PERSONALITY VARIABLES IN SPONTANEOUS PSI RESEARCH: CONTEXTUALIZING THE BOUNDARY CONSTRUCT IN ITS RELATIONSHIP TO SPONTANEOUS PSI PHENOMENA

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Introduction

The idea of an *anomaly-prone* personality is an attractive one, and one which is supported in the mainstream (i.e., psychological and neuroscience) and parapsychology literatures. This is to say that by knowing how an individual scores on a given battery of personality questionnaires, one can ascertain the likelihood of that person experiencing and reporting spontaneous psi phenomena.[1]

This paper will present and evaluate how and why individual differences in 'boundary thinness' impacts upon the tendency to experience spontaneous psi phenomena. Boundary thinness will be introduced and described from a hierarchical perspective. This will begin at the physiological level, move up to the cognitive level (e.g., attention and representational boundaries), and include discussion of intrapersonal subjective experiences (including consciousness). Finally, it will explore *inter*personal experiences, and boundaries that are working at a societal/cultural level. In summary, boundary thinness can be understood to reflect a tendency toward greater interconnections or less inhibition within and between the neural structures of the brain (i.e., left and right hemispheres and cortical and sub-cortical structures), between subjective emotional states and states of consciousness (less distinctness between usually distinct states of consciousness such as being 'awake' or 'asleep', and more 'in-between' states), between

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[1] It is possible that we may also be able to ascertain the likelihood of their success on a genuine ESP task. However, the veridicality of ESP is somewhat outside of the scope of this paper, i.e., we cannot know for sure whether spontaneous psi phenomena are genuinely psychic or an example of a situation of 'pseudo psi', we can however, map what we know about the personality correlates of laboratory performance of ESP to subjective experiences and have a better idea about which experiences could *potentially* be genuine.

representational and other structures of the cognitive system and between other intrapersonal and interpersonal subjective experiences. This results in those with thinner boundaries exhibiting several characteristics:

a. being efficient at processing subliminal information and having more information associated with the functioning of evolutionarily older brain areas (namely the limbic system and reptilian brains) available to the cortex;

b. having more availability of information associated with the functioning of the right hemisphere (via reduced dominance in the left hemisphere and increased connectivity between the hemispheres);

c. having a tendency toward experiencing altered and 'in between' states of consciousness such as the hypnagogic state[2];

d. experiencing a fusion of emotions and thoughts;

e. being prone toward making cognitive associations;

f. experiencing extreme empathy and a proneness toward getting emotionally close to other individuals.

As spontaneous experiences reflect a mixture of pseudopsychic alongside potentially more genuine phenomena, this paper will explore how boundary thinness could shed insight on the etiology of both explanations for apparently psychic experiences.

This author considers that there are several psychometric variables reflective of boundary thinness. Here, Positive Schizotypy, Thalbourne's Transliminality, Hartmann's Boundary Thinness and Persinger's Temporal Lobe Lability will each be introduced as *anomaly-prone* personality types. These in turn relate to other psychometric variables associated with psi experiences, which include creativity, dissociation, absorption and extraversion. These (secondary) variables may also be associated with boundary thinness and as such, a *boundary* approach could allow for a deeper (and more parsimonious) understanding of spontaneous psi experiences. Much of the current paper will focus on the construct of Positive Schizotypy, although it

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[2] The liminal state of consciousness between wakefulness and sleep (e.g., see Mavromatis, 1987).

will be argued that all of these constructs are psychometrically and descriptively very similar.

This author also considers that a traditional 'personality' approach to understanding psi experiences may in fact be somewhat restrictive and should be elaborated in order to fully understand *how* individual differences may impact upon the tendency to experience anomalous phenomena. As such, there is room for deep elaboration on what we know and where we are going with a view to developing a greater understanding of anomalous experiences from this perspective.

This paper will review trait measures of boundary thinness, and move on to break boundaries down into their constituents in a hierarchical exploration of boundaries in the brain, mind and society. The argument that [thinner] boundaries are both a personality trait and state of consciousness, possible among everyone, will be presented. In addition, several suggestions for the manipulation of boundary thinness will be presented, which could have relevance to clinical psychology in addition to parapsychology.

Various *types* of thin boundary may exist within the overall personality construct. This is coupled with the observation that spontaneous psi phenomena are multifaceted. As such, there is also a need to delineate which types of boundaries are more relevant to understanding each of the various types of spontaneous psi phenomena.

Next, it will be argued that researchers considering using boundary relevant individual differences measures in spontaneous psi research should explore personality *profiles* in contrast to using individual personality scales. This will enable greater understanding of the mental health/wellbeing of the person reporting a spontaneous psychic experience.

This paper will then explore *why* an anomaly-prone personality might exist in the first place, and an argument for an evolutionary understanding of anomalous and paranormal experiences will be made. It will be argued that anomaly-prone personalities are associated with positive schizotypy, which is genetically related to schizophrenia. As such, anomalous experiences may be related to the genes associated with schizophrenia. An evolutionary perspective on ESP is not a new idea, although the idea that ESP might be related to schizophrenia is a twist on current thinking in clinical and personality psychology. An evolutionary perspective which maps parapsychology to the mainstream may also allow for greater acceptance of research into anomalous experiences.

Finally, it is considered that the perspectives of Situationism and Interactionism in mainstream personality research should be mapped to parapsychology. The basic premise behind this view is that personality is not a consistent/fixed internal code, but rather an emergent property of the mind/brain/body, that is both situational and interacts with other psychological (e.g., preferred state of consciousness, one's gender/gender role) social (e.g., the demands of the particular social situation) and environmental factors (e.g., of geomagnetism and solar influences). If boundary thinness is both a state of consciousness and a personality trait, it is important to ascertain which circumstances are conducive to spontaneous psychic phenomena (or accessing states of boundary thinness) in reference to one's own particular personality profile.

Boundaries and Anomalous Experiences

Spontaneous psi phenomena are more common among certain individuals, and are more likely in certain states of consciousness and situations. On the surface, these correlates may appear to be somewhat disparate. In terms of personality, psi experiences are more likely to be reported by those who score high on absorption (Irwin, 1985), dissociation (Pekala, Kumar & Marcano, 1995; Ross & Joshi, 1992), positive schizotypy (Wolfradt, Ouibaid, Starube, Bischoff & Mischo, 1999), temporal lobe lability (Persinger & Valliant, 1985), transliminality (Thalbourne & Delin, 1994), boundary thinness (Krippner, Wickramasekera & Tartz, 2001), extraversion (Eysenck, 1966) and creativity (Dalton, 1997).[3]

In terms of states of consciousness/situations, psi experiences have been associated with dreams (Rhine, 1953), the hypnagogic state of consciousness (Gurney, Myers & Podmore, 1886; Sherwood, 1998), meditation (Roney-Dougal & Solvin, 2006), being subjectively awake but doing repetitive tasks (Gurney, Myers & Podmore, 1886), the action of the right hemisphere (Broughton, 1983), 'consciousness

[3] For a comprehensive review of individual differences and psi experiences, the interested reader is referred to Irwin (2004) and Targ, Schlitz & Irwin (2000).

binding'[4] processes (Don, McDonough, & Warren, 1998), and subliminal perception (Beloff, 1973; Roney-Dougal, 1986).

In this paper, it will be argued that a parsimonious way to understand these variables and their relationship to psi experiences is by consideration of boundary thinness as both personality trait and a state. This way, spontaneous psi experiences are possible in anyone given the right state, but some individuals are more prone to experience such states in terms of their trait biological and psychological makeup. As noted in the introduction, there are a number of features associated with 'thin boundaries'. This basically reflects how connected or separate a neural structure or cognitive process is, in relation to other structures or processes in the brain or mind; 'weak' or 'thin' boundaries imply that there are many connections between structures and processes in the neurological and cognitive systems, whilst 'firm' or 'thick' boundaries implies fewer connections between such structures and processes. This reflects the extent to which a person is likely to be aware of information that is usually outside of the focus of attention or in the subliminal area of the mind/brain (including information processing from the right hemisphere). It also reflects the extent to which one is likely to experience certain altered states of consciousness. Boundary thinness versus thickness is fundamentally entwined with a tendency to experience spontaneous psi and other anomalous phenomena.

Boundaries are not a new idea in psychology or parapsychology. Indeed, the concept of thresholds and boundaries in the mind were explored over a century ago by Frederick Myers and William James (Thalbourne, 1999) and are also apparent in the thinking of Bergson in terms of *filter* theories of psi (e.g., 1913). In recent years, boundaries have been explored explicitly and psychometrically by two researchers in particular: Thalbourne in his construct of transliminality (e.g., Thalbourne & Houran, 2000) and Hartmann in his construct of boundary thinness (Hartmann, 1991; Hartmann, Harrison & Zborowski, 2001). A third route of understanding derives from the literature on positive schizotypy (e.g., see Claridge, 1997) and related variables (e.g., Persinger's Temporal lobe lability, absorption and dissociation).

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[4] Consciousness binding refers to the fusion of disparate elements of a perceptual object or scene into a unified conscious mental experience. It has recently been asserted that gamma wave synchrony may be implicated in binding. Interested readers are directed to, Engel & Singer, 2001 for more information.

These personality variables are associated with increased reporting of subjective paranormal experiences and may share neurological and cognitive attributes. The next section will present an overview of these variables, and their "anomaly-proneness".

Personality and Boundaries

Positive Schizotypy

Schizotypy is a term derived from 'schizophrenic genotype' and indicates a greater disposition toward schizophrenia (Claridge, 1997). This is currently understood to reflect a continuum (Bentall, 2000, 2003; Crow, 2008a), although psychologists differ in their understanding of the nature of the continuum. Some (e.g., the Chapman group, see Claridge & Beech, 1995) consider that *any* presence of 'schizotypal traits' are indicative of psychopathology, and take a quasi-dimensional view of schizotypy. Other authors (in particular, Claridge, e.g., 1997) consider schizotypy to be a fully dimensional personality construct. With this approach, the cognitive and perceptual anomalies associated with schizophrenia are considered to be normally distributed among the general population, with only extreme levels *potentially* resulting in psychotic breakdown. As such, few people would have extremely low and high expression of these traits, but the average person would exhibit a moderate level of the traits associated with schizotypy. This suggests a useful role for watered down schizotypal traits; indeed, there is some evidence for the idea of the high scoring 'happy' or 'benign' schizotype (Goulding, 2004, 2005; Holt, Simmonds-Moore & Moore, 2008; Jackson, 1997) who is psychologically healthy and exhibits adaptive traits such as creativity (Brod, 1997; Holt, Simmonds-Moore & Moore, 2008). The competing perspectives on schizotypy continue to co-exist despite considerable evidence for the better explanatory value of the personality explanation over that of the psychopathological 'taxon' (Rawlings, Williams, Haslam, & Claridge, 2008). The perspective of this author is that schizotypy reflects a personality continuum ranging from low scorers through normals to high scorers who may be more prone to schizophrenic breakdown.

Schizotypy is a multidimensional variable that is comprised of four factors (Claridge & Beech, 1995): positive schizotypy (magical thinking, hallucinations and altered perceptual experiences); cognitive disorganisation (attentional difficulties); negative schizotypy or

introvertive anhedonia (preference for solitude, lack of enjoyment from social sources); and impulsive nonconformity (impulse ridden, reckless behaviors).[5] The traits associated with positive schizotypy are those most associated with anomalous phenomena. This variable relates to subjective anomalous and paranormal experiences and beliefs (Simmonds & Roe, 2000; Wolfradt, Ouibaid, Starube, Bischoff & Mischo, 1999). Several authors have also found that Magical Ideation (as a measure of positive schizotypy) is a predictor of above-chance ESP scoring in the ganzfeld (Lawrence & Woodley, 1998; Parker, 2000a; Parker, Grams & Petterson, 1998; Parker & Westerlund, 1998). However, work using other measures of positive schizotypy (e.g., unusual experiences subscale of the OLIFE: Mason, Claridge, & Jackson, 1995) has found no significant relationship with ESP (Simmonds, 2003; Simmonds-Moore & Holt, 2007). A recent assessment of clusters or types of schizotypy scorers did indicate that those who scored high on positive schizotypy but low on the other 3 scales did better at an ESP test addressing psi as the unattended stimulus (Holt & Simmonds-Moore, 2008). Other work by Simmonds (Holt & Simmonds-Moore, 2008; Simmonds, 2003; Simmonds & Fox, 2004; Simmonds & Holt, 2007) has also addressed schizotypy and ESP from a multidimensional perspective, but the only significant relationship with ESP, when each scale was individually correlated with the psi measure was a negative relationship with impulsive nonconformity in Simmonds and Fox's (2004) research.

Hartmann's Boundary Questionnaire

Hartmann's construct of psychological boundaries refers to a continuum of boundary thinness in the mind and brain (Hartmann, 1991; Hartmann *et al.*, 2001). *Thin* boundaries refer to a relative connectedness of psychological processes, which is reflected in a thinking style of 'shades of grey'. *Thick* boundaries in the mind, on the other hand, refer to a relative separateness of psychological processes, which is reflected in a thinking style of 'black and white' (Hartmann, Rosen & Rand, 1998). These concepts reflect structural boundaries, (e.g., how connected neural structures are to one another), representational boundaries (e.g., how related representations and concepts are to one another), and boundaries in how one thinks or

[5] Impulsive nonconformity is however a controversial factor considered by some to reflect more manic tendencies (e.g., Loughland & Williams, 1997).

processes information (e.g., is thinking focused or unfocused/associative). Hartmann (1991) suggests that boundaries should be seen as one broad dimension of personality, although he considers that there are 12 types of boundary assessed by the Hartmann boundary questionnaire (BQ: Hartmann, 1991)—see Table 1.

TABLE 1.
Examples of boundary types from the Hartmann (1991) Boundary Questionnaire

Type of boundary	Example of a question addressing this form of boundary
Sleep/wake/dream	When I awake in the morning, I am not sure whether I am really awake for a few minutes.
Unusual experiences	I have had déjà vu experiences.
Thoughts, feelings, moods	Sometimes I don't know whether I am thinking or feeling.
Childhood, adolescent, adulthood	I am very close to my childhood feelings.
Interpersonal	When I get involved with someone, we sometimes get too close.
Sensitivity	I am very sensitive to other peoples' feelings.
Neat, exact, precise	I keep my desk or worktable neat and well organised.
Edges, lines, clothing	I like houses with flexible spaces, where you can shift things around and make different uses of the room.
Opinions about children and others	I think a good teacher must remain in part a child.
Opinions about organizations	In an organization, everyone should have a definite place and a specific role.
Opinions about people, nations, groups	There are no sharp dividing lines between normal people, people with problems and people who are considered psychotic or crazy.
Opinions about beauty and truth	Either you are telling the truth or you are lying; that's all there is to it.

Boundary thinness has been associated with subjective success at a psi task (Richards, 1996) and is higher among those who consider themselves to be psychic (Krippner, Wickramasekera & Tartz, 2001). A recent study found that overall thinner boundaries were related to biological PK (Palmer, Simmonds-Moore & Baumann, 2006).

Thalbourne's Transliminality

The Transliminality variable reflects "the hypothesized tendency for psychological material to cross thresholds into or out of consciousness" (Thalbourne & Houran, 2000, p. 861). It was originally derived from a factor analysis of several variables including paranormal belief, magical ideation, manic-like experience, depressive experience, creative personality and mystical experience. These clustered on a single factor (Thalbourne & Delin, 1994).

The transliminality construct, as it is currently defined, is comprised of absorption, fantasy proneness, magical ideation, paranormal belief, mystical experience, hyperesthesia, (a "hypersensitivity to environmental stimulation"—Thalbourne, 1998, p. 403), creative personality, manic experience and attitude to dream interpretation. It is currently measured employing a 17-item scale (Lange, Houran, & Storm, 2000). There is some evidence that transliminality is associated with increased psi performance in the laboratory (Sanders, Thalbourne & Delin, 2000; Storm & Thalbourne, 1998-1999, 2001) although results are mixed overall, and several studies addressing transliminality have found chance scoring (e.g., Simmonds, 2003).

Persinger's Temporal Lobe Lability

Temporal lobe lability may also be considered to reflect a personality continuum from normals through to epileptics in the general population (Persinger & Makarec, 1987). This reflects a continuum of electrical activity in the temporal lobes—effectively indicating how interconnected temporal lobe structures are with the rest of the brain. Lability can also change as a result of meditation, hypoglycemia (prolonged fasting), fatigue, hypoxia, alterations in vascular flow associated with drugs and the biochemical effects caused by personal crises (Persinger & Makarec, 1987; Persinger, 1989).[6]

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[6] The idea that boundary thinness is a state as well as a trait is revisited in a later section.

Normal people with heightened lability of their temporal lobes may experience a benign or sub-clinical variety of 'seizure', which may be associated with anomalous experiences (c.f. Persinger & Makarec, 1993). Those who score higher on this scale are indeed particularly likely to report paranormal beliefs (e.g., Persinger & Richards, 1991), subjective paranormal experiences (e.g., Persinger & Valliant, 1985) and anomalous experiences (e.g., Kennedy, Kanthamani & Palmer, 1994). High scorers are also prone to finding great meaning or significance in events, and are more likely to be creative and suggestible (Persinger & Makarec, 1993). Meaning and significance are associated with the functioning of the amygdala, (housed within the temporal lobes) which is effectively more available to the rest of the brain in those who score high on this scale.

How Do Personality Variables Inter-Relate?

It is clear that many of these variables share common variance, for example, Simmonds-Moore correlated and factor-analyzed scoring on schizotypy, transliminality, Hartmann's boundary questionnaire and temporal lobe lability and found one unified factor (Simmonds, 2005a; Simmonds-Moore, 2009). A similar study employing transliminality, a measure of positive schizotypy[7], temporal lobe lability and Hartmann's boundary questionnaire (Thalbourne & Maltby, 2008) also found one unified factor underpinning these variables.

Following a cluster analysis, Simmonds-Moore also found that there were two types of scorer in the data set, which supports the idea of a boundary basis for anomalies (Simmonds, 2005b; Simmonds-Moore, 2009) One cluster reflected high scoring on all boundary-relevant variables (temporal lobe lability, transliminality, and schizotypy, moderately high scoring on boundary thinness and high scoring on anomalous experiences). The second cluster had lower scoring on all boundary related questionnaires and anomalous experiences.

Temporal lobe lability has also been found to share considerable variance with schizotypy, (Brugger & Graves, 1997; Simmonds, 2003) and with the transliminality scale (Thalbourne, Crawley & Houran, 2003). Transliminality also correlates positively and significantly with schizotypy (Thalbourne, 1998; Thalbourne, Keogh & Witt, 2005). In

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[7] Thalbourne and Maltby (2008) used the Unusual Experiences subscale of the Oxford Liverpool Inventory of Feelings and Experiences as a measure of positive schizotypy.

fact, Thalbourne (1999) considers that "schizotypy represents what is probably the closest conceptually and empirically to transliminality" (p. 20). Transliminality also correlates positively with boundary thinness (Houran, Thalbourne, & Hartmann, 2003; Sherwood & Milner, 2004-2005). Until recently, boundary thinness had not been directly compared to schizotypy, but those with schizotypal personality do tend to score 'thinner' (Hartmann, 1991).

Relationship to Other Variables Associated With Psi Experiences

As noted earlier, spontaneous psi experiences are also associated with creativity, absorption, dissociation and extraversion. Most of these variables correlate with the psychometric measures for boundary thinness, and may themselves be associated with different forms of boundary thinness.

Creativity

It has already been noted that schizotypy is associated with creativity (Brod, 1997) and that creativity is a component of the Transliminality variable (Thalbourne & Delin, 1994). In addition, temporal lobe lability also correlates with creativity (Kennedy, Kanthamani & Palmer, 1994) and is particularly prevalent among drama students and poets (Persinger & Makarec, 1993). In fact, Gianotti and colleagues (e.g., 2001) consider that the tendencies underpinning creativity, schizotypy and paranormal ideation are all related to a proneness to make associations (see later discussion).

Absorption

The absorption variable (Tellegen & Atkinson, 1974) is associated with a proneness toward total internal attention and a tendency to experience altered states of consciousness (Targ, Schlitz & Irwin, 2000). It seems to be important in the psi process as both a state and a trait (Irwin, 1985). Absorption correlates with both schizotypy (Parker, 1999) and temporal lobe lability (Kennedy, Kanthamani & Palmer, 1994). Williams (1997) found a common factor between schizotypy variables of magical ideation, perceptual aberration and hypomania alongside absorption and paranormal experiences.

Dissociation

Dissociation is a clinical syndrome, personality type and state of being which refers to a lack of usual integration of thoughts, feelings

and experiences into the stream of consciousness and memory (Burnstein & Putnam, 1986). Dissociation is related to the increased reporting of paranormal beliefs (Rattet, & Bursik, 2001; Wolfradt, 1997) and subjective psi experiences (Pekala, Kumar, & Marcano, 1995; Ross & Joshi, 1992; Zingrone & Alvarado, 1994). Depersonalization and amnesia aspects of dissociation relate to the OBE (see Alvarado & Zingrone, 1997) while imaginative tendencies and detachment aspects of dissociation relate to anomalous sleep experiences (Watson, 2003).

Dissociation may relate indirectly to psi experiences due to a tendency to experience altered states of consciousness (Targ, Schlitz & Irwin, 2000). The dissociative OBE has also been associated with claims of subjective paranormal experiences (Alvarado, 2000) as well as elevated psi-performance (Dalton *et al.*, 1999). After Blackmore, Alvarado & Zingrone (1997) suggested that being out of the body may allow a shift in one's cognitive map of reality, which could potentially allow for psi experiences.

Interestingly, the limbic system is implicated in alterations in the state of consciousness (Roll & Montagno, 1985), in particular, dissociation. In support of this, temporal lobe lability relates strongly to dissociative experiences (Persinger & Makarec, 1993). Dissociation also correlates with positive schizotypy (Merckelbach, Rassin, & Muris, 2000) and transliminality (Thalbourne, 1998). Watson (2001) found that dissociation and schizotypy are strongly correlated but maintains that they are distinct constructs.

Extraversion

Extraversion is a complex variable relating to one's sociability, sensation seeking, impulsivity, and level of outgoingness (among other components). It is also conceptualized and measured in a number of ways (Friedman & Schustack, 2006). It appears to relate to some, but not all psi-related experiences (Targ, Schlitz & Irwin, 2000). For example, it relates to precognitive experience (Rattet, & Bursik, 2001) and ESP performance (Storm & Thalbourne, 1998-1999). Superficially, this variable seems rather different from the variables discussed thus far. However, Claridge (1967) has noted that different forms of schizotypy are associated with different 'arousal profiles'. This reflects tonic arousal, ranging from low to high anxiety and homeostatic arousal, which reflects the arousal profiles of extraverts and introverts. The arousal systems become partially dissociated in positive

schizotypy, which is overall more associated with high anxiety (physiological lability) and high extraversion. Although positive schizotypy does not relate to psychometric extraversion (Day & Peters, 1999) it does appear to relate to impulsivity (Dinn, Harris, Aycicegi, Greene, & Andover, 2002), perhaps in men only (Rim, 1994). This may reflect the impulsive component of the schizotypy construct, which correlates with positive schizotypy (e.g., Mason, Claridge & Williams, 1997). It may also imply that some experiences associated with the extraversion variable may also reflect the experiences of someone who is 'thinner boundaried'.

A Hierarchical Exploration of Boundary Thinness and Anomalous Experience[8]

To gain further insight into personality and spontaneous psi experiences, it is necessary to strip the boundary construct down to the components which may contribute to the psychological and parapsychological experiences associated with psychic (and pseudo psychic) experiences. There are several ways in which we can understand boundary thinness. Here, 'boundaries' in the perceptual-cognitive system will be considered hierarchically. This exploration will begin at the level of psychophysiology and move up to cognition, subjective conscious (intrapersonal) experiences and interpersonal phenomena.

Connections in the brain

Thin boundaries may reflect a neural system that has more connections; directly as more neural connections and indirectly in the form of a reduction in the level of neural inhibition, which results in more *functional* connectivity. Hartmann considers that a brain with thin boundaries has "more complex or multiple connections in the cortex", while those with thick boundaries have "relatively simple straightforward or specific connections" (Hartmann, 1991, pp. 241-242). To Hartmann, the normal nervous system has *fine-tuned* itself, whilst the thin-boundaried system, exhibits connections that have grown (or not died off/been neurally 'pruned'). Hartmann (1991) also

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[8] This idea was presented in an earlier form at a conference on *Perspectives on Anomalous Experiences*, and a paper on the same topic will appear as a book chapter within a volume of the same name.

suggests that the thick boundary brain may be considered to have completed its development, whilst the thin boundary brain may reflect a system that is still developing, and in some ways may be considered to be childlike.

Boundaries can also be considered in terms of the extent to which inhibitory processes[9] are active in the system. A thin boundary system would reflect a *reduction* in such processes. For example, McCreery and Claridge (1996) note that there is a dissociation between the tonic and homeostatic arousal systems in the positive schizotypal nervous system. This results in a weakening of inhibitory mechanisms in the central and autonomic nervous systems (whilst excitatory mechanisms are high), In turn, this results in a relaxed nervous system that is more open to incoming and lower levels of information. Less inhibition might also allow for the inclusion of more neurological structures and more cognitive processes which may have an impact on what is available to conscious awareness as well as the contents of consciousness.

The Role of Subcortical Processes and 'Vertical' Connectivity

Boundary thin personalities may be associated with increased connectivity (anatomical or functional) between subcortical and cortical brain structures. Thalbourne (1999), for instance, has suggested that the physiological nature of transliminality may be conceptualized as the interconnectedness of various distinct parts of the brain, namely in the form of a sensitivity of the neocortex to information which flows from subcortical parts of the brain (the R-Complex or reptilian brain and the limbic system—Houran in Thalbourne, 1999, p. 21). Thus, there would be a consequent increased level of communication between higher and lower parts of the brain. A similar theory has been suggested by Hartmann (1991) in terms of the boundary thinness variable. Interestingly, states of consciousness associated with a dominance of alpha and theta EEG rhythms (which reflect more influence of sub-cortical activity on the cortex, see Mavromatis, 1987) are related to extrasensory perception experiences (Alvarado, 1998).

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[9] Much of the neurological system functions as a result of a balance between excitatory and inhibitory connections between neurons and neuronal pathways. We are wired such that many of our nerve cells and neuronal pathways connect with one another, but are not all activated due to the execution of inhibitory controls. Less inhibition means that the pathways which do already exist are more 'used'.

The Right Hemisphere and 'Lateral' Connectivity

There is a greater contribution of information processing that is linked to the right hemisphere among those with thinner boundaries. For example, there is increased EEG coherence between the hemispheres among those who score high on positive schizotypy (McCreery & Claridge, 1996), which indicates greater communication between the hemispheres. [10]

There is also a shift in the usual lateralization patterns across the two hemispheres of the brain such that the right hemisphere has a greater role in high scorers on positive schizotypy (Gruzelier & Doig, 1996). For example, ambidextrous individuals tend to score higher on schizotypy scales (Somers, Sommer, Boks & Kahn, 2008), which reflects a more bilateral organization of language. Other authors have found that those who score high on positive schizotypy have a right hemispheric bias in their information processing (Brugger, Gamma, Muri & Shafer, 1993; Leonhard & Brugger, 1998).

In terms of psi experiences, Simmonds (2005a) found that ambidextrous individuals reported more subjective paranormal experiences. This may implicate the deployment of *both* left and right hemispheric processes in the etiology of these experiences.[11] This finding complements the finding that those possessing a complimentary thinking style, including both rational and intuitive[12] thinking styles, tend to be more likely to believe in paranormal phenomena than those with only intuitive *or* rational thinking styles (Genovese, 2005; Wolfradt, Oubaid, Straube, Bischoff & Mischo, 1999). The expression of *two* thinking styles simultaneously related to paranormal belief, experience and ability, and was associated with schizotypy. They

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[10] In addition, among those who exhibit positive schizophrenia, there is also a larger corpus callosum and inter hemispheric blood flow (see Luh & Gooding, 1999), which may manifest in a watered down form among those scoring high on positive schizotypy.

[11] This may reflect right and left hemispheric representations of language, alongside other cognitive processes.

[12] Irwin and Young (2001) did not find the combination pattern in their later study, and note that Wolfradt *et al.* failed to find it in a replication of their 1999 study. In fact, Irwin and Young found that paranormal beliefs were more related to an intuitive (and not rational) thinking style. However, there was a trend toward a relationship between a combination of rational and intuitive thinking and new age beliefs.

suggest the combination of the two modes results from the brain's attempted psychological regulation of the two very different types of thought. This may imply that processes associated with right and left hemispheres are both more involved in such experiences, which may lead to increased hemispheric connection (or communication) and ability to entertain two different ways of approaching the world simultaneously.

Persinger has suggested that some anomalous experiences may be explained by a relative discrepancy in the arousal levels across the two hemispheres of the brain (Persinger & Richards, 1991). This results in intrusions of right hemispheric processes, such as the homologue of the sense of self, into the left hemisphere (Munro & Persinger, 1992). This may result in experiences of a sense of presence (in addition to OBEs and feelings of detachment from the body—examples of *dissociation*). Munro and Persinger suggest that this type of mystical experience is due to a "hemispheric mismatch in temporal lobe theta activity" (p. 899). However, Houran, Ashe and Thalbourne, (2003) did not find any relationship between bi-laterality, preferred side of the body and entity encounter experiences.

The right hemisphere is also considered to be important in the psi process (Braud, 1975). There has been some empirical support for the role of the right hemisphere in psi processing (Broughton, 1983), but recent work has not supported a difference between those with a preference for the right or left hemisphere on a psi task (Alexander & Broughton, 1999). It may well be that a contribution of *both* hemispheres might be more informative when considering both subjective paranormal experiences and genuine psi performance.

Attentional Boundaries

Psi related experiences may also be considered from a cognitive perspective. For example, in terms of attention, a psi stimulus may be processed in a manner akin to an unattended stimulus that is usually filtered out of conscious awareness. The idea of a filter in the mind which sifts incoming information dates back to Bergson (e.g., 1913), Broadbent (cited in Roney-Dougal, 1986) and Myers (1902/2002). Roney-Dougal (1986) suggests that selection filters in the normal mind prevent our experiencing an overload of perceptual experience, which might otherwise lead to madness. If attentional mechanisms break down, then filtering mechanisms would allow too much information into the cognitive system, which may or may not include a psi signal

amid perceptual noise (from both outside and within the cognitive system). In those with marginally weaker filters, we may see evidence of more information entering conscious awareness. Indeed, Thouless and Wiesner (1946) considered psi to be an evolutionarily older method of communication that should therefore only manifest under conditions which are detrimental to perceptual attention.

Those who score high on positive schizotypy (and impulsive nonconformity) performed better on two cognitive paradigms addressing attentional filtering (Simmonds, 2003)[13]. These are the negative priming and latent inhibition paradigms, respectively (Claridge & Beech, 1995). Among those who do not score high on positive schizotypy, information that was previously ignored or irrelevant becomes less available when it is subsequently needed, as it is inhibited or filtered out of conscious awareness. Among high scorers on positive schizotypy, however information is readily available, even though it was previously ignored. As such, Claridge and Beech (1995) consider that these reflect 'superior performance paradigms' for positive schizotypes. Interestingly the dissociation variable is associated with enhanced attentional abilities and increased information capacity in working memory (de Ruiter, Phaf, Elzinga, & van Dyck, 2004; de Ruiter, Phaf, Veltman, Kok, & van Dyck, 2003).

Recent work (Holt, Simmonds-Moore & Moore, 2007) found support for the idea that ESP might work like the unattended stimulus, which is usually filtered out of conscious awareness.[14] In addition, the same study explored the idea that wider attentional boundaries in schizotypy and transliminality might relate to ESP. Creativity, belief in the paranormal and unusual experiences (which may function as the transliminality variable) correlated with the attention based psi effect, but schizotypy (as measured as a unidimensional scale) did not. Where schizotypy was measured in clusters, the cluster relating to healthy positive schizotypy demonstrated more efficient inhibition of the irrelevant psi stimulus (Holt & Simmonds-Moore, 2008). This work should be replicated to further elucidate the roles of attention and personality for psi experiences.

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[13] However, this is not always the case. Recent work did not find evidence of 'weaker' filtering of normal irrelevant information among positive schizotypes (Holt & Simmonds-Moore, 2008).

[14] This was undertaken by employing an adapted latent inhibition paradigm with the addition of two psi conditions.

Attentional widening may also relate to pseudo-psychic experiences. Bullen, Hemsley and Dixon (1987) suggest that anomalies of attention allow more automatic/preconscious processing to become conscious. This may be associated with experiential and perceptual anomalies, which may seem to be psychic, even if they are not, perhaps due to chance coincidences with events in the external world. It is important to undertake further work exploring the nature of the relationship between attentional boundaries and psi experiences.

Availability of Subliminal Information

'Subliminal' information (stimuli presented below the normal perceptual threshold for conscious awareness) may be more available to conscious awareness among those with thinner boundaries than those with thicker boundaries. For example, positive schizotypy is associated with an increased sensitivity to subliminal primes (Evans, 1997). In addition, those with thinner boundaries (as measured by the BQ), had greater access to imagistic stimuli (in 'image' or pictorial format) which were presented subliminally, than those with thicker boundaries (Levin *et al.*, 1998-1999). This tendency seems to translate to other mental imagery, as high scorers on positive schizotypy are also more likely to remember nightmares and enjoyable dreams (Claridge, Clark & Davis, 1997) and report hypnagogic imagery (Jakes & Hemsley, 1987).

This tendency may be mediated by lax attentional processing and a general reduction of inhibitory processes in the mind-brain which would allow greater access to lower levels of awareness among those scoring high on positive schizotypy and related variables. Subliminal information may or may not also include veridical psi information. Several authors have noted a similarity between subliminal perception and psi phenomena (Beloff, 1973; Carpenter, 2004). Roney-Dougal, (1986), for example, suggests that both psi and subliminal percepts are weak inputs to the cognitive system and are good substrates for the study of how information moves from the subconscious to the conscious mind. Roney-Dougal's review of the literature demonstrates considerable overlaps between the correlates of subliminal perception and ESP. For example, both processes influence conscious percepts and behavior, they are both associated with right hemisphere processes and occur more in altered states of consciousness. This is particularly the case with semantic and associational responses to stimuli. Finally, there is a similarity in physiological responses (e.g. by means of galvanic

skin responses) to both psi and subliminally presented targets, particularly when these stimuli are emotional in nature. Direct experimental comparisons have revealed that the two forms of perception are actually related to one another in many contexts (Roney-Dougal, 1986). Carpenter (2004) has noted that ESP may work at a stage prior to subliminal perception, working to *orient* the organism toward or away from a particular target or object. This would be seen in the laboratory as psi hitting or psi missing and fortuitous events in the real world. He notes that many experiments exploring subliminal areas of mind may be applied to our understanding of ESP.

Alternatively, increased awareness of subliminal information may be implicated in pseudopsychic experiences. In this explanation, distracting information from lower levels of consciousness and unfiltered information from the external world may not be ignored by those with thinner boundaries. This information may then become incorporated in a "chain of semantic activation which may lead to intrusions of irrelevant information into consciousness" (Williams & Beech 1997, p. 77). This information may then be experienced as 'psychic'. In support of this proposal, an experiment addressing the relationship between transliminality and performance at a subliminal card guessing task found that high transliminals outperformed low transliminals where they received subliminal primes as to the correct card choice (Crawley, French & Yesson, 2002). There was no difference where no primes were given which indicates that subliminal information was misattributed as psi among these individuals. Other work (Houran & Lange, 1998) has indicated a relationship between dream frequency and the reporting of precognition, which could indicate an increase in sense data which may be meaningfully related (coincidentally) to events in the real world.

Associational Thinking

The right hemisphere is linked with associational thinking. As there is a right hemispheric bias among positive schizotypes, they exhibit a particular tendency to form cognitive associations and connections (Brugger & Graves, 1996). For example, Evans (1997) found that there is an increase in the activity of automatic associational networks among

those scoring high on positive schizotypy (Evans, 1997)[15]. Brugger and Graves (1997) propose that a hyper-activation of the medial temporal lobes results in disinhibition of associative processing in positive schizotypes.[16]

This thinking style may underpin the propensity to see connections and patterns where none are really there (the Type I error or *apothenia*—see Brugger, 2001, Gianottti *et al.*, 2001). The tendency to report a signal in noise has been demonstrated empirically by several authors in both visual (Feelgood & Rantzen, 1994; Jolley, Jones & Hemsley, 1999) and auditory domains (e.g., Young, Bentall, Slade & Dewey, 1987). Perceived patterns are also experienced as more complex (Jakes & Hemsley 1986) and there is greater confidence in the decision that a signal is present, irrespective of the accuracy of signal detection (Nuchponsai, Arakaki, Langman & Ogura, 1999). Being prone to making associations is also related to making more unusual word associations, which supports the existence of a relationship between positive schizotypy and creativity (Rawlings & Locarnini, 2008).

The 'loose' cognitive style is associated with a tendency toward new age beliefs and practices (which includes anomalous and paranormal experiences—see Farias, Claridge & Lalljee, 2005). Gianotti and colleagues (2001) have proposed a continuum reflecting associative processing, which underlies the tendency to think creatively, experience paranormal cognition, and at higher levels, to have psychopathological delusions.

Brugger (2001) considers that the tendency to make a type one error *explains* the relationship between paranormal thinking and psychopathology. This group does not entertain the possibility that paranormal ideation might also include genuine psi phenomena. Simmonds and Fox (2004), however, explored this tendency (employing visual noise) and found significant psi missing in the overall study. They also found some interesting patterns between schizotypy variables and ESP. This suggests that finding a signal in noise may relate to psi, and that this is associated with schizotypy. In

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[15] This is likely to be underpinned by the biological features of boundary thinness—anatomical (more connections) and functional connectivity (decreased inhibition) as described earlier.

[16] In contrast, a hypo-activation of the frontal association cortex results in an inhibition of associative processing in negative schizotypes, presumably indicating a total lack of associational thinking.

addition, de Boer and Bierman (2006) also found some evidence for the ESP hypothesis in a study comparing believers and disbelievers on an image priming task, which included an embedded psi condition. Here there was no difference between believers and disbelievers but some evidence for veridical ESP with positive primes.

Roll (1966), Irwin (1979) and Broughton (2006) consider that the ESP response may be formed from the person's own memory traces, which presumably would be better accessed with more efficient access to associational networks. Interestingly, one of the limbic structures—the hippocampus—functions as a key to access cortical memories. Enhanced memory processes have been found to relate to temporal lobe lability (Persinger, 1996) and psi performance (Feather, 1967; Rhine, 1954; Roll & Montagno, 1985).

Perceived Meaningfulness

Those with thinner boundaries are also prone to find significance and meaningfulness in mundane perceptions (e.g., Brugger, Regard, Landis, Cook, Krebs & Niederberger, 1993). This is related to the tendency to form associations, and may be mediated by the activity of another limbic structure, the amygdala, which has a role in attaching meaning to both external and internal experiences which may often be rather mundane (Skirda & Persinger, 1993). As there is more vertical connectivity in boundary thinness, limbic processes may have more impact on conscious experience. Brugger *et al.* (1999) consider that thick boundaried individuals would be less likely to report seeing meaningfulness or perceiving a shape in randomness when one is actually there (the Type II error).

Positive schizotypy does relate to the tendency for people to endorse Barnum statements as personally significant (Claridge, Clark, Powney & Hassan, 2008). This tendency also has relevance to ESP scoring in the laboratory, as Parker (2000b) found that high scorers on the magical ideation scale were more likely to undertake a cognitive strategy which he called 'spread your bets' in attributing mental imagery content to telepathy. This was associated with seeing meaning (and with imagery being available). Those who were particularly high scorers on the scale (a New Age group) and those who reported more paranormal experiences scored higher in correctly identifying the psi target. Thus, this group had a greater likelihood of seeing correspondences which resulted in increased likelihood of attaining psi hits.

Synesthesia

Synesthesia is a blurring of sensory experiences where one modality is experienced when another modality is stimulated (Reber, 1985) and is considered by some authors (e.g., Marks, 2000) to be on a continuum in the general population. As such, a few individuals will be at an extreme and are classic 'strong' synesthetes. Weaker forms of synesthesia, which are possibly those associated with thinner boundaries, are often associated with the experience of colored alphabets (where certain letters or words are experienced as particular colors) and musical experiences of colors (where certain notes are experienced as particular colors), etc., which may be more of a cognitive form of boundary thinness. Different theories abound on the reasons for synesthesia, which include sequence learning, failure of neural pruning, sensory leakage of information in brain pathways, disinhibition of neural feedback, hybrid models and increased functioning of the limbic system (for good reviews, see Grossenbacher & Lovelace, 2001; Harrison, 2001; Marks, 2000). Synesthesia may be considered hierarchically in its own right, reflecting biological, perceptual, cognitive boundaries as well as possibly boundaries of consciousness.

In general, those prone to synesthesia, have less neural inhibitory processes than those who are not (Grossenbacher, 1997) and the majority of models imply that synesthesia relates to a thinning of boundaries in the mind/brain. Indeed, synesthesia relates to psychometric measures of boundary thinness (Hartmann, 1991) to schizotypy (Williams *et al.*, 1996) and to transliminality (Thalbourne, Houran, Alias & Brugger, 2001). Synesthesia has been suggested to be a building block of anomalous experiences (Irwin, 1999; Williams, 1997). Indeed there is some recent support for the role of synesthesia in the etiology of the OBE (see Terhune, 2009). In addition, a qualitative exploration of subjective paranormal experiences found that psychic experients often describe phenomena in a synesthetic manner (Simmonds, 2004).

Synesthesia may allow a person to see the world (or experience the world) in a different way, and as such have more access to psi phenomena, but this has yet to be explored directly in an empirical investigation.

Interpersonal Boundaries

One of the original boundaries on Hartmann's original BQ (1991) relates to interpersonal boundaries, such that an extremely thin boundaried person is likely to get 'too close' to another individual. In support of this, higher scorers on an empathy scale do tend to score higher on a measure of positive schizotypy (Rim, 1994). It has been suggested that empathy and telepathy may be very similar constructs (Donovan, 1998). Unfortunately, however, there is little empirical work exploring connections between empathy, boundary thinness and psi experiences.[17] However, there is some evidence that empathy and compassion between those who love each other may be visible as a physiologically based psi effect (see Radin *et al.*, 2008). In addition, recent work found that healing was more successful with pairings of people who were close compared to those who did not know one another (Achterberg, 2008).

Dalton (1997) found that close emotional and biological bonds are associated with increased performance at a psi task. In addition, Sheldrake (2003) also found that emotional closeness between individuals was an important variable in his assessment of telephone telepathy. Other research has found that those who are biologically identical (monozygotic twins) displayed EEG *coherence*; in other words they were acting as if there were *no boundaries* between them (Duane & Berendt, 1965). This finding has been extended more recently in the work of Grinberg-Zylberbaum and colleagues (e.g., 1994) who found that there was a physically observable apparently *transferred* evoked potential between the brains of pairs of participants who had got into a state of 'deep communication' through shared meditation. This work has recently been replicated using EEG and fMRI (Standish, Johnson, Kozak, & Richards, 2003).

A shared meditative state among several minds may also correlate with anomalous physical effects. For example, Radin and Atwater (2006) recently found a greater coherence of random number generators when a group of people were experiencing a similar meditative state induced by Hemi-sync tapes. This could imply that greater social 'connectivity' or boundary thinness could allow for more psi phenomena at a cultural level. Indeed, one might expect that

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[17] In collaboration with Dr Ginette Nachman, this author will be undertaking an empirical study exploring empathy and boundary thinness in a psi experiment.

cultures based more on the idea of *community* and *connectivity* might experience more paranormal phenomena.

Boundaries as a State of Consciousness

Thin boundaries might be better considered as both state and trait. Perhaps there are states in the brain/mind/body that are conducive to experiencing particular types of psi phenomena. Such a state would hypothetically be accessible to everyone, but more *readily accessed* by those who score psychometrically 'thinner'. It may also be that this state is closer to the waking state among those who have thinner boundaries. This section will explore boundaries as a state of consciousness.

Psychometric thinner boundaries may reflect greater access to the hypnagogic state of consciousness. Hypnagogia reflects the liminal state of consciousness between wakefulness and sleep (see Mavromatis, 1987). This is an interesting, and paradoxical state which seems to reflect many forms of boundary thinness as described in the preceding section. For example, thoughts include primary process thinking, incorporating dissociation of thought and image alongside magical thinking (Vogel, Trosman & Foulkes, 1966). Hypnagogic thinking may be described as *paralogical*, where everything may be related to everything else; as such, hypnagogic thinking may reflect associational boundary thinness (Vogel *et al.*, 1966). Hypnagogic thinking may also reflect attentional boundary thinness, as fatigue is associated with an impairment of normal filtering processes.[18]

Hartmann (1991) suggests that the sleep-related neurotransmitters norepinephrine and serotonin (Hobson, 1989) are important in terms of attentional boundaries. Norepinephrine effectively serves to increase the signal to noise ratio, affecting inhibitory processes and sharpening and increasing focused attention. He notes that increasing norepinephrine and serotonin in the cortex results in a thickening of boundaries, while reducing norepinephrine and serotonin in the cortex results in a thinning of boundaries. It is also the case that when one is wide awake, serotonin and norepinephrine are increased, whilst when

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[18] Impaired filtering is also the result of the consumption of the drug LSD and stress (Reed, 1988).

one is asleep they are decreased; particularly in dreaming sleep (Hobson, 1989).[19]

Interestingly, Mavromatis (1987) has suggested that hypnagogia reflects a reduction in cortical dominance with more availability of subcortical processes to conscious awareness. Hypnagogia is also characterized by the presence of alpha waves and theta waves[20] (Tanaka, Hayashi & Hori, 1996) which themselves relate to psi phenomena (Alvarado, 1998).

The hypnagogic state is not restricted to falling asleep (Hayashi, Katoh & Hori, 1999; Hori, Hayashi & Morikawa, 1994; McKellar & Simpson, 1954). In fact, hypnagogic thinking has also been observed in relaxed wakefulness during daytime hours without any expectation that it might occur and accompanying a waking EEG reading (Foulkes & Fleisher, 1975). It may be that hypnagogic experiences occur in wakefulness among all individuals (Foulkes & Fleisher, 1975), but are more likely among those who have psychometric thin boundaries (in particular, positive schizotypy e.g., McCreery, 1997). This is relevant to understanding psi experiences as hypnagogia is associated with the reporting of both genuine ESP and pseudo psi experiences (Sherwood, 1998).

Hartmann (1991) has suggested that those with thinner boundaries exhibit more 'halfway' states of consciousness between waking and sleeping and exhibit brain activity normally localized only in REM sleep at other times. This suggestion is supported by the presence of anomalies in the arousal systems of positive schizotypes. This renders them likely to experience changes in state at any time (even during daytime hours), which results in hypnagogic interruptions or 'microsleeps' into waking awareness (McCreery, 1997). Interestingly, McCreery also notes that microsleeps may result from both under *and* over arousal (i.e., sleep response results from being tired and incredibly over-stressed). If psi experiences are associated with hypnagogia, this contributes a parsimonious explanation for superficially disparate etiologies of psi experiences in the real world. Positive schizotypy is associated with hypnagogic experiences (Jakes & Hemsley, 1987;

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[19] As noted by David Luke at the Utrecht II conference, it may well be that boundary thinness could also be addressed in terms of chemical boundaries, which would include sleep related neurochemicals in addition to chemicals such as dopamine which are associated with increasing associational thinking (as noted in the dopamine model of schizophrenia).

[20] In addition, the state is often characterized by the presence of sleep spindles.

Pizzagali *et al.*, 2001), while negative schizotypy may reflect the opposite tendency, and is associated with a *lack* of lability in the nervous system (Mason, Claridge & Clark, 1997). The idea that schizotypy might function as a state is not a new one (see, e.g., Zanes, Ross, Hatfield, Houtler & Whitman,1998) but this may be useful in terms of further understanding why psi experiences are particularly likely under an array of circumstances in the real world.

Manipulating Boundary Thinness

If boundary thinness is a state, it may be possible to encourage anomalous experiences or prevent unwanted experiences associated with this state. In terms of manipulating boundaries, it is of interest that temporal lobe lability is encouraged by meditation, hypoglycemia (prolonged fasting), fatigue, hypoxia, alterations in vascular flow associated with drugs and the biochemical effects caused by personal crises (Persinger, 1989; Persinger & Makarec, 1987). Thalbourne, Crawley and Houran add that boundary thinness may be mediated by intense emotional states and driven by activation of the limbic system, which, via connectivity with the sensory cortex can produce anomalous phenomena (Thalbourne, Crawley & Houran, 2003).

Interestingly, the work of this author demonstrated that sleep quality was a direct predictor of anomalous experiences and boundary thinness (Simmonds, 2005a). As such, a reduction in sleep quality[21] may have an impact on boundary thinness and anomalous phenomena. It is of interest to note that disturbed dream patterns were recently found to relate to scoring on dissociation (Giesbrecht & Merckelbach, 2004). This may reflect an increased tendency to experience mental imagery or dream whilst awake, which could have an impact upon daytime anomalous experiences. Simmonds (2005b), however, found no direct support for the idea that reduced sleep length impacts on anomalous experiences, although longer and shorter sleep both related to scoring on a measure of positive schizotypy. This supports previous research finding a similar pattern (Reid & Zborowski, 2006). This may imply an indirect route toward anomalous experiences, but more work is needed to explore the complex relationships between sleep, boundaries and psi experiences.

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[21] Sleep quality may be disturbed for a number of reasons, both internal (e.g., more nightmares and dreams) and external (e.g., having a baby or noisy neighbors).

Meditation may be useful for manipulating boundaries. Hemispheric synchrony has been observed in transcendental meditation in terms of frontal coherence (a measure of functional connectivity) and lateralized asymmetry, a measure of inter-hemispheric differences in power (Travis & Arenander, 2006). Hemi-sync technology (to drive meditative states) has also been purported to increase synchronization between right and left hemispheres (Atwater, 2004). In addition, meditation (Woodfolk, 1975, cited in Yardi, 2001) and Hemi-synch induced meditation (Atwater, 2004) also result in less cortical control and greater influence of information associated with sub-cortical processes on conscious awareness. The effects of meditation seem to encourage more efficient processing outside of the normal range of attention (e.g., Sudarsham Kriya yoga meditation; see Srinivasan & Baijal, 2007), which may encourage greater access to usually subliminal components of the mind. Meditation may also encourage synesthesia [22] (Walsh, 2005), which was noted previously to be associated with psi experiences. Meditation and hemi sync have also both been related to anomalous experiences, including extrasensory perception (Atwater, 2004; Palmer, Khamashta & Israelson, 1979; Rao & Rao, 1982).

It may be that consciousness itself should be considered in terms of boundaries. Several authors (e.g., Engel & Singer, 2001; see Hebert, Lehmann, Tan, Travis & Arenander, 2005, for a review) have suggested that synchronization of 40 Hz (or gamma) activity in the visual system may serve to bind the features of an object into a unified conscious experience. Recently, alpha has also been considered to be important in binding (Hebert *et al.*, 2005). It may be that meditative and other states where boundaries are 'thinned' (vertically and laterally) may allow for a *more efficient* unity of consciousness. Hebert *et al.*, for example, found enhanced EEG alpha time-domain phase synchrony during transcendental meditation. Increased efficiency may permit mystical, spiritual and possibly paranormal experiences. This was supported by findings of Don, McDonough and Warren (1998), which indicated that psi information may have reached the neocortex but not to a large enough extent to be *bound* into consciousness.

In summary, a state and trait approach allows for a richer and more parsimonious understanding of the etiology of psi experiences. It

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[22] Synesthesia may also be induced by ingestion of drugs (Simpson & McKellar, 1955)

implies that psi experiences are more likely under certain spontaneous (e.g., stress, crisis) and deliberate (meditation, drug ingestion) circumstances in everyone, irrespective of personality, but are potentially more likely among those with thinner boundaries, as these individuals are more able to experience appropriate states. This approach also allows for the development of methods for controlling/encouraging psi experiences occurring in the real world. For example, if increasing sleep quality can thicken boundaries, methods to do this may allow for a reduction in unwanted psi experiences which have become overwhelming.

Types of 'Boundary' and Spontaneous Psi Experiences

There are different types of psychometric boundary thinness, which overlap with one another in potentially different ways. For instance, only *some* subscales of boundary thinness were found to be significant predictors of transliminality (Sherwood & Milner, 2004-2005). It may be that certain forms of boundary thinness are more relevant to spontaneous psi phenomena than others.

In support of this idea, research by this author (Simmonds, 2005a) found that some psychometric measures of boundary thinness (notably transliminality and temporal lobe lability) were statistically more directly related to the reporting of anomalous experiences than other measures (boundary thinness in particular). Boundary measures also had slightly different variables as their *own* predictors. As such, psychometric measures of boundary thinness may well all be measuring aspects of boundary thinness but some might be more directly important when considering the etiology of anomalous experiences than others. This makes sense in terms of their item content, as some seem to be more directly related to actual experience, such as altered states of consciousness, whilst others seem to function at a higher level and reflect more cognitive/descriptive experiences.

In addition, relationships between different measures of boundary thinness and anomalous experiences undoubtedly reflect the item contents of the measure used to address psi experiences. Some measures are 'wider' than others, for example, the Anomalous Experience Inventory (AEI: Kumar, Pekala & Gallagher, 1994) is a broad construct containing traditionally paranormal experiences in addition to anomalous experiences such as the out of body experience and dream-related phenomena. As such, boundaries related to the

action of the temporal lobes and the biological and cognitive biases which underpin the transliminality variable may relate more directly to experiences tapped by the AEI than a more narrowly defined measure of psi experiences (Simmonds, 2005a).

If one takes a hierarchical approach to boundaries, it may be that different *aspects* of boundary thinness could be associated with different *types* of anomalous and paranormal experience. In addition, some forms of boundary thinness may be more associated with veridical psi, whilst others are more associated with pseudopsi.

Hartmann's original BQ is actually broken down into 12 types of 'boundary' (see Table 1) and it may be the case that some, but not all of these aspects of boundary thinness are relevant for understanding psi phenomena. Richards (1991) found that only four related to perceived success at an interpersonal psi task. These reflected sleep, unusual experiences, thoughts and feelings and sensitivity boundaries. Interestingly, these reflect boundaries relating to subjective experiences in states of consciousness, cognition and emotion, but not those associated with (abstract) ways of thinking and interacting with the world. It may be that abstract boundaries are not relevant for understanding psi experiences, although more work is needed to delineate specifically which boundaries are relevant for different types of psi experience.

In addition to the association between hypnagogic thinking and paranormal experiences (Sherwood, 1998) there is some support for the contribution of other sleep variables to anomalous experiences. Reduced sleep quality functioned as a direct (albeit weak) predictor of anomalous experiences in addition to measures of psychometric boundary thinness (Simmonds, 2005a). The importance of sleep boundaries in the etiology of psi experiences clearly follows from the argument that boundaries can be considered as a state of consciousness as well as a trait variable.

Other work has indicated that the Sensitivity and Children subscales of a short form of the BQ (Rawlings, 2001-2002) were also found to correlate directly with PK performance in an experimental context (unpublished data from Palmer, Simmonds-Moore, & Baumann, 2006). It may well be that some boundaries have good explanatory value, whilst others are simply not relevant for the understanding of spontaneous psi phenomena.

In terms of psychometric measures of boundary thinness, there are currently three forms of Hartmann's BQ, which may allow for different

levels of understanding regarding the relationship between boundaries and psi experiences.[23] These are the original long questionnaire (Hartmann, 1991), a conceptually derived shorter version (Kundzendorf, Hartmann, Cohen & Cutler, 1997), and a statistically derived short version (Rawlings, 2001-2002). Despite the advantages of using short forms of the boundary questionnaire, it may well be that not all types of boundaries can be adequately assessed by these shorter versions. These measures may well allow for an excellent psychometric assessment of global 'thinness' or 'thickness', but different types of boundaries may function very differently with regard to different behaviors, experiences and beliefs. For example, recent work found that a mixture of thin and thick boundaries provided the best understanding of celebrity worship (Houran, Navik & Zerrusen, 2005). It follows that a fuller picture regarding boundaries and psi experiences may only be attained by employing the full BQ (reflecting 138 items), or a selection of subscales which seem to be more directly related to psi experiences.

Much more work on how boundaries relate to psi phenomena is needed. From the author's perspective, it is clear that boundary thinness may also be broken down differently to Hartmann's original understanding, in terms of a hierarchy reflecting various levels of understanding, from psycho-physiological, cognitive, consciousness, intrapersonal experiences and interpersonal experiences. Each type of boundary may be differentially relevant to spontaneous psi phenomena. Not enough research has explored how types or levels of boundaries contribute to psi experiences. It would be of great interest for researchers to attempt to distinguish which types of boundary are more related to the pseudo psi hypothesis and which could be more related to genuine psi phenomena.

There is little work that has empirically explored different aspects of boundary thinness and their relationships to psi and pseudo psi experiences. Indeed, it is particularly difficult to test the impact of lower levels of boundary thinness (e.g., neural and functional connectivity) on psi phenomena, as these are perhaps likely to impact on both psi and pseudo psi hypotheses (as they relate to neural and cognitive architecture upon which both may arise). There is some

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[23] A similar argument can be made for the schizotypy construct, whereby different questionnaire measures reflect different conceptual understandings regarding schizotypy.

empirical support for the relative contribution of processes associated with the right hemisphere for genuine psi experience (Braud, 1975, Broughton, 1983). However, at least for subjective psi experiences, the left hemisphere may also be involved, potentially to function as an interpreter (Wolfradt, *et al.*, 1999).

There is a lot of empirical support for the observation that the right hemispheric tendency to make associations/find a signal is associated with pseudo psychic experiences related to apothenia (Brugger, 2001). However, only a few researchers (de Boer & Bierman, 2006; Simmonds & Fox, 2004) have entertained a psi hypothesis. The findings of both studies indicate that the associational tendency may well contribute to genuine psi experiences (in addition to pseudo psi experiences), which suggests that more work should be undertaken on this form of boundary thinness.

In addition, although the associational tendency is considered as a continuum (with the tendency to make a type II error at the opposite end), little or no work has systematically explored the idea that disbelievers/those with thick boundaries might miss a signal. The current author plans to explore this idea in future research. There is much need for further empirical exploration of the relationship between associational boundaries with regards to the psi as well as the pseudo hypothesis.

There is also empirical support for attentional filters in the psi process. Holt *et al.*'s (e.g., 2007) recent work found evidence that psi may be processed in a similar manner to the unattended stimulus, and as such may usually be filtered out of conscious awareness. This work also found differences in psi scoring between healthy positive schizotypy and a less healthy form of positive schizotypy (Holt & Simmonds-Moore, 2008). As such, this indicates that boundaries are complex and that healthy boundaries may well be more related to better filtering of both psi and normally perceived irrelevant information.

Recent research also indicates that empathy and social boundary thinness could also be promising for understanding genuine psi related experiences (Achterberg, 2008; Radin *et al.*, 2008). Consciousness binding, which is considered to be one form of boundary in this paper, may be important for the psi process, as referenced in the findings of Don *et al.* (1998). Interestingly, schizophrenia is characterized by its lack of gamma binding across the brain (Strelets, Novototsky-Vlasov & Golikova, 2002) whilst meditation is characterized by its enhanced coherence across the brain. Meditation is associated with above chance

ESP (Palmer, Khamashta & Israelson, 1979; Rao & Rao, 1982), whilst schizophrenia is associated with feeling like one is being psychic, whilst actually scoring at chance (Greyson, 1977). Here, we might learn more about ESP by exploring boundaries of consciousness in these two contrasting situations. Hartmann (1991) noted that healthy individuals actually have a mixture of thin and thick boundaries, and that boundary thinness can be altered.

Only by careful and systematic further research will the true nature of the various relationships between different forms of 'boundaries' and spontaneous cases of psi be further understood. This is important, as manipulation of different forms of boundary thinness may then be possible. This could lead to greater control over psi experiences, which has relevance for clinical psychology as well as parapsychology. The implications of greater knowledge of the etiology of psi experiences from a boundary perspective could be that who are overwhelmed with subjective psi experiences may develop protective practices to 'thicken' relevant boundaries, whilst those who are interested in having more psi experiences may learn to 'dip' into psi states via thinning relevant boundaries. The next section discusses mental health and thin boundaries.

Profiles of Personality, Mental Health and Spontaneous Psi Experiences

As noted earlier, the traits associated with schizophrenia-proneness or schizotypy are distributed as a continuum (or continua) within the general population. It was also noted that there are two competing perspectives on how to understand such a continuum—the fully dimensional personality approach (Claridge, 1997) versus the quasi-dimensional taxon approach of the Chapmans and others (e.g., Claridge & Beech, 1995). Both models acknowledge the overlap between schizotypy and psychopathology. However, the personality approach considers that traits can also be associated with mental health/adaptiveness, whilst the taxon approach considers that traits reflect an association with psychopathology. For example, the taxon approach acknowledges the existence of watered down versions of schizophrenia (e.g., that the relatives of schizophrenics are characterized by other forms of psychopathology, in particular affective and bipolar disorders) but consider that this reflects diluted forms of psychopathology, rather than being a *personality* dimension. In support

of this, Nettle (2006) found that the mean score on schizotypy scales is indeed higher for those with non-psychotic affective disorders, schizophrenia and bipolar disorder in comparison to those who have no history of psychopathology. However, this in itself does not imply that schizotypal traits *per se* are equivalent to psychopathology.

In fact, there are adaptive and less adaptive components associated with positive schizotypy. For example, in the same study, Nettle (2006) found that highly creative individuals had scores on schizotypy which overlapped with the scores of those suffering from schizophrenia. Jackson (1997) found a similar pattern with regard to spiritual experiences, schizotypy and schizophrenia in his research. The benign or 'happy schizotype' was described earlier as someone who scores high on positive schizotypy and who is psychologically healthy in spite or because of the traits they possess, exhibiting spirituality and meaningfulness in life (Jackson, 1997) or extreme creativity (Brod, 1997; Holt, Simmonds-Moore & Moore, 2008; Nettle, 2006).

It is argued here that a more comprehensive understanding of boundaries, (in particular those associated with positive schizotypy) mental health and spontaneous psi experiences can be elucidated by addressing personality profiles/clusters. Although positive schizotypy is the factor that is most relevant to parapsychology, there are three other factors of schizotypy that are pertinent to understanding both psi experiences and mental health.

Recent work in personality research and parapsychology has focused on exploring clusters of schizotypy (Goulding, 2004, 2005; Holt, Simmonds-Moore & Moore, 2008; Loughland & Williams, 1997; Williams, 1994). Just as a factor analysis works by grouping variables that share common variance in a data set, a cluster analysis groups individuals or objects into 'clusters' according to their responses on a particular set of variables, such as the four subscales comprising schizotypy (see Hair, Anderson, Tatham & Black, 1998). Of interest for the current paper, cluster analysis of schizotypy dimensions has resulted in three or four clusters[24] (Goulding, 2004, 2005; Holt, Simmonds-Moore & Moore, 2008 Loughland & Williams, 1997, Simmonds, 2003; Williams, 1994). These reflect the following groups;

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[24] Clusters differ according to the variables put into the analysis, and differences in pre-specification of the cluster solution. Work by Simmonds and colleagues has included impulsive nonconformity in the analysis, whilst other research has not considered this variable to be relevant to the schizotypy construct.

happy schizotypy (score high on positive schizotypy but low on all other measures), low schizotypy (score low on all measures of schizotypy), high schizotypy (score high on all measures of schizotypy) and negative/disorganized schizotypy (score high on negative schizotypy and cognitive disorganization). Of interest to the parapsychologist are the two clusters with high scoring on positive schizotypy: happy schizotypy and high schizotypy. Both types of positive schizotypy have a strong relationship with paranormal belief and experience (Holt, Simmonds-Moore & Moore, 2008). However, the high scorer on positive schizotypy with the happy schizotypy response profile is more psychologically healthy than the high scorer on positive schizotypy who has the high schizotypy response profile (Goulding, 2004, 2005; Holt, Simmonds-Moore & Moore, 2008). As such, there are healthy and less healthy forms of boundary thinness, and the presence of negative (and other) traits seems to have an impact upon mental health. Other research indicates that possessing negative schizotypal symptoms alongside positive is associated with psychopathology. For example, Chapman, Chapman, Kwapil, Eckblad and Zinser (1994), found that although magical ideation was related to psychotic breakdown, this was more likely if one had negative in addition to positive traits of schizotypy. Nettle (2006) noticed that creative individuals who practiced poetry and art were characterized by scoring high on positive aspects of schizotypy but with a lack of negative symptoms (no anhedonia and avolition). In addition, Zanes *et al.* (1998) found a healthy and unhealthy form of positive schizotypy whereby inconsistent high scoring was related to creativity, while consistent high scoring was related more to psychopathology. Schofield and Claridge (2007) recently found that the relationship between paranormal experiences, schizotypy and mental health was underpinned by the cognitive disorganization factor; the relationship between positive schizotypy and pleasant paranormal experiences was associated with being cognitively organized, whilst the relationship between negative schizotypy and distressing paranormal experiences was associated with being cognitively disorganized. Interestingly, recent work has indicated that the healthy schizotypy cluster is also associated with better psi performance than other groups (Holt & Simmonds-Moore, 2008).

Recent research has employed several scales designed to measure positive schizotypy. This has often focused on use of the magical ideation scale (Eckblad & Chapman, 1983), although other work has

used other scales (e.g., the STA and OLIFE) and scales associated with the boundary construct. It is clear that each personality scale has different theoretical underpinnings and differs from one another despite all being concerned with 'schizotypy'. However, much research in parapsychology which explores the relationship between positive schizotypy/boundary thinness and psi experiences continues to employ unidimensional scales. This is problematic, as the happy schizotype can only be truly identified by filling out a multidimensional battery of schizotypy scales, such as the OLIFE (Mason, Claridge, & Jackson, 1995), or including a measure of mental health/wellbeing. If the bias toward unidimensional approaches continues, the two types of positive schizotype will not be distinguishable, when they reflect different personality types. As such, this author disagrees with Thalbourne (1999) that transliminality and schizotypy are one and the same. This is because both types of positive schizotype are characterized by thinner boundaries, which would be subsumed within any unidimensional measurement. Perhaps research should focus on the development of a scale which could quickly assess negative and positive boundaries. Unidimensional measures such as transliminality would then become useful in terms of distinguishing the types of scorer likely to be mentally healthy, creative, and psi conducive, versus those who are mentally less healthy, not creative, and not psi conducive. In summary, the relationship between thin boundaries and psi is more complex than it superficially appears to be, with two forms of boundary thinness. Multidimensional scales should be employed or shorter scales developed which allow for the assessment of psi conducive and non psi conducive boundary thinness (and mental health). Ways of encouraging healthy boundary thinness could also be explored, given that boundaries can be manipulated.

Evolution, the Schizophrenia Gene and Psi

This section will take an evolutionary perspective on boundary thinness and argue that, in a watered down form, traits associated with genetic schizophrenia (thinner psychological boundaries) may bestow biological, psychological and social advantages to their holder. Specifically, it will be suggested that the tendency to access boundary thin states (and therefore the anomalous experiences associated with those states) may be associated with the schizophrenia gene(s) (as positive schizotypy). As such, the tendency to experience psi

phenomena may be an indirect association with the schizophrenia gene(s). By arguing for an indirect selection of psi, the current argument extends previous arguments regarding the evolution of psi *per se*, as well as strengthening the argument for the healthy schizotype. It may also allow for greater acceptance of psi experiences in mainstream psychology and science.

It may well be that positive healthy schizotypy was selected by natural selection for its benefits to the individual and to society, which include creativity, religious experiences and paranormal (psi) experiences. It was noted earlier that positive healthy schizotypy (in the absence of negative traits) reflects a profile of mental health rather than ill health (Goulding, 2004, 2005; Holt, Simmonds-Moore & Moore, 2008), a tendency to be highly creative (Brod, 1997; Nettle, 2006), highly spiritual (e.g., Jackson, 1997), to report more psi experiences and a tendency to perform well on an ESP task (Holt & Simmonds-Moore, 2008). An evolutionary argument will be made for the selection and maintenance of psi experiences via an association with the schizophrenia gene (as positive schizotypy).

Why Does Schizophrenia Remain in the Gene Pool?

Several authors (Brüne, 2004; Burns, 2006) have noted the paradox associated with the idea that the schizophrenia gene(s) might be selected by evolution. Schizophrenics have an increased likelihood of suicide/early death, less likelihood of reproducing (i.e., reduced 'fitness'), and suffer greatly (as do their friends and families) at the hands of the disease. However, schizophrenia is common to all human cultures, and exhibits similar rates of incidence (1%). This implies that it may have occurred at a similar point in time, when it then spread around the globe. There is also evidence of a genetic influence on schizophrenia (e.g., in terms of twin and family studies) indicating that rather than being 'selected out' something is consistently inherited across generations (Burns, 2006). As such, the implication is that there might be something about the genetic makeup of schizophrenia which persists in the gene pool despite all the negative consequences for the schizophrenic individual (and family)[25]. It has recently been argued that the key to understanding why schizophrenia remains in the gene pool

[25] Brüne suggests that this could reflect the survival value of the genes themselves (genetic polymorphism) or via linkage to other advantageous genes (pleotropy).

lies in the relationship between schizotypy and creativity (e.g., O'Reilly, Dunbar, & Bentall, 2001). In this section, this idea will be extended to encompass mystical, spiritual and psi experiences (of which at least some may be genuine).

In order to be fit an evolutionary argument[26], there are a number theoretical considerations that boundary related traits should meet. 'Natural selection' refers to the tendency for those displaying traits that are associated with better survival benefits in a given environment (more food, better success at mating, longer lives) to be more likely to be picked as a mate. The offspring of those with the successful traits will also inherit them, and natural selection of that trait is then said to have taken place. As such, to be selected, traits should be genetically based (run in families); associated with an adaptation to the environment at some point in the history of humankind (otherwise known as an ultimate cause) and/or reflect a current level of adaptiveness (a proximate cause). According to Sanderson (2008), *adaptation* refers to the natural selection of a trait which promoted survival and reproduction at some point in our evolutionary history, while *adaptiveness* reflects the 'current usefulness' of any particular trait (p. 5). These are different concepts, as a psychological trait or physical organ could have evolved, but no longer be useful in the modern era[27]. A selected trait will be associated with increased fitness (which refers to the number of healthy offspring produced). Finally, behavior which is consistent with an evolutionary perspective will also favor those carrying similar genes (i.e., close family members) and will be biased toward survival of the individual and his or her genes.

Adaptation—Ultimate Causation

It has been argued that those in possession of the schizophrenia gene, who are unaffected by disease may have a reproductive or cultural advantage (see Burns, 2006 for a review and critique of theories of ultimate causation of schizophrenia[28]). There is some

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[26] Barrett, Dunbar and Lycett (2002) present an excellent discussion of theories and observations from the perspective of evolutionary psychology.

[27] Sanderson gives the example of the human appendix which must have been an evolutionary adaptation at some point in the history of the human being, but is no longer adaptive as it currently seems superfluous to the functioning of the human body.

[28] Burns notes a variety of theories, including physical protection of unaffected relative, social advantages, group selection models – which allow for the

support for the idea that schizophrenia may have been an adaptation; arising for some reason in the history of humankind which has relevance for psi experiences. For example, schizophrenia is associated with problems in consciousness, language and thought (Birchwood & Jackson, 2001). Davis and Lowell (2006) propose that solar activity may have instigated a genetic mutation which produced a brain capable of consciousness and thought and that the genetic instability associated with the adaptable, *creative* brain also produced disease. Others have argued that the evolution of schizophrenia is associated with cerebral asymmetry and language (Crow, 2008b). Burns, however, notes that schizophrenia may actually reflect variability in adaptiveness which allowed for the development of the social mind (he considers conscious experience to be fundamentally socially derived). As such, schizophrenia may reflect a kind of 'costly by-product' of the evolution of the social brain among humans (Burns, 2006). This is of interest for those interested in boundaries and psi experiences on two counts; firstly as psi experiences are often associated with social experience and secondly, that the neural circuits underpinning social cognition reflect an increased level of cortical (and subcortical) connectivity. That mental illness is a recent evolutionary occurrence is supported by findings in neuroscience reflecting the presence of susceptibility genes (DISC1) for schizophrenia in humans and monkeys but watered down or absent forms in animals purported to be less highly evolved (Bord, *et al.*, 2006).

Adaptiveness and Creativity

Several authors, (Nettle, 2006; Nettle & Clegg, 2006; O'Reilly *et al.*, 2001[29]) have explored the idea that creativity may serve as an adaptive advantage which is associated with schizophrenia in the modern era. For example, O'Reilly *et al.*'s (2001) review of the literature indicates both increased creativity and participation in creative professions among relatives of those suffering from mood disorders.

It has been suggested (see Nettle & Clegg, 2006) that artistic creativity may serve as what is known as a 'costly signal' in

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creation of new adaptive outgroups in line with beliefs of schizotypal charismatic leaders.

[29] O'Reilly et al (2001) present an excellent discussion of the argument for an adaptive component to the schizophrenia gene.

evolutionary terms[30]. This refers to the observation that female sexual selection may sometimes focus on male traits that are aesthetically pleasing, but potentially 'costly" in terms of their upkeep.[31] The trait and the preference are understood to be genetically determined in males and females, respectively, and there is an observable increase in the offspring produced by those with costly signals. If artistic creativity works as a costly signal, then we would expect to see more offspring among those who are highly artistic (in terms of their production). In the modern era evolutionary psychologists have looked to number of sexual partners as an index of fitness.

Interestingly, Nettle and Clegg (2006) found that not only is creativity related to evolutionary fitness, but that this is underpinned by positive schizotypy (and by implication, any underlying genes). They found that positive schizotypy predicted creativity[32], which in turn predicted the number of sexual partners. Impulsive nonconformity directly predicted the number of sexual partners (probably due to their reckless and carefree lifestyles, incorporating a liberal attitude toward sexuality). Interestingly, introvertive anhedonia negatively predicted both creativity as well as the number of sexual partners. This implies that healthy/benign positive schizotypy (particularly characterized by the absence of negative traits) may also relate to increased evolutionary fitness (more sexual partners) whilst scoring high on introvertive anhedonia (negative traits) is related to reduced fitness (fewer sexual partners).

However, natural selection does not work on the gene itself, but rather on the observable features coded by the genes and their interaction with environmental factors (the thin boundaried phenotype). Sanderson (2008) notes that adaptativeness may sometimes reflect a

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[30] See Barrett, Dunbar and Lycett (2002) for a good discussion of concepts and issues in modern evolutionary psychology, including the notion of the costly signal.

[31] One of the most common examples of this is in the peacock's tail, which is vastly heavier and more elaborate than its female counterpart, and may be quite a heavy burden to the bird. The tail is, however, a sought-after commodity among females seeking a mate, as it signals that the male is of good genes and can survive despite the potential disadvantages associated with having such a large and elaborate tail to drag around.

[32] Here I mean prediction in a *statistical* sense – i.e., as a result of a regression analysis. Regression addresses correlation rather than cause, i.e., we cannot infer that one definitely causes the other.

by-product of other (cognitive) developments. Creativity is associated with the perceptual-cognitive system associated with having thin boundaries/scoring high on positive schizotypy. It may well be that this pattern could translate to other experiences, associated with having thinner boundaries, either directly or indirectly (e.g., via creativity). Interestingly, religious experiences are also associated with positive schizotypy (Day & Peters, 1999; Maltby, Garner, Lewis & Day, 2000) and also seem to reflect an evolutionary adaptation (Sanderson, 2008[33]). Psi experiences may also reflect evidence of evolutionary selection.

Evolution of Psi?

Several researchers have considered whether ESP might reflect an evolutionary adaptation/function (Broughton, 1988; Taylor, 2003; Thouless & Wiesner, 1946). Indeed, this type of approach would certainly contribute toward answering the question regarding why psi phenomena might exist (Broughton, 1988). Broughton (2006), for example, considers that "evolution tends not to devise new systems where existing systems can be adapted and extended to serve new needs and confer new advantages" and that with ESP, this may reflect an adaptation of the emotion and memory systems. There is some evidence supporting an evolutionary explanation of psi phenomena. Indeed, in terms of evolutionary considerations, psi experiences may well have a genetic basis (Taylor, 2003), and are more likely among certain families (Cohn, 1994; Schilling & Mora, 2008). If Hamilton's idea of inclusive fitness is considered[34], we would be more likely to try to save family members (in particular, those who we share more of our genes with) when they are under threat. This may translate to psi experiences, where such experiences should occur more among kin, or in situations where survival of kin may be under threat. Stories of psi experiences relating to kin are common among those who are genetically related to one another (Rhine, 1961). In addition, biologically related pairs have also been found to perform better on a psi task than unrelated pairs (Alexander & Broughton, 1999).

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[33] Sanderson notes that in modern societies, religious belief is associated with better physical and mental health, and seems to be particularly associated with reducing stress. Religion is associated with promotion of family life and there are greater numbers of offspring than those who are less religious or atheistic.

[34] There is a lot of evidence in support of this in evolutionary psychology; see Barrett, Dunbar and Lycett (2002).

Other physiological work in parapsychology, e.g., the presentiment effect (Radin, 1996) indicates that psi may also be associated with an early warning system, with the autonomic nervous system responding precognitively to emotional targets that are associated with the fight-flight response. In support of an evolutionary explanation, violent stimuli resulted in stronger effects than those associated with sex (Bierman & Radin, 1997) which implies a greater early warning advantage in escaping a predator compared to having an opportunity to propagate ones genes. Psi could therefore reflect a perceptual function which is biased toward biological survival of the individual and his or her genes (as kin). Broughton (2006) notes that humans are by nature 'future-oriented', using information to plan future actions.

However, psi experiences do not appear to be increasing within the population at large (Taylor, 2003) and so do not appear to be directly selected. Taylor (2003) suggests that psi is biologically need-serving and proposes a theory titled "Evolution's Need Serving Psi" to describe how it might function within an evolutionary context. He notes many problems with other need-serving understandings of ESP, and argues that ENSP suggests psi is associated with an unconscious (but not constant) scanning of the local (and non-local) environment. This idea has also been postulated by other researchers (e.g., Carpenter, 2004).

Psi might usually be filtered out of attention by the highly developed action of the cerebral cortex. Information that is associated with survival may reach conscious awareness more easily than other information. Interestingly, scanning is also the job of the amygdala, which has been found to respond most efficiently toward events which are associated with survival (it reacts more to emotions of surprise and fear and the presence of blood than those of sadness and happiness; see Whalen, 1998). It has also been noted (Broughton, 2006) that the relationship between evolution and psi may be observed in its inherently emotional nature. Broughton (2006) suggests that ESP may have adapted existing brain systems and seems to be based on the emotional and memory systems (this reflects the limbic system and how memory records are accessed). This is of interest given that thinner boundaries are associated with a greater awareness of processes associated with sub-cortical structures and with a looser (associative) cognitive style. Might those with thinner boundaries be selected due to their greater ability to survive?

Indirect Evolution of Psi

Although psi may well occur in an evolutionary context, there are problems with the notion that psi was directly selected via evolution (Taylor, 2003). Psi ability may have been indirectly selected via evolution due to its relationship with the cognitive perceptual features associated with the schizophrenia gene (as thin boundaries). The idea of an indirect selection of anomalous abilities has previously been proposed by Winkelman (2000, cited in Sanderson, 2008) and McClenon (2004). Shamanistic practices emerged at the same point in human history, and may reflect the first religion; a "universal adaptation to biocognitive potential" (Sanderson, 2008, p. 8) reflecting an interaction between brain development and the demands of the social and physical environment. Winkelman observed that the rituals associated with shamanism, namely the altered state of consciousness is potentially adaptive as it allows for healing (and other) processes via the relaxation which results from being in the state. McClenon's (2004) Ritual Healing Theory suggests that the human capacity for dissociation, (as evidenced among those who score high on boundary related personality dimensions), developed as a coping mechanism and means for accessing relaxation-facilitating altered states of consciousness in certain rituals (particularly associated with Shamanism). Dissociative ability (which is associated with boundary thinness) may have been selected via evolution, in order to allow for altered states of consciousness and transpersonal experiences, including divine and paranormal experiences among them[35]. McClenon (2004) has suggested that there are biological and social benefits associated with having better dissociative ability, which led to an increase in the genes associated with dissociation and hypnotic ability. Dissociative ability would allow for altered states of consciousness, which enables healing. It also allows for the expression of a range of anomalous phenomena, including psychokinesis (PK) and other phenomena which became tied up with Shamanism. McClenon (2004) notes that altered states of consciousness may also drive genuine psi phenomena in a Batcheldorian manner (e.g., see Isaacs, 1984). The observation of apparent anomalies (it does not matter whether they are 'real' or not) would allow for belief (or suspension of disbelief) in anomalous experiences. This may, in turn, drive genuine physical phenomena, via

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[35] Daniels (2005) for example, has chronicled the types and the contexts of all possible transpersonal experiences, of which there are 25 in total.

access to a pro-PK state of mind, even when the original stimulus for that belief might have been faked (as in many rituals). Dissociation driven removal of disbelief might also drive genuine healing experiences via positive effects on the immune system and pain relief. There is some support for the Ritual Healing Theory, in particular, that hypnotizability may lead to transliminality which may then lead to anomalous experiences (Cooper & Thalbourne, 2005).

To date, there is no research which directly addresses the relationships between schizotypy, psi experiences and evolutionary fitness. Such evidence would contribute greater understanding to psi experiences, the existence of the thin boundaried personality, and the maintenance of the 'schizophrenia gene' in the gene pool.

Interactionism and Situationism: Their Impact on Spontaneous Psi Experiences

Interactionism refers to the observation that, despite some consistency in trait measurements of personality, people are not always consistent in their behavior across situations, or longitudinally across time. As such, in many ways, we might become different personalities according to different situations, and the motivations and appraisals we make of those situations at different times in our life. For example, Friedman and Schustack (2006) note "there is no reason to be disappointed or even surprised that a highly extraverted person may be sitting silently, avoiding a party; or that a highly neurotic person is sitting in a composed, poised manner, calmly comforting a child" (p. 383). In terms of personality and spontaneous psi experiences, we can apply this in terms of a complex combination of variables, which will serve to elicit boundary thinness or thickness. As we have observed earlier, boundaries are not fixed, with any given person being able to access a boundary thin state. Trait boundary thinness may reflect a natural tendency to enter such states. However, this tendency may be affected by a number of other social, psychological and environmental variables. Three such considerations for interactionism will be considered here, although this list is not exhaustive.

Interactions between State and Trait

Individuals in the real world may have different experiences according to a complex interaction between their pre-existing tendency to be thin or thicker boundaried and the conditions under which they

experience 'psi'. Given that there are individual differences in preference for, and likelihood of experiencing different states of consciousness according to personality, it may well be that psi experiences are possible or more likely in the waking state in some and in altered states in others (Tart, 1969). Spontaneous experiences should therefore be classified according to personality and state of consciousness to ascertain who is more likely to experience psi phenomena and under which circumstances. For example, it may be that some people (e.g., those with thicker boundaries) might only ever experience psi under extreme circumstances (e.g., stress), whilst others (with thinner boundaries) might regularly report a full range of psi experiences including some which might be more mundane. As those with thinner boundaries are prone to hypnagogic microsleeps (McCreery, 1997), they may be more likely to report anomalies where they *feel* subjectively wide awake. Further research could assess subjective states of consciousness and the context and content of experiences in relation to personality and psi experiences. It may be that those who are thicker boundaried might experience anomalous phenomena in situations they can readily attribute to other (more normal) explanations, e.g., 'I was lying in bed; therefore I must have been asleep or dreaming'. Thin boundaried individuals, on the other hand, might be walking or driving when such anomalies occur, given that hypnagogic experiences can interject into waking consciousness. As such, experiences may seem more real and less attributable to a normal explanation.

Psi experiences should also be monitored with regard to personality and the time of day when they occur. It would be interesting to note whether such experiences are more likely at certain times in the day (e.g., in the afternoon, when hypnagogic experiences might be more likely). Rossi (1986), for example, has noted that every 90 minutes, there is an increased tendency to experience dream-like mentation (as ultradian rhythms) in the daytime. Ultradian rhythms reflect 'trance like' experiences in a variety of modalities which may not be as pronounced as during nocturnal sleep. It may be that psi experiences may be more likely to occur during these cycles, particularly among thinner boundaried individuals. A diary study could illuminate our understanding of the relationships between personality, state of consciousness and psi.

It may also be possible to rate subjective experiences in terms of their level of apparent impressiveness and ascertain which may be more

likely to relate to genuine ESP in the real world. This way, an assessment could be made with regard to the relationships between spontaneous cases of psi, their 'impressiveness', the emotions/ subjective state of consciousness associated with them, and underlying personality. Innovative work by Holt (2007) has explored psi experiences occurring in the real world from an experience sampling approach. A diary study incorporating this approach might allow for a more in depth exploration of the relationships between personality, state of consciousness and subjective psi experiences.

In the laboratory, individual differences in state preference for psi may also have contributed to variability in whether psi is demonstrated in experiments such as the ganzfeld. The use of certain sample groups with individual differences in psi state preference may have resulted in the inconsistent outcomes in the ganzfeld literature since the time of the original Honorton PRL series. Some participants may score very well while others score below chance, thus canceling each other out and resulting in a null psi score overall. Considering individual differences alongside different states of awareness may help to explain the null outcome of Milton and Wiseman's (1999) meta-analysis. It may also help to explain the reporting of psi experiences among spontaneous cases in both waking and borderline states.

The interaction between the trait likelihood of entering boundary states (as schizotypy), the experimental manipulation (the ganzfeld, as a means to manipulate boundaries) and psi performance was explored by the author (Simmonds-Moore & Holt, 2007). It was expected that there would be an interaction between personality trait (schizotypy), state of consciousness (manipulated by experimental condition) and psi performance. Despite no significant psi effects overall, there was an inverse pattern for positive (and negative) schizotypes according to the state of consciousness the experiment was encouraging (a waking state ESP task and a ganzfeld). A cluster analysis of scoring on the personality scales and comparison of psi-scoring between groups indicated a weak and non-significant interaction pattern reflecting marginally better psi-performance among negative schizotypes in the ganzfeld compared to the waking state and marginally better psi-performance among positive and low scoring schizotypes in the waking state. Other work (Stanford *et al.*, 1988) has explored how absorption and extraversion variables may interact with components of the ganzfeld experiment, and found that absorption variable was unaffected

by white noise, while introverts were distracted by noise. This may also have an impact on the aetiology of experiences in the real world.

More work should explore how personality may interact with states of consciousness in terms of the types, content, and impressiveness of psi experiences reported.

Interactions between Gender, Personality and Psi Experiences

Psi experiences are commonly understood to be more associated with females than males. For example, in representative surveys of paranormal experiences, women often report more experiences than men (c.f. Blackmore, 1991), however, this difference is not always significant (Palmer, 1979). This tendency may reflect an interaction with psychometric boundary thinness, such that females are more likely to have thinner boundaries than males (Hartmann, 1991). A similar pattern is observed with the positive schizotypy variable, where females score higher than males (Lipp, Arnold & Siddle, 1994; Mason *et al.*, 1995; Mason, *et al.*, 1997; Miller & Burns, 1995).

Specifically, females exhibit thinner boundaries in terms of hemispheric processes where there is increased homogeneity and less lateralization of the temporoparietal regions and linguistic representations in the non-dominant (right) hemisphere (Persinger, 1994). As such, women have been proposed to be more prone to anomalous experiences associated with the intrusion of right hemispheric processes into the left hemisphere. Persinger (1991) considers that such experiences are fewer in normal men because the incidence of inter-hemispheric coherence is less frequent and the boundaries between the hemispheres less 'permeable'. It may be that these experiences are likely among men who score higher on one (or more) psychometric measures reflecting boundary thinness. Future research should focus on males who report more psi experiences, in order to explore these potential interaction effects.

It may also be that paranormal experiences are more associated with having a feminine psychology/thinking style, rather than being female *per se*. This tendency may relate to boundary thinness and impact upon likelihood to report spontaneous psi phenomena. However, anomalous experiences correlate with masculinity as well as femininity (Spinelli, Reid & Norvilitis, 2001-2002). As such, it may well be that gender role, which may actually reflect a fusion of both masculine and feminine forms of thinking (as androgynous or undifferentiated gender role—see Simmonds-Moore & Moore, in press) has an impact on both

boundary thinness and psi experiences.[36] The lack of relationship between gender role and boundary thinness in Simmonds-Moore and Moore's study, could reflect the use of a shorter psychometric measure of boundary thinness and the use of women only as participants. Future work might further explore these relationships, which could imply that society could function to thin or thicken some psychological boundaries.

Interactions between Trait and Environment

Traditional understandings of interactionism might need to be extended/expanded for parapsychology. For example, to date, research has not fully explored the interaction between personality and geomagnetism with regard to anomalous experiences. Many correlations in parapsychology (and mainsteam psychology) do not consistently hold up. This may be because many researchers take a unidimensional approach; by considering one variable and correlating it with a second variable (subjective paranormal experience or ESP performance), without considering how other variables might moderate the relationship. Geomagnetism, for example, seems to correlate positively with PK performance (Braud & Dennis, 1989; Chauvin & Varjean, 1990; Gissurarson, 1992:, Nelson & Dunne, 1986) and episodes of poltergeist activity (Gearhart & Persinger, 1986) and negatively with ESP experiences (Persinger & Schaut 1988) and psi performance (Persinger & Krippner, 1989).[37]

However, GMF may relate differently to psi experiences according to personality type of the participants in the study. For example, Radin, McAlpine & Cunningham (1994) found that among normal participants there was a negative correlation between geomagnetism and ESP hit rate. However, among creative participants, the direction of this correlation was reversed such that there was a higher hit rate when geomagnetism was higher. Palmer *et al.* (2006) also found a relationship between boundary thinness, GMF and psi (as PK), such

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[36] This study focused on women only, and found that androgynous gender role related to both paranormal belief and anomalous experiences. Psi performance was non significantly stronger among those with an undifferentiated gender role category.

[37] These effects may also be mediated by local sidereal time (e.g., Spottiswoode, 1997).

that the PK effect was greater among thin-boundaried participants when the GMF box was switched off.[38]

These patterns may be associated with the lability of the limbic system in thin boundaried individuals, which is sensitive to geomagnetic disturbances (Persinger, 1998). In addition, it seems that exposure to geomagnetism in excess of 30 nT immediately following birth relates to increased scoring on temporal lobe lability in human males (Hodge & Persinger, 1991). As such, boundary thinness itself may be influenced by environmental factors. Jawer's (2005) recent survey work supports the notion of an 'environmentally sensitive' individual, who has thinner boundaries and may be more affected by a range of environmental factors. However, recent work which experimentally manipulated environmental factors (including infrasound and geomagnetism) did not support a relationship between temporal lobe lability and increased environmental sensitivity in the aetiology of experiencing 'haunt' experiences (French, Haque, Bunton-Stashyshyn & Davis, in press).

A similar argument, which fits in with an evolutionary perspective on boundary thinness, has been postulated in terms of the relationship between solar activity, creativity and adaptability (Davis & Lowell, 2006). Solar cycles were found to correlate with the incidence of mental illness and creativity, which the authors consider reflects an interaction between solar activity and embryonic tissue. It could potentially be that these individuals are more sensitive to such activity.

It may be that melatonin in the pineal gland, may react to solar flares or the increased level of light on the earth (as one of the many correlates of increased geomagnetism). This pigment is particularly sensitive to light and has been found to correlate with subjective paranormal experiences (Persinger, 1988). In general, pineal gland activity seems to be affected by geomagnetism and has been suggested as important in the psi process (Roney-Dougal & Vogl, 1993). It is also related to the activity of the limbic system.

Solar activity, geomagnetism and melatonin should perhaps be considered when exploring the relationship between boundary thinness and psi. It seems that those with thinner boundaries could have a different relationship to ESP and other experiences relating to subjective psi phenomena compared to those who score thick or

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[38] This was the pattern across all participants, but greater among those with thinner boundaries.

average. More work is needed to further understand interactions and their relevance to genuine and pseudo psi experiences in the real world.

Conclusions

This paper has introduced and explored the notion of boundary thinness as both a personality type and a state of consciousness which seems to be associated with increased reporting of spontaneous psi phenomena (both in terms of ESP and PK phenomena). As these are taking place in the real world rather than the laboratory, these phenomena reflect a mixture of pseudo-psychic and potentially genuine psi phenomena. Boundaries reflect the functional/anatomical level of connectivity between neural, biological, and cognitive structures in the mind-brain and the extent to which conscious experiences are experienced as fused or separated. Boundary thinness may also be observed interpersonally at social and cultural levels. All levels of understanding allow for increased insight in the understanding of both spontaneous pseudo psi phenomena in addition to phenomena which may reflect more genuine psi processes. Boundaries are therefore an important construct for both psychologists and parapsychologists. Several superficially disparate personality types may actually map onto the thin boundary personality construct. As such, this allows for a parsimonious understanding with respect to why many variables relate to psi experiences. It is also the case that boundaries can be understood as a state (which itself can be accessed via under *or* over arousal), which may be more likely among those who score high on boundary-related personality variables. As such, boundary related approach also allows for greater parsimony in understanding why disparate states and situations all seem to relate to psi experiences.

In terms of personality, this paper focused particularly on the construct of positive schizotypy, which is understood to be related to the schizophrenia gene. Evidence was reviewed that indicates that there are two types of positive schizotype—the healthy positive schizotype (who scores highly on positive schizotypy in isolation) and the high scoring schizotype (who scores highly on positive, negative, disorganized and impulsive types of schizotypy). Both types of positive schizotype report increased levels of paranormal experience and belief, but only one of these is associated with genuine ESP and a profile of positive mental health, whilst the other scores at chance on ESP and demonstrates a profile of poorer mental health. As such, boundary

thinness cannot simply reflect the question of being simply 'thin' or 'thick'.

The relationship between psi experiences and the schizophrenia gene were explored an argument made that one of the reasons why schizophrenia may remain in the gene pool is due to the relationship it has to engendering psi conducive states of consciousness, in particular, among those who are healthy high scorers on the positive schizotypal personality dimension. Indeed, evidence exists in favor of the selection of healthy schizotypy in terms of increased fitness. However, positive schizotypy is complex, and profiles of scorers on this and the other factors of schizotypy are necessary in order to delineate the type of schizotype. It is also necessary to delineate whether psi is a direct or indirect consequence of boundary thinness. For example, it may function via dissociation or creativity (or both).

Boundary thinness must also be considered from the perspectives of interactionism and situationism. This is to say that each person has an individual personality profile in terms of boundaries, which will differentially relate to spontaneous psi phenomena according to situational factors, including how trait and state interact according to the demands of a particular situation (or experiment). This also includes factors associated with the physical environment, such as geomagnetism. Geomagnetism and solar activity may relate more to boundary thin personality types as these have been argued to drive areas of the brain which are more labile. It may also be that solar activity was associated with driving the genetic mutation which led to schizophrenia and consciousness in the first place. As such, personality types related to this gene could be particularly sensitive to these environmental fluctuations. There is room for much research in this area. In particular, the relationship between infrasound and personality has not yet been fully explored.

It is important that boundaries are contextualized in terms of the type of boundary thinness one has, and the situation within which one finds oneself. It must also be considered that there are various types of boundaries within the cognitive-perceptual hierarchy and that a completely open system (total boundary thinness) may be less prone to spontaneous psi phenomena than one which reflects a combination of thin and thick processes. Researchers should be seeking to identify which boundaries are more related to genuine psi phenomena whilst which might be more related to pseudo psi phenomena. Some boundaries may also be more related to certain forms of psi

phenomena. Equally, we should be addressing which types of boundary thinness might relate more to mental health and which to mental ill health. Some of this has been elucidated by recent research on attentional boundaries by the author.

Finally, following consideration of state boundary thinness and thickness, and the identification of a healthy and unhealthy form of boundary thinness, researchers should also be looking to understand and develop the means to elicit control over access to boundary related states of consciousness (and psi experiences). This may also enable a mapping of knowledge from the discipline of parapsychology into clinical psychology as well as into mainstream academic psychology.

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GENERAL DISCUSSION

ROE: We will open up the floor to more general questions or comments. I'd like to start things by noting that for me a common theme that ran across all three talks this afternoon was the emphasis on the importance of investing the experience with personal meaning; with schizotypy that may be a trait of personality in that you *over*-invest, and are more likely to attribute meaning where perhaps there isn't any, and personal meaningfulness seems to be a common feature that permeated the spontaneous experiences. Although meaning was mentioned this morning, I don't think that it had that same kind of power in comparison. I wonder if you had any advice based on your own experiences as to how we might invest experimental tests of psi with some of that relevance or personal meaning.

VAN DE CASTLE: Earlier I gave an illustration of entanglement and mentioned the highly unusual dream I had of a fish turning into a man's face and this other dreamer also had it, so it seems that the study is trying to show you that if you go with what people are sharing at the conscious level you get mediocre stuff, if you go towards the preconscious you get more, and if you can get both going conscious to unconscious, dreamer to dreamer you get even more. There was a PF conference in Nice, I believe in 1970, and one of the presenters was Al Rechtschaffen. He took his subject, hypnotized them and told them, "In a few moments I am going to suggest a dream to you". He then hypnotized them, and in one case the dream he gave them was about Martin Luther King; he had been shot and there was a great deal of concern about riots. Rechtschaffen takes another person and hypnotizes them and tells them, "You are now going to dream the dream that the other person had". It was almost exactly the same; King had been shot, they were picking up rocks and stones, policemen were coming out starting to patrol, and there was a great deal of concern over the riot. Rechtschaffen is not a parapsychologist, but he tried it and found incredible results and he was willing to report it, showing that the more you can get both people in at the same level, unconscious to unconscious, the better—Charley Tart had some great work on mutual hypnosis like that. So it's not trying to be all bright-eyed and bushy tailed when trying to do the test with someone, if you can both get into this deeper state in some way together, dream to dream, to me that would be one way of making it more personally relevant.

SIMMONDS-MOORE: I think we need to go back to the spontaneous experiences and basically really evaluate what people are *saying* and move that into the laboratory. For example, something Sally Feather and I are doing with PK experiences is to talk to people in depth about their experiences and what they mean to them, and this will inform future research in the laboratory as we will know more about the nature of the experiences. There are other ways we can approach qualitative research now, for example using transpersonal research methods to get more meaningful information about the actual experience. That's also going to be a spur for researchers, who I think can get bored just doing and hearing about laboratory experiments, and I think it may help increase the meaningfulness of the phenomena for the experimenter as well if they can hear some personal stories and take what you find in those stories back into the lab.

MACHADO: I would like to comment firstly on the importance of integrating field investigations with experimental studies, because if you do not do it we get separate data and do not give meaning to the experiences within the lab and we do not know the meaning of psi in our real life. So if you want to discover something else about this kind of experience or phenomena we have to integrate these kinds of phenomena to discover how they work. I think a good way of doing it is to bring into the lab those people who report cases and experiences in their daily lives, who perhaps pay more attention to little signs of psi in their lives that others don't pay attention to. It is a question of cognitive style or personality; I believe everyone can have some kind of psychic experience, but maybe not everybody can report it, so it is very important to pay attention to the little things. Integrating lab research with field investigation is most important. I cannot understand parapsychology or psi research that takes place in separate groups when they are complementary actions that build knowledge about what we live in our everyday lives.

SIMMONDS-MOORE: I think as well you could use new methods to fuse the laboratory research more with spontaneous cases. For example, Nicola Holt has been working with creatives using a PDA [Personal Digital Assistant] to have people record their experiences in a systematic fashion but while going about their daily lives. And you can use this to test hypotheses. If thin-boundaried personality types are having more interjections of experiences that are associated with sleep states then you might expect to see psi experiences happening

cyclically. You could automatically measure whether psi experiences occur when hypnogogic-type experiences are going to occur. Something like that may be new and exciting and meaningful in a way that you could fuse the two types of approaches into one.

MACHADO: I would like to point out something else in regards to longitudinal studies. It would be very important to study people who report spontaneous experiences or people who were considered to be the agents of a poltergeist case and tracking this person for a long period of time to see what are the consequences of the experiences in their lives. Even with possibly fraudulent cases, if you consider the case as a narrative you can see that the genuine case and the fraudulent case have the same structure, and the meaning can be the same so we could explore the consequences and functions of these things in their lives.

LUKE: I would like to go back to Christine's talk and add to what Etzel was saying about the neurological approach to looking at boundary thinness. You talk about it in terms of interconnectedness of neural structures, a more anatomical conceptualization of boundary thinness, but we may also have to think in terms of a neurochemical approach, particularly in terms of greater neural connectivity, disinhibition, and so on. Certainly recent research has found that psychedelic substances can lead to a reduction in the brain's inhibiting functions, as shown by an increased startle effect. This seems to map onto boundary thinness and to overlap with the conceptualizations you have here of its neurological basis, and may be another way of considering it.

SIMMONDS-MOORE: I was going to talk about neurochemistry but decided I already had too much in here. Hartmann talks about the chemicals of sleep and how serotonin and norepinephrine are associated with thinning and thickening of the boundaries associated with sleep.

LUKE: There seem to be associations between psychoactive substances and psi as well, of course.

WEST: A question to Christine. I know that you spoke mostly about the relation between personality types and spontaneous cases, but you did have some experience of translating it into experiments. I remember that in the past when people were doing experiments and correlating experimental results with personality types and attitudes they had a very pronounced view that sheep-goat was the most important factor. When doing that they found the sheep score positively and the goats

deviated from chance but in a negative direction. Do you find the same thing with your personality types, and if so does it produce a difference between positive and negative scoring, or between positive and null scoring?

SIMMONDS-MOORE: I don't think enough research has been done in this area to answer that question. I think this should be done. I don't think enough has been done in recent years to look at the performance of disbelievers or of people who score high on negative schizotypy traits. I think that definitely needs to be looked at.

VAN DE CASTLE: Well I think the reason the sheep-goat experiment got so much emphasis was because at that time it was their most robust finding—they did not get it every time, but if they had enough studies done they would find overall that the sheep did better. You could play with that. You could measure it for example by asking the question, "Could you accept a theoretical possibility that ESP exists?" Not that you have it, but do you accept its possibility. But who is that question important to? There is an Allport-Vernon scale of values and one of the scales is theoretical, so that people who scored above the 90th percentile on the theoretical scale, well they care about theoretical questions. So if you take a sheep that scores highly on such a theoretical scale and give them the Sheep-Goat question they will score even higher than a regular sheep. If you take the goats and they score highly on the theoretical scale they will score lower than a regular goat. So if you get something that is relevant to the sheep and goats it's there, and at the time that was our most robust measure. But I think our most robust factor is dreaming. If you look at Radin's book on entangled minds and you look at the meta-analyses, the Maimonides results are 55 million to one yet we usually think of the ganzfeld as being where the payoff is. There have been several studies done comparing individuals in ganzfeld and dream conditions and you get better scores with the dreams than the ganzfeld. So if you get something as outstanding as it is with the Maimonides results then that seems to be where the payoff is. And the beauty is that everyone could potentially dream. The work of Rechtschaffen is brilliant because you are having somebody dream someone else's dream with a method that is so strict, 'you're gonna dream about this and you see what the other persons dream was'. If I didn't know Rechtschaffen was such a strict tutor, I'd say this task is impossible because the dreams are so alike, just stunning. We all freak out that somebody got a big .05 finding in some

little area here, and then you see these correspondences that Rechtschaffen is getting and he is saying what started to occur to him was not 'what's the meaning of dreams?', but 'whose dream are you having?', because he said that when you get a hit with these kinds of things, they are so striking, you don't have to try and evaluate and go through this little nit-picking analysis process, they just kick you right in the teeth because they are so strong. I think a lot of psychic researchers themselves get very frightened of psychic stuff; as long as they get a dribbly .05 finding about twice a year, then you won't shake them up and they're okay, but if they get into these kicking-in-the-teeth, heavy psychic stuff, they don't know what the hell to do with it, and it really upsets them. So, I was playing around with the idea that we ought not to allow anybody to become a parapsychologist until you could give a bona fide of what was your powerful psychic experience that you've had, they now understand what the field is, rather than you have some abstract theoretical curiosity.

DOBYNS: I'd like to address Dr Machado's discussion of fraud or fraudulent poltergeist reports. Specifically, I frankly find it incomprehensible how the meaning of the experience can be the same for somebody who is out there rigging a fraudulent device to emulate the experience versus an actual agent (if there are such beings) who is having things flying around and doesn't know why or can't do anything about it. Moreover, the recent comment about addressing this as a 'narrative', I don't see it as really being helpful on this point because it seems fairly obvious that the reason fraudulent cases have the same narrative structure as the real ones is that narrative structure is now fairly widely known and a fraud is wanting people to think the experience is real.

MACHADO: Let me tell you about one fraudulent case we have investigated to try and address the question of why we might see features that can have parallels with genuine cases. Of course as far as the nature of the phenomena are concerned we have a big difference between genuine and fraudulent cases, since we cannot yet understand what kind of forces are at work in a genuine case. But in terms of meaning and purpose we might see similarities. We investigated a case in the countryside in Sao Paulo state in Brazil where fire was said to appear spontaneously in a house. We stayed for 2 or 3 days in the house and we saw many fires happening, it was very strange. We started to say, 'this phenomenon doesn't happen so easily so something wrong is

going on'. We left the camera turned on in the corner of a room in the house, and we could see the mother setting fire to some objects in a fraudulent way. It was very dangerous because she set fire to the crib. We asked why this woman would do these things. They were so poor and had few things yet she was destroying everything. The father was so worried; he was completely confused and wanted to stop everything because he was worried about the children, who were very young. Finally the mother admitted to the priest what she'd done, but not as a religious confession so we could know what he had been told. She said she was so tired of her life; she did not like her husband anymore, didn't want to be a mother, and wanted to work and do other things and wanted to finish everything. So she was distressed and was expressing her need to separate from her husband and leave, but as they didn't have money she needed the husband to be the one to leave so she could stay with her family. So she was creating a situation that would lead to a solution. We have other cases that seem to be genuine and where the objective or motivation seems to be the same. If you connect the meaning of the objects that are affected with the situation or context of the case you see that there is a symbolic or semiotic connection between these things. So when you are talking about the meaning of phenomena, the symbolism can be similar whether they are produced anomalously or fraudulently. In terms of meaning, if we detect a fraud, it's not worthwhile in terms of the ontology of PK, but in terms of the meaning in life, why people would choose this kind of expression over others as a solution for their problems can help us understand what motivates the apparently genuine PK occurrences. I hope that makes my meaning clearer now.

DELANOY: I just want to follow up and really re-emphasize the point that Christine made earlier at the beginning of this question period, when she mentioned Nicola Holt's work with PDAs. We have also had Bob talk about the very large effects that are commonly found with spontaneously occurring dreams and I agree with Fatima that we should be looking at ways to take field investigations into the lab. But technology has really evolved to the point where we can almost do away with the lab altogether, we can take very controlled experimental environments easily out into the field. People can generate controlled responses to experimental suggestions spontaneously when they feel like it. If we are looking forward to the future of parapsychology, where it is going in a way that would be much more ecologically valid and easier for people to relate to, I really think advances in technology,

such as PDAs and other devices, is giving us a way of moving into the future in a way that will really allow us to combine in a properly controlled way, the field, spontaneous cases and the lab. I would really like to get others' opinions on that.

MACHADO: Wellington Zangari and I have made with Dean Radin a study that was presented at the 1999 PA convention in which we took a computer to a place of ritual, so instead of taking the mediums to the lab we took the lab to the mediums, we went to their setting. It was an experiment about the influence in distant patients—they were in Las Vegas, we were in São Paulo, Brazil—and it was very interesting. We took the computer to their temple where there are saints, there is a mix of Catholic beliefs and spiritualism and African religion. We thought that perhaps it would be complicated for the mediums to accept our doing that—maybe it would spoil the research—but they loved to take part in it. So maybe the problem is in us, not in people in general. We had to change our attitude toward the research we were doing, not forgetting the protocols because scientific research has to follow rigorous protocols but thinking about this scenario I think it is really important.

VAN DE CASTLE: In terms of technology catching up, being able to identify different REM periods certainly enabled the Maimonides work to go forward because now you knew if you had a REM period and someone else is looking at a picture then you could wake them up to see if the dream is showing it. Similarly there is a lot of debate about lucid dreams; did such a thing exist, or did it only exist in California? What you are able to do in a lab is to show that the EEG indictates they are asleep and if the person makes a certain pattern, a left right left right movement, and you wake them up they will report a lucid dream. In my lab Joe Daniel was doing some research. He was able, with the help of some hypnosis, to take 15 women who had never had a lucid dream, and after one night in the lab 12 out of the 15 had had a lucid dream. He told them if you are in a lucid dream I have to wake you in 30 seconds if you don't re-signal me. One of the people in there did that for 11 minutes, so the EEG is showing she is asleep but every 30 seconds she was making the designated eye movements so she could stay in a lucid sleep for 11 minutes. Now the power of lucid dreams is another enormous topic of where we could go in terms of people hooking up with other people, going on trips together in lucid dreams, including a lot of fantastic stories about healing in lucid dreams. Some,

to me, are giving us some visions almost of how the physical model of the universe works. People starting in the lucid dream state have said they would like to know better the laws of the universe and how they work, and they get elaborate diagrams that seem to try and fit in with the latest theoretical models. It is so ripe out there and now technology has shown us that, yes, we can do this and lucid dreaming is fairly easy. You do not have to have an EEG for it; you can wear a mask with electrodes and when the eyes start moving during REM it activates a red light. If you notice the little red light you know you are lucid, you may interpret it in different ways in your dream—someone saw it as rear lights on a car being turned on, someone may see it as policeman but they somehow make an interpretation of the red light, but whatever way they see it they know the red light is there, and this reminds them that they are dreaming and they can learn much more quickly how to have a lucid dream.