for hypochondriasis (Salkovskis, 1989; Warwick, 1989) or panic disorder (Clark, 1986). The core cognitive aspect in such a model could be the misinterpretation of bodily sensations as somatic symptoms. Features such as low pain tolerance (perhaps due to lower

vibration and thermal thresholds), an inadequate concept of health as a state without bodily sensations, a negative self-concept (perhaps related to “ego weakening,” as in Chapter 2), or selective attention (Haenen, Schmidt, Kroeze, & van den Hout, 1996) may be further cognitive aspects of somatization. In another study (Rief, Shaw et al., 1998), it was demonstrated that patients with somatization syndrome had elevated levels of cortisol and showed a lack of habituation in physiological parameters. Habituation refers to a decrease in responsivity to a stimulus at the neural level due to repeated stimulation. Thus, the cognitive features interact with physiological arousal.

Cognitions may be the trigger for stress responses, as well as for factors that maintain stress responses. Rief, Hiller et al. (1998) consequently proposed that the interpretation of being physically ill leads to avoidance behavior that is typically accompanied by a lower rate of physical activity. The reduction in physical fitness, however, may enhance the probability of body misinterpretations. Stressors and deficits in coping mechanisms, as well as affective components (e.g., negative affectivity: see Leventhal, Hansell, Diefenbach, & Glass, 1996; Watson & Pennebaker, 1989), may be moderating features for most of the variables mentioned.

The cognitive formulation of transliminality in Chapter 2 could conceivably contribute to this process. In particular, lower physiological thresholds and low “ego strength” would seem to facilitate somatosensory amplification. In addition, the cognitive processes thought to underlie transliminality would be expected to promote misattributions of body sensations as physical illness, due to an enhanced semantic and associative network related to liberal cognitive regulation.

4.2.2 PARANORMAL IDEATIONS AS IDIOMS OF PSYCHOPHYSIOLOGICAL DISTRESS

In a previous era, spirits and demons oppressed us. Although they have been replaced by our contemporary concern about invisible viruses, chemicals, and toxins, the mechanisms of contagious fear remain the same (Wessely, 2000, p. 129)

Authorities in the field (Bentall, 2000; Neppe, 1992) note that the relationship of psychiatric illness and symptom perception to paranormal belief and experience is an important area of exploration. Indeed, studies by Houran and Lange (Houran & Williams, 1998; Lange & Houran, 1998, 1999, 2000) suggest that: (i) paranormal beliefs and experiences can be modeled as a process of delusional thinking, and (ii) attributional processes with both emotional and cognitive aspects appear to underlie the construction and maintenance of these ideations. Therefore, like other authors (e.g., Kulhara, Avasthi & Sharma, 2000; Pizzagalli, Lehmann & Brugger, 2001; Pizzagalli, Lehmann, Gianotti, Koenig, Tanaka, Wackermann, & Brugger, 2000), researchers Houran and Lange regard the study of subjective paranormal ideation as a beneficial approach to understanding mechanisms underlying the broader range of delusions. In particular, Lange and Houran's (1998, 1999, 2000, 2001) process model of delusions of the paranormal provides some mathematical validation for the conclusions by Garety and colleagues (Garety & Freeman, 1999; Garety, Kuipers, Fowler, Freeman, & Bebbington, 2001) that the most parsimonious conceptualization of delusion formation and maintenance is a multi-factorial model that incorporates a data-gathering bias and an externalizing attributional style.

Such information processing, especially when fueled by fearful reactions to ambiguous stimuli, typify socially-oriented delusions known as *contagious psychogenic illnesses* (Colligan, Pennebaker, & Murphy, 1982; Wessely, 1987). However, contrary to

Wessely's (2001) quote given above, these delusional episodes may still manifest frequently as outbreaks of "spirit infestation." Experiences traditionally known as *haunt* or *poltergeist* episodes are commonly reported in many cultures throughout the world (Haraldsson, 1985; Ross & Joshi, 1992) and involve "... measured or inferred physical changes such as object movements, electrical failures, or strange sounds...reports of psychological experiences include 'odd feelings,' intelligible phrases, and sometimes the perception of human forms" (Persinger & Cameron, 1986, p. 49). In extreme cases, phenomena such as bites, cuts, scratches, welts, and possession-like trances have been documented (see e.g., Amorim, 1990; Mulacz, 1999).

Nisbet (1979) speculated that experiences of spirit infestation are symptoms of some kind of illness—perhaps in the same way that psychological distress is expressed through somatization (Hotopf, Wadsworth, & Wessely, 2001). To be sure, Hess' (1988, 1990) anthropological field studies suggest that outbreaks of haunts and poltergeists function as idioms of distress. Other researchers have come to similar conclusions. For example, a report by Sabatini, Gaud, and Guillemarre-Alzieu (1987) detailed a woman who was hospitalized after a suicide attempt prompted by an argument with her lover. In telling the attending psychiatrists her life history, the woman described her place of employment as haunted by a presence connected with an old family secret. Apparently, themes related to ghosts and "supernatural beings" are effective media through which many types of stories can be told (Edwards, 2001). Therefore, it is not surprising that ghosts may be universal personifications of troubled psyches (cf. von Franz, 1995); Siegel and Marion (1973) even noted that some psychiatric patients perceive images of ghosts on the projective Rorschach psychological test. Indeed, Fogliani, Fogliani, and

Castorina (1976) reported that a higher incidence of ghost-like (phantasmic) content in Rorschach responses was a common factor in their sample of psychosomatic patients.

Similarly, Lange and Houran (1998, 1999, 2001) have argued that some outbreaks of perceived spirit infestation parallel the phenomenology of contagious psychogenic illnesses in that both episodes are characterized by ambiguous stimuli that trigger a sudden onset of dramatic symptoms predominantly in young individuals who are under stress. Fear and anxiety, which are often neglected variables in delusion research (Freeman & Garety, 1999), are significant factors that sustain both types of episodes (see Lange & Houran, 1999; Wessely, 1987).

Despite their qualitative similarities, empirical evidence for a connection between episodes of spirit infestation and psychogenic illness is lacking. For example, it might be expected that claims of haunt and poltergeist experiences (and other paranormal ideations) are associated with hypochondriacal and somatic tendencies. However, few studies have examined this issue in depth. Windholz and Diamant (1974) were among the first to report that believers in the paranormal tend to score highly on measures of hypochondriasis and neuroticism, i.e., complaints about bodily ailments and a subjective state of suffering. Others since have found similar associations between paranormal belief/experience and neuroticism (Thalbourne, Dunbar & Delin, 1995; Sebastian & Mathew, 2001), somatic complaints (Wickramasekera, 1986, 1989; Sebastian & Mathew, 2001), somatoform dissociation (Houran et al., 2001; Irwin, 2000), and even panic attacks (Thalbourne & Fox, 1999). These findings sit well with Lester, Thinschmidt, and Trautman (1987) who found that paranormal belief is stronger in those who emphasize feeling over thinking, perceiving over judging, and intuition over perception. Arcangel

(1997) reported similar findings for experiments of facilitated apparitions in psychomanteum (mirror gazing) studies.

Following from this background material, it is expected that heightened hypochondriacal and somatic tendencies, transliminality, and paranormal belief work together to significantly predict self-reported haunt and poltergeist experiences. Similar patterns are anticipated for general paranormal experiences and perceived paranormal abilities as well. Establishing these links will bolster previous suggestions (Houran & Williams, 1998) that some subjective paranormal experiences are misattributions of internal experience to external (paranormal) sources—a process that hypothetically could initiate an episode of contagious (mass) psychogenic illness by encouraging the collective perception of similar “symptoms” in a group of people due to suggestion and demand characteristics (cf. Colligan et al., 1982; Lange & Houran, 1997; O’Mahony, 1978; Slosson, 1899). Further and more importantly, it is anticipated that associations among scores on the RTS, paranormal belief, and relevant screening measures will inform models of both transliminality and hypochondriasis and the somatization syndrome.

4.2.3 HYPOTHESES

Based on the arguments above, this study tested the premise that RTS scores are related to hypochondriacal and somatic tendencies and that these variables together with a framework of paranormal belief promote subjective paranormal experiences, such as spirit infestation and perceived paranormal ability. The hypotheses are therefore worded in terms of standard multiple regression analyses. While collective effects of predictor variables are obviously expected, it is specifically anticipated that RTS scores individually contribute to each of the regression equations that follow from the formal

hypotheses. Four specific hypotheses are tested:

1. Scores on the measures of hypochondriacal and somatic tendencies (CABAH, SOMS-2, Whitely Index), the RTS, and AEI subscale of Anomalous/Paranormal Belief predict scores on the AEI Poltergeist subscale.
2. Scores on the measures of hypochondriacal and somatic tendencies (CABAH, SOMS-2, Whitely Index), the RTS, and AEI subscale of Anomalous/Paranormal Belief predict scores on the AEI Encounters subscale.
3. Scores on the measures of hypochondriacal and somatic tendencies (CABAH, SOMS-2, Whitely Index), the RTS, and AEI subscale of Anomalous/Paranormal Belief predict scores on the AEI subscale of Anomalous/ Paranormal Experiences.
4. Scores on the measures of hypocondriacal and somatic tendencies (CABAH, SOMS-2, Whitely Index), the RTS, and AEI subscale of Anomalous/Paranormal Belief predict scores on the AEI subscale of Anomalous/ Paranormal Ability.

4.3 SCREENING FOR SOMATIZATION SYMPTOMS (SOMS-2)

The SOMS is a questionnaire that includes all items relevant for somatization disorder (see Appendix E). Participants are instructed to answer “yes” when a symptom has been present in the last two years, when a doctor did not find a sufficient explanation, and when the symptom bothered the participant to a significant degree. Although the original version (cf. Rief, Hiller, Geissner, & Fichter, 1995) covered all 35 symptoms from the *DSM-III-R* list of somatization disorder (SD), the modified version used in the present research (SOMS-2: cf. Rief, Hiller et al., 1998) included all *DSM-IV* SD symptoms, as well as those of *ICD-10* and *ICD-10* somatoform autonomic dysfunction (SAD: Rief, Hiller, & Heuser, 1997). Thus, the questionnaire consists of 53 somatization

symptoms and 15 inclusion and exclusion criteria mentioned in the classification approaches (such as duration of illness or frequency of doctor visits). The number of positively identified symptoms is totaled for the somatization index. This index shows good test-retest reliability (for the *DSM-III-R* symptom list, $r = 0.85$; Rief, Hiller, Goebel, & Fichter, 1995).

According to the different classification approaches, the modified SOMS-2 allows one to compute the sum of scores of the somatization index *DSM-IV* (*DSM-IV* somatization disorder symptom list), the somatization index *ICD-10* (*ICD-10* somatization disorder), the SAD-index (*ICD-10* somatoform autonomic dysfunction symptom list), and a symptom total score. Because these somatization indices are highly intercorrelated, this study follows the example of Rief, Hiller et al. (1998) and uses the somatization index according to the *DSM-IV*. The correlation between the somatization index (*DSM-IV*) according to a diagnostic interview and this questionnaire is 0.75, and further validation indices are reported in the manual (Rief et al., 1997).

4.4 WHITELEY INDEX (WI)

The WI (Pilowsky, 1967) is one of the most commonly used self-rating scales for hypochondriacal tendencies (see Appendix F). It consists of 14 “true/false” items selected from factor analysis, which cover three main aspects of hypochondriasis: (i) bodily preoccupation, (ii) disease phobia, and (iii) conviction of the presence of disease with non-response reassurance. Pilowsky’s (1967) factor structure has subsequently been replicated in cross-cultural studies (Rief, Hiller, Geissner, & Fichter, 1994). Representative items from the WI include: “Do you often have the symptoms of very serious illnesses?” “If a disease is brought to your attention (through the radio, television,

newspapers or someone you know) do you worry about getting it yourself?”, and “Do you think there is something seriously wrong with your body?” The test has good discriminant validity (see Pilowski, 1967, pp. 91-92) and high test-retest reliability ($r = 0.81, p \leq .001, 44$ weeks).

4.5 COGNITIONS ABOUT BODY AND HEALTH QUESTIONNAIRE (CABAH)

The original version of the CABAH (Rief, Hiller, & Margraf, 1996) consisted of 68 items that were answered on a 4-point scale as follows: 3 (*completely right*), 2 (*mostly right*), 1 (*mostly wrong*), and 0 (*completely wrong*). The item pool was selected from self-formulated items concerning interpretation of body signals, perception of minor body events, attitudes about body and health, health habits, and nine items from Barsky's Somatosensory Amplification Scale (Barsky et al., 1990). The aim of this item pool was to find possible cognitive features for somatizing and hypochondriacal patients (Rief, Hiller et al., 1998). Thus, the items were not simply parallels of classification symptoms, but rather they were anticipated to be present in healthy controls to a lower degree.

Principal axis factoring with subsequent varimax rotation (a common factor analytic technique) by Rief, Hiller et al. (1998) revealed five stable factors consisting of 31 items from the item pool:

1. *Catastrophizing Interpretation of Bodily Complaints* (14 items: e.g., “Bodily complaints are always a sign of disease” and “A healthy body doesn't cause complaints”).
2. *Autonomic Sensations* (4 items: e.g., “I hate to be too hot or too cold” and “I often feel my heart beating because my circulatory system is very sensitive”).

3. *Bodily Weakness* (6 items: e.g., “I’m physically rather weak and sensitive” and “I’m not as healthy as most of my friends and acquaintances”).
4. *Intolerance of Bodily Complaints* (4 items: e.g., “If something is wrong with my bodily sensations, it upsets me at once” and “I consult a doctor as soon as possible when I have bodily complaints”).
5. *Health Habits* (3 items: e.g., “I’m always careful to live really healthily” and “If I feel physically weak, I get some fresh air to recuperate”).

Cronbach alphas for the total scale show excellent reliability across clinical and nonclinical samples (ranging from 0.80 to 0.90), and the five subscales likewise show satisfactory reliability (see Rief, Hiller et al., 1998, p. 590). Further, Rief, Hiller et al. (1998) provide evidence for the CABAH’s discriminant validity. The current version of the CABAH is given in Appendix G.

4.6 ANOMALOUS EXPERIENCES INVENTORY (AEI)

The AEI (Appendix H) was constructed using cluster analysis, correlations with external criteria, and item analyses. As previously described in Chapter 1 (Section 1.3.1), this measure contains 70 items (taken from the Mental Experience Inventory and items specifically written for the AEI) that form the five subscales of Anomalous/ Paranormal Experiences (29 items), Anomalous/ Paranormal Beliefs (12 items), Anomalous/ Paranormal Abilities (16 items), Fear of the Anomalous/ Paranormal (6 items), and Drug Use (7 items). KR-20 reliability coefficients for the five subscales are 0.85, 0.77, 0.71, 0.64, and 0.68, respectively (Gallagher, Kumar, & Pekala, 1994). Further, the AEI shows good convergent validity (Gallagher et al., 1994; Thalbourne, 2001). Several psychological and parapsychological studies have used the AEI (e.g., Thalbourne, 2001;

Lange & Houran, 1998, 1999, 2000), since it allows researchers to conveniently test various aspects of paranormal ideations in a single instrument.

In addition to these five subscales, two other subscales can be formed from the item pool:

1. *Anomalous/ Paranormal Encounter* (10 items: e.g., “At times, I have felt possessed by an outside force” and “I am able to communicate with supernatural forces”). This new subscale was proposed originally by Pekala, Kumar, and Marcano (1995, p. 323) for use in a study on shamanistic phenomena. Note that this index concerns the number of different *varieties* of encounter experience, as opposed to the *frequency* of encounter experiences. Houran and Thalbourne (2001a) reported a Cronbach alpha of 0.75 for this subscale in their sample of 125 participants.
2. *Poltergeist and Hauntings* (8 items: e.g., “I have experienced objects appearing or disappearing around me (materialization or dematerialization)” and “I have seen a ghost or apparition”). This new subscale was proposed to Kumar and Pekala by the author for their study on the relation of hypnosis-specific attitudes and behaviors to paranormal experiences (Kumar & Pekala, 2001). Houran and Thalbourne (2001a) reported a Cronbach alpha of 0.64 for this subscale. In addition, in a preliminary attempt at validation, Houran and Thalbourne (2001a) found that this subscale correlated 0.54 ($p \leq .001$) with item #18 of the Australian Sheep-Goat Scale (Thalbourne & Delin, 1993), i.e., “I am completely convinced that persistent inexplicable physical disturbances, of an apparently psychokinetic origina (as for example a ‘poltergeist’) have occurred in my presence at some

time in the past.” Most recently, Rasch (1960/1980) scaling analyses by Houran and Lange (2001c) demonstrated that the eight AEI Poltergeist/ Hauntings items (which seem diverse in their content) constitute a unidimensional Rasch hierarchy.

4.7 METHOD

4.7.1 PARTICIPANTS

Data were derived from a convenience sample of 314 undergraduate psychology students ($M_{age} = 22.8$ yrs, $SD = 6.3$, range = 18-53 yrs, 68% women) from West Chester University (West Chester, PA, USA). Approximately 83% of the students were enrolled in various Introduction to Psychology classes and 17% were from upper level undergraduate courses. V. K. Kumar, Ph.D., and his two graduate students, Nicole Lavertue and Betsey Robin are credited with the collection of this dataset. Dr. Kumar was asked to assist in this study since he had convenient access to a substantial number of potential respondents over the course of two academic years.

4.7.2 MEASURES

Five measures were used in the study:

- (i) Lange, Thalbourne, et al.’s (2000) RTS (Form B), described in Chapter 1. See Appendix A.
- (ii) Kumar et al.’s (1994) AEI. As noted above and in Chapter 1 (see Appenedix H), the AEI contains 70 “true/false” items that comprise seven subscales, beginning with Anomalous/Paranormal Belief, Anomalous/Paranormal Experience, Anomalous/Paranormal Ability, Fear of the

Anomalous/Paranormal, and Drug Use. Two other subscales can be constructed from items from the Experience and Ability subscales: the Poltergeist subscale and the Encounter subscale (an adaptation of which was used in the study in Chapter 2). Higher scores on each subscale reflect stronger endorsement of the various factors. The subscales of Fear of the Anomalous/Paranormal and Drug Use were omitted in this study.

- (iii) Whitley Index (WI) (Pilowsky, 1967). The WI is a 14-item, “true/false” scale that measures hypochondriacal tendencies. See Appendix F.
- (iv) Screening for Somatization Symptoms (SOMS-2: Rief et al., 1995a, 1998) is a questionnaire that includes all items relevant for somatization disorder. As such, it consists of 53 somatization symptoms and 15 inclusion and exclusion criteria mentioned in the classification approaches (such as duration of illness or frequency of visits to the doctor). Respondents indicate “yes” when a symptom is present in the last two years, when doctors did not find a sufficient explanation, and when the symptoms significantly bothered the respondent. The number of positively identified symptoms is summed for the somatization index. See Appendix E.
- (v) The Cognitions About Body and Health Questionnaire (CABAH: Rief et al., 1998). This contains 31 items to be answered on a 4-point scale (completely right, mostly right, mostly wrong, completely wrong). The items form five subscale scores: Catastrophizing Cognitions (14 items), Autonomic Sensations (4 items), Bodily Weakness (6 items), Intolerance of Bodily Complaints (4 items), and Health Habits (3 items). High scores greater higher endorsement

of the various factors. See Appendix G.

4.7.3 PROCEDURE

The measures were administered on behalf of the author to students at West Chester University of Pennsylvania. In particular, Introduction to Psychology students participated to complete a departmental research requirement for their classes. The students had the option of completing alternative projects. The Introduction to Psychology students completed the questionnaires either individually or in small groups. The upper level classes completed the questionnaires during their regular class period. Participation was completely voluntary and students could terminate their participation at any time without impunity. After being collected, the data was sent to the author for analysis.

4.8 RESULTS

4.8.1 PRELIMINARIES

Table 4.1 lists the descriptive statistics (mean and standard deviation) for the measures. Participants did not strongly endorse paranormal ideations, although scores on the measures of hypochondriasis, somatization, and cognitions about the body were slightly higher than those reported by Rief, Hiller et al. (1998, p. 592) for a healthy control group.

Table 4.1: Descriptive Statistics and the Range of Possible Scores on the Research Measures ($N = 314$)

<i>Variable</i>	<i>M</i>	<i>SD</i>	<i>Range of Possible Scores</i>
AEI Poltergeist	.57	.99	0 - 8
AEI Encounter	.55	1.09	0 - 10
AEI Paranormal Experience	5.72	4.06	0 - 29
AEI Paranormal Ability	1.40	1.51	0 - 16
AEI Paranormal Belief	5.88	2.63	0 - 12
RTS	23.06	4.06	13.7 - 37.3
WI (hypocondriasis)	4.30	3.01	0 - 14
SOMS-2 (Somatization Index)	8.14	5.29	0 - 33
CABAH			
Catastrophizing Cognitions	13.55	6.88	0 - 42
Autonomic Sensations	5.26	2.45	0 - 12
Bodily Weakness	5.99	3.10	0 - 18
Intolerance of Bodily Complaints	5.32	1.92	0 - 12

Before performing the main correlational and multiple regression analyses, rank-order correlations were computed between age, gender and the research measures to conservatively estimate the extent of these confounding variables. Consistent with the findings that “focal persons” in outbreaks of poltergeists and psychogenic illnesses tend to be young in age (Roll, 1977), Table 4.2 shows that younger respondents tended to score slightly higher on measures of hypochondrical tendencies, somatization, and cognitions about bodily sensations. This pattern is generally inconsistent with Rief et al.’s (2001) findings based on participants from the general population. With respect to effects of gender, women reported slightly fewer paranormal ideations but scored higher than the men on somatization. Age and gender account for only 2-5% of the variance, so these variables are not regarded as significant confounds in this study.

Table 4.2: Correlations Between Age, Gender and Research Measures ($N = 314$)

	AGE	GENDER
AEI Poltergeist	-.07	-.12*
AEI Encounter	.02	-.15*
AEI Paranormal Experience	-.09	-.07
AEI Paranormal Ability	.01	-.14*
AEI Paranormal Belief	.09	-.08
RTS	-.02	-.17**
WI (hypochondriasis)	-.13*	.09
SOMS-2 (Somatization Index)	-.18*	.23**
CABAH		
Catastrophizing Cognitions	-.14*	-.02
Autonomic Sensations	-.16**	.00
Bodily Weakness	-.13*	-.07
Intolerance of Bodily Complaints	-.03	.05
Health Habits	-.01	.03

Note: * $p \leq .05$, ** $p \leq .01$, Gender: Men = 0, Women = 1

4.8.2 CORRELATIONAL FINDINGS

Table 4.3 gives the correlation matrix for the research measures. Unlike the study in Chapter 2 where several of the measures yielded Rasch interval-level of measurements, the research measures used here should be regarded mainly as ordinal-level. Thus, conservative Spearman rank-order correlations were applied to the initial correlational analyses. It can be seen that many of the variables were positively related to one another, and at a significance level ($\leq .001$) that suggests these relationships were not artifacts of multiple analyses. However, the restricted range of scores in this sample (cf. Table 4.1) might have contributed to the low to moderate effect sizes. The general pattern of significant intercorrelations among the measures of hypochondriasis and somatization replicates the findings of Rief et al. (1998).

Table 4.3: Spearman Rank-Order Correlations Among the Research Measures (N = 314)

	1. Para Belief	2. Para Ability	3. Para Experience	4. Poltergeist Experience	5. Encounter Experience	6. Whiteley Index	7. Catastroph Cognition	8. Bodily Weakness	9. Intolerance Bodily Complains	10. Health Habits	11. Autonomic Sensations	12. Somatization	13. Transliminality
1	--	.43***	.56***	.37***	.30***	.17**	.10	.11	.12*	.01	.19**	.16***	.54***
2		--	.54***	.42***	.44***	.19**	.14**	.11	.10	.07	.16**	.15**	.48***
3			--	.66***	.53***	.30***	.18**	.24***	.18**	.04	.28***	.30***	.65***
4				--	.60***	.20***	.08	.15**	.04	-.12*	.23***	.21***	.45***
5					--	.11	.04	.11*	.05	-.05	.21***	.08	.46***
6						--	.30***	.29***	.33***	-.00	.24***	.33***	.30***
7							--	.58***	.62***	.22***	.47***	.16**	.09
8								--	.40***	.03	.49***	.24***	.19**
9									--	.21***	.38***	.18**	.16**
10										--	.14**	-.01	.03
11											--	.24***	.29***
12												--	.25***

Note: * $p \leq .05$, ** $p \leq .01$, *** $p \leq .001$

4.8.3 MULTIPLE REGRESSION ANALYSES

Given the pattern of significant non-parametric correlations in Table 4.3, regression analyses were deemed acceptable to test the four specific hypotheses identified earlier. Specifically, four separate multiple regression analyses (standard method) were performed to determine the best predictors of Poltergeist Experiences (AEI), Encounter Experiences (AEI), General Paranormal Experiences (AEI), and perceived Paranormal Ability (AEI). This is the same regression method used in Chapter 3. In each of the four regression analyses the predictor variables were scores on the RTS, Paranormal Belief (AEI), WI (hypochondriacal tendencies), SOMS-2 (somatization), and the five subscales from the CABAHA: Catastrophizing Cognitions, Autonomic Sensations, Bodily Weakness, Intolerance of Bodily Complaints, and Health Habits.

Predicting Scores on AEI Poltergeist. The multiple correlation R for the regression was significantly different from zero, $R = .51$, $R^2 = .26$, $F(9, 269) = 10.69$, $p \leq .001$; that is, scores on AEI Poltergeist were significantly related to the set of independent variables. Altogether, scores on the RTS, Paranormal Belief (AEI), WI (hypochondriacal tendencies), SOMS-2 (somatization), and the five subscales from the CABAHA predicted 26% (or 24% adjusted, adjusted $R^2 = .24$) of the variability in the scores on AEI Poltergeist. Only three of the independent variables contributed significantly ($\leq .05$) to the prediction of scores on AEI Poltergeist: RTS (beta = .34, $p \leq .001$, $sr^2 = .07$), Health Habits (beta = -.14, $sr^2 = .02$), and AEI Paranormal Belief (beta = .14, $sr^2 = .01$).

All tolerance statistics in this and all subsequent regression analyses were well above zero (ranging from .33 to .89), so multicollinearity of the predictor variables was of no practical concern (Darlington, 1990).

Predicting Scores on AEI Encounter. The multiple correlation R for the regression

was significantly different from zero, $R = .47$, $R^2 = .22$, $F(9, 270) = 8.39$, $p \leq .001$; that is, scores on AEI Encounter were significantly related to the set of independent variables. Altogether, scores on the RTS, Paranormal Belief (AEI), WI (hypochondriacal tendencies), SOMS-2 (somatization), and the five subscales from the CABAHA predicted 22% (or 19% adjusted, adjusted $R^2 = .19$) of the variability in the scores on AEI Encounter. Only one of the independent variables contributed significantly ($\leq .05$) to the prediction of scores on AEI Encounter: RTS (beta = .37, $sr^2 = .09$). Another variable of potentially marginal significance ($p = .09$) was Paranormal Belief (beta = .11, $sr^2 = .01$).

Predicting Scores on AEI Anomalous/Paranormal Experience. The multiple correlation R for the regression was significantly different from zero, $R = .71$, $R^2 = .49$, $F(9, 268) = 29.70$, $p \leq .001$; that is, scores on AEI Paranormal Experience were significantly related to the set of independent variables. Altogether, scores on the RTS, Paranormal Belief (AEI), WI (hypochondriacal tendencies), SOMS-2 (somatization), and the five subscales from the CABAHA predicted 49% (or 48% adjusted, adjusted $R^2 = .48$) of the variability in the scores on AEI Paranormal Experience. Only three of the independent variables contributed significantly ($\leq .01$) to the prediction of scores on AEI Paranormal Experience: RTS (beta = .45, $sr^2 = .13$), SOMS-2 (beta = .15, $sr^2 = .02$), and AEI Paranormal Belief (beta = .27, $sr^2 = .05$).

Predicting Scores on AEI Anomalous/Paranormal Ability. The multiple correlation R for the regression was significantly different from zero, $R = .50$, $R^2 = .25$, $F(9, 268) = 9.98$, $p \leq .001$; that is, scores on AEI Paranormal Ability were significantly related to the set of independent variables. Altogether, scores on the RTS, Paranormal Belief (AEI), WI (hypochondriacal tendencies), SOMS-2 (somatization), and the five

subscales from the CABAH predicted 25% (or 23% adjusted, adjusted $R^2 = .23$) of the variability in the scores on AEI Paranormal Ability. Only two of the independent variables contributed significantly to the prediction of scores on AEI Paranormal Ability: RTS (beta = .30, $sr^2 = .06$) and AEI Paranormal Belief (beta = .22, $sr^2 = .04$).

These results are in line with the stated four hypotheses. In particular, in each case the collective effect of transliminality, paranormal belief, and hypochondriacal-somatic tendencies significantly predicted scores on various measures of subjective paranormal experiences. Moreover, RTS scores were validated as a consistently significant, individual predictor variable. AEI Paranormal belief was the next most robust individual predictor variable, while measures related to hypochondriacal-somatic tendencies only contributed significantly to prediction of two types of subjective paranormal experience: AEI Poltergeist and AEI Anomalous/Paranormal Experiences.

4.9 EPILOGUE

As hypothesized, scores on transliminality, paranormal belief, and cognitions about the body consistently predicted various forms of subjective paranormal ideations. As such, these findings conceptually replicate previous research (e.g., Windholz & Diamant, 1974), as well as provide some validation for the clinical observations of Wickramasekera (1986, 1989) that individuals with high scores on hypochondriacal-somatic tendencies also tend to report frequent paranormal experiences.

However, the regression analyses revealed that different aspects of somatoform phenomena predict different types of paranormal ideations. In particular, poor health habits contributed significantly to the prediction of AEI Poltergeist scores, while somatization scores (as measured by the SOMS-2) contributed significantly to general

reports of paranormal experiences. Thus, it might be that the *type* of bodily cognition varies with the *specificity* of the paranormal experience. In this case, the results are consistent with the idea that some (general) subjective paranormal experiences are related to misattributions of internal experience to external (paranormal) sources, while poltergeist experiences are associated with tendencies not to eat or live healthily. These latter tendencies could be motivated by psychophysiological tensions, which are hypothesized to underlie haunt and poltergeist manifestations (Rogo, 1979; Roll, 1977; Roll & Persinger, 2001).

The core behavior that might be operating with both somatic-hypochondriacal tendencies and paranormal belief is that ambiguous events are explained impulsively, i.e., automatically and without much reflection. Thus, bodily complaints are not seen as natural fluctuations in a normal, healthy body. Rather, they are more frequently interpreted as threatening. This argues for the conclusion that the concepts of chance and random fluctuation probably have little meaning for these individuals (cf. Brugger et al., 1994). Therefore, it is also easy to see how beliefs in paranormal experiences arise in individuals with somatic-hypochondriacal tendencies. For instance, just as meaning is automatically attributed to random processes such as fleeting aches and pains, occasional involuntary thoughts might be perceived as cases of ESP, associations and coincidences masquerade as synchronicity, and occasional physical incidents might be seen as evidence for psychokinesis.

Interpreting these correlational data speculatively in terms of Lange and Houran's (1998, 1999, 2000) model of delusional thinking denotes psychosomatic phenomena as ambiguous—even threatening—stimuli in need of an explanation. The robust effects of

transliminality observed here and in previous studies (e.g., Houran & Thalbourne, 2001a) are consistent with the idea that transliminality is a major perceptual-personality variable that mediates the production and/or perceived intensity of psychosomatic and/or somatosensory phenomena—perhaps similar to a conversion disorder. In other words, experiences of spirit infestation, general paranormal experience, and somatic complaints may all derive from a hypersensitivity to a broad range of imagery, ideation, affect, and environmental stimuli. For example, Schreier (1999) discussed how hallucinatory imagery sometimes coincides with migraines, high levels of anxiety, and affective disorders. There is also some preliminary evidence for a relationship between ‘thin boundaries,’ multiple chemical sensitivities, and paranormal experiences (Jawer, 2000). Accordingly, somatosensory amplification in these individuals may strongly reflect cognitive factors, such as selective attention (Kirmayer et al., 1994) and poor gating among frontal cortical loops (regulating inhibition: Chao & Knight, 1995; Fuster, 1999), temporal-limbic structures (regulating affective components and autonomic functions), and primary or secondary sensory areas and/or sensory association cortices (regulating perception of external and internal sensations).

Regarding the cognitive factors, Rief, Hiller et al. (1998) stressed the roles of a low pain tolerance (threshold), a negative self-concept, and selective attention in somatosensory phenomena. The idea of a transliminal or ‘thin-boundary’ trait that influences the perception of physiologically processes is not new. It should be reiterated from Chapter 1 that Freud discussed boundaries a few times, especially when he spoke of the stimulus barrier or “reitzschutz” (a protective shield against stimulation). He referred to the entire ego as initially a body-ego derived from the body surface (Freud, 1923), and

many of Freud's followers explored boundaries in more detail (see e.g., Federn, 1952). In the psychoanalytic literature, solid ego boundaries are considered a kind of ideal, and the emphasis is on defects and weaknesses in ego boundaries that lead to psychosis or other pathological conditions.

Again, the terms "ego" and "ego strength" have been used purely to describe cognitive functions and personality characteristics (Alias, 1974, 2000; Perry et al., 1995; Stone, 1980). In this context, ego is seen as the central "magnetic sphere" of the psyche that integrates and coordinates the autonomous cognitive fragments consisting of "percept units" and (reactive and non-reactive) "thought units" (Alias, 1974), and ego strength as the centripetal, cohesive force with which the integration and coordination of the cognitive fragments are prosecuted (Alias, 2000). As indicated in Chapter 2, synthetic function refers to the ego's capacity to integrate diverse elements into an overall unity. As such, it involves organizing, coordinating, and generalizing or simplifying large amounts of data (Kaplan & Sadock, 1998). Freeman (1960) proposed that damage to the perceptual system of ego leads to a failure of its screening function. As a result the individual can no longer insulate a train of thought from extraneous sensory stimulation (i.e., deficient sensory gating: Braff et al., 1999; Perry et al., 1999; Swerdlow & Geyer, 1998). Percepts and images now compete for attention with already existing thoughts.

Explanations for transliminal experiences would likely be shaped in part by the situational context in which the experiences occur (Houran, 2000; Lange & Houran, 2001a). In particular, somatosensory symptoms experienced in a cafeteria setting are likely to be explained automatically in terms of 'food contaminants,' whereas somatic complaints perceived in an office complex might be regarded as a consequence of poor

'air quality.' If seemingly conventional explanations for psychosomatic phenomena are absent, paranormal beliefs can serve an adaptive function by providing a "...cognitive framework for effectively structuring many events and experiences...so that they appear comprehensible and thereby able to be mastered, at least intellectually" (Irwin, 1999, p. 291). That is, an individual with an investment in paranormal explanations may be more motivated to interpret any unusual perceptual experiences or thoughts in the context of such beliefs, especially in a culture that readily accepts these beliefs (for cultural perspectives see: Al-Issa, 1977; Bankat, 2000). In support, the data consistently indicate that the combined effects of transliminality, somatic tendencies, and paranormal belief best predict several varieties of subjective paranormal experiences. The most striking finding in this study was that transliminality (as measured by the RTS) was an individual predictor variable of high significance [and in effect size (sr^2) relative to the other independent predictor variables] in each of the regression equations. RTS scores also consistently showed significant correlations of moderate magnitude among scores on the SOMS-2 (somatization), WI (hypochondriasis), and the CABAH subscales (except catastrophizing cognitions and health habits). These results side with the interpretation that transliminality involves heightened proprioception, which may play a more significant role in somatosensory amplification than cognitive factors.

On a more applied level, the results of this study are consistent with the hypothesis that experiences of spirit infestation are delusions inspired by somatosensory phenomena, which themselves are produced through transliminal processes. Lange and Houran's (1998, 1999) model of delusions predicts that the duration of the episode depends in part on the fear and anxiety levels of those involved. Delusional beliefs reduce

low or mild fears and anxieties associated with facing ambiguous stimuli, thereby creating a negative (self-correcting) feedback loop (Lange & Houran, 1998). Yet, this strategy does not work when people are already highly fearful. In these instances, delusional beliefs and experiences instead increase fear, thus creating a positive (self-reinforcing) feedback loop (Lange & Houran, 1999). Taken together, these findings indicate that people face a basic choice between fear and belief, and this hypothesis is supported by the results of advanced nonlinear analyses that use this juxtaposition as the dependent variable (Lange & Houran, 2000).

The effect sizes reported here are by no means large, but the findings established a direct link between experiences of spirit infestation and somatic-hypochondriacal tendencies. Of course, this by itself does not conclusively demonstrate that haunt and poltergeist episodes are varieties of contagious psychogenic illnesses. The present data are partly consistent with this idea, but detailed field research is needed for validation. Outbreaks of 'mysterious toxins' receive widespread media attention as legitimate phenomena and may be investigated while in progress. However, the negative social stigma of reporting disturbing paranormal experiences likely prevents many cases of haunts and poltergeists from ever coming to the attention of serious investigators. As a result, it is anticipated that progress along the lines presented here will be slow.

One potentially instructive question for future research is whether the temporal patterns of psychogenic illnesses correspond to those of poltergeist-like episodes. In particular, the timing of individual perceptions in some published poltergeist cases follows a power law-type frequency distribution (Lange & Houran, 2001a, 2001b). Curiously, the exponent of this power law distribution lies well within the range of values

that characterize *music*. That is, some “poltergeist outbreaks” can be seen as a series of events that are both sufficiently novel and sufficiently predictable such that—like music—people find them intrinsically interesting (Voss & Clark, 1978). It was further found that the timing of “poltergeist” manifestations obeyed a nonlinear autoregressive cusp catastrophe model (see e.g., Lange & Houran, 2001a, 2001b), i.e., future intervals could be predicted from preceding ones by assuming that past poltergeist-like events form a bi-stable system that alternates between longer and shorter intervals in a quite abrupt fashion. Lange and Houran (2001a, 2001b) concluded, therefore, that poltergeist outbreaks are the result of attentional biases to ambiguous stimuli that subsequently become self-sustaining due to inherent interest generated by their temporal properties. Assuming this general hypothesis is correct, it is expected that similar results will be found for symptom perception in outbreaks of contagious psychogenic illness.

CHAPTER 5:
IMPACT OF TRANSLIMINALITY AND COMPETING
PERCEPTUAL-PERSONALITY VARIABLES ON ANOMALOUS
EXPERIENCES IN A NATURALISTIC SETTING⁵

5.1 PROLOGUE

Chapter 4 presented evidence consistent with the hypothesis that some subjective experiences of spirit infestation and paranormal experiences of broader scope are collective expressions of transliminality, hypochondriacal tendencies, and an attributional cognitive style that utilizes a framework of paranormal belief. This chapter presents an experiment that attempts to test the predictive validity of this basic notion in a naturalistic setting. Since this thesis has used the theme of encounter experiences throughout, the present application concerned a field study of a reported “haunt.”

Many people worldwide report inexplicable experiences of apparitions, sounds, smells, sensed presences, bodily sensations, and physical manifestations in the environment (Haraldsson, 1985; Ross & Joshi, 1992). Parapsychologists refer to these phenomena as a *haunt* when they are site-specific, although cultural names and theories for these outbreaks vary widely given that experients often interpret these experiences according to their beliefs and prevailing worldview (Evans, 2001; Puhle, 2001). Indeed, most authorities agree that haunts involve a complex mosaic of sociocultural, physical, and psychological variables (for an overview, see Houran & Lange, 2001b). What is not known, however, is the extent to which these variables explain haunt experiences.

⁵ Part of this chapter was published as (Appendix L):
Houran, J., Wiseman, R., & Thalbourne, M. A. (2002). Perceptual-personality characteristics associated with naturalistic haunt experiences. *European Journal of Parapsychology*, 17, 17-44.

Detailed studies are needed in order to make progress in this respect. Cases that are easily accessible and seem promising for study are therefore given priority by field researchers, regardless if the site has been highly publicized by folklore or media attention.

Three basic methodologies define much of the empirical literature on haunts: (1) large-scale studies of the psychological background of experiencers and the content of their experiences, (2) participant-observation studies that test whether experimentally-blind participants and objective instrumentation corroborate witness reports, and (3) attempts to induce haunt experiences in experimental subjects under laboratory conditions or in naturalistic settings. Recently, Wiseman, Watt, Stevens, Greening, and O'Keefe (2003) integrated these three methodological approaches within a single design to systematically investigate physical and psychological variables involved in haunt experiences.

Consistent with Lange and Houran's (2001) psychophysiological model derived from attribution theory, Wiseman et al. (2003) concluded that the haunts they studied did not represent evidence for paranormal activity, but were instead the result of people responding to and interpreting conventional stimuli in their surroundings. These findings advance the notion that these experiences are not purely imagination. Rather, haunts may reflect an interaction between external factors in the environment and the experient's psychological structure and/or perceptual biases and needs.

Psychical research has traditionally focused on defining to what external factors (paranormal vs. conventional stimuli) experiencers are responding, but it is also important to isolate what psychological characteristics facilitate the perception of these stimuli. In this way, insights may be gained into what stimulates haunt experiences—at least in some cases. Accordingly, the study presented in this chapter complements the report by

Wiseman et al. (2003). Additional psychological data on a substantial subset of their participants was obtained, enabling an empirical investigation of posited relationships between naturalistic encounter experiences and specific perceptual-personality variables that are hypothesized to facilitate people's sensitivity to internally and externally-generated stimuli—and hence—anomalous experiences.

5.2 BACKGROUND AND HYPOTHESES

5.2.1 PERCEPTUAL-PERSONALITY VARIABLES AND HAUNT EXPERIENCES

Haynes (1986) suggested that people have different thresholds for experiencing apparitions, similar to differences in pain thresholds. Recent research on the concept of transliminality provides some support for this basic view. Transliminality is the “hypothesised tendency for psychological material to cross thresholds into or out of consciousness” (Thalbourne & Houran, 2000, p. 853). This construct was already anticipated as early as William James (1902/1982) and Myers (1903), but it was only recently given empirical definition and measurement by Thalbourne (1998) in terms of a 29-item true/false scale and later a Rasch scaled 17-item version (Lange, Thalbourne et al., 2000).

High scores on transliminality correlate with experiences of apparitions and kindred phenomena (Houran & Thalbourne, 2001a), which suggests that experiencers possess an “encounter-prone” trait. However, transliminality may function as a state variable as well, particularly when the situational context is conducive to the production and experience of large amounts of imagery, ideation, affect, and perception (Houran & Thalbourne, 2001b).

One such powerful situational context is expectation. For instance, approximately

one hundred years ago, Slosson (1899) studied the spatial-temporal spreading of ambiguous perceptions among groups of observers. During a classroom demonstration Slosson poured perfectly odorless distilled water over a cotton ball and led students to believe that it was a chemical with a strong odor which nobody had ever smelled before. He asked them to raise their hands as soon as they got aware of the odor. Slosson described how, within fifteen seconds, most persons sitting in the front row had raised their hands. Whether as a consequence of peer pressure or of genuine olfactory hallucinations (or both), students sitting towards the back of the room gradually indicated awareness of the odor, and within a minute about three quarters of the observers had raised their hands.

More recently, O'Mahony (1978), in the course of a television program about the chemical senses, told viewers that recent research would allow smells to be transmitted by sound and that on sending a particular tone viewers would be able to "synesthetically" experience an odor. Because the television program (along with a parallel radio version) was broadcast in the late evening, viewers were told that the tone chosen would not correspond to any smell typically present in average households at that time of day. Rather, they were lead to expect a "pleasant country smell." Viewers were asked to communicate their experiences by phone or in writing, irrespective of whether the transmission was successful. After sending a tone (a standard Dolby tuning sound) of ten seconds duration, a total of 179 listener reports were received within the next 24 hours. While twenty-four individuals reported that they had not smelled anything, 155 people reported a variety of odors, mostly of hay, grass, leaves or fruit. In addition, some attributed one or more of the following effects to the experimental sound: sneezing,

sudden clearing of the nose, attacks of hay fever, vibrations across the bridge of the nose. Similar mechanisms may play a role in some haunts. In particular, the suggestion that a particular environment is associated with unusual experiences has likewise been shown to induce physical complaints, physiological alterations, and hallucinations (Orne, 1962; Lange & Houran, 1997). Furthermore, there is evidence that hallucinatory experiences occur more frequently under periods of stress or when people are exposed to environments that either are lacking in stimuli or are noisy (Slade & Bentall, 1988). The work of Bentall (1990, 2000) should be consulted for more detailed discussions of these issues.

Given the consistently positive relationships between subjective paranormal belief and experiences and hypochondriasis and somatization syndromes (cf. Chapter 4, Section 4.2.2), it is not surprising that some authors have likened haunts and poltergeists to episodes of contagious psychogenic illness (Lange & Houran, 1998, 1999) or so-called environmental illnesses (Jawer, 2000) such as “sick building syndrome.” Either of these views might predict that haunt experiences are positively related to hyperesthesia, a heightened sensitivity to environmental stimuli. This prediction recently received some support from the study in Chapter 4 in which a significant positive relationship was found between hyperesthesia [as measured by the Sensitivity subscale of Hartmann’s (1991) Boundary Questionnaire] and self-reported encounter experiences.

Interestingly, the study of apparitions led to the concept of waking dreams and metachoric experiences (Green, 1990), which Werner (1948) regarded as examples of syncretic cognition. Syncretic cognition entails an undifferentiation of perceptual qualities in subjective experience, such as synesthesia (cross-modal experiencing),

structural eidetic imagery, and psychological absorption. Therefore, apparitions might represent the experiential blending together of sensations, cognitions and emotions. Anthropologists Ember and Ember (1988) envisioned such a process to account for ghosts—

There are many cues in everyday experience that are associated with a loved one, and even after...death those cues might arouse the feeling that the dead person is still somehow present. The opening of a door, the smell of tobacco or cologne in a room, may evoke the idea that the person is still present, if only for a moment. Then, too, loved ones live on in dreams. Small wonder, then, that most societies believe in ghosts (p.420).

Consistent with this view, Glicksohn and colleagues (Glicksohn, Salinger, & Roychman, 1992; Glicksohn, Steinbach, & Elimalach-Malmilyan, 1999) have repeatedly found that synesthesia is related to eidetic imagery, which in turn has been implicated in some apparitional experiences (e.g., Martin, 1915; Osis, 1986). Similarly, Jacome (1999) reported in a recent case study that a woman diagnosed with multiple sclerosis and temporal lobe epilepsy experienced general hallucinations and Lilliputian imagery with synesthetic components. However, discussions of synesthetic-like experience in the context of subjective paranormal phenomena have only recently appeared in the literature (e.g., Alvarado, 1994; Hunt, 1995; Irwin, 1985a, Ch. 8; Irwin, 1999, pp. 238-240; Irwin, 2000; Ring & Cooper, 1999; Sako & Homma, 1997; Zingrone & Alvarado, 1997).

Lastly, it is important to mention that belief in the paranormal also can be conceptualized as a perceptual-personality variable. There are at least two explanations for how this accounts for the positive relationship (Houran, 2000; Houran & Thalbourne, 2001a; Kumar & Pekala, 2001) between paranormal belief and actual haunt and poltergeist experiences. Kumar and Pekala's (2001) review of the literature indicates

paranormal belief is associated with a myriad of hypnosis-related attitudes and behaviors. Perhaps this means, as found by Irwin (1985b), that experiencers have a marked need for psychological absorption. These findings may also underscore the role of paranormal belief as a cognitive or motivational bias in individuals who are faced with information or situations that are ambiguous or uncertain (Lange & Houran, 2001). Indeed, Lange and Houran's (1998, 1999) path analyses consistently suggested that—contrary to the structural model reported by Lawrence, Edwards, Barraclough, Church, and Hetherington (1995)—paranormal beliefs elicit paranormal experiences, rather than vice versa.

It follows from this view that some believers in the paranormal tend to interpret paranormal phenomena and information only in the context in which they are presented (Snel, van der Sijde, & Wiegant; 1995; Wiseman, Greening, & Smith, submitted). For example, curious things happen when naïve subjects observe staged 'paranormal' demonstrations. Proponents of psychic phenomena ("sheep") tend to rate the demonstrations as more paranormal than disbelievers ("goats"), and these beliefs can persist even *after* debriefing (French, 1992; Smith, 1992-1993; Wiseman & Morris, 1995). Apparently for some people, the paranormal is the preferred explanation even when such beliefs conflict with the empirical evidence that is available (Krippner & Hastings, 1961).

However, the consistently strong relationship between paranormal belief and paranormal experience can be interpreted in other ways. Gertrude Schmeidler (1952; Schmeidler & McConnell, 1958) demonstrated that attitudes affect putative psi performance. In particular, she noticed the tendency for "sheep" to score above mean chance expectation on ESP tests and for "goats" to score significantly below chance

level. Schmeidler (1966; Moss & Schmeidler, 1968; Maher & Schmeidler, 1975) later applied this basic idea to investigations of haunts. She had experimentally-blind “sensitives” (self-described psychics) and later control groups visit reportedly haunted sites and mark floorplans where they perceived anomalous phenomena. Significant relationships were obtained between the areas marked by the sensitives and the areas indicated by previous witnesses. Additional studies using this methodology have yielded similarly robust effects (for a review see: Maher, 1999).

In summary, psychological and parapsychological studies suggest that self-reported haunt experiences (frequency and phenomenology of reports) are facilitated by:

1. Transliminality
2. Expectation
3. Hypochondriacal-Somatic Tendencies
4. Hyperesthesia
5. Synesthesia
6. Belief in the Paranormal

5.2.2 HYPOTHESES

The main objective of this study was to test the hypothesis that scores on RTS, Expectation, Hypochondriacal-somatic Tendencies, Hyperesthesia, Synesthesia, and Paranormal Belief are related to patterns in naturalistic haunt experiences. In addition, it was of interest to conceptually replicate Houran and Lange’s (2001a) finding that haunt and poltergeist-like phenomena form a unidimensional Rasch (1960/1980) hierarchy of events. Furthermore, it is not known which of the above variables is most salient in relation to the others. The premise of this thesis argues that transliminality should be the

most significant predictor variable, as the construct is hypothesized to underlie most if not all of the other psychological concepts. Three formal hypotheses and one exploratory hypothesis were to be tested:

1. Scores on the measures of the RTS, participant Expectation, WI (hypochondriasis), Hyperesthesia, Synesthesia, and paranormal belief (New Age Philosophy and Traditional Paranormal Beliefs) distinguish haunt Experiencers from Non-Experiencers.
2. Scores on the measures of the RTS, participant Expectation, WI (hypochondriasis), Hyperesthesia, Synesthesia, and paranormal belief (New Age Philosophy and Traditional Paranormal Beliefs) predict the number of anomalous experiences reported by participants.
3. Scores on the measures of the RTS, participant Expectation, WI (hypochondriasis), Hyperesthesia, Synesthesia, and paranormal belief (New Age Philosophy and Traditional Paranormal Beliefs) predict the number of different modalities that define anomalous experiences reported by participants.
4. *Exploratory*: It was to be determined whether certain types of haunt experiences reflect syncretic cognition, while other types reflect an attentional bias to physical events in the environment. This latter aspect follows from the suggestion in Chapter 4 that paranormal (and psychosomatic experiences) derive from an attributional cognitive style, which in this case incorporates a belief in the paranormal.

5.2.3 "THE EDINBURGH GHOST PROJECT"

The present research, conducted in the context of a larger study (Experiment Two

from Wiseman et al., 2003), took place in part of the South Bridge Vaults in Edinburgh, Scotland. Edinburgh's South Bridge was constructed in the late eighteenth century to ease transportation problems in the city. The Bridge consisted of nineteen huge stone arches supporting a wide road lined with several three-story buildings. A series of "Vaults" (small chambers, rooms, and corridors) were built into the Bridge's arches to house workshops, storage areas, and accommodation for the poor (Henderson, 1999). However, ineffective water proofing and overcrowding meant that by the mid-nineteenth century the Vaults had degenerated into a disease-ridden slum. The area was abandoned during the late nineteenth century, but rediscovered and opened for public tours in 1997. Today, the Vaults may be described as having variable lighting (some areas have dim but electric lighting while others are only illuminated with candlelight), musty and/or damp in areas, uneven dirt flooring, generally cool in temperature, and with minimal ventilation.

During some of the tours, both members of the public and tour guides have experienced many unusual phenomena, including a strong sense of presence, visual apparitions, and phantom footsteps (Wilson, Brogan, & Hollinrake, 1999). Popular books and television documentaries have disseminated these accounts potentially worldwide. As a result, the Vaults have acquired a local and perhaps international reputation for being one of the most "haunted" parts of Scotland's capital city. This fact might call into question the legitimacy of this case or any experiences subsequently reported by those exposed to these initial reports. Nevertheless, the leader of the "Edinburgh Ghost Project" Richard Wiseman, Ph.D. (R.W.), was impressed with the sincerity of the first-hand testimony from the tour guides. Thus, this site was deemed worthy of investigation even

though it could be argued that this case is too new to warrant being regarded as a haunt with typical features, such as a long history of similar experiences (shared by two or more people simultaneously) reported by independent parties with no advance knowledge of the case. Irrespective of any evidential value this case has for parapsychological purposes, the location seemed promising for facilitating transliminal (syncretic-like) experiences in participants from the general population. Thus, the site was deemed appropriate for the specific aims of this study.

“The Edinburgh Ghost Project” was part of the *International Edinburgh Science Festival* (April, 2001). The project was advertised in the festival’s program and in many local newspapers. Those interested in participating in the study telephoned the festival’s box office to purchase tickets for a certain time. These self-selected participants took part in one of six daily sessions held over the course of four days (two separate weekends). Each session involved a maximum of ten people.

The first part took place in a private function room close to the Vaults. Participants arrived at the time predetermined by the box office, sat down on a row of chairs, and R.W. provided a brief introduction about how participants would soon visit one Vault each and subsequently record the details concerning any of their anomalous experiences. R.W. and each of the assistant experimenters were blind to the hypotheses stated above. Face Sheets (see Appendix I) asking about demographics (age, gender) were attached to clipboards that were randomly arranged on these chairs, and participants were allowed to choose their own seats. The Face Sheet also contained a number that corresponded to a specific Vault the participant would later visit. Thus, this procedure was meant to randomize the participants in each session across the ten Vaults. The ten

Vaults were ranked according to the number of previous experiences associated with them as reported by tour guides and visitors (this ranking is later referred to as the 'haunted order'). Accordingly, there were five "active" or target Vaults and five "inactive" or control Vaults. The Mercat Tours company operates the South Bridge Vaults, and one of their senior employees performed this ranking. All on-site experimenters were blind to this ranking, and all experimenters were blind as to the participants' responses on the Face Sheet.

5.3 METHOD

5.3.1 PARTICIPANTS

Wiseman et al.'s (2003, Experiment Two) original sample consisted of 218 participants ($M_{\text{age}} = 35.3$ yrs, $SD = 13.2$, range = 11-77 yrs, 58% women) who completed the experimental protocol from the Edinburgh Ghost Project (described in more detail below). Of this sample, 142 packets were returned (65 % return rate), but eight of these had to be discarded due to missing information. This left the responses of 134 participants (61% of original sample; $M_{\text{age}} = 34.6$ yrs, $SD = 12.2$, range = 16-74 yrs, 62% women) for analysis. This return rate is considered good by most standards in the social sciences (Bickman & Rog, 1998), but it is possible that there could have been a marked tendency for people to return their packet only if their experiences were consonant with their expectations. Such biases could side with either a skeptical or non-skeptical response style on the questionnaires, as is noted above. However, Table 5.2 shows that the present sample can be characterized as having an average level of paranormal belief measured via Lange, Irwin, and Houran's (2000a) Rasch scaled version of the Revised Paranormal Belief Scale (Tobacyk, 1988), a low expectation of

experiencing anomalies in the South Bridge Vaults, and apparently little if any conscious prior knowledge about details concerning the Vaults ($M = -.81$, $SD = .51$; Index of Prior Knowledge scores range from -1 to 1).

5.3.2 MEASURES

In addition to the Face Sheet noted above, the participants completed five measures arranged in counterbalanced order:

- (i) Lange, Thalbourne, et al.'s (2000) RTS (Form B), described in Chapter 1. See Appendix A.
- (ii) Lange, Irwin et al.'s (2000) Rasch version of the RPBS (Tobacyk, 1988). This consists of 26 statements rated on a 7-point Likert scale. Two subscales are computed: New Age Philosophy (11 items) and Traditional Paranormal Beliefs (5 items). High scores on each subscale reflect higher levels of belief. See Appendix D.
- (iii) Tellegen's Synesthesia Scale. This index consists of seven true/false items constructed by Tellegen as a result of factor analysis of his Absorption Scale (Tellegen & Atkinson, 1974). The alpha was 0.68 in a study of 295 students (further analysis of Thalbourne, 1998), and 0.76 in another study of 115 people from the general population (further analysis of Thalbourne et al., 1997, Study 5). Representative items include, "Different colors have distinctive and special meanings for me," "Sometimes I can change a noise into music by the way I listen to it," and "I find that different odors have different colors." Rather than measuring synesthesia as defined in rigid neurological terms, this scale likely addresses forms of "pseudosynesthesia"

as well, e.g., artistic metaphor and experiencing synesthesia through drug use. However, some authors (e.g., da Costa, 1996; van Campen, 1999) argue that synesthetic-like experience can include strong emotional components, and consistent with Ember and Ember's (1988) view of ghosts, there is evidence that imagery contextualizes emotion (Kunzendorf et al., 1999-2000).

Therefore, Tellegen's Synesthesia Scale is perhaps best regarded as a measure of "weak" synesthesia, which pertains to cross-sensory correspondences expressed through language, perceptual similarity, and perceptual interactions during information processing (Martino & Marks, 2001). See Appendix J.

- (iv) **Hyperesthesia.** This measure is taken from Thalbourne (1996) and consists of six true/false items. These items reflect strong reactions to environmental stimuli and were chosen mainly from the MMPI and the Perceptual Aberration Scale. The alpha was 0.63 in one study of 99 students (further analysis of Thalbourne, 1996), and 0.62 in another study of 298 students (further analysis of Thalbourne, 1998). Three of the test items overlap with items on the RTS, so these were excluded from the scoring of the present scale. Thus, hyperesthesia was indexed by the following three questions: "Ordinary colors sometimes seem much too bright to me (without taking drugs)," "My hearing is sometimes so sensitive that ordinary sounds become uncomfortable," and "At times I hear so well it bothers me." These questions are limited to aspects of visual and acoustic hyperesthesia, but these varieties are well recognized in the field of neuroscience (see e.g., Bohnen, Twijmstra, Wijnen, & Jolles, 1992). The Hyperesthesia Scale and Tellegen's Synesthesia

Scale were administered in a single questionnaire format (see Appendix J).

- (v) Whiteley Index (WI: Pilowsky, 1967). This 14-item true/false test is one of the most commonly used self-rating scales for hypochondriacal tendencies. As noted in Chapter 4, this instrument has good reliability and validity. See Appendix F.

5.3.3 PROCEDURE

Arrangements were made with R.W. to test the previously stated hypotheses in the context of his larger study on haunts. This approach was used since R.W. had convenient access to a large number of potential participants, and further, the location and context of the experiment fit with psychological variables that theoretically would facilitate dramatic syncretic cognitions (such as hallucinations and awareness of somatosensory phenomena).

At the start of the experiment, R.W. briefly outlined the purpose of the study, and then asked participants to complete the questions on the Face Sheet. Among these questions was an index of the participants' expectations of having an experience during the session: "Do you expect to experience any unusual phenomena in The South Bridge Vaults today?" This index of Participant Expectation had five response options: Definitely Yes (scored 2), Probably Yes (scored 1), Uncertain (scored 0), Probably No (scored -1), and Definitely No (scored -2). Participants were also asked to rate their Prior Knowledge about the South Bridge Vaults before taking part in the session: "Have you heard (e.g., from acquaintances, television programmes or newspaper articles), *where* in The South Bridge Vaults people have reported experiencing unusual phenomena?" This question had three response options: Yes (scored 1), Uncertain (scored 0), and No

(scored -1). Participants were informed in writing that their responses were confidential.

As part of the participants' informed consent, it was made clear that anyone could terminate their participation in the study at any time without penalty. Indeed, several people declined to participate further after the second author outlined the protocol due to their apprehension about having an anomalous experience in the Vaults. The Face Sheet data from these individuals and those few who did not show up for the study were excluded from the database. There was no difference in the distribution of active/ inactive sites between participants and drop-outs. For those participants who remained to complete the study, several experimenters were available for assistance and counseling in the event that participants became anxious or otherwise upset during the proceedings.

Mercat Tours required that one of their employees facilitate the basic operation of the sessions due to safety and legal issues. This assistant experimenter was blind to the participants' responses on the Face Sheet and the hypotheses of this study, but it must be pointed out that this assistant experimenter had extended contact with the participants in addition to detailed knowledge of the previous haunt reports. Thus, there is a risk of verbal or nonverbal cueing from this assistant experimenter to our participants. Possible advance (if unconscious) knowledge, including other forms of cueing, is always a serious concern in investigations of publicized cases. This is an important limitation of the protocol, and one that exists to one degree or another in other published investigations (see e.g., Maher, 2000; Maher & Hansen, 1995). R.W. and this assistant experimenter discussed the issue of cueing, and it was agreed that the assistant experimenter would neither provide any information to the participants or other experimenters nor allow participants to talk among themselves throughout the study.

The assistant experimenter escorted participants individually to their assigned Vault, while other assistant experimenters monitored these actions to help guard against cueing. Participants were given exactly ten minutes to spend alone in their assigned Vault, during which the participants were instructed to spend a few minutes quietly standing in their area, and then document in narrative form any unusual experiences no matter how faint they might be. The reverse side of the Face Sheet contained specific sections for these narratives (see Appendix I). The assistant experimenter then escorted the participant from the Vault. After returning their Face Sheets to the assistant experimenter, participants were given a packet containing the instruments used in this study to complete and mail back to R.W. Most packets were returned within two weeks, and all were returned within four weeks. R.W. subsequently collated the packets for the author to analyze.

Validity issues with *post hoc* testing are always a concern, but there are possible advantages of this approach in relation to the present study. Time restrictions at the *Edinburgh International Science Festival* prevented the administration of the relevant measures during the experimental sessions. However, the strong context effects associated with the present procedure could have significantly distorted participants' responses to these psychological tests if this approach had been adopted. For instance, skeptically minded participants could have over-endorsed items that entailed a conventional explanation for anomalous experiences, whereas strong believers in the paranormal might have under-endorsed the same items for similar reasons.

Furthermore, state factors imposed by our proceedings likely would have influenced the participants' responses to some of the psychological tests, such as the

Revised Transliminality Scale (for a discussion of this, see Houran & Thalbourne, 2001b). Therefore, administering the tests in a large group format either immediately prior to or immediately after the experimental sessions could have encouraged serious response biases. To minimize these artifacts it was decided to have participants complete the psychological tests on their own and return them as promptly as possible. This approach had the added benefit of allowing participants to take their time answering the tests in a private atmosphere, thereby further insulating respondents from experimenter expectations (Bickman & Rog, 1998). This is a significant concern in parapsychological studies, including those that are based solely on questionnaires (Watt & Wiseman, 2002).

Nevertheless, the *post hoc* approach was not ideal and limits the conclusions drawn from this study. Therefore, an improved protocol is outlined later in this chapter for use in replication studies.

5.4 RESULTS

5.4.1 PATTERNS IN THE REPORTED HAUNT EXPERIENCES

None of the assistant experimenters reported any anomalous experiences during their extensive time in the Vaults, which totaled approximately twenty-four, non-continuous hours. This included both private time before the participants arrived and after they had left, as well as during the actual experimental proceedings. By contrast, sixty-six participants (49%) had at least one anomalous experience during the session, with the mean number of experiences for this group being 2.36 ($SD = 1.58$, range = 1-8) and the mean number of different categories (cf. Table 5.1: temperature changes, auditory perceptions, bodily sensations, physical manifestations, visual apparitions/imagery, emotional responses, olfactory perceptions, and sensed presence) of experiences being

1.76 ($SD = .88$, range = 1-5). The incidence of experiences is higher than the mean of .71 ($SD = 1.17$, range 0-7) that Houran and Lange (2001a) observed for their sample of 865 people who completed the eight-item 'Poltergeist' subscale of the Anomalous Experiences Inventory (Kumar & Pekala, 2001) during a survey. Our present sample also averaged more experiences than Lange and Houran's (1997, p. 1457) sample of eleven people who toured a reputedly haunted location for approximately 30 minutes and whose anomalous experiences were facilitated via expectation and suggestion effects.

Table 5.1: Item Locations and Fit Statistics for the Rasch Analysis of the Reported Haunt Experiences ($N = 134$)

	%	Item Location (in logits, δ)	SE	Infit	Outfit
Temperature Changes	67.6	0.57	0.15	0.7	0.7
Auditory Perceptions	54.4	0.79	0.16	1.3	1.1
Bodily Sensations	36.8	1.18	0.20	1.1	1.0
Physical Manifestations	20.6	1.76	0.27	1.1	0.7
Visual Apparitions and Imagery	19.1	1.83	0.28	1.3	1.1
Emotional Responses	16.2	2.00	0.30	1.0	1.2
Olfactory Perceptions	11.8	2.32	0.35	0.9	1.1
Sensed Presence	8.8	2.60	0.41	1.2	0.8

Table 5.1 gives the distribution of the various categories of experience reported by the participants. These categories were predefined in light of the original classification system proposed by Lange, Houran, Harte, and Havens (1996; cf. Houran, 2000). By far, most experiences involved a perceived change in temperature, sounds, or physiological alterations, but there were a few reports of dramatic experiences such as visual apparitions or the inexplicable onset of strong emotions. One woman in particular had to be counseled by the author while she was in her assigned Vault in order to end her

session and leave the site. The woman was literally engrossed in her experiences and needed to be eased back into a normal waking state of consciousness. The author spent some time with her afterwards as well to ensure her welfare. This particular woman regarded her session over all as a wonderfully positive experience. Other participants commented about the profound negative and positive effects of even subtle experiences⁶.

As in Houran and Lange (2001a), Rasch scaling was used to obtain a linear measure of the experiences' occurrence. Specifically, the frequency by which each experience was reported was modeled as the outcome of a Poisson process. The notion that haunt experiences define a probabilistic response hierarchy does not simply mean that experiences differ with respect to their endorsement rates. Rather, Rasch scaling requires that a scale of haunt experience forms a (latent) quantitative dimension on which *each* respondent and *each* type of haunt experience assume a position (see e.g., Bond & Fox, 2001). These positions reflect respondents' trait levels and the trait level implied by the item, respectively, and together they determine the likelihood of a given response on the scale. These item and person locations (also called, item and person *measures*) are expressed in a common *Logit* (δ) metric (Wright & Masters, 1982). Fit of the Rasch model implies that items form a hierarchy that reflects the structure of the variable, thus establishing construct validity (Bond & Fox, 2001) by defining the variable's semantics (for a recent discussion, see Lange, Irwin, & Houran, 2001). For instance, given the item and person locations described above, the Rasch model implies that higher response categories should have a greater probability of being selected for items with lower locations than for items with higher locations. Also, respondents with higher trait levels

⁶ Refer to the work of Arthur Hastings (1983; Targ & Hastings, 1987) for a discussion of how to approach paranormal experiences within a clinical context. See also Coly and McMahan (1993).

should be more likely to give higher ratings than are respondents with lower trait levels. Finally, both properties should hold across *all* respondents, items, and response categories. It can be shown (see e.g., Wright & Masters, 1982) that when these requirements are fulfilled, the resulting variable has the property that the responses of those with lower trait levels are probabilistic subsets of those with higher trait levels.

The fit statistics shown in Table 5.1 indicate that this approach is a suitable one, as the infit and outfit statistics of all items fall inside the range 0.7 to 1.3. Further, as is customary in Rasch scaling (Linacre & Wright, 2000), the items' poisson parameters were rescaled to obtain an average person measure of 0 and the adjusted δ values are shown in column 3 of Table 5.1. These results indicate that the experiences reported at the South Bridge vaults constituted a probabilistic hierarchy of events, which was not confounded by gender bias ($\chi^2 = 7.4$, $df = 16$, *ns*).

The hierarchy of experiences associated with the South Bridge Vaults does not fully agree with the Rasch order of four other items that share similar thematic content that Houran and Lange (2001a) reported previously. There are many possible reasons for this discrepancy. Differences between the two studies in terms of instruments, environments, instructional sets, and implicit demands could be confounds. The discrepancy could also imply that a probabilistic hierarchy of haunt perceptions is idiosyncratic to specific environments. Nevertheless, there does appear to be some agreement regarding the sequence of general *themes* common to the two hierarchies. In both hierarchies, experiences of a more subjective nature tend to be endorsed more easily, followed by perceptions of physical manifestations, and finally the most extreme types of experiences revert back again to a subjective nature.

Comparisons and contrasts between the two hierarchies cannot be pushed too far given the caveats noted above. Still, research is planned to test the idea that hierarchies vary according to the environment in which the experiences occur. Interesting theoretical and methodological benefits would follow from this inquiry. For example, different Rasch hierarchies might differentiate cases based on fraud, imagination, or electromagnetic activity. Thus, future work in this area might eventually yield a heuristic to guide field researchers in determining the likely cause of a given case. In this way, investigators will have a valuable tool to screen initial reports and subsequently better allocate resources to the study of those cases with likely evidential value.

5.4.2 EXPERIENTS VS NON-EXPERIENTS

Descriptive statistics (mean and standard deviation) for the independent variables are given in Table 5.2.

Table 5.2: Descriptive Statistics on the Research Measures for the Complete Sample ($N = 134$), Haunt Experiencers ($N = 66$), and Non-Experiencers ($N = 68$)

<i>Measure</i>	<i>Full Sample</i>		<i>Experiencers</i>		<i>Non-Experiencers</i>	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
RTS	22.61	3.71	23.35	3.74	21.89	3.56
WI (hypochondriasis)	3.27	2.39	3.36	2.26	3.18	2.53
Synesthesia	3.46	1.98	3.83	2.08	3.10	1.83
Hyperesthesia	.87	1.12	1.18	1.29	.56	.82
New Age Philosophy	26.19	15.65	31.41	15.19	21.13	14.49
Traditional Paranormal Beliefs	11.55	7.35	14.18	7.38	9.00	6.41
Participant Expectation	-.52	.76	-.27	.65	-.76	.79

To assess the relation between the perceptual-personality variables and the occurrence of haunt experiences, a standard logistic regression analysis was performed with scores on Participant Expectation, New Age Philosophy, Traditional Paranormal Beliefs, RTS, WI (hypochondriasis), Synesthesia, and Hyperesthesia as predictors of Experient Status (experient vs. non-experient). A logistic regression determines which variables serve differentially to predict group membership and is especially useful when one or more of the individual predictor variables is not normally distributed (Tabachnick & Fidell, 1996). In a standard logistic regression analysis all predictor variables are entered simultaneously. The analysis evidenced a significant multivariate result ($-2 \log \text{likelihood} = 152.9$, goodness of fit = 128.0, $\chi^2 [7, N = 134] = 32.88, p \leq .0001$). That is, the set of independent variables predicted group membership to a significantly better degree than a model in which the difference between groups was a simple constant. There were no problems with multicollinearity of the independent variables (Tabachnick & Fidell, 1996, p. 618).

A summary of the analysis is given in Table 5.3, which gives the regression coefficients and their standard errors, the results of Wald's test with associated degrees of freedom and level of significance, and the multivariate correlations. According to the associated classification matrix, the logistic regression equation correctly identified 70% (46 of 66) experients in the sample and 69% (47 of 68) of non-experients. The only predictor variables that independently discriminated experients from non-experients were Hyperesthesia ($R = .156, p = .012$), Traditional Paranormal Belief ($R = .126, p = .026$), and Participant Expectation ($R = .105, p = .045$). It can be seen that these predictor variables explain little of the variance independently, but the *collective* effect of the seven

perceptual-personality variables was a robust predictor of whether a person did or did not have an experience.

Table 5.3: Standard Logistic Regression of Transliminality, Somaticism, Synesthesia, Hyperesthesia, New Age Philosophy, Traditional Paranormal Beliefs, and Participant Expectation on Haunt Experience (Experient vs Non-Experient) ($N = 134$)

<i>Variable</i>	<i>B</i>	<i>SE</i>	<i>Wald</i>	<i>Df</i>	<i>p</i>	<i>R</i>
Transliminality	-.057	.007	.534	1	.465	.000
Hypochondriasis	-.034	.088	.151	1	.694	.000
Synesthesia	.160	.125	1.628	1	.202	.000
Hyperesthesia	.560	.219	6.498	1	.011	.156
New Age Philosophy	-.000	.020	.000	1	.988	.000
Traditional Paranormal Beliefs	.086	.039	4.931	1	.026	.126
Participant Expectation	.638	.318	4.04	1	.045	.105

5.4.3 ASSOCIATIONS AMONG THE PERCEPTUAL-PERSONALITY VARIABLES AND THEIR RELATION TO THE REPORTED HAUNT EXPERIENCES

To better understand the relationships between the perceptual-personality variables and participants' reported number of experiences and reported number of different categories of experience, conservative Spearman rank-order correlations (two-tailed) were calculated among all of the measures (see Table 5.4).

Table 5.4: Spearman Rank-Order Correlations Between Age, Sex, Variables Related to Haunt Experience, and Research Measures for Complete Sample (N = 134)

	1	2		4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
	Sex (female)	Age	Temp	Visual	Aud	Phys Event	Emot	Sens Pres	Bod Sens	Olfac	Sum Types	Sum Exp	Expect	Somatic	Synes	Hypers	Trans	NAP	TPB
1	-	.02	.13	-.01	-.02	-.01	.03	.14	.18*	.07	.13	.13	.04	.19*	.17*	.09	.14	.20*	.18*
2		-	.04	.05	-.00	-.04	.06	.08	.03	.12	.03	.06	-.10	-.07	.04	.01	-.03	-.03	-.12
3			-	.16	.16	.20*	-.01	.26**	.29***	.11	.69***	.67***	.24**	.03	.04	.16	.08	.20*	.18*
4				-	-.04	.02	.26**	.12	.05	-.07	.34***	.35***	.13	-.02	-.04	.28***	.13	.15	.09
5					-	.26**	-.04	-.08	-.05	.07	.46***	.53***	.13	.03	.11	-.01	.07	.10	.11
6						-	-.08	.28***	.15	-.07	.41***	.39***	.15	.06	.01	-.02	.01	.10	.09
7							-	-.05	.16	-.07	.27***	.25**	.03	.03	.06	.17*	.12	.08	.01
8								-	.06	-.04	.27**	.23**	.08	.03	-.02	.09	.04	.06	.01
9									-	.09	.48***	.45***	.23**	.12	.20*	.25**	.23**	.24**	.21*
10										-	.28**	.28**	.20*	.09	.18*	.09	.13	.13	.16
11											-	.98***	.35***	.09	.17*	.27***	.21*	.31***	.30***
12												-	.37***	.11	.18*	.25**	.22**	.34***	.32***
13													-	-.06	.11	.14	.16	.50***	.46***
14														-	.13	.19*	.22*	.20*	.12
15															-	.21*	.61***	.34***	.17
16																-	.42***	.30***	.11
17																	-	.52***	.33***
18																		-	.69***

Note. Temp = Temperature Change; Aud = Auditory; Phys Event = Physical Manifestation; Emot = Emotion; Sens Pres = Sensed Presence; Bod Sens = Bodily Sensation; Olfac = Olfactory; Sum Types = Total Number of Different Categories of Experience; Sum Exp = Total Number of Experiences; Expect = Participant Expectation; Synes = Synesthesia; Hypers = Hyperesthesia; Trans = Transliminality; NAP = New Age Philosophy; TPB = Traditional Paranormal Belief. * $p \leq .05$, ** $p \leq .01$, *** $p \leq .001$ (sig given Bonferroni adjustment for multiple analyses).

Two multiple regression analyses (standard method) were conducted to assess which of the seven perceptual-personality characteristics (RTS, Expectation, WI, Synesthesia, Hyperesthesia, New Age Philosophy, and Traditional Paranormal Beliefs) were the best predictors of the number of reported haunt experiences and the number of different categories of haunt experience.

Predicting Total Number of Reported Haunt Experiences. The multiple correlation R for the regression was significantly different from zero, $R = .39$, $R^2 = .15$, $F(7, 127) = 3.30$, $p = .003$; that is, the total number of reported experiences was significantly related to the set of independent variables. Altogether, scores on the RTS, Expectation, WI (hypochondriacal tendencies), Synesthesia, Hyperesthesia, New Age Philosophy, and Traditional Paranormal Beliefs predicted 15% (or 11% adjusted, adjusted $R^2 = .11$) of the variability in the number of reported haunt experiences. Only one of the independent variables contributed significantly ($p \leq .05$) to the prediction of number of reported haunt experiences: Participant Expectation (beta = .21, $sr^2 = .03$).

Predicting Total Number of Different Categories of Reported Haunt Experience. The multiple correlation R for the regression was significantly different from zero, $R = .44$, $R^2 = .19$, $F(7, 127) = 4.27$, $p \leq .001$; that is, the total number of different categories of experience was significantly related to the set of independent variables. Altogether, scores on the RTS, Expectation, WI (hypochondriacal tendencies), Synesthesia, Hyperesthesia, New Age Philosophy, and Traditional Paranormal Beliefs predicted 19% (or 15% adjusted, adjusted $R^2 = .15$) of the variability in the number of different categories of experience. Only one of the independent variables contributed significantly ($p = .005$) to the prediction of number of reported haunt experiences: Hyperesthesia (beta

= .26, $sr^2 = .05$). Participant Expectation was of marginal significance (beta = .18, $p = .058$, $sr^2 = .02$).

These findings suggest that relative to the contribution of the other independent variables, the number of experiences the participants reported was more a function of their level of expectation of having an anomalous experience, while the number of different categories of experiences participants reported was more a function of their sensitivity to visual and acoustic stimuli, perhaps with the added effect of expectation.

Based on previous work linking transliminality to “entity encounter experiences” (Houran & Thalbourne, 2001a), it was expected that RTS scores would have played a greater role in predicting the patterns of reported experiences. Besides a restriction in range of scores, one possibility for the weak effects of transliminality is that the component of hyperesthesia played a more important role than did other core constituents of transliminality. Also, it is feasible that the physical environment to which the participants were exposed contained several sources of vivid external stimuli, such as light levels exterior to the test areas, floorspace, and the height of the vaulted ceilings, which Wiseman et al. (2003) found to positively correlate with the ‘haunted order’ of the Vaults (rho’s = .74, $p = .03$; .73, $p = .03$; and .65, $p = .05$, respectively) and with the mean number of participants’ experiences (rho’s = .84, $p = .01$; .58, $p = .08$; and .64, $p = .05$, respectively). Furthermore, it is conceivable that various areas of the Vaults could be prone to infrasound effects that are hypothesized to elicit unusual sensory experiences as well (Tandy, 2000; Tandy & Lawrence, 1998). Thus, such conditions may have produced unusual sensory effects that even participants with low transliminality could have easily experienced and subsequently interpreted as being “ghostly.”

However, it is clear that while transliminality was not a prerequisite for perceiving phenomena at the South Bridge Vaults, transliminality certainly facilitated experiences. In particular, *post hoc* analyses revealed that participants with scores above the Rasch mean on the RTS ($N = 21$) reported significantly [$t(132) = -2.95, p = .004$, two-tailed] more experiences ($M = 2.10, SD = 2.28$) than those with low to average Rasch scores on the RTS ($N = 113, M = .99, SD = 1.41$). Likewise, participants with scores above the Rasch mean on the RTS reported significantly [$t(132) = -2.91, p = .004$, two-tailed] more different categories of experience ($M = 1.50, SD = 1.44$) than those with low to average Rasch scores on transliminality ($M = .75, SD = .96$).

5.4.4 TWO DISTINCT CLASSES OF EXPERIENCE?

Persinger and Cameron (1986) distinguished two classes of haunt and poltergeist phenomena—

These events... involve measured or inferred *physical changes* such as object movements, electrical failures, or strange sounds. Reports of *psychological experiences* include “odd feelings,” intelligible phrases, and sometimes the perception of human forms (p. 49, emphasis added by author).

Houran and Lange (1996) also argued for such a distinction, although haunt experiences may include both of these classes. The idea of two classes of experience was examined in more detail by dividing the eight categories of experience reported by the experiencers into two Classes of Experience (Psychological Experiences vs. Physical Changes). Using Persinger and Cameron’s (1986) classification scheme, the Psychological Experiences class comprised the summed total of visual apparitions (and related visual imagery), bodily sensations, emotional responses, and sensed presences. This category arguably overlaps with Werner’s (1948) notion of syncretic experience.

The Physical Changes class consisted of the summed total of temperature changes, auditory experiences, physical manifestations, and olfactory experiences. Auditory and olfactory experiences were designated as Physical Changes due to the way participants described these experiences. In other words, these phenomena seemed to reflect actual environmental stimuli available to the participants, as opposed to hallucinatory-type stimuli. For instance, the auditory phenomena primarily consisted of ambiguous sounds rather than intelligible phrases. Likewise, the olfactory experiences corresponded to natural stimuli in the Vaults.

Table 5.5 gives the correlations between these two classes of experience and the perceptual-personality variables. The two classes significantly correlate ($r_{ho} = .21, p = .013$), but share only 4% of the variance in the rank orders. Taken together with their differential relations to the research measures, the two classes of experience can be differentiated and therefore may have different sources. Psychological Experiences showed significant correlations with six (perceptual-personality traits and belief in the paranormal) of the seven variables, but statistical tests of difference (Hinkle et al., 1988) on these correlations indicated that Physical Changes did not correlate as well with the perceptual-personality variables. In particular, Physical Changes only correlated to a small degree with Participant Expectation and Belief in the Paranormal. Statistical tests of difference on the correlations between the two Classes of Experience and these three variables nevertheless were non-significant.

Table 5.5: Tests of Differences (two-tailed) in Spearman Rank-Order Correlations Between Class of Experience (Psychological Experience vs. Physical Changes) and Perceptual-Personality Variables for Complete Sample ($N = 134$)

<i>Variable</i>	<i>Psychological Experiences</i>	<i>Physical Changes</i>	<i>t</i> (131)
RTS	.27**	.11	3.78***
WI (hypochondriasis)	.09	.08	0.00
Synesthesia	.14	.14	--
Hyperesthesia	.38***	.10	4.01***
Participant Expectation	.25**	.32***	.69
New Age Philosophy	.28***	.24**	.39
Traditional Paranormal Beliefs	.19*	.25**	.84

Note. No analysis was computed for Synesthesia given that the correlation coefficients were identical. *** $p \leq .001$ and significant given a Bonferroni adjustment for multiple analyses

Therefore, the Psychological Experiences label appears reasonable in that these experiences were consistently more frequently related to the perceptual-personality variables. One interpretation of this finding is that some of these anomalous perceptual experiences were partly aroused via expectation and subsequently given credence due to a belief in the paranormal (Houran & Williams, 1998). Another interpretation is that only those individuals with a high capacity for imagery, ideation, and affect had sufficiently low thresholds for perceiving ghosts or psi manifestations (Haynes, 1986).

Physical Changes were consistently independent of the perceptual-personality factors that were measured, except for the small associations with Participant Expectation and Paranormal Beliefs. Of course, future research may find that the perception of physical changes correlates with perceptual-personality variables not taken into account. Still, it is possible that the physical manifestations perceived by the participants were objective events in the environment. Some may argue that the lack of consistent relations

between Physical Changes and perceptual-personality variables argues for a psi component to some or all of these types of experiences. However, it is also plausible that the perceived physical changes were conventional stimuli that were consistent with the physical structure and location of the Vaults but were interpreted as being ‘ghostly’ in part due to the influence of expectation and belief in the paranormal (cf. Houran, 1997; Houran & Brugger, 2000).

5.5 EPILOGUE

The Edinburgh Ghost Project contributed new information to our understanding of the psychological factors attending haunt experiences at “commercial” sites. It must also be reiterated that the experiences at the South Bridge Vaults were of a pseudo-facilitated nature, i.e., they were naturalistic but not entirely spontaneous. Rather, people participated in this study knowing that the aim was to collect perceptions of ghostly phenomena in a location with a well-known reputation for being haunted. Under these conditions, pressures from priming and expectation likely introduced significant demand characteristics that resulted in the unusually high number of experiences that people reported compared to other studies (Houran & Lange, 2001a; Lange & Houran, 1997). As a result, it is not clear how well these findings generalize to genuinely spontaneous experiences in which such immediate cognitive and motivational biases—although perhaps present (Houran, 2000)—are apparently minimized.

Other confounds exist as well. For example, Wiseman et al. (2003, Experiment Two) reported that the Spearman rank-order correlation between the ‘haunted order’ of the Vaults and the mean number of anomalous experiences reported in each Vault was 0.76 ($p = .02$). That correlation actually increased to 0.87 ($p = .009$) when individuals

with conscious knowledge of the Vaults were excluded from analysis. On the face of it, this would seem to conceptually replicate the findings from field research by G. R. Schmeidler (1966; Moss & Schmeidler, 1968) and M. C. Maher (1999; Maher & Schmeidler, 1975) in that witness reports are not distributed evenly throughout the location of a haunt—rather, phenomena tend to be perceived only in certain areas. However, the possibility of unintentional cueing on the part of the tour guide in the South Bridge Vaults nullifies Wiseman et al.'s (2003, Experiment Two) correlations as reliable evidence for psi. It cannot be ruled out that some or all of the participants responded to extrasensory stimuli (including discarnate entities) in the Vaults; nevertheless, the potential for sensory leakage from the tour guide who served as an assistant experimenter combined with the significant associations between certain environmental variables and participants' reports suggests that the experiences studied here likely derived from conventional sources. Furthermore, the physical "atmosphere" of the Vaults is consistent with environmental conditions that Slade and Bentall (1988) described as being conducive to hallucinatory experiences.

Taken together with the fact that the haunt experiences reported here conformed to a probabilistic hierarchy of events, the available empirical evidence strongly suggests that some haunts derive from a systematic interaction between certain individuals and select elements in the environment. The present findings elucidate what perceptual-personality characteristics facilitate this interaction. As predicted, the combination of *psychological set* (Participant Expectation and Belief in the Paranormal) and *perceptual variables* (Transliminality, Hypochondriasis, Synesthesia, and Hyperesthesia) reliably distinguished experiencers from non-experiencers. Interestingly, these seven variables

differentially predicted participants' total number of experiences and their total number of different categories of experience. Lange and Houran (2001) argued that priming effects and belief in the paranormal induce some people to notice and give credence to ambiguous (but otherwise conventional) stimuli, which include physiological sensations, cognitions, and emotions (Houran & Williams, 1998; Lange & Houran, 1997). Consistent with this scenario is the fact that Participant Expectation weakly but significantly contributed to the overall regression equation to predict the number of reported experiences. On the other hand, sensitivity to environmentally-based visual and acoustic stimuli (Hyperesthesia) and arguably to some extent a person's degree of priming (Participant Expectation) weakly but significantly contributed to the overall regression equation to predict the number of different categories of experience.

This pattern of results complements previous findings (Lange & Houran, 2001; Houran & Thalbourne, 2001a) that were not based on data collected *post hoc* and suggests that two basic processes are operating within this case (and maybe other cases of a similar nature as well), akin to differences between a shifting of attention and a focusing of attention (Turatto, Benso, Facoetti, Galfano, Masetti, & Umiltà, 2000). Specifically, the initial perception or detection of haunt stimuli may follow from a shifting of attention, while the content of haunt experiences may derive from a focusing of attention. What may be a further indication of multiple processes operating within some haunts is the suggestive evidence for two distinct classes of phenomena—Psychological Experiences and Physical Changes. In particular, experiences classified as psychological in nature (perhaps syncretic in nature) consistently showed small but significant correlations with the perceptual-personality variables, while experiences

classified as involving objective and physical events were only weakly related to priming and belief in the paranormal.

Differences in outward appearance, of course, do not preclude Psychological Experiences and Physical Changes from sharing a common precipitating source, e.g., misinterpretation, electromagnetic effects or psi. The fact that our Rasch analyses replicated previous evidence (Houran & Lange, 2001a) for a unidimensional model of haunt experiences is consistent with this idea. However, it is argued that there can still be different sources for the two proposed Classes of Experience (cf. Houran & Lange, 1996). Specifically, Psychological Experiences are expected to derive in part from the experient's physiology, whereas Physical Changes are phenomena caused by external, non-personal forces and are detected and given credence in part due to cognitive and motivational biases. This behavior arguably overlaps with to some degree Glicksohn's (1998) notion of symbolic cognition. Believers in the paranormal (especially those with beliefs indicative of a need for control over the environment) might perceptually and cognitively link these unrelated classes of experience together in a synesthetic-like fashion due to an enhanced associative network (Brugger, 2001). This is reminiscent of Ember and Ember's (1988) anthropological view of ghosts. This could partly explain the positive intercorrelations among paranormal belief, the number of haunt experiences, the number of different categories (i.e., modalities) of haunt experience, transliminality, hyperesthesia, and synesthesia.

Demand characteristics and priming effects would be expected to intensify these relationships, and belief in the paranormal would provide a "...cognitive framework for effectively structuring many events and experiences...so that they appear comprehensible

and thereby able to be mastered, at least intellectually” (Irwin, 1999, p. 291). Therefore the underlying dimension to the Rasch hierarchies of haunt experiences could be a cognitive-labeling process. However, the order of the particular experiences that are reported may be idiosyncratic to specific cases. Follow-up work is needed to clarify this possibility.

Although this discussion emphasized a traditional psychological interpretation of the results drawing on the cumulative work of Lange and Houran (2001), other interpretations of the findings are possible. To be sure, Haynes’ (1986) idea that people have different thresholds of perceiving psi phenomena may have merit. Nevertheless, such parapsychological theories must take into account at least the facilitating role of psychological factors. In particular, the accumulated evidence from psychological and parapsychological studies using the three basic approaches to this area of research suggests that haunts are not solely objective, physical forces that people can easily understand independently from themselves. Rather, the findings agree with Tyrrell’s (1943/1953) seminal idea that experiencers seem to be active participants in the construction of their experiences, much the same way that characters in fictional ghost stories are complex, emergent products of the interplay between narrative design and narrative processing (Herman, 2000).

This study identified a few salient perceptual-personality characteristics that relate to naturalistic haunt experiences, but the effect sizes found in this study are modest. This could be attributable to many factors. For instance, it could be argued that the weak effects imply that perceptual-personality variables have little more than a mediating role in some haunt experiences, or alternatively that haunt experiences are more strongly

related to perceptual-personality traits not considered here. By contrast, a statistical perspective might posit that the lack of Rasch scaled instruments in tandem with a restricted range of scores limit the power of our analyses. Consequently, there remains substantial empirical investigation concerning these variables, particularly the validation of their role in haunt experiences of a more spontaneous nature. A more stringent design is needed that takes into account other sources of possible response bias on the part of participants.

It is proposed that a methodology similar to the one used here be used, but with important modifications. First, in future studies it would be wise to minimize artifacts related to prior knowledge and cueing by investigating cases whose details are not publicly known and which have no “commercial” connotations associated with them. A large sample of participants then could be identified in advance and divided randomly into quarters. In this way a quarter of the psychological tests can be distributed long in advance of the sessions, a quarter immediately before the sessions, a quarter immediately following the sessions, and a quarter long after the sessions. The participants should not have any advance knowledge about the sites, and all on-site experimenters should be experimentally blind as well. The trends and ideas reported in this chapter would have greater validity if they can be confirmed under these conditions and replicated across many haunt cases. This line of inquiry would also inform both psychological and parapsychological theories. Ultimately both perspectives seek to answer the really exciting question of what remains of haunt experiences once the psychological trappings are removed.

Following on from this issue of the etiology of haunt/ encounter experiences, the

present results provide some convergence for the findings in Chapter 4, namely that encounter experiences can be predicted from the collective effects of transliminality, somatic-hypochondriacal tendencies, and paranormal belief. It was instructive that RTS scores did not play a significant role on the *individual* level in predicting the details of naturalistic haunt/encounter experiences. This seems to contradict the consistent results obtained in the study from Chapter 4. However, the instances of participant drop-outs in the present study suggest that the context surrounding the experimental proceedings was emotionally or cognitively overwhelming for some individuals. Thus, Participant Expectation, as opposed to trait levels of transliminality, might have promoted physiological arousal—and hence anomalous experiences. In addition, the physical attributes of the Vaults (lighting levels, temperature, ceiling height, etc.) may have been sufficiently strong or noticeable that even participants with low levels of transliminality unwittingly responded to them and thus experienced anomalous experiences. In this sense, expectation may have fueled hyperesthesia as it relates to selective attention rather than to trait levels of transliminality. Irrespective of these confounds, *post hoc* analyses confirmed that transliminality (as measured by the RTS) facilitated both the number of reported haunt experiences and the number of different categories of haunt experience.

These findings, combined with the significant correlations between RTS scores and other relevant perceptual-personality variables, conceptually replicate previous work reviewed in Chapter 2, as well as the results from Chapters 3 and 4. As such, this study helps substantiate the idea that psychological experiences within spontaneous haunt/encounter episodes are in part transliminal phenomena that theoretically correspond to syncretic experience (Werner, 1948, 1957/1978), as conceptualized in

terms of the Cognitive Regulation Hypothesis.

CHAPTER 6:
QUASI-EXPERIMENTAL STUDY OF TRANSLIMINALITY,
VIBRATACTILE SENSITIVITY, PROCESSING SPEED, AND
SELF-REPORTED ABERRATIONS IN MEMORY⁷

6.1 PROLOGUE

The naturalistic observation study reported in Chapter 5 supported to a degree the validity of transliminality and other relevant perceptual-personality variables in predicting details of naturalistic encounter experiences, which theoretically might be produced from the cognitive mechanisms reviewed in Chapter 2. Yet, the psychological variables contributed differentially to these anomalous experiences. A striking result from the field study was that scores on Participant Expectation (i.e., motivation) and Hyperesthesia (heightened sensitivity to environmental stimuli) outperformed the other psychological variables in the regression analyses. Hyperesthesia is a core constituent of the RTS, but the nature of the test site and the *post hoc* questionnaire procedure described in Chapter 5 leaves the question open as to whether the effects of hyperesthesia derived from the dramatic environmental conditions or from empirically lower sensory thresholds related to transliminality.

The Cognitive Regulation Hypothesis implies that high transliminals might have lower sensory thresholds because of weak or erratic sensory gating, including poorer screening function. Initially, such disinhibition would be beneficial in that the functional

⁷ Parts of this chapter were published as (Appendix L):

Houran, J., Hughes, L. F., Thalbourne, M. A., & Delin, P. S. (submitted). Quasi-experimental study of transliminality, vibrotactile thresholds, and performance speed.

Houran, J., & Thalbourne, M. A. (2003). Transliminality correlates positively with aberrations in memory. *Perceptual and Motor Skills, 96*, 1300-1304.

interconnectedness among frontal cortical loops, temporal-limbic structures, and primary or secondary sensory areas and/or sensory association cortices would conceivably augment pattern and object recognition and thus promote creativity. Faster processing of—or reaction to—stimuli (on the sensory and/or motor level) would also be expected given that the cognitive regulation paradigm involves frontal cortical loops, which regulate inhibition (Chao & Knight, 1995; Fuster, 1999). However, the proposed deficient screening functions in high transliminals would seem to compromise their performance on selective attention tasks when competing stimuli bombard conscious experience. This phenomenon might manifest in daily life as more lapses or aberrations in memory. This would be consistent with the definition of transliminality as psychological material crossing thresholds *out* of consciousness, as well as into consciousness.

Therefore, this chapter presents a quasi-experimental test of these aspects of the cognitive model of transliminality from Chapter 2. The test involves the detection of a vibratactile (vibration-touch) stimulus by high and low transliminality groups while the stimulus is masked by competing stimuli of two levels of intensity and complexity. A vibratactile stimulus was selected because the nature of cutaneous sensitivity and its measurement provide for threshold determination that is quick, accurate, and noninvasive. Accordingly, the chapter also reviews the concept of sensory thresholds, traditional methods of their estimation, and cutaneous sensitivity.

6.2 BACKGROUND AND HYPOTHESES

6.2.1 DEFINITION AND MEASUREMENT OF THRESHOLDS

Technically, *threshold* is defined as a boundary. As a perceptual concept, threshold can be used in different ways, most notably to define minimal values of stimulation. Clearly, no individual is responsive to all portions of the possible range of physical energies. Instead, the potential stimulus must be of sufficient or minimal intensity (and duration) to cause a certain degree of neural activation in order for it to be sensed. There are two main types of threshold values used in experimental research: *absolute threshold* and *differential threshold*. These are reviewed next along with methods of their estimation.

6.2.1.1 ABSOLUTE AND DIFFERENTIAL THRESHOLDS

The minimum magnitude values of the stimulus necessary for detection are generally known as absolute threshold values. Traditionally, these values define an approximation of the lower limit of the individual's absolute sensitivity. If the magnitude of the stimulus is too weak, not producing a detection response, the stimulus magnitude is said to be a *subthreshold* or *subliminal*; in contrast, above threshold values of the stimulus are termed *suprathreshold* or *supraliminal*. The concept of an absolute threshold assumes that there is a precise stimulus point on the intensity or energy dimension that when administered, becomes just perceptible. Accordingly, one single unit weaker will not be detected. For instance, the individual would not detect the stimulus until a certain energy level was reached at which point and beyond the stimulus is detected 100% of the time. This situation rarely occurs. Rather, as the energy level is increased there is also an increase in the probability that a stimulus will be detected. Thus, there is no single

immutable or absolute value that represents the minimum stimulus energy necessary for a detection response, i.e., no fixed point separating the energy levels that *never* yield a detection response from those that *always* do. As an approximation of the threshold value, psychologists have adopted a statistical concept. By convention the absolute threshold value is assumed to correspond to that stimulus magnitude eliciting a detection response on 50% of the test trials (Schiffman, 1982).

The differential threshold is a measure of the smallest difference between two stimuli that can be detected. It is traditionally defined as the difference in the magnitude between two stimuli, usually a standard and a comparison stimulus, that is detected 50% of the time (Schiffman, 1982). For instance, if two tones of the same intensity or nearly the same intensity are presented, one immediately following the other, people will generally report that they are identical in loudness. However, as the intensity difference between the two tones is gradually increased, a difference in intensities will be reached at which a “difference” judgment on 50% of the trials will be reported. The magnitude of this difference defines the differential threshold. That is, the differential threshold is a statistical measure of the difference between two stimuli that “on average” is just noticeable.

The values for absolute and differential thresholds differ from person to person and even for the same person over time (Benjamin, Hopkins, & Nation, 1987). By studying large groups of people under standardized testing conditions, psychologists are able to make judgments about what stimulus values are necessary to be perceived by the “average” person. These kinds of normative data are useful in assessing hearing in school children, visual acuity in candidates for flight training, and taste sensitivity in would-be

chefs. In fact, an important Rasch (1960/1980) scaled variation on such normative data in olfactory discriminations has been recently constructed (Lange, Donathan, & Hughes, 2002) to use as a screening tool for Alzheimer's disease. The methods by which absolute and differential thresholds are estimated are reviewed next.

6.2.1.2 METHODS OF ESTIMATING THRESHOLDS

There is a traditional set of procedures used to determine thresholds. One of the simplest procedures is called the *method of limits* or the *method of minimal change*. For example, to determine absolute threshold for the detection of light, the experimenter might start with a light sufficiently intense to be perceived by the observer and then systematically reduce its intensity in small graded steps with a light dimmer until the observer reports that the light is no longer detectable. That intensity level is then recorded and then the light is showed at a still dimmer setting but now its intensity is gradually increased until the observer reports that it is just perceptible. After a number of ascending and descending series of trials, the average is computed based on the energy levels at which the stimulus just crosses the boundary between being undetectable and just becoming perceptible. That is, a numerical estimate of the absolute threshold is computed by taking the average of the stimulus intensity reached when the observer attains a limit or makes a response shift for the ascending and for the descending series of stimuli. This average serves as the statistical measure of the threshold for that observer under the general experimental conditions of testing.

In comparison, the *method of adjustment* has the intensity of the stimulus under the perceiver's control, who is required to maintain it at a just detectable level. The experimenter can arrive at an estimate of the perceiver's threshold by calculating the

intensity that the perceiver attempts to maintain.

Another common technique of determining the absolute threshold, called the *method of constant stimuli*, requires a series of forced choice trials. In this case, a fixed number of stimuli of different intensities are individually presented many times in random order. Upon each presentation, the individual makes a detection response—either “yes” for detection, or “no” for no detection. Then the percentage of trials during which each stimulus intensity is detected is computed and that stimulus value yielding a detection response on 50% of the test trials serves as the measure of the absolute threshold.

Most recently, psychologists have applied an *adaptive-procedure* for testing thresholds that overcomes many methodological problems associated with traditional methods. In an adaptive procedure, a stepping algorithm with null stimuli updates the estimate of the individual’s threshold after each experimental trial and then that estimate is subsequently used to select the intensity level of the test stimulus. This tailored stimulus selection is more efficient and accurate than the method of limits or the method of adjustment. Specifically, since a judgment is made at each level tested before proceeding to the next, the individual may take whatever time is needed to reach a decision or make a response. Slow responses will therefore not spuriously raise thresholds.

Step stimuli are ideally suited for use in computer quantitative sensory testing because they permit use of forced-choice or stepping algorithms in which the level of stimulus intensity can be varied depending on response, and quick, complex algorithms of testing can be managed without error. Referring to cutaneous sensitivity, Dyck,

O'Brien, Kosanke, Gillen, and Karnes (1993) showed that the 4, 2 and 1 stepping algorithm of testing provides accurate estimates of threshold in both human subjects and computer simulations. The algorithm also has the advantage of minimizing participant and experimenter bias. For example, the presentation of stimuli and the documentation of participants' responses are fully automated by computer. Thus, threshold testing is increasingly standardized across participants. Further, the time needed to obtain a threshold with the 4, 2 and 1 stepping algorithm is approximately one-quarter of the time required to get threshold estimation with the forced-choice approach of traditional methods. This saving of time aids minimization of sources of participant bias, such as from prolonged testing, boredom, and drowsiness.

6.2.2 *TRANSLIMINALITY AND SIGNAL DETECTION THEORY*

Research has shown that stimulus values or changes in those values are not the only important determinants of thresholds. Also of critical importance are such variables as the characteristics of the individual being tested and the condition of the environment in which the testing takes place. For example, very different values for the absolute threshold would be expected when it is measured in a quiet testing chamber and when measured in a testing booth situated in a busy shopping mall. Further, a host of variables associated with the individual, such as fatigue or sensory adaptation (the decline in receptor activity when stimuli are unchanging), affect the measurement of thresholds.

An approach to threshold measurement that is more sensitive to these concerns is called *Signal Detection Theory* (Green & Birdsall, 1978; Swets, Tanner, & Birdsall, 1961). This approach views the detection of a stimulus as a process in which the perceiver is faced with the task of distinguishing the stimulus from the rest of the

perceptual world of which it is part. The stimulus to be detected is called the “signal,” and the rest of the existing stimulation is called “noise.” In signal detection experiments, noise is present in each trial, but the signal occurs randomly. Thus, the participant must decide whether the signal is present or absent in each trial. The presence of noise often leads participants to think they detected the signal and to report its presence when in fact it did not occur.

This situation is very similar to the task people face in making many everyday perceptual judgments. For example, suppose you are listening to the radio in your room when you hear your phone ring and answer it. There is no one on the phone; only a dial tone greets your ear. In this case, the sounds in your room (such as the radio) provide the noise, and the signal is the ring of the phone, which apparently did *not* occur. In signal detection theory such a response would be called a false alarm. These responses might not be common, but their likelihood of occurrence can be increased. Again, suppose you are in a room listening to the radio and waiting for a very important phone call. Under these circumstances of expectation and anxiety, you might be particularly likely to experience false alarms, thinking you hear the phone ring when in fact it is not ringing. Therefore, detecting a signal is dependent not only on the perceptual sensitivity of the individual but also on certain decisional factors, called *receiver operating characteristics*, that are part of the perceiver.

In a detection task in which a signal occurs in some trials but not in others, one individual might be especially motivated to detect every signal that is presented. To do so, the person will have to say the signal is present on a number of trials when it in fact does not occur. This is regarded as a liberal strategy for detection. Another person might

want to be absolutely certain that a signal is present before making such a judgment, which is a conservative strategy for detection. The liberal observer will produce many false alarms but will have a high hit rate; the conservative observer will have a lower hit rate but also fewer false alarms. This situation is illustrated in Figure 6.1.

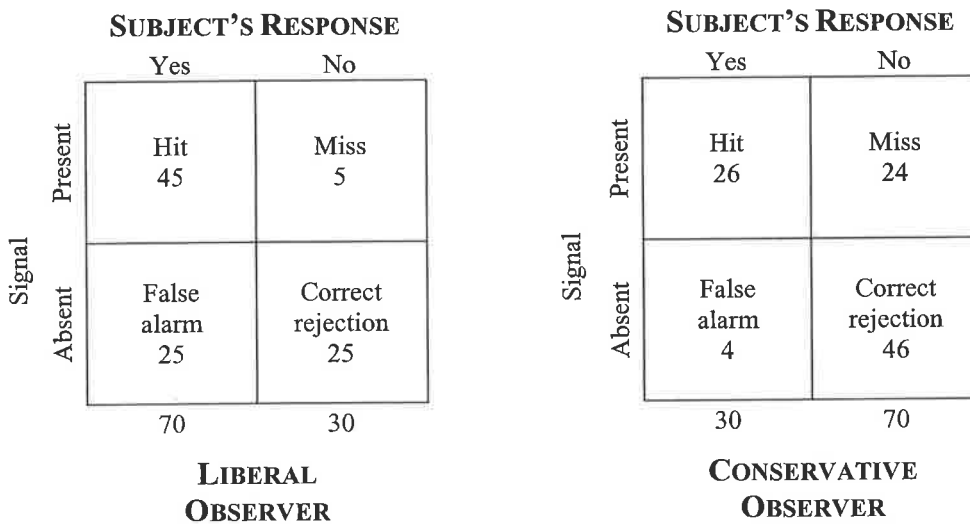


Figure 6.1: Comparison of a liberal and conservative observer in a signal detection task of 100 trials, 50 with the signal present and 50 with the signal absent. Correct responses (hits + correct rejections) are essentially the same for the two observers: 70 for the liberal observer and 72 for the conservative observer. Focusing on the hits only, it might be assumed that the liberal observer had a lower threshold, but looking at the pattern of responses suggests that the subjects have very different response criteria [ADAPTED FROM: Benjamin et al., 1987].

When individuals complete signal detection tasks under time limits (e.g., reaction time studies), then a phenomenon known as the *speed-accuracy trade off* (see e.g., MacMilan & Creelman, 1991) comes into play as well. Individuals with an emphasis on extreme accuracy are slower in their decisional processes, and hence, their reaction times. By contrast, individuals with an emphasis on extreme speed (quicker reaction time) are more liberal in their decisional processes, and hence, they exhibit low accuracy. These differing response strategies are further examples of receiver operating characteristics.

These kinds of behavior can obviously disrupt the measurement of thresholds. Therefore, special steps must be taken to see that the threshold measure is primarily a function of the sensory capabilities of the individual, and not heavily influenced by decisional characteristics. In reality, these decisional characteristics cannot be completely eliminated.

Experimental support for the hypothesis that transliminality is related to heightened signal detection under certain conditions was provided by Crawley et al. (2002), who conducted a test of subliminal visual perception disguised as a computerized ESP 'card-guessing' task. Remember from Chapter 2 that these authors hypothesized that participants scoring high on the 29-item Transliminality Scale would outperform those with low scores when given subliminal primes or 'clues' to the correct choice of card, but not in the absence of primes. As predicted, higher transliminality scores were associated with a greater number of correct selections of the target-card on the primed trials, but not on the unprimed trials. In addition, a positive correlation was obtained between transliminality scores and detection accuracy as given by d -prime, suggesting that transliminality was associated with greater sensitivity to priming (cues) and not response bias. Comparison of the authors' original findings with the RTS indicates that the results of Crawley et al. (2002) are robust with respect to the measurement of transliminality (see Table 6.1).

Table 6.1: Pearson Correlations Between the Dependent Variables from Crawley et al. (2002) and Two Versions of the Transliminality Scale ($N = 100$)

	29-item Transliminality Scale	17-item RTS	t (97)
Primed Guesses	.240*	.286**	1.64, ns
Unprimed Guesses	.151	.142	---
D-Prime	.253*	.207*	1.61, ns
Criterion	-.038	-.087	---

Note: * $p \leq .05$, ** $p \leq .01$

While Crawley et al. (2002) showed that high scores on transliminality are associated with greater sensitivity to priming, they did not demonstrate that RTS scores correspond to lower absolute or differential thresholds for sensory stimuli. Furthermore, their study did not investigate the efficacy of screening function in high transliminals when target stimuli are masked with competing stimuli of various intensity and complexity levels. In other words, increased levels of transliminality might be advantageous in basic signal detection tasks, but performance might decline when target stimuli are masked with increasingly intense or complex stimuli that the brains of high transliminals cannot properly filter.

The Cognitive Regulation Hypothesis basically conceptualizes transliminality as broad neurological disinhibition. In the context of selective attention tasks, for example, the cognitive mechanisms responsible for active suppression (or gating) of irrelevant information from conscious awareness are proposed to be defective, i.e., weak or erratic (Braff et al., 1999; Lieb et al., 1996; Perry et al., 1999; Peters et al., 2000; Swerdlow & Geyer, 1998). In addition, the hypothesized condition of looser gating among frontal-subcortical loops and primary or secondary sensory areas and/or sensory association cortices would conceivably augment pattern and object recognition, as well as signal

detection. Faster processing of—or reaction to—stimuli (on the sensory and/or motor level) would also be expected given that the cognitive regulation paradigm involves the frontal lobes, which regulate inhibition (Chao & Knight, 1995; Fuster, 1999). However, the proposed deficient screening functions in high transliminals would seem to compromise their performance on selective attention tasks when competing stimuli bombard conscious experience due to increased intensity and/or complexity. This deficiency might manifest in daily life as more lapses or aberrations in memory. Recall that functional interconnectedness is necessary for psychological integration, but integration will be compromised (Nasrallah, 1985) when the interconnectedness is not selective (O’Kusky et al., 1988; Witelson, 1985).

The nature of vibratactile sensation in humans makes it an ideal topic for which to accurately and efficiently test the ideas presented above. Cutaneous sensitivity and related issues are reviewed next.

6.2.3 OVERVIEW OF CUTANEOUS SENSITIVITY

The human skin is the largest sensory organ, forming an integument or covering for the entire body. The skin is also the most versatile sensory organ of the body, serving as a flexible shield against many forms of foreign agents and mechanical injury. It holds in vital fluids. It serves to ward off the harmful ultraviolet and infrared radiations of the sun, and by means of pigmentation, the skin protects against the loss of light-sensitive vitamins and metabolites (Branda & Eaton, 1978). When appropriate, it stabilizes body temperature (in birds and mammals), either cooling the body or retarding heat loss. It also has a role in regulating the pressure and direction of blood flow. Finally, the skin has nerve endings embedded within it that can be stimulated in a variety of ways to mediate

sensations. The experiential result of skin stimulation is termed *cutaneous sensitivity*.

Four basic qualities or sensations of cutaneous stimulation have been identified as mediated by adequate stimulation of the skin: pressure or touch (vibratactile), cold, warmth, and pain.

Externally viewed, the skin appears as a highly variegated surface, manifesting distinct surface qualities and extensions—hairs, feathers, scales, creases, colorations, thicknesses—in different regions. However, the skin is not a single structural unit but is composed of layers: the epidermis, dermis, and subcutaneous tissue, which contain various receptors distributed throughout these layers. Although it is held that the nerve endings found in the skin are the receptors for cutaneous experience, it has not been clearly established that stimulation of a particular type of receptor exclusively initiates a certain cutaneous experience. The sensations of pressure, cold and warmth, and pain have been based on subjects' responses rather than on the identification of anatomically distinct fibers. That is, evidence for the existence of distinct cutaneous sensations is accessible only through introspective report.

6.2.3.1 Vibratactile Sensitivity

A good part of the outer surface of the skin structure responds to the pressure or touch of the environment. In humans—the fingers, the hands, parts of the mouth, and the tip of the tongue—are most sensitive to those mechanical encounters with the environment that provide pressure or touch stimulation (Carlson, 1986; Schiffman, 1982). Less sensitive areas, with fewer pressure spots, are the legs, arms, and trunk, areas where less important mechanical events occur. Schiffman (1982, pp. 107-108) noted that it is

sometimes held that the underlying receptors for pressure are *Pacinian corpuscles* (held to be the skin's as well as the joints' primary receptor for mechanical distortions), *free nerve endings* (called "basket cells," situated in hairy regions of the skin), and *Meissner corpuscles* (in hairless skin regions); however, direct evidence of this is not substantial.

The adequate stimulus for touch or pressure is a mechanical deformation of the skin, that is, a change of shape or pressure differential. Uniformly distributed pressure or continuous gradations of pressure are not deforming, hence not mechanically stimulating. Consider the situation proposed by Geldard (1972, p. 290) in which a finger is immersed in a heavy liquid such as mercury, where the pressure deep in the liquid is greater than at the surface. There is a continuous gradient of uniform pressure both from the surface on downward and from the surface upward. Thus, these gradients are not deforming ones and are ineffective stimuli. The pressure is felt only at the boundary—the *discontinuity*—between liquid and air, and it is this discontinuity that provides the adequate stimulus. In general, discontinuities are the important stimulus events for the organisms, not continuous gradients (Schiffman, 1982).

6.2.3.2 Thresholds for Pressure

Under certain conditions of stimulation, displacements of the skin less than 0.001 mm (0.00004 in.) are sufficient to elicit a pressure sensation (Schiffman, 1982). However, the sensitivity to pressure stimulation varies not only with the strength of the mechanical stimulus applied but also with the region of the skin stimulated. Using nylon filaments, whose force could be precisely calibrated in milligrams, Weinstein (1968, as cited in Schiffman, 1982) tested various body parts of right-handed subjects for threshold

levels of pressure or touch. The results for the right and left sides of the body indicate that the face is the most pressure-sensitive part of the body. The trunk is next, followed by the fingers and arms. The least sensitive body parts for pressure are found in the lower extremities. Males and females show about the same trend in sensitivity, but in general, women manifest lower thresholds, i.e., they appear more sensitive to touch than males (Schiffman, 1982).

6.2.3.3 Point Localization for Pressure

It is possible to localize pressure sensations on the region of the skin where stimulation is applied; however, this ability largely varies with the region of the body stimulated. For example, stimulation applied to the fingertip or the tip of the tongue is well localized (the average error is on the order of a millimeter: Schiffman, 1982). In contrast, stimulation of the upper arm, thigh or back produces an error of localization of more than a centimeter. Generally, the more mobile the skin regions stimulated (e.g., hands, feet, mouth), the more accurate is the point localization.

Cortical representation plays a role in the point localization differences for various body regions. The skin is topographically projected and arranged in the sensory cortex. In other words, underlying nerve fibers from each part of the body surface of the skin are systematically represented in a particular part of the sensory cortex. Some areas of the skin, such as those of the fingers, lips, and tongue, are more densely supplied with nerve fibers; hence, they are more easily innervated, are more sensitive than others, and are correspondingly represented by larger areas of the sensory cortex (see Weinstein, 1968; Schiffman, 1982, Carlson, 1986). Consequently, accuracy of localization at various

skin sites seems to be highly correlated with the amount of cortical representation devoted to the skin receptors of that body region.

6.2.3.4 Adaptation to Pressure

The result of continued pressure stimulation may be a decrease or even a complete elimination of its sensory experience. Pressure sensibility undergoes adaptation. As with thresholds, the temporal course of adaptation varies with a number of factors, particularly the size and intensity and skin area contacted. The time taken for the sensation produced by a weight resting on the skin to completely disappear is directly proportional to the intensity of this stimulus and inversely proportional to the skin area contacted (Geldard, 1972). The sensation, however, can be quickly restored by a brief movement of the stimulus or some other form of abrupt change in the stimulation given to a skin area. A continuous change in stimulation, of course, is what normally occurs when the perceiver *actively* touches surfaces and objects.

An interesting instance of enhanced sensitivity of the skin to actively imposed pressure or touch stimulation is observed when using a simple surface aid. Individuals may detect the surface undulations of an object more accurately when they move a thin, intermediate sheet of paper across the surface than when the bare fingers are used (Gordon & Coper, 1975). This method of “feeling” has long been employed by craftsmen and autobody shops to examine the “smoothness” of the finish on surfaces. According to Lederman (1978), as the bare fingers are moved over a rough surface, lateral (or shear) forces are applied to the skin of the fingertips; such forces serve to mask some of the critical stimuli for roughness that are produced, in part, by normal (or downward) force.

When an individual moves the intermediate sheet of paper across the surface, the paper reduces the shear force, which also reduces the interfering masking. The result is an increase in sensitivity to the roughness of a surface when felt through the sheet of paper moving with the fingers relative to that experienced with the bare fingers.

6.2.4 HYPOTHESES

Based on the above, this study tested four hypotheses:

1. RTS scores positively correlate with scores on the O-Scale measure of memory aberrations.
2. Individuals with high transliminality scores (HT) have lower thresholds than individuals with low transliminality scores (LT).
3. The HT group take less time than the LT group to obtain a threshold.
4. The presence of a stimulus that competes for attention increases the time and thresholds of the HT group to a greater extent than those of the LT group. For the present purposes, a competing stimulus is categorized in terms of relative intensity and complexity. It is expected that a high-intensity stimulus will interfere with selective attention more than a low-intensity stimulus. Furthermore, it is expected that a static stimulus, like white noise, will interfere less with selection attention than a dynamic stimulus (such as a musical arrangement with lyrics). Accordingly, white noise is categorized here as a low complexity stimulus and music as a high complexity stimulus.

6.3 O-SCALE

The O-Scale is a set of seven “true/ false,” plain language statements penned by

M. A. Thalbourne especially for this study (see Appendix K). It addresses various forms of lapses or aberrations in memory. Responses of “true” are scored as “1” and responses of “false” are scored “0.” The first and fourth statements on the measure are reverse scored, so high scores reflect greater endorsement of self-reported aberrations in memory. Note that the O-Scale is intended to provide an estimate of a broad range of self-reported aberrations in memory that individuals from both clinical and nonclinical populations can experience. However, the measure is not an exhaustive representation of all forms of transient or chronic memory lapses an individual could experience. Cronbach’s alpha for this measure in the present sample was 0.73, which compares favorably with Kline’s (1986) criterion of 0.70 for satisfactory reliability (internal consistency).

6.4 COMPUTER AIDED SENSORY EVALUATOR (CASE IV) SYSTEM

6.4.1 DESCRIPTION OF CASE IV SYSTEM

The CASE IV System (V 4.26: WR Medical Electronics Co., 1995) is an automated diagnostic device for detecting and characterizing sensory thresholds that have been altered by disease of sensory receptors, nerve fibers, central nervous system tracts, and cerebral association areas. The CASE IV also detects improvements in sensory perception that result from medical treatment. This is the only device of its kind that provides highly sensitive, quantified, specific, and reproducible test results. At present, the CASE IV can determine vibration and thermal (cooling, warming, heat-pain) thresholds; however, only vibratory thresholds were obtained in the present study. Upon completion of testing, the CASE IV stores the participant’s data on the computer for later analysis. The specific application of the CASE IV System in this study is detailed in the

procedure section.

The system is made up of a personal computer, also called the Host Computer (with video screen and keyboard), which is used to enter biographical data and for display of operator instructions, menus, operating conditions, or problems; a Printer (for print out of test results); and a Base or Main Unit (containing power supplies and electronic circuits). In addition, the set-up used in this study utilized the CASE IV's Vibration Stimulator, the Vibration Stimulator Calibration System, a Participant Cueing Device, and a Participant Response Device.

6.4.2 DESCRIPTION OF CASE IV SYSTEM HARDWARE

The CASE IV Main Unit contains all the circuitry for generation of stimuli, participant cueing, and participant response recording. The Main Unit and Host Computer communicate using a standard serial/modem connection.

The Vibration Stimulator provides the vibrating stimulus to the participant. It uses a very precise electronic actuator known as a galvanometer. Vibration is at 125 cycles per second, and is variable between 0 and 576 micrometers. The cantilevered design provides a 30-gram preloading force. The area to be tested is placed under the stimulating stylus, and the height of the stimulator is adjustable to compensate for different finger dimensions. The Vibration Stimulator is leveled by turning the height adjustment knob. The finger being tested rests on a lump of puttylike substance (such as artist's putty) to ensure that the finger does not twist or rotate.

Using numbers "1" and "2" or red and green lights, the Participant Cueing Device displays the time period in which a stimulus is given. Then, via the Participant Response

Device, participants respond by indicating the period in which the stimulus was detected (or whether the stimulus was detected). The Participant Response Device has two momentary contact buttons, typically “1” and “2” or “Yes” and “No.” Participants indicate their responses by depressing and then releasing the appropriate button.

6.4.3 DESCRIPTION OF CALIBRATION PROCEDURE

The Vibration Stimulator Calibration System consists of two different calibration apparatus, one of which is used to check the excursion range of the Vibration Stimulator arm and another to check the electronic zero point of the Vibration Stimulator circuitry.

For checking the excursion range of the Vibration Stimulator arm, a laser diode and test stand are used. The laser measures the excursion range of the Vibration Stimulator in micrometers. The laser diode assembly is mounted vertically above the stimulator arm, pointing down towards a small prism on the stimulator arm. The laser beam is projected through the prism, is refracted 90 degrees, and then projects onto a screen that is a fixed distance away from the Vibration Stimulator. The displacement of the beam that is projected on the calibration screen is a function of the actual excursion of the Vibration Stimulator.

For checking the electronic zero point of the Vibration Stimulator circuitry, a short adapter cable is plugged directly into the CASE IV Main Unit.

6.5 METHOD

6.5.1 PARTICIPANTS

A convenience sample of 50 participants ($M = 23.14$ yrs, $SD = 2.95$, range = 18-29 yrs, 56% women) was recruited from the general community and local area colleges

with a snowball sampling approach (see e.g., Babbie, 1989). This approach was used to assist in identifying participants between the ages of 18 and 30, which is an age bracket with relatively constant vibratactile sensitivity (Dyck, 1994). Participants received no remuneration for their participation. The selection procedure yielded 17 individuals who scored above the mean (HT) on the RTS and 33 who scored below the mean (LT).

6.5.2 MEASURES

Three measures were used in this study:

- (i) Lange, Thalbourne, et al.'s (2000) RTS (Form B), described in Chapter 2. See Appendix A.
- (ii) The O-Scale (Appendix K). This measure is a set of seven "true/ false," plain language statements that address various forms of lapses or aberrations in memory. Responses of "true" are scored as "1" and responses of "false" are scored "0." Two statements are reverse-scored, so high scores reflect greater endorsement of self-reported aberrations in memory.
- (iii) Vibratactile sensitivity was assessed using the Computer Aided Sensory Evaluator (CASE) IV System (V 4.26: WR Medical Electronics Co., 1995) described in Section 6.4.

6.5.3 PROCEDURE

Participants were given a brief introduction to the study that involved a review of the consent form and the basic protocol of the study. The administration of the RTS and the O-Scale were sequentially counterbalanced with threshold determination. The

following statement was read to participants immediately before threshold testing:

This is a test of your ability to detect a vibration. The test is not painful. It usually takes from three to four minutes. The stimulus may feel like vibration, buzzing, trembling, or rumbling. Some people cannot describe it, but they know a stimulus was given. All you have to do is decide whether you felt a stimulus during the interval when the number "1" is displayed. You will feel the stimulator resting on your finger at all times. I will ask you to decide whether you felt an additional vibrating or other mechanical stimulus during the presentation of number "1" on the display. After the number "1" has disappeared, you should push "yes" if you felt a vibration, or "no" if you did not feel a vibration. Please get comfortable, relax your hand, and do your best. As you complete this task, you will be listening to various sounds through a set of headphones. Once again, the object is to determine the smallest vibration you can feel. Do you have any questions?

The CASE IV quantified a participant's sensory threshold by controlling the amplitude of a series of noninvasive vibratory stimuli, and recording the participant's responses. Sensitivity was measured on the pad of the second finger of the participant's non-dominant hand, so the dominant hand could manipulate a response key. During administration of the CASE IV test, a light alerted a subject to the onset of a test-interval. Dyck et al.'s (1993) adaptive 4, 2, and 1 stepping algorithm was used for threshold testing. Testing began at an intermediate level (13 micrometers). The stimulus increased (if not felt) or decreased (if felt) by four steps to the point of turnaround (felt at the higher level when not felt at lower levels, or not felt at the lower level when it had been felt at the higher level). After the first turnaround, stepping was in steps of two. After the second turnaround, stepping was done by steps of one. A total of twenty stimulus events were used. Five of these were randomly distributed null stimuli.

The participant indicated whether vibratory stimulation was "present" or "absent" during each stimulus interval by pressing a response key. This algorithm determined the amplitude of the next stimulus presented. During the course of a given test, the system

determined a participant's vibratactile threshold scaled in 'just noticeable differences' (JNDs). The JND refers to the least change in the magnitude of a stimulus that is detectable. When the test was complete, the CASE IV stored the participant's data on the computer for later analysis.

Each participant received three practice trials to minimize training effects and to ensure they understood the procedure for the vibratactile test. The data sessions consisted of three trials of threshold testing while exposed to each of four competing auditory stimuli over a set of headphones. One auditory condition involved listening to a low-amplitude (56 db SPL, conversation level in a very quiet environment) recording of white noise, the second condition involved listening to a low-amplitude recording of a musical selection, the third condition involved listening to a moderate-amplitude (70 db SPL, conversational level in an office environment) recording of white noise, and the fourth condition involved listening to a moderate-amplitude recording of the same musical selection. Each participant completed threshold determination for each of the four auditory conditions. The presentation order of the auditory conditions was randomized across subjects.

The CASE IV generated the white noise. A Koss stereo (Model No. PC38G) was used to present the musical selection (the song "Abacab" by the pop music band *Genesis*). This song was selected for its musical complexity and its relatively long duration of 252 seconds. The stereo was set to play continuously during the music conditions. Participants received a five-minute break between the trials within each of the four auditory conditions. The vibratory thresholds and times to complete the threshold testing were recorded for each of the three trials and then averaged to produce a mean

JND and a mean time of completion for each of the four auditory conditions. The administrator of the threshold test (J.H.) was blind to whether participants belonged to the HT or LT group.

6.6 RESULTS

6.6.1 RTS AND O-SCALE MEASURE OF MEMORY ABERRATIONS

Scores on the O-Scale for the entire sample ranged from 3 to 7 ($M = 5.08$, $SD = 1.01$). As hypothesized, RTS scores were positively associated ($r = 0.59$, $p \leq .001$, two-tailed) with the total number of memory aberrations participants endorsed on the O-Scale. Given that the O-Scale is an ordinal-level measure, this parametric result was crosschecked with a conservative rank-order correlation ($\rho = .53$, $p \leq .001$, two-tailed). A partial correlation controlling for age and sex simultaneously confirmed that these findings were robust, $r = .58$ ($p \leq .001$). Expressed in terms of mean differences between transliminality groups, the HT group ($M = 6.06$, $SD = 0.83$) endorsed significantly [$t(48) = -6.89$, $p \leq .001$, two-tailed] more aberrations in memory than the LT group ($M = 4.58$, $SD = 0.66$).

6.6.2 VIBRATACTILE THRESHOLD DATA

A mixed-effects factorial Analysis of Variance (ANOVA) was used to assess vibratory thresholds. Translinality (low vs. high) and Gender (male vs. female) were the between-subject variables, and Intensity (low vs. high) and Complexity (white noise vs. music) of the competing auditory stimulus were the within-subject variables. The Tukey procedure was used for all *post hoc* analyses. In addition, estimates of effect sizes for the ANOVAs were computed with partial eta squared (η^2). By way of explanation, η^2

gives the proportion of variance in the dependent variable that is associated with levels of an independent variable (Tabachnick & Fidell, 1996).

Transliminality effects. The high Transliminality (HT) group ($M = 7.15$, $SD = 2.11$) evidenced significantly [$F(1, 46) = 74.16$, $p \leq .001$, $\eta^2 = .617$] lower thresholds than the low Transliminality (LT) group ($M = 12.45$, $SD = 2.06$). No significant interactions of Transliminality with Gender or stimulus Complexity were found (F 's < 1). A significant interaction between Transliminality and Intensity was found ($F(1, 46) = 78.15$, $p \leq .001$, $\eta^2 = .629$). As depicted in Figure 6.2, the threshold of the LT group did not significantly change as a function of the competing stimulus intensity ($M_{\text{low}} = 12.37 \pm 2.05$, $M_{\text{high}} = 12.65 \pm 2.07$, $p = .81$), whereas thresholds for the HT group were increased in the presence of the higher intensity stimulus ($M_{\text{low}} = 5.13 \pm 2.47$; $M_{\text{high}} = 9.22 \pm 2.46$, $p \leq .01$). It is noted that this latter threshold is still lower than the mean threshold of the LT group (9.22 vs. 12.37, $p \leq .01$).

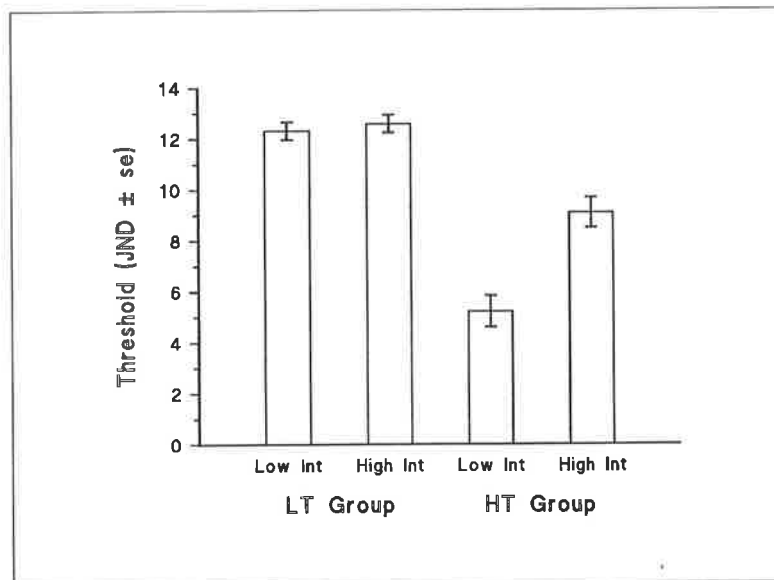


Figure 6.2: Vibratory thresholds of the low and high Transliminality groups during simultaneous masking by low and high auditory Intensity (int) conditions.

Intensity effects. Intensity of the competing auditory stimulus interacted with all variables; however, the effect size for any of these effects (except the Transliminality x Intensity effect discussed above) was very small. In an effort to understand the higher order interactions involving Intensity, separate analyses were run for the LT and HT groups. When only the LT group was considered, no significant interactions of Intensity with Complexity or Gender were found (p 's > .49). When only the HT group was considered, the interaction of Intensity x Complexity x Gender was significant ($F(1, 15) = 33.49, p \leq .001, \eta^2 = .691$). A plot of this interaction (see Figure 6.3) revealed a difference in threshold related to the intensity of the competing stimulus that was approximately the same for the music stimuli and the noise stimuli for males (-0.04) and a little smaller for music than for noise stimuli for females (+3.03). The statistically significant differences due to stimulus Complexity or Gender for the HT group appear to be very small (in the order of the trial-to-trial variability of threshold measurement) and not systematically related to the treatment.

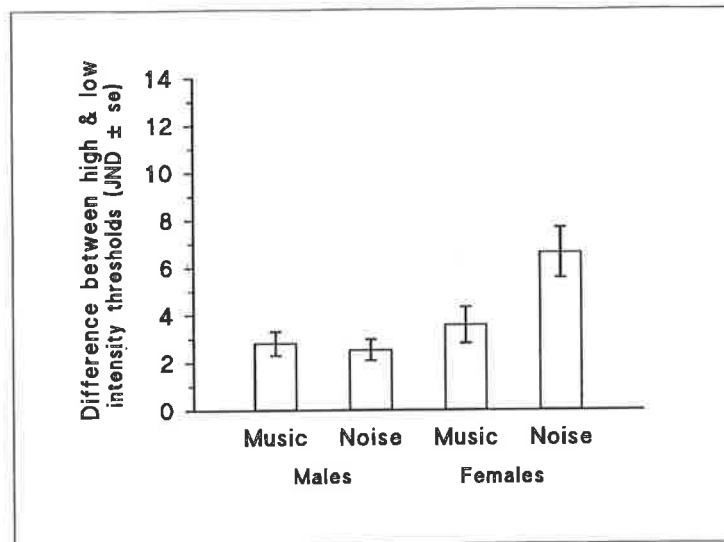


Figure 6.3: Difference in thresholds between high and low Intensity conditions for each Complexity of stimulus by Gender.

6.6.3 TIME TO DETERMINE THRESHOLD

The same mixed-effects factorial design was employed to analyze the amount of time that the self-paced subjects took to arrive at a threshold. There were no significant main effects or interactions that involved Complexity or Gender. However, there was a significant interaction between Transliminality and Intensity ($F(1, 46) = 15.49, p \leq .001, \eta^2 = .252$). As shown in Figure 6.4, the intensity effect (longer completion times when the competing stimulus was more intense) was larger for the HT group ($M_{\text{low}} = 110.09 \text{ sec.}, SD = 2.93$ vs. $M_{\text{high}} = 119.08 \text{ sec.}, SD = 4.73, p \leq .001$) than for the LT group ($M_{\text{low}} = 120.86 \text{ sec.}, SD = 12.77$ vs. $M_{\text{high}} = 122.48 \text{ sec.}, SD = 8.02, p = .81$). The only other significant effects were the resulting main effects of Transliminality ($F(1, 46) = 7.59, p \leq .01, \eta^2 = .142$) and Intensity ($F(1, 46) = 32.07, p \leq .001, \eta^2 = .411$).

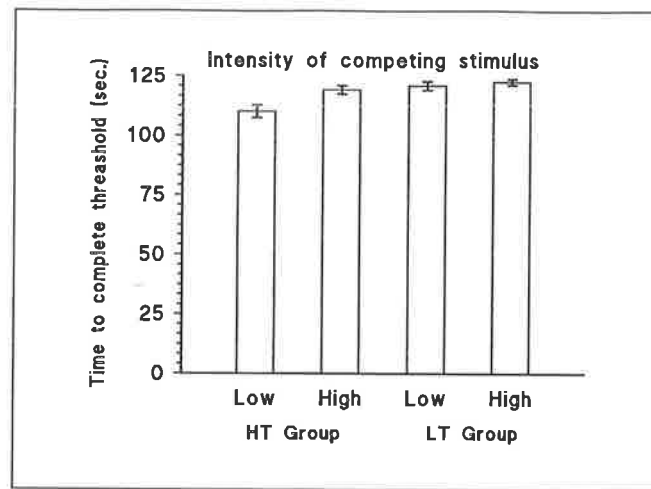


Figure 6.4 Time for the low and high Transliminality groups to obtain thresholds during simultaneous masking by low and high auditory Intensity conditions.

6.6.4 RELIABILITY

Thresholds for the experimental conditions were computed as the average of the threshold obtained on 3 successive trials. The average intercorrelation between threshold values for the 3 trials was .983. In spite of the practice trials given before data collection, there was a small decrease in threshold values across the 3 trials ($9.88 \pm .314$; $9.81 \pm .308$; $9.71 \pm .306$, respectively). This .17 decrease in the JND was significant ($F(2, 92) = 5.73, p \leq .01, \eta^2 = .111$). Time to complete threshold determination was also recorded on the three successive trials across the four auditory conditions. The average intercorrelation for time to determine threshold values for the 3 trials was .784. There was a small increase in the time to determine threshold values across the 3 trials (117.63 ± 1.190 ; 118.11 ± 1.303 ; 118.65 ± 1.411 , respectively), and this increase of 1.02 seconds was significant ($F(2, 92) = 3.56, p \leq .05, \eta^2 = .072$). This combination of decreased thresholds and increased time to obtain threshold might reflect a small effect of a speed-

accuracy trade off.

6.6.5 POSSIBLE RESPONSE BIASES

Two participants (both from the HT group) evidenced a false positive, each on just one occasion. These two individuals obtained mean threshold values that ranked the second to lowest ($M = 12.32$ JND) and the highest ($M = 22.42$ JND) within the HT group. The false positives occurred during the white noise condition (one at high intensity and one at low intensity). In particular, the individual who made the false positive during the high-intensity/white noise condition received the 7th lowest mean threshold within the HT group ($M = 25.16$ JND), whereas the individual who made the false positive during the low-intensity/white noise condition received the second lowest mean threshold within the HT group ($M = 3.50$ JND). The lack of false positives prevented the calculation of an index of sensitivity or response bias. However, it appears that false positives were nearly absent for both Transliminality groups, i.e., participants from both groups indicated that a vibration was present only when they seemed absolutely confident. Furthermore, the false positives did not correspond to the individuals with the lowest thresholds in the HT group. Accordingly, it is reasonable to conclude that response biases cannot entirely account for the lower vibratactile thresholds of the HT group.

6.7 EPILOGUE

Crawley et al. (2002) showed that high scores on transliminality are associated with greater sensitivity to priming cues. The present study complements this work by demonstrating that scores on transliminality are related to actual changes in sensory thresholds. As expected, the HT group evidenced significantly lower vibratory thresholds

than the LT group. This suggests that the attentional or regulatory mechanisms of the HT group are more easily affected than those of the LT group.

For example, the thresholds of the LT group did not significantly vary with differences in the Intensity or dynamics of the competing auditory stimulus, but the thresholds of the HT group increased in the presence of a competing stimulus of high Intensity. However, even when the vibratactile thresholds of the HT group were affected by a competing stimulus of high Intensity, their thresholds were still significantly lower than the thresholds of the LT group. The thresholds of the HT group did not increase in the presence of a dynamic stimulus, which could mean that the musical arrangement did not possess the qualities that interfere with attentional mechanisms or inhibit sensory gating.

It should be noted that while noise is usually viewed as a detriment to signal detection, the detectability of a weak stimulus sometimes is enhanced by the presence of another signal. Known as negative masking, this psychophysical phenomenon has been observed in vibratactile sensation for cases wherein the test stimulus and the masker (or pedestal) are sinusoidal signals of the same frequency and phase (Gescheider, Verrillo, & Pelli, 1992; Hamer, Verrillo, & Zwislocki, 1983; Verrillo, Gescheider, Calman, & Van Doren, 1983). In addition, recent studies demonstrate that mechanical noise can even be used clinically as a suitable pedestal for enhancing detection of a subthreshold vibratactile stimulus in older adults and patients with neuropathy (Dhruv, Niemi, Harry, Lipsitz, & Collins, 2002; Liu, Lipsitz, Montero-Odasso, Bean, Kerrigan, & Collins, 2002). Future research might likewise examine how LT and HT groups respond to such stochastic resonance-type effects.

Besides lower thresholds, the HT group consistently demonstrated faster times to obtain a threshold (i.e., complete the testing) than the LT group. Additional work is needed to determine whether this effect reflects faster processing at the sensory level and/or more disinhibition on the motor level, but taken together with the fact that these quicker times were associated with lower thresholds in the HT group, indicates that this effect of speed cannot be attributed to a speed-accuracy tradeoff. Analysis of the times to obtain a threshold pattern in the HT group provided further indication of weaker sensory gating or cognitive mechanisms regarding attention as compared to the LT group. The Intensity of the competing stimulus negatively affected the time to obtain thresholds for both Transliminality groups, but the Intensity effect was strongest for the HT group. Lastly, the magnitude of the interaction of Intensity x Stimulus Dynamics x Gender suggests that this finding is a minimal effect at best. In fact, the magnitude was no greater than the fluctuation in magnitudes found in repeated trials of the threshold testing.

The cumulative findings from this study can be interpreted as being broadly consistent with the Cognitive Regulation Hypothesis, which specifies that high transliminals have a weaker ability to gate or ignore irrelevant stimuli. Nevertheless, additional research is needed to confirm these results with other sensory modalities and with alternative research designs. For instance, a two-interval forced choice task might be a more effective method to estimate the influence of possible response bias. Moreover, stronger evidence for Thalbourne et al.'s (2001) ideas would come from studies that directly relate RTS scores to differences in the hypothesized brain activity.

The HT group consistently outperformed the LT group in responding to vibrotactile stimuli that were simultaneously presented with competing auditory stimuli,

but the decreased ability of the HT group to gate or ignore competing stimuli of higher intensity could suggest that there is a point at which increased levels of transliminality change from being functional (such as in promoting creativity) to maladaptive (such as promoting schizotypal and schizophrenic-like experience). This supposition is bolstered by the strong positive correlation between scores on the RTS and the O-Scale. That is, higher levels of transliminality corresponded to increases in memory aberrations that occur in participants' daily lives. Drawing on the threshold findings, these self-reported lapses in memory are interpreted as further evidence that a high level of transliminality fosters interference in selective attention. As a result, the trend towards higher thresholds for the HT group depicted in Figure 6.1 might be extended with stimuli of even higher levels of intensity and thereby lead to thresholds in the HT group that exceed those in the LT group. It might also be expected that individuals with extreme levels of transliminality (theoretically expressed in psychopathologies like schizophrenia) would show a marked speed-accuracy trade off. Indeed, Saoud, Coello, Dumas, Franck, d'Amato, Dalery, and Rosetti (2000) recently presented results consistent with this speculation.

CHAPTER 7:
GENERAL DISCUSSION OF RESULTS FROM THE SERIES
OF FOUR STUDIES AND THEIR IMPLICATION FOR A
COGNITIVE REGULATION MODEL OF TRANSLIMINALITY

7.1 PROLOGUE

The notion of transliminality as an empirical construct has not been sufficiently popularized in the recent scientific literature to attract much criticism, but Gordon Claridge has published a few critical remarks. Other somewhat dismissive commentaries have stemmed from peer-reviews of submitted papers. One potential area of criticism is that research on this variable has been based to a large degree on student populations, and this fact challenges the generalizability of the results and their subsequent theoretical implications. For this reason, previous studies (e.g., Thalbourne & Houran, 2000) and a good portion of the research comprising this thesis have used members of the general population and samples from universities with students of non-traditional age. Claridge and his colleagues (Claridge, Clark, & Davis, 1997, p. 385), in a paper on nightmares, commented as follows:

Although we have set the discussion here in the context of schizotypy research, similar ideas have been articulated under several other headings: in Hartmann's (1991) boundary permeability theory and the notion of openness (McCrae, 1994); in Thalbourne's notion of transliminality (Thalbourne & Delin, 1994); and as skinlessness, a descriptor for highly emotionally-attuned individuals at risk for psychopathology (Anthony, 1987).

J. H. Brod, in a recent chapter on creativity and schizotypy (Brod, 1997, pp. 289-293) wrote approvingly of transliminality, but her editor Gordon Claridge was again not so enthusiastic:

Unfortunately, finding a usable alternative to schizotypy is not easy. Brod suggests biocentricity; she also refers to the descriptor transliminality, introduced by Thalbourne (Thalbourne & Delin, 1994), which covers many of the ideas discussed in the present volume. But such neologisms rarely catch on because they emerge from no historical or linguistic tradition (Claridge, 1997b, p. 301).

A few peer-reviewers of submitted papers have echoed Claridge's basic sentiments and as a result dismissed the concept of transliminality on the grounds that it did not seem to differ meaningfully from more "established" concepts and related measures—such as fantasy proneness, absorption, openness to experience, and schizotypy.

Actually, transliminality has a long—if quiet—tradition in psychology. Psychological researchers Usher and Burt coined the term "trans-liminal" in 1909, and it was shown in Chapter 1 that its underlying ideas can be found to some extent in the thoughts and writings of F. W. H. Myers, and particularly, of William James. Transliminal processes were later discussed outside of the realm of parapsychology and applied to the mainstream areas of imagination and creativity (MacKinnon, 1971; Rugg, 1963). It is true that "transliminality" as a noun was only recently proposed by Thalbourne (1991), yet there is evidence that the concept is gaining acceptance, not only with Brod, but with other researchers (e.g., Irwin & Green, 1998-1999, pp. 3-4; Parker et al., 1998, p. 334; Wulff, 2000, pp. 409, 412). In this author's opinion, the name imparted to the construct should follow from its etiology. If indeed this construct concerns the tendency for psychological material to cross thresholds into or out of consciousness, then arguably the term *transliminality* is broader and more neutral than say *schizotypy*—which emphasizes psychopathology.

The question is whether any evidence points to the etiology of the processes that

underlie the construct variously named above. Therefore, this chapter integrates what is known about transliminality with what has been learned in the series of four studies presented in this thesis. This body of results is discussed in relation to the cognitive model proposed in Chapter 2.

7.2 GENERAL DISCUSSION

The concept of mental boundaries and its clinical and experiential sequelae have long been of interest to investigators hailing from anomalistic and transpersonal psychologies. Some authors (Grof & Grof, 1990; Lukoff, 1985; Nelson, 1994) have attempted to differentiate qualitatively between positively and negatively impactful altered states of consciousness and shifts within those forms. Likewise, Krippner (1997) and White (1997) have conceptualized exceptional states of consciousness as ranging along multiple dimensions of awareness versus dissociation, control versus lack of control, and life potentiation versus life depotentiation. On the other hand, transpersonal psychologists like Almaas (1986) and Washburn (1994) proposed an inseparability between integrative states of consciousness and some degree of dynamic conflict and emotional pain. Hunt, Dougan, Grant, and House (2002) further argued based on correlational and factor analysis of questionnaire data that transpersonal, growth-enhancing states of consciousness and more conflicted dissociated states were different manifestations of a background, bivalent dimension of absorption/openness to experience.

The Rasch scaling (1960/1980) analyses of the core constituents of the RTS presented in Chapter 1 essentially bring empirical resolution to these basic issues. These analyses, which overcome the limits of classical test theory, clearly indicated that many

psychological variables relevant to states of consciousness share a common dimension, and by implication the same underlying process. Thus, the construct identified here as transliminality is not merely a synonym for other psychological states, such as schizotypy, openness to experience, absorption, imaginative involvement, fantasy proneness, 'flexibility of repression' or ego-permissiveness. Rather, transliminality as an empirical construct goes beyond these labels and aims to define the nature of this underlying dimension and process, which was recently proposed as "the hypothesized tendency for psychological material to cross thresholds into or out of consciousness" (Lange, Thalbourne et al., 2000, p. 591; Thalbourne & Houran, 2000, p. 853).

The experiences that define the items from the RTS strongly parallel Werner's (1948, 1957/1978) notion of syncretic experience. Remember that syncretic cognition entails a dedifferentiation of perceptual qualities in subjective experience—e.g., physiognomic perception (the fusion of perception and feeling), synesthesia (the fusion of sensory modalities), and structural eidetic imagery (the fusion of imagery and perception). This idea was supported by numerous studies on the psychological correlates of the RTS reviewed in Chapters 1 and 2, as well as the consistent positive correlations presented in Chapter 3 between RTS scores and the subscales from Hartmann's (1991) Boundary Questionnaire (BQ) that pertained to anomalous experiences and an openness to experience. The other BQ subscales, which showed lower but significantly positive correlations with RTS scores, were interpreted as reflecting higher order symbolic cognitions.

The psychological and BQ correlates of the RTS strongly suggested that transliminality entailed a blending of imagery, affect, ideation, and perception. Taken

together with the strong association between RTS scores and the Kundalini experience (energy surging up through the spine to the brain), it was proposed that these experiences reflected greater integration among the three systems of MacLean's (1973, 1990) "triune brain" theory, i.e., the R-Complex, the Limbic System, and the Neocortex. By contrast, additional findings reported in Chapter 3 suggested that this hypothesized condition of cognitive fluidity was not significantly influenced by bilaterality, as measured by the Briggs-Nebes (1975) Handedness Scale. This cognitive regulation paradigm was subsequently refined in light of the theoretical and empirical work on the etiology of schizophrenia and schizophrenic-like experience, including the underlying similarities between psychotic and creative thought. In particular, the production of syncretic experiences of various content inspired the broad conceptualization of transliminality as a cognitive phenomenon deriving from graduated regulation (functional interconnectedness) of interaction among frontal cortical loops, temporal-limbic structures, and primary or secondary sensory areas and/or sensory association cortices. The positive relationship between RTS scores and the amplification of somatosensory phenomena and occurrence of physiognomic perception as inferred from scores on somatic-hypochondriacal tendencies reinforces this conceptualization.

Testing the predictive validity of these ideas in a field study provided additional evidence consistent with the Cognitive Regulation Hypothesis for transliminality. The field project described in Chapter 5 involved invoking anomalous experiences at a reportedly "haunted site"—a procedure that was enormously successful in yielding two types of experiences. These included *psychological experiences* that paralleled syncretic cognition (e.g., structural eidetic imagery, somatic complaints), and *physical*

manifestations that were interpreted here as random physical events that were given credence and linked with psychological experiences due to expectation and a cognitive framework of paranormal belief. This psychological set arguably involved a degree of symbolic cognition. Like past research (Houran & Lange, 2001a), both types of these experiences further conformed to a probabilistic Rasch (1960/1980) hierarchy. In particular, experiences of an apparently syncretic nature occurred early in the hierarchy, while events that were interpreted here as examples of symbolic-like cognition occurred later in the hierarchy. The hierarchical nature of the reported experiences meant that rare events (e.g., physical manifestations) tended to occur only when more common events (e.g., somatic complaints) occurred as well. Thus, higher scores on number of different categories of haunt experience imply an increased mixture of syncretic and symbolic cognitions.

Scores on transliminality and variables relevant to the construct collectively predicted patterns in the spontaneous experiences to a significant degree, while RTS scores showed small but significant correlations with the number of discrete experiences a participant reported and the number of different categories of experience reported. This suggests in principle that higher levels of transliminality generally correspond to a greater mixture of syncretic and symbolic cognitions. However, assuming that premise is correct, the low magnitude of these effects indicates that the relationship between transliminality and psychological integration (higher levels of cognitive processing) may not be strictly linear. That is, it seems that moderate levels of transliminality are adaptive and advantageous, but increasingly more liberal interconnectedness among the respective brain systems may inhibit the capacity for higher levels of processing, such as symbolic

cognition. In this respect, the level of transliminality would seem to directly follow from the rigidity of an individual's screening or regulatory functions.

Chapter 6 reported the results of a study that examined this hypothesis via a quasi-experimental test of vibratactile thresholds, in which the vibratory stimulation was simultaneously presented with auditory stimuli of varying levels of intensity and complexity. As expected, a high-transliminality group had significantly lower sensory thresholds and faster performance speed than a low-transliminality group. However, the thresholds of the high-transliminality group increased while the performance speed decreased in the face of increasingly intense competing stimuli. These results strengthen the suspicion that the liberal gating that is hypothesized to underpin transliminality is initially advantageous because it promotes enhanced and flexible integration, such as expressed through creative personality, increased signal detection, and mystical and transpersonal experiences. However, sufficiently high levels of transliminality might reflect gating that is too liberal and thus leads to dysfunction. Stated alternatively, moderately high levels of transliminality seem to represent cognitive disinhibition that is beneficial psychologically and psychophysiologicaly and which allow the capacity for symbolic cognition, but at some point increased levels of transliminality may become maladaptive and instead promote pathology and subjective experience with negative content.

This interpretation is augmented by the fact that RTS scores showed significant positive correlations with aberrations in memory, as well as the low magnitude of association between RTS scores and mixture of syncretic-symbolic cognition, as inferred from the study of spontaneous haunt experiences reported in Chapter 5. In addition,

Chapters 1, 2, and 4 showed that RTS scores are associated with various pathologies and conditions that can impact daily functioning to varying degrees of severity.

There is a considerable amount of parallel research that complements this view. For example, Spanos and Moretti (1988) found that individuals who score highly on questionnaires of mystical experience and an extreme category of “diabolical” experience were both high on absorption, but only the latter were also significantly high on neuroticism. Stifler, Greer, Sneck, and Dovenmuehle (1993) similarly reported that groups of experienced meditators and hospitalized deluded patients both showed high levels on Hood’s questionnaire of mystical experience compared to a control group, with only the patients showing elevated levels on a questionnaire measure of narcissism and a scale of “ego grasping.” Consistent with the kind of qualitative analyses of Lukoff (1985), Nelson (1994), and Grof and Grof (1990) differentiating the more mystical from the more psychotic experiences, Hughes (1992) found that a small group of trance channelers had significantly lower scores on the Dissociative Experiences Scale than a comparison group diagnosed with multiple personality disorder. Similarly, Greyson (1993) compared a group of subjects with major near-death experiences with a psychiatric inpatient sample and found significantly more hallucinatory and Kundalini effects in the former.

Other research has attempted to locate the underlying basis of the more extreme integrative versus dissociative states of consciousness in high versus low visual-spatial cognition and physical balance, based on the prominence of abstract spatial metaphors (light, color, expansion) in transpersonal states and the negative impact of traumatic experience on body image and vestibular integration, and so on deep levels of self-image,

as well (Hunt, 1995). Whereas childhood and adult schizophrenia can show extreme decrements in spatial ability and physical balance (Angyal & Blackman, 1940; Ornitz & Ritvo, 1968), participants who report classical mystical experiences (Swartz & Seginer, 1981) and out-of-body experiences (Irwin, 1985a) perform at high levels on a measure of physical orientation and the embedded figures test, respectively. Specially selected subjects reporting high levels of lucid and archetypal dreaming, show correlations with waking mystical experiences, show superior visual-spatial and physical balance abilities (Ayers, Beaton, & Hunt, 1999; Gackenbach & Bosveld, 1989; Spadafora & Hunt, 1990), whereas those with prominent nightmares and night terrors show corresponding decrements (Spadafora & Hunt, 1990). Similarly, with participants selected on the basis of high recall of transpersonal experiences from early childhood, there were significant positive correlations with high adult performance on embedded figures and block designs tests, with negative correlations for early night terrors (Hunt, Gervais, Shearing-Johns, & Travis, 1992).

In effect, those with enhanced spatial and body image integration have easier access to the full experience of transformative states based on self-referential metaphors of space, light, and expansion, whereas those more affected by trauma will have to deal sooner and more prominently with experiences centered on imageries of fragmentation, implosion, and imbalanced disorientation (Hunt et al., 2002). This conclusion agrees in principle with research suggesting deficits in abstract thought in schizophrenia (see Wright, 1975). Two salient studies along these lines are worth noting.

In particular, Suler (1980, p. 152) cited a study by Hersch (1962), inspired by Werner's (1948) theory, comparing schizophrenics, artists, and controls on the Rorschach

projective ink blot test. Hersch suggested looking at Rorschach responses in terms of differentiation or dedifferentiation (e.g., in describing the blot as being “troubled,” this would reflect “a syncretic relationship between the self and the external world” [p. 195]). He showed that both schizophrenics and artists had access to a more syncretic mode of thinking than the controls did. Further, whereas the artists also had access to a more mature (integrative) mode of thinking, the schizophrenics did not. In a related study, Glicksohn and colleagues (2000-2001) compared the performance of eight schizophrenics, six visual artists, and ten controls across a series of tasks evoking symbolic cognition (symbol production, proverb comprehension, and symbol representation) and syncretic cognition (synesthesia, structural eidetic imagery, and absorption). Both the schizophrenics and visual artists relative to the controls exhibited a high degree of syncretic cognition, but the schizophrenics were markedly impaired on tests related to symbolic cognition and logical reasoning.

Thus, the conclusions from the study reported in Chapter 3 require slight amendment. Specifically, that chapter concluded with the hypothesis that the boundary construct might best be conceptualized as the hierarchical progression of syncretic cognition to symbolic cognition. It was further suggested that schizophrenics would be situated lower on this hierarchy because they theoretically have access to only a syncretic mode of cognition, whereas artists would be further along the hierarchy since they had access to the higher level of symbolic cognition (cf. Glicksohn et al., 2000-2001). In essence, schizophrenic and creative thinking are deemed as endpoints along a continuum of thought. The pattern of findings presented in this thesis inspires a revision in that thinking.

The degree of neurological interconnectedness as a function of an individual's rigidity in screening function might be a more effective descriptor for the hypothesized continuum of creative and schizophrenic-like thought. According to this view, low levels of transliminality correspond to more selective screening functions and thus lower levels of syncretic experience and of highly abstract cognition; moderate levels of transliminality promote both syncretic and symbolic cognitions, whereas higher levels of transliminality only serve to intensify syncretic cognition and retard symbolic cognition. Therefore, healthy controls would serve as anchors at the low point of the continuum (or hierarchy as formulated in Chapter 3) because their more rigid screening function may retard syncretic cognition and highly symbolic cognition⁸ (except in physiological states that inhibit frontal lobe activity); followed by creative artists in the middle of the continuum, as their more liberal (but still functional) screening functions facilitate syncretic and symbolic cognitions due to a flexibility of perception and thought; and finally anchoring the high point of the continuum would be schizophrenic-like thought, in which screening functions are so unselective that there is a dysfunctional or pathological "looseness" among imagery, ideation, affect, and perception.

This proposal does not contradict the basic tenets of Werner's (1948) organismic-developmental theory. Werner also believed that artistic perception and creative thinking could rely on, or have access to, the same syncretic level of cognition (Barten, 1983; Barten & Franklin, 1978). On the creative side, this dedifferentiation would allow for a flexibility of perception and thought (cf. Ehrenzweig, 1953), as categories dissolve,

⁸ For example, healthy controls might be able to comprehend well proverbs and perform well on various reasoning tests, but this does not mean that such individuals can easily create proverbs or construct creative tests to measure reasoning skills.

become entwined, and in general interact, much as an interactionist approach to metaphor and metaphoric thinking would advocate (Glicksohn & Gootblatt, 1993). In Werner's (1957/1978) terms:

One might argue that in creative reorganization, psychological regression involves two kinds of operations: One is the dedifferentiation (dissolution) of existing schematized or automatized behavior patterns; the other consists in the activation of primitive levels of behavior from which undifferentiated (little-formulated) phenomena emerge (p. 124).

On the pathological side, this would entail some prelogical thought, paleological thought, or "looseness" of thinking, that could suggest an incoherence of thought, an impaired mode of thought, and a certain degree of autism, much as appear in different classification systems for thought dysfunction in schizophrenia (e.g., Steffy, 1993). In other words, following Werner, these just might be two sides of the same coin. Of course, Werner (1948) did not believe in equating creativity and artistic expression with psychopathology. Rather through an analysis of the different levels of cognition, one could view disparate phenomena through an organismic-developmental lens, and in this manner make both theoretical and empirical progress (Werner, 1959/1978).

However, in this thesis it is argued that phenomena like creativity and schizophrenic-like thought are neither disparate nor endpoints along the continuum of thought. Rather, the past research reviewed in this work and the data from the four studies are consistent with the premise that transliminality represents functional regulation of interaction among frontal-subcortical loops, temporal-limbic structures, and primary or secondary sensory areas and/or sensory association cortices. No evidence was found to suggest that this condition follows from enhanced cross-activation of the brain hemispheres (bilaterality).

Moreover, the relationship between transliminality and functional impairment is not regarded as strictly linear, but rather the transition between a healthy behavior towards a pathological state could be related to a bifurcation, e.g., the transition between a chaotic behavior (unstable, aperiodic) to a periodic one (behavior that exactly repeats after a fixed interval of time) and vice versa. This phenomenon, called 'dynamical diseases' (e.g., Bélair, Glass, an der Heiden, & Milton, 1995; Mackey & Glass, 1977; Mackey & Milton, 1987), is related to modifications in the control parameters of physiological systems that subsequently lead to abnormal dynamics. Such bifurcations have been found associated with clinical improvement in depressed patients (Thomasson, Pezard, Allilaire, Renault, & Martinerie, 2000) and with the affective components related to the generation and maintenance of paranormal beliefs (Lange & Houran, 2000). Likewise, transliminality may involve sudden, nonlinear changes that occur in physiological systems. An example of such a dynamic system is a beam under stress: initially increasing stress will do little to a beam until a critical point is reached where the beam suddenly buckles or breaks. This illustrates that a system that changes nearly linearly over a wide range of its inputs can nevertheless suddenly behave in a totally different manner. Given the consistent correlations between transliminality and various psychopathologies (cf. Chapters 1, 2, & 4), it is speculated that transliminality will also show patterns that resemble dynamical diseases.

7.3 EPILOGUE

Additional research using the RTS in methodologically superior studies is needed to validate the results and conclusions presented in this thesis. Besides testing more detailed predictions from the Cognitive Regulation Hypothesis, Rasch (1960/1980) scaled

tests and measures should alone be used in future work. The convergent results among the studies presented here, combined with frequent crosschecking with partial correlations that took into account effects of age and gender, encourage the author's confidence in the main findings. These facts notwithstanding, it must be emphasized that potential differential item functioning (bias) was neither estimated nor controlled for in some measures that correlated with the RTS. This is a major limitation of this thesis, as well as the past research on transliminality.

From a psychometric perspective, on the other hand, the threshold findings from Chapter 6 and those of Crawley et al. (2002) bolster the construct validity of the RTS. Until this recent experimental work linking transliminality to empirical thresholds of awareness, the validity of the scale (and by default the construct) was based solely on correlations with a number of anticipated attitudinal and experiential phenomena. William James (1902/1982) provided an especially cogent and vivid description of some expected manifestations of transliminal processes:

If the word 'subliminal' is offensive to any of you...call it by any other name you please, to distinguish it from the level of full sunlit consciousness. Call this latter the A-region of personality, if you care to, and call the other the B-region. The B-region, then, is obviously the larger part of each of us, for it is the abode of everything that is latent and the reservoir of everything that passes unrecorded or unobserved. It contains, for example, such things as all our momentarily inactive memories, and it harbors the springs of all our obscurely motivated passions, impulses, likes, dislikes, and prejudices. Our intuitions, hypotheses, fancies, superstitions, persuasions, convictions, and in general all our non-rational operations come from it. It is the source of our dreams, and apparently they may return to it. In it arise whatever mystical experiences we may have, and our automatisms, sensory or motor; our life in hypnotic and 'hypnoid' conditions, if we are subjects to such conditions; our delusions, fixed ideas, and hysterical accidents, if we are hysterical subjects; our supra-normal cognitions, if such there be, and if we are telepathic subjects. It is also the fountainhead of much that feeds our religion (pp. 483-484).

The comprehensive listing of correlates of the RTS in terms of salient attitudinal and personality variables (see Table 7.2) and experiential and behavioral phenomena (see Table 7.3) nicely parallel these early speculations of William James.

Table 7.2 Comprehensive Summary of Correlations[†] (Two-tailed) Between the RTS and Salient Attitudinal and Personality Variables

ATTITUDINAL/PERSONALITY VARIABLE	CORRELATION WITH RTS	REFERENCE
Cattell's 16 PF		
A (warmth)	.20*	Lange, Thalbourne, Houran & Storm (2000)
G (rule-consciousness)	-.20*	“
M (abstractedness)	.36*	“
Q1 (openness to change)	.22*	“
TM (tough-mindedness)	-.32*	“
SC (self-control)	-.21*	“
Openness to Experience	.33*	Thalbourne (2000b), reanalysis
Religiosity	.48 [‡] **	Thalbourne & Delin (1999), reanalysis
Hartmann's Boundary Questionnaire		
Sumbound	.66 [†] **	Houran, Thalbourne, & Hartmann (2003)
Sleep/wake/dream	.52 [†] **	“
Unusual experiences	.57 [†] **	“
Thoughts/feelings/moods	.63 [†] **	“
Childhood/adolescence/adulthood	.23 [†] **	“
Interpersonal	.23 [†] **	“
Sensitivity	.31 [†] **	“
Neat/exact/precise	.28 [†] **	“
Edges/lines/clothing	.41 [†] **	“
Opinions about children/others	.17 [†] **	“
Opinions about organizations/relationships	.38 [†] **	“
Opinions about peoples/nations/groups	.32 [†] **	“
Opinions about beauty/truth	.32 [†] **	“
Whiteley Index (hypochondriasis)	.30 [†] **	Houran, Kumar, Thalbourne, & Lavertue (2002)
“	.22*	Houran, Wiseman, & Thalbourne (2002)
Cognitions About Body and Health Questionnaire		
Bodily weakness	.19**	Houran, Kumar, Thalbourne, & Lavertue (2002)
Intolerance of bodily complaints	.16**	“
Autonomic sensations	.29**	“
Screening for Somatization Symptoms	.25**	“

Note:

†Spearman rank-order correlation unless otherwise noted

‡Pearson correlations as reported in original sources

^a $p = .06$, * $p \leq .05$, ** $p \leq .01$

Table 7.3: Comprehensive Summary of Correlations[†] (Two-tailed) Between the RTS and Salient Experiential and Behavioral Phenomena

EXPERIENTIAL/BEHAVIORAL VARIABLE	CORRELATION WITH RTS	REFERENCE
Survey of Traumatic Childhood Events	.39**	Thalbourne, Houran & Crawley (submitted)
Creative Personality	.42**	Thalbourne (2000a), reanalysis
Tellegen's Synesthesia Scale	.61**	Houran, Wiseman, & Thalbourne (2002)
(ibid)	.61**	Houran (2002), further analysis
O-Scale (memory aberrations)	.53**	Houran & Thalbourne (2003)
Primed Subliminal Perception (visual)	.29 [†] **	Crawley, French, & Yesson (2002)
D-Prime Subliminal Perception (visual)	.21 [†] *	"
Vibratactile threshold (JND)	-.65**	Houran, Hughes, Thalbourne, & Delin (submitted), further analysis
Time to obtain vibratactile threshold (sec.)	-.53**	Houran, Hughes, Thalbourne, & Delin (submitted), further analysis
Dream Recall	.17 [†] ^a	Thalbourne & Delin (1999), reanalysis
Lucid Dreaming (Australia)	.37**	Thalbourne & Houran (2000), further analysis
Lucid Dreaming (USA)	.34**	"
Spadafora & Hunt Dream Scale		
Archetypal	.39**	Lange, Thalbourne, Houran, & Storm (2000)
Control	.43**	"
Fantastic nightmare	.24*	"
Posttraumatic nightmare	.48**	"
Lucid	.42**	"
Prelucid	.35**	"
Night terror	.46**	"
Hood's Mysticism Scale	.66 [†] **	Thalbourne & Delin (1999), reanalysis
Mystical Experience Ratings	.51 [†] **	"
Absorption (corrected for item overlap)	.72 [†] **	Thalbourne (1998), reanalysis
Hyperesthesia (corrected for item overlap)	.42**	Houran, Wiseman, & Houran (2002)
Anomalous Experiences Inventory		
Paranormal experiences	.65**	Thalbourne (2001), reanalysis
"	.65**	Houran, Kumar, Thalbourne, & Lavertue (2002)
Paranormal belief	.58**	Thalbourne (2001), reanalysis
"	.54**	Houran, Kumar, Thalbourne, & Lavertue (2002)
Paranormal ability	.61**	Thalbourne (2001), reanalysis
"	.48**	Houran, Kumar, Thalbourne, & Lavertue (2002)
Encounter experiences	.61**	Houran & Thalbourne (2001)
"	.46**	Houran, Kumar, Thalbourne, & Lavertue (2002)
Poltergeist	.51**	Houran & Thalbourne (2001)
"	.45**	Houran, Kumar, Thalbourne, & Lavertue (2002)
Tobacyk Revised Paranormal Belief Scale (Rasch version)		
New Age Philosophy	.47**	Thalbourne (2001), reanalysis
"	.52**	Houran, Wiseman, & Thalbourne (2002)

Traditional Paranormal Beliefs	.37**	Thalbourne (2001), reanalysis
“	.33**	Houran, Wiseman, & Thalbourne (2002)
Mental Experiences Inventory		
Paranormal belief (Australia)	.54**	Thalbourne & Houran (2000), reanalysis
“ (USA)	.59**	“
Paranormal experience (Australia)	.75**	“
“ (USA)	.77**	“
Sense of being high (Australia)	.57**	“
“ (USA)	.57**	“
Daydreaming (Australia)	.57**	“
“ (USA)	.46**	“
Sense of mental potency (Australia)	.68**	“
“ (USA)	.43**	“
Introspection (Australia)	.71**	“
“ (USA)	.60**	“
Persinger's Personal Philosophy Inventory		
General temporal lobe epilepsy scale	.72 [†] **	Thalbourne, Houran, & Crawley (2003)
Complex partial epileptic signs	.71 [†] **	“
All temporal lobe signs	.70 [†] **	“
Sense of presence	.57 [†] **	“
Liberal (exotic) beliefs	.56 [†] **	“
Depersonalization	.55 [†] **	“
Auditory-vestibular experiences	.53 [†] **	“
Visual images	.52 [†] **	“
Paranormal experiences	.48 [†] **	“
Hypomania	.39 [†] **	“
Intense meaning	.38 [†] **	“
Olfactory experiences	.37 [†] **	“
Perseveration	.36 [†] **	“
Hypergraphia	.26 [†] **	“
Rare (psychotic-like)	.24 [†] **	“
Limbic motor	.23 [†] **	“
Acquiescence response bias	.23 [†] **	“
Conservative religious beliefs	.21 [†] **	“
Success rate on <i>I Ching</i> test of psi	.11*	Combined samples (Storm & Thalbourne, 1998-99, 2001; Storm, 2002), reanalysis
Number of haunt experiences reported by participants during field study	.22**	Houran, Wiseman, & Thalbourne (2002)
Number of different categories of haunt experience reported by participants during field study	.21*	“

Note:

†Spearman rank-order correlation unless otherwise noted

‡Pearson correlations as reported in original sources

^a $p = .06$, * $p \leq .05$, ** $p \leq .01$

This accumulated pattern of findings also updates Thalbourne's (2000d) review

and conceptualization of transliminality. Since the psychophysiological model of transliminality presented in this thesis is broadly supported by evidence from psychometric, personality, behavioral, and psychophysical realms, it provides a conceptual framework for reinterpreting psychological concepts such as absorption, 'openness to experience,' imaginative involvement, fantasy proneness, 'flexibility of repression' and ego-permissiveness. Transliminality appears to be a robust individual difference characteristic that integrates cognitive, affective, perceptual, and behavioral processes on a single dimension. The dimension underlying transliminal phenomena is proposed to be graduated regulation (functional interconnectedness) of interaction among frontal cortical loops, temporal-limbic structures, and primary or secondary sensory areas and/or sensory association cortices. It is argued that this looser gating promotes lower sensory thresholds; faster processing on the sensory and/or motor levels; an undifferentiation of imagery, affect, ideation, and perception; and superior pattern-object recognition and signal detection.

However, this gating is proposed to be dysfunctional at more extreme levels as weak or erratic screening functions fail to transform interconnectedness into selective integration. In this context, higher levels of transliminality might gradually or abruptly convert creative processes and positive syncretic experiences into psychopathology. Thus, there may be nonlinear or dynamic relationships between transliminality and certain cognitive phenomena, including artistic ability, personality traits, and aspects of cognitive and emotional intelligence. RTS scores correlate with many cognitive, affective, perceptual, and behavioral processes as illustrated in Tables 7.2 and 7.3, but the possibility of nonlinear effects may help explain why some studies have seemingly failed

to identify a transliminal component (as measured by the Transliminality Scale) to some psychological variables. For example, Thalbourne et al. (1997) found, contrary to predictions, that transliminality was not related to repression-sensitization (Byrne et al., 1963), three measures of verbal creativity (Torrance, 1966/1974; cf. Brod, 1997, pp. 289-291), or, in line with predictions, to intelligence (Raven, 1965). Likewise, Thalbourne (2000b) did not confirm a significant correlation between transliminality and the Revised Barron-Welsh Art Scale (Welsh & Barron, 1963). Lastly, Lange, Thalbourne et al. (2000, p. 611) reported several non-significant associations between transliminality and variables from Cattell's 16PF (Russell & Karol, 1994), including reasoning, emotional stability, dominance, liveliness, social boldness, sensitivity, vigilance, privateness, apprehension, self reliance, perfectionism, tension, extraversion, anxiety, and independence.

These disparate findings suggest that future research might profitably examine the construct specificity of the RTS. Assuming the general validity of the Cognitive Regulation Hypothesis from Chapter 2, additional studies with the RTS and advanced instrumentation may help in determining the precise functional and/or structural source of the hypothesized cognitive disinhibition. For example, Ramachandran and Hubbard (2001, p. 12) postulated that cross-activation can come about by at least four different mechanisms: (1) cross-wiring between adjacent areas, either through an excess of anatomical connections or defective pruning, (2) disinhibition between adjacent areas, (3) increased feedback connections between successive stages of the sensory hierarchy, and (4) excess activity between successive stages in the hierarchy as a result of disinhibition of feedback connections.

Any one of these four different mechanisms would seem to theoretically produce transliminality, but it is possible that each of these different mechanisms may produce somewhat qualitatively diverse experiences—and perhaps even characterize different psychological states and psychiatric conditions. As a result, the RTS may prove to be an instrument that has application beyond theoretical research and perhaps can be a valuable measure for use in clinical or other applied contexts. Transliminality might therefore be a crucial variable in understanding the proposed continuum within the general population along which ordinary and pathological forms of cognition and perception may be mapped (Chapman & Chapman, 1980; Claridge, 1990, 1997a; Hewitt & Claridge, 1989; Johns, Nazroo, Bebbington, & Kuipers, 2002; Peters, Day, McKenna, & Orbach, 1999; Posey & Losch, 1983-1984; Prentky, 1989).

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APPENDICES

**APPENDIX A:
TRANSLIMINALITY SCALE (FORM B)**

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APPENDIX A:

TRANSLIMINALITY SCALE (FORM B)

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**APPENDIX B:
HARTMANN'S BOUNDARY QUESTIONNAIRE**

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HARTMANN'S BOUNDARY QUESTIONNAIRE

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**APPENDIX C:
BRIGGS-NEBES HANDEDNESS SCALE**

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APPENDIX C:

REVISED PARANORMAL BELIEF SCALE

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**APPENDIX D:
REVISED PARANORMAL BELIEF SCALE**

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APPENDIX D:

REVISED PARANORMAL BELIEF SCALE

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**APPENDIX E:
SCREENING FOR SOMATIZATION SYMPTOMS (SOMS-2)**

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APPENDIX E:

SCREENING FOR SOMATIZATION SYMPTOMS (SOMS-2)

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WHITELEY INDEX**

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**APPENDIX G:
COGNITIONS ABOUT BODY AND HEALTH QUESTIONNAIRE**

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APPENDIX G:

COGNITIONS ABOUT BODY AND HEALTH QUESTIONNAIRE

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**APPENDIX H:
ANOMALOUS EXPERIENCES INVENTORY**

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APPENDIX H:

ANOMALOUS EXPERIENCES INVENTORY

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**APPENDIX I:
EDINBURGH GHOST PROJECT - FACE SHEET**

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APPENDIX I:

EDINBURGH GHOST PROJECT – FACE SHEET

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**APPENDIX J:
SYNESTHESIA-HYPERESTHESIA SCALE**

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APPENDIX J:

SYNESTHESIA-HYPERESTHESIA SCALE

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O-SCALE**

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APPENDIX K:

O-SCALE

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**APPENDIX L:
PUBLICATIONS**

Houran, J., Thalbourne, M.A. and Lange, R. (2003) Methodological note: Erratum and comment on the use of the Revised Transliminality Scale.
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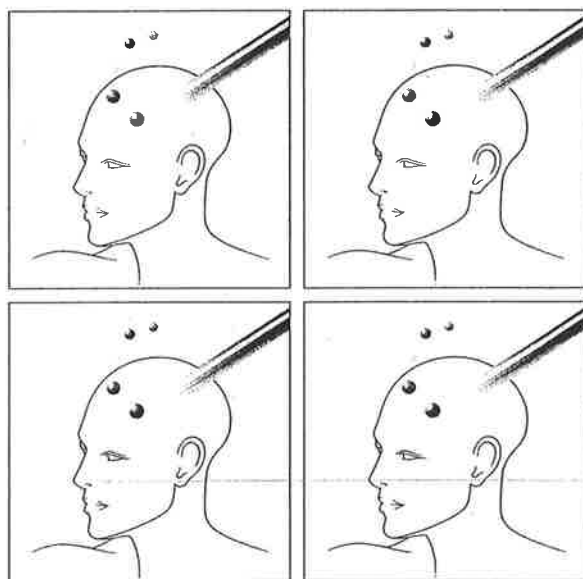
<http://dx.doi.org/10.2466/PMS.96.1.311-323>

4º SIMPÓSIO DA FUNDAÇÃO **Bial**

AQUÉM E ALÉM DO CÉREBRO

BEHIND AND BEYOND THE BRAIN

Casa do Médico - Porto
4, 5 e 6 de Abril de 2002



F U N D A Ç Ã O

Bial

Instituição de utilidade pública

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**ENCOUNTER EXPERIENCES IN THE CONTEXT OF
MENTAL BOUNDARIES AND BILATERALITY**

By James Houran, Diane D. Ashe, & Michael A. Thalbourne

in press, *Journal of the Society for Psychical Research*

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