

THE EVOLUTION OF BELIEFS IN GOD, SPIRIT, AND THE PARANORMAL. III: DIRECT BENEFITS OF PARANORMAL ABILITIES

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ABSTRACT: Positive schizotypy (reality distortion), and other components of transliminality, may constitute a genetic balanced polymorphism in which the disadvantageous effects of conditions associated with extreme ends of the trait dimension are balanced by advantages associated with more moderate levels of trait expression. Positive schizotypy and creativity are associated with mating success. The relatives of psychotic individuals have elevated schizotypy levels, and one recent study reported that the relatives of psychotics have greater fecundity. The evolution of beliefs in God, spirit, and paranormal phenomena may be mediated not by reduced death anxiety, but rather by a set of interrelated adaptive traits including creativity, positive schizotypy, and hypnotizability, which are components of the superordinate trait dimension of transliminality. Paranormal beliefs are related to paranormal experiences as well as paranormal abilities, which, if veridical, would have direct adaptive advantage. Correlates of paranormal abilities overlap with component characteristics of transliminality. Beliefs in spiritual and paranormal phenomena may have evolved simply because such beliefs are in some manner true, and the associated traits and abilities are highly adaptive.

Keywords: paranormal belief, evolution, transliminality, direct benefits

In the first article of this series, the terror management theory of religion was reviewed. Although there is extensive evidence linking religiosity to reduced death anxiety, the evidence is somewhat inconsistent and limited to certain aspects of death anxiety, certain aspects of religiosity, and a restricted range of belief conviction. There is no evidence linking death anxiety to fecundity. Ritual healing theory (McClenon, 1997) is an alternative evolutionary account of beliefs in the paranormal, spirit, and God, which proposes that anomalous experiences are the experiential source of such beliefs, and that such experiences originally occurred in the context of shamanic healing rituals. Individuals who were high in hypnotizability were more susceptible to the healing benefits of such rituals, resulting in selection for this heritable trait, facilitating the evolutionary development of beliefs in paranormal and spiritual phenomena. In the second paper, evidence was reviewed suggesting that hypnotizability and paranormal belief and experience are components of a superordinate trait dimension, transliminality (Thalbourne & Delin, 1994), which is also composed of schizotypy, fantasy-proneness, and creativity. In this article, schizotypy, and by extension transliminality, is considered in light of the balanced polymorphism model of the genetics of psychosis. Disadvantageous effects

of psychosis on fecundity may be balanced by advantageous effects conferred by schizotypy, hypnotizability, and particularly creativity, all components of transliminality. Paranormal beliefs and experiences, as well as other aspects of transliminality, are also associated with paranormal abilities. A further evolutionary account is described, in which genes contributing to transliminality were selected because associated paranormal abilities have direct benefits in terms of enhanced survival.

Balanced Polymorphism

Far from being just a pathological condition, vulnerability to schizophrenia spectrum disorder or other “psychosis-continuum” psychopathological conditions (i.e., schizotypy) may at times confer certain advantages or superior abilities, such as creativity, giftedness, and high intelligence (Brodsky & Brodsky, 1981; Huxley, Mayr, E., Osmond, H., & Hoffer, 1964). The occurrence of normal as well as disadvantageous phenotypes suggests that the genetic determinants of schizophrenia spectrum disorders may be what is known as a “balanced polymorphism.” Schizophrenics and their unaffected siblings have a lower fertility rate than the general population (Avila, Thaker & Adami, 2001; Bassett et al., 1996; Buck, Hobbs, Simpson, & Wanklin., 1975; Erlenmeyer-Kimling, 1978; Gottesman & Erlenmeyer-Kimling, 1971; Lewis, 1958; MacSorley, 1964; Odegaard, 1980; Slater, Hare, & Price, 1971; Stevens, 1969), as do patients with affective illness (Baron, Risch, & Mendelwicz, 1982; Odegaard, 1980; Slater, Hare, & Price, 1971). The genes underlying schizophrenia should be decreasing in frequency with each generation. However, the incidence rate for schizophrenia has remained stable world-wide for the past 100 years (Gottesman, 1991; Jablensky et al., 1992; Sartorius & Jablensky, 1976), and the prevalence rate is regarded as being similar across different cultures and different times (Book, Wetterberg, & Modrzewska, 1978; Hafner, 1987; Rosenthal, 1970). The lowered reproductive capacity of the schizophrenic and closely related phenotypes may be offset by a high mutation rate, or by other phenotypes that are either very widespread or have an increased survival value compared to the general population. The decreased survival value of the schizophrenic phenotype may be compensated by phenotypes, probably manifest in healthy (non-first-degree) relatives, with advantages in terms of increased survival value in order to maintain a stable incidence of the schizophrenic genotype in the population (Huxley et al., 1964; Jarvik & Deckard, 1977; Nettle, 2001; Shaner, Miller, & Mintz, 2004).

Schizophrenia Spectrum Disorders and Creativity

The schizophrenia genotype(s) may be associated with certain advantageous characteristics, such as creativity and intellectual giftedness, and this association may apply at both the individual and familial levels.

Whereas a subgroup of preschizophrenic individuals have academic difficulties and cognitive impairments, another subgroup may be gifted. A higher proportion of preschizophrenic boys (11%) had excellent school grades compared to only 3% in comparison groups (Isohanni et al., 1999). Another study found that preschizophrenic children attained higher school grades in drawing and writing but lower marks in physical education compared to controls matched for school, grade, and sex (Hultman et al., 1999). There is extensive evidence that positive schizotypy is associated with creativity (e.g., review by Brod, 1997), which may be the advantageous phenotype which is selected for (O'Reilly, Dunbar & Bentall, 2001). If the schizophrenic spectrum includes creative tendencies in addition to neurotic traits, antisocial behavior, mental deficiency and psychoses, there may well be reproductive advantages as well as disadvantages of the genotype (Brodsky & Brodsky, 1981; Huxley, Mayr, Osmond, & Hoffer, 1964). While there is no compensating increase in the fertility of parents (Hare & Price, 1970) or siblings of schizophrenics (Bleuler, 1978; Buck, Hobbs, Simpson, & Wanklin, 1975), it may be that such advantages are expressed only in more distant relatives.

There is evidence that creativity is associated with mental illness, including both schizophrenia spectrum disorders and manic-depressive illness, on both familial and individual levels (e.g., Andreasen, 1987; Eysenck, 1983; Hare, 1987; Jamison, 1989, 1990, 1993). Family studies consistently reveal a range or spectrum of psychopathology associated with the schizophrenic genetic diathesis: about 15% will be psychotic and 40% will be antisocial, that is, sociopathic or alcoholic (Rosenthal, 1970). Of the remainder, some will be normal and perhaps 5% will be "superphrenic" (Brodsky & Brodsky, 1981). These are described as individuals who are artistically or musically creative, intelligent and rational, and are functioning at an above average level in their lives. Pedigree analyses of families with schizophrenic members in Iceland revealed that the relatives of psychotics have a significantly greater probability of being eminent and successful scholars, creative authors, political leaders, financially successful community officials, and clergymen, compared to the general population or to control subjects without psychotic relatives (Karlsson, 1968, 1970, 1974, 1978, 1981, 1983, 1984). Conversely, when scholarly achievement or creative success was used to define index cases, the relatives of accomplished Icelanders showed a higher rate of psychotic disorders (Karlsson, 1981). Other earlier genealogic studies have found increased rates of mental illness in the families of creative persons (Babcock, 1895; Galton, 1871, 1892; Juda, 1949; Kretschmer, 1931; Lombroso, 1891; Maudsley, 1895; Myerson & Boyle, 1941; Nisbet, 1900). More recent investigations have also supported the hypothesis of familial and individual associations between mental illness, particularly affective disorder, and creativity (Andreasen, 1987; Andreasen & Canter, 1974; Andreasen & Glick, 1988; McNeil, 1971; Richards, Kinney, Lundes, Benet, & Merzel, 1988).

Heston (1966) and Heston and Denny (1968) reported that the adopted-away children of schizophrenics showed an increased incidence of schizophrenia, mental deficiency (IQ < 70), sociopathic personality, and/or neurotic personality disorder. Heston and Denny (1968) also reported:

The 21 experimental subjects who exhibited no significant psychosocial impairment were not only successful adults but in comparison to the control group were more spontaneous when interviewed and had more colorful life histories. They held more creative jobs: musician, teacher, home designer; and followed the more imaginative hobbies: oil painting, music and antique aircraft. (Heston & Denny, 1968)

Heston (1966) and Heston and Denny (1968) suggested that their results may be explained in terms of a polygenetic disorder, in which a subcritical dose of the pathological genes produces or predisposes to disabilities other than schizophrenia “and perhaps in other combinations to especially adaptive personality traits” (Heston & Denny, 1968).

These considerations suggest that schizophrenia is a “balanced polymorphism.” This is defined as “a polymorphism that is stable (tends to remain unchanged over time) and is probably maintained by an advantage of the heterozygote over both homozygotes” (Bodmer & Cavalli-Sforza, 1976, p. 756). For example, while sickle cell anemia, a genetically determined disorder, results in decreased fertility, the gene frequency for the sickling trait does not decrease over time because of an advantage conferred to heterozygotes involving resistance to malarial diseases. Schizophrenia, and perhaps its genetic determinants, may also be associated with certain biological advantages, such as a resistance to rheumatoid arthritis (Baldwin, 1979; Eaton, 1985; Jablensky, 1986; Tsuang, Perkins, & Simpson, 1983), and possibly to neoplastic disease. Perhaps these resistances to certain physical diseases apply also to relatives without spectrum disorders. The selection of advantageous phenotypes may occur at the level of selected traits, such as creativity (O’Reilly, Dunbar & Bentall, 2001). Whether protection against certain physical diseases or greater functional adaptability due to high levels of creativity and talent, the schizophrenic genotype may confer some reproductive advantages to nonaffected carriers, thus compensating for the lowered fertility of schizophrenics and their siblings and maintaining the gene frequency over time.

Heritability and Reproductive Advantage

Schizotypy. Twin and family studies have demonstrated a genetic contribution to schizotypy, and both positive and negative schizotypy have been found to have moderate to high heritability (Battaglia et al., 1999;

Kendler & Hewitt, 1992; Kendler et al., 1991; Lin et al., 2007; Linney et al., 2003). Negative schizotypy seems to be more closely linked to schizophrenia (Bunke, Pogue-Geille, Garrett, & Hall, 1991; Huxley et al., 1993; Kendler, McGuire, Gruenberg, & Walsh, 1995; Squires-Wheeler et al., 1997; Torgersen, 1985), whereas positive symptoms of schizotypy are more likely to be associated with “healthy schizotypy.” That is, the occurrence of positive traits alone is neutral with respect to mental health outcomes, whereas the combination of positive schizotypy with negative and/or disorganized schizotypy is associated with an increased likelihood of the later development of psychosis (Chapman, Chapman, Kwapil, Eckblad, & Zinser, 1994; Kwapil, Miller, Zinser, Chapman, & Chapman, 1997). Cluster analytic studies have suggested that when positive schizotypal traits occur alone (in the absence of high scores on other aspects of schizotypy) they are associated with good health, but when positive schizotypy occurs in conjunction with negative and/or disorganized schizotypal traits, poorer mental health results (Goulding, 2004, 2005; Goulding, McClure-Tone & Compton, 2009). Schizotypal symptoms have been found to be as elevated in the first-degree relatives of patients with affective disorder as in the relatives of schizophrenics (Gilvarry, Russell, Hemsley, & Murray, 2001; Squires-Wheeler, Skodol, Friedman, & Erlenmeyer-Kimling, 1988; Squires-Wheeler, Skodol, Bassett, & Erlenmeyer-Kimling, 1989). Conversely, the incidence of mood disorder is elevated in the first-degree relatives of patients with schizotypal personality disorder (Bornstein, Klein, Mallon, & Slater, 1988; Schulz et al., 1986). These findings are consistent with the hypothesis of a schizophrenia-affective disorders continuum and the association of schizotypy with the later development of both schizophrenic and affective psychoses.

Nettle and Clegg (2006) studied the relationship between mating success, defined as the number of different sexual partners, and schizotypy in a large sample of poets, visual artists, and control subjects. A sample of 425 British adults was categorized as not producing poetry or art, being a hobby producer, a serious producer, or a professional producer. Across the entire sample, there were significant positive associations between the number of different sexual partners and scores on the O-LIFE Unusual Experiences and Impulsive Nonconformity scales, and a significant negative association with scores on the Introvertive Anhedonia scale. Similar relationships were found in the subsample of those who were not producers of poetry or art. Serious and professional art producers had larger numbers of sexual partners than nonproducers and hobby producers. Path analysis showed that Unusual Experiences had a significant positive effect on creative activity (poetry and art), which in turn had a significant positive effect on number of partners. In other words, the relationship between positive schizotypy and mating success was mediated by creativity. Impulsive nonconformity had a direct positive effect on number of partners that was not mediated by creative activity. Introvertive anhedonia had both an inhibiting effect on creative activity, and also a direct inhibiting effect on number of sexual

partners. Thus, both unusual experiences and impulsive nonconformity were related to enhanced mating success, and the relationship between unusual experiences and mating success was mediated by creative activity. The relatives of psychotic patients have higher schizotypy levels (Clementz, Grove, Katsanis, & Iacono, 1991; Franke, Maier, Hardt, & Hain, 1993; Gilvarry, Russell, Hemsley, & Murray, 2001; Grove et al., 1991; Katsanis, Iacono, & Beiser, 1990; Kendler, Thacker, & Walsh, 1996; Schürhoff, Laguerre, Szöke, Méary, & Leboyer, 2005), and one study has reported a higher fertility rate in the relatives of schizophrenic probands than in control subjects without psychotic relatives (e.g., Weiser et al., 2009), although there are several reports of contradictory findings for relatives of schizophrenics, cited earlier. Another study reported a trend toward greater fertility in the offspring of psychotic probands (McCabe, Koupil, & Leon, 2009). Of course, enhanced fertility, sexual frequency, and number of sexual partners are at best weak proxy measures of enhanced evolutionary fitness, as such associations may not be universal and may not apply to premodern eras or populations.

Other components of transliminality. Transliminality is a hypothesized tendency for psychological material to cross thresholds into or out of consciousness. The concept of transliminality was suggested by the research of Thalbourne and Delin (1994), who found that belief in the paranormal, creativity, mystical experiences, magical ideation, a history of manic-like experience, and a history of depressive experience were all highly intercorrelated and loaded highly on a single factor. Subsequent studies expanded the concept of transliminality to include schizotypy, psychoticism, extraversion, neuroticism, fantasy proneness, absorption, hyperaesthesia, general religiosity, frequency of dream interpretation, and a positive attitude toward dream interpretation (Thalbourne, 1998; Thalbourne & Delin, 1999; Thalbourne, Keogh, & Crawley, 1999; Thalbourne, Bartemucci, Delin, Fox, & Nofi, 1997). Many of the components of transliminality have been found to be influenced by genetic factors. The results of twin studies indicate that hypnotizability is influenced by genetic factors (Duke, 1969; Morgan, 1973; Morgan, Hilgard, & Davert, 1970). The relationship between hypnotizability and the therapeutic benefits of hypnotherapy for both psychological and somatic disorders has been well documented (e.g., see McClenon, 1997). The beneficial effects of hypnotizability on mental and physical health may enhance the likelihood of survival and enhance fecundity. Similar benefits may derive from a more general propensity to enter altered states of consciousness, that is, transliminality, via its association with absorption and dissociation. Twin studies have also yielded evidence that creativity is influenced by genetic factors (e.g., Barron, 1970; Barron & Parisi, 1976; Grigorenko, LaBuda, & Carter, 1992). Creative artists have greater mating success (a larger number of sexual partners) than nonartists, and creative productivity mediated the relationship between schizotypy and mating success (Nettle & Clegg, 2006). Studies done in Asia many years ago demonstrated that gifted persons have in the past had an increased likelihood of

bringing larger families to adulthood (Osborn, 1968). Twin and family studies have revealed a genetic contribution to other components of transliminality, including openness to experience (Bergeman et al., 1993; Wainwright, Wright, Luciano, Geffen, & Martin, 2008) and religiosity (Bouchard, Lykken, McGue, Segal, & Tellegen, 1990; Button et al., 2011; Martin et al., 1986; Vance, Maes, & Kendler, 2010; Waller, Kojetin, Bouchard, Lykken, & Tellegen, 1990; Winter, Kaprio, Viken, Karvonen, & Rose, 1999). There is considerable evidence that religion and religiosity are associated with a wide range of physical and mental health benefits (e.g., Koenig, 1998).

The Search for Candidate Genes

As yet, no studies have examined the heritability or genetics of transliminality. However, there is extant research concerning heritability and genetic influences on constituent characteristics such as schizotypy (and its extreme manifestation, schizophrenia), creativity, hypnotizability, openness to experience, and religiosity. There is also evidence to suggest that transliminality and its constituent characteristics may be associated with enhanced interhemispheric transfer and increased size of the corpus callosum. Therefore, genes involved in the development of the corpus callosum and schizophrenia spectrum traits may be potentially viable candidate genes for transliminality.

The search for a single genetic locus underlying psi abilities or transliminality and its constituent characteristics is likely doomed to failure, given the considerable evidence supporting a multifactorial polygenic model of genetic influences on schizophrenia spectrum vulnerability, and interaction of polygenic with epigenetic factors influencing neurodevelopment (e.g., reviews by Abdolmaleky, Thiagalingam, & Wilcox, 2005; Gejman, Sanders & Duan, 2010; Jablensky, 2000; Owen, 2005; Portin & Alanen, 1997; Tsuang, Gilbertson & Faraone, 1991). Gottesman and Shields (1982) argued that a multifactorial-polygenic system underlies the diathesis, with vulnerability increasing as the number of different genetic factors increases. Although random mutation theories have been proposed (e.g., Keller & Miller, 2006), the polygenic model seems to have wider support. For example, Pearlson and Folley (2008) stated:

Although it is possible that the disorder may represent an agglomeration of diseases caused by multiple, rare, individual mutations, schizophrenia is more likely a complex, multigene trait, with common risk alleles in the general population that may have relatively weak individual effects, be pleiotropic, and interact with each other multiplicatively. No single such allele is either necessary or sufficient for the development of the full disorder. (Pearlson & Folley, 2008, p. 722)

The genetics and evolutionary models of schizophrenia are beyond the scope of this review (see reviews by Keller & Miller, 2006; Pearlson & Folley, 2008; Polimeni & Reiss, 2003). While the polygenic balanced polymorphism model could certainly benefit from additional empirical support, it remains a viable candidate theory. Transliminality is similarly a complex behavioral phenotype, likely to be influenced by a large number of genetic factors. Family studies to identify genetic markers, and reverse phenotyping using genetic markers to refine the phenotype, will provide valuable information concerning the neurobiology of transliminality (Schulze & McMahon, 2004). The val allele of the gene for catechol-O-methyltransferase (COMT) was associated with negative schizotypy (Docherty & Sponheim, 2008; Schürhoff et al., 2007), positive schizotypy (Schürhoff et al., 2007), perceptual aberration (Avramopoulos et al., 2002), and disorganized schizotypy (Smyrnis et al., 2007; Stefanis et al., 2004), although others have reported an association of met/met homozygosity with disorganized schizotypy (Ma et al., 2007; Sheldrick et al., 2008). One study failed to find any significant association between paranormal beliefs and COMT polymorphisms (Raz, Hines, Fossella, & Castro, 2008). Rather than searching for a single gene, investigation of various combinations and interactions of genes, epigenetic factors, and environmental influences is likely to prove more illuminating for understanding the etiology of transliminality. Interestingly, Ott, Reuter, Hennig and Vaitl (2005) found that although absorption (a component of transliminality) was not significantly related to the COMT val(158)met polymorphism alone, there was a significant association between absorption and the interaction between the T102C and COMT polymorphisms. Bachner-Melman et al. (2005) found that creative dance performance and absorption were associated with the interaction between genes coding for the serotonin transporter and the arginine vasopressin receptor.

Testable Hypotheses

McClenon (1997) proposed that hypnotizability is the mediating factor linking shamanic healing ritual to beneficial effects, and the evolution of paranormal and religious belief. The evidence reviewed here suggests that hypnotizability is but one component of a superordinate trait dimension, transliminality, which also includes positive schizotypy, paranormal beliefs and experiences, creativity, and sleep-related experiences. McClenon's (1997) theory would be further strengthened by replacing hypnotizability with transliminality as the mediating psychological endophenotype. Cooper and Thalbourne (2004) found that hypnotizability was positively and significantly correlated with anomalous experience, and anomalous experience was positively and significantly correlated with shamanic belief/experience, suggesting that the various variables postulated by McClenon in the chain of causation are related to each other in the way that he posits. Transliminality correlated with all the variables in the model

except childhood trauma, suggesting that transliminality may mediate the relationship between hypnotizability and anomalous experience. This extension of McClenon's (1997) theory suggests the following hypotheses, the first five of which are parallel to those suggested by McClenon.

1. Transliminality, and its constituent characteristics, should be associated with higher survival and fecundity, and perhaps with better physical and mental health.
2. Transliminality should mediate or account for the beneficial effects of hypnosis, meditation, prayer, trance states, and spiritual healing.
3. Transliminality, and its constituent characteristics, should have a genetic component, manifested in a high degree of heritability in twin and family studies.
4. Altered states of consciousness induced by shamanic and religious ritual practices have been practiced for a sufficient time to have a meaningful impact on the frequency of transliminality genotypes (see McClenon, 1997).
5. Transliminality should affect the frequency and characteristics of anomalous, paranormal, and religious experiences.
6. Transliminality, and its constituent characteristics, should be associated with increased interhemispheric coherence and the size of the corpus callosum.
7. Transliminality, and its constituent characteristics, should be associated with overlapping polygenic sets of genetic loci and gene polymorphisms implicated in corpus callosum neurodevelopment and schizophrenia spectrum vulnerability, possibly including COMT, DISC1, GRIN1, and BDNF genes.

Adaptive Advantages of Paranormal Ability

Several studies have reported strong correlations between paranormal beliefs and paranormal experiences (Blackmore, 1997; Glicksohn, 1990; Musch & Ehrenberg, 2002; Persinger & Makarec, 1986; Rattet & Bursick, 2001). Paranormal belief is also associated with paranormal ability (e.g., Haraldsson, 2003; Haraldsson & Houtkooper, 1992; Palmer, 1977; Parker, Grams, & Pettersson, 1998; Schmeidler, 1952; Schmeidler & McConnell, 1958). Indirect benefit theories posit that ESP and other paranormal abilities and experiences contribute to human survival through associations with adaptive emotional and memory functions (e.g., Broughton, 1988, 2006; Stanford, 1974a, 1974b, 1977, 1990; Simmonds-Moore, 2010; Taylor, 2003; Winkelman, 1982). An alternative evolutionary account posits that God beliefs and beliefs in the paranormal or a spiritual dimension to existence evolved because these beliefs were associated with a greater likelihood of paranormal or spiritual experiences (including veridical paranormal experiences) and paranormal abilities, which would

be highly adaptive. The selection of psi abilities would be more likely in healthy schizotypes and transliminals, who may be more prevalent in cultural contexts more conducive to anomalous experiences (i.e., shamanic societies). The fact that psi abilities do not appear to be increasing from generation to generation in modern times may be due to the decreased overall incidence of psi beliefs and experiences due to the pervasive influence of the prevailing scientific-materialist zeitgeist.

There is considerable experimental evidence that paranormal phenomena such as telepathy, clairvoyance, precognition, and psychokinesis actually exist (e.g., meta-analytic reviews by Bosch, Steinkamp, & Boller, 2006; Milton, 1997; Radin, 1997; Radin, Nelson, Dobyns, & Houtkooper, 2006; Storm, Tressoldi, & Riso, 2010). This conclusion is compellingly supported by meta-analyses of hundreds of studies, which have become increasingly methodologically sophisticated over the past several decades. There is also evidence from well-controlled studies of communication with the dead that mediums are able to access information about deceased individuals (e.g., Kelly & Arcangel, 2011; Schwartz, 2002). If, as the empirical evidence suggests, these paranormal and “spiritual” phenomena actually exist, then it may be reasonable to speculate that other paranormal phenomena, that is, various shamanic powers or Siddhi powers, *may* possibly be real, albeit extremely infrequent, and may be the object of legitimate scientific inquiry. This is not to say that such phenomena *are* real, only that there is no valid logical a priori reason to assert that they are impossible.

Such paranormal abilities would likely be highly adaptive. Precognition has obvious survival value, as knowing about impending threats facilitates avoidance of danger. Clairvoyance, obtaining knowledge of distant events, would allow knowing where distant game or food resources are located. Similarly, telepathy has survival value, as long-distance communication would facilitate group survival in a variety of ways. Psychokinesis also has obvious survival value, especially advanced forms such as levitation or deflection of projectiles, which would enhance survivability by enabling an individual to escape more quickly from predators or to defend oneself during intertribal conflicts. Access to information from spiritual (transdimensional) realms of existence would also have survival value by providing a wide range of potentially useful knowledge. If spiritual dimensions of existence interact with and influence events and processes within the four-dimensional physical realm, then communicating with spiritual entities may actually be able to influence physical processes, including biological functioning. There is evidence that prayer is efficacious as a healing process, that is, prayer is associated with improved health outcomes (e.g., Astin, Harkness, & Ernst, 2000; Dossey, 1998; Harding, 2001; Jantos & Kiat, 2007), although there are many contradictory findings and controversies concerning the healing power of prayer (e.g., Abbot, 2000; Halperin, 2001; Paul, 2008; Roberts, Ahmed, Hall, & Davison, 2009).

A material reductionist accounting for the cross-cultural universality or ubiquity of mythic archetypes of the shaman figure (e.g., wizard, witch, magician, saint, holy person) assumes that these stories are fictional (based on false or delusional beliefs), arising from wish-fulfillment fantasies, cognitive distortions, and fraud or trickery. The adaptive value of such beliefs is indirect, presumably mediated by reduced death anxiety (or other psychological factors). If the evidence provided by parapsychological research is valid, it may be reasonable to entertain an alternative and simpler evolutionary account which posits that such stories of paranormal abilities and associated beliefs in the paranormal/spiritual are true. For some individuals, anomalous experiences may lead to belief in the paranormal, whereas for others belief in the paranormal may predispose the person to an openness to anomalous experiences. Beliefs in the paranormal/spiritual and associated experiences and abilities may be selected for because associated experiences and abilities are directly related to enhanced adaptation and group survival. This evolutionary theory can be tested. Experimentally demonstrated psi performance should be associated with enhanced fecundity (number of offspring, number of mating partners, frequency of sexual contact) and enhanced survival (enhanced physical and mental health outcomes), particularly in cultural contexts in which belief in psi abilities is more widespread (i.e., shamanic tribal cultures). Of course, it is likely that there is also a high frequency of fraudulent attempts to claim such abilities, or an embellishment through showmanship by those shamans and aspirants whose abilities may be transient, not well developed, and not easily controlled. Even experienced shamans may employ showmanship to enhance the expectancy effects of ritual participants, enhancing their responsiveness to hypnotic suggestions concerning health and somatic functioning. Enhanced expectancy effects may also extend to enhanced susceptibility to altered states of consciousness and receptivity to psi phenomena.

Correlates of Psi Performance

Belief in the paranormal is a core characteristic of transliminality, and one of the most widely replicated predictors of psi performance. Belief in paranormal phenomena such as ESP is associated with paranormal abilities. Subjects who accepted the possibility of paranormal success under experimental conditions, classified as “sheep,” scored significantly higher than nonbelievers, classified as “goats,” on card-guessing ESP tasks (e.g., Haraldsson, 2003; Haraldsson & Houtkooper, 1992; Palmer, 1977; Parker, Grams, & Pettersson, 1998; Schmeidler, 1952; Schmeidler & McConnell, 1958), indicating that those who are open to the possibility of ESP experiences will be more apt to have these experiences. The sheep-goat effect is one of the most widely replicated findings in ESP research (Palmer, 1977). Subjects who believe in paranormal or psychic phenomena (i.e., “sheep”) performed better on ESP tests than nonbelievers or “goats”

(e.g., Haraldsson, 2003; Haraldsson & Houtkooper, 1992). There is also an experimenter effect in parapsychological research, such that investigators who believe in the possibility of paranormal phenomena are more likely to find evidence of such (review by Irwin, 1999). Paranormal belief is strongly associated with positive schizotypy, and subjects who performed successfully on a psi task scored significantly higher on the Magical Ideation Scale, a measure of positive schizotypy, compared with unsuccessful subjects (Parker et al., 1998). Distant healers scored higher on schizotypy measures as well as measures of conscientiousness and openness to experience compared to control subjects (Hergovich & Arendasy, 2007).

ESP performance is significantly correlated with religiosity (Haraldsson, 2003; Haraldsson & Houtkooper, 1992). Several studies have reported that paranormal belief has low but significant positive correlations with measures of religiosity, particularly intrinsic religiosity (Goode, 2000; Haraldsson, 1981; Hergovich, Schott, & Arendasy, 2005; Irwin, 1985; Thalbourne, 2003; Thalbourne & Hensley, 2001; Thalbourne & Houtkooper, 2002). General religiosity is strongly correlated with transliminality (Thalbourne, 1998; Thalbourne & Delin, 1999).

ESP performance in the ganzfeld is associated with a history of spontaneous psi experiences (paranormal experiences), a history of practicing meditation or other mental discipline, and a feeling-perceptive Jungian personality type (Honorton, 1997; Honorton & Schechter, 1987; Kanthamani & Broughton, 1994). Receivers who practiced mental discipline such as yoga, transcendental meditation, and so forth, produced a better hit rate in an autoganzfeld task than those who did not (Alexander & Broughton, 2001), and there is extensive evidence that meditation increases interhemispheric coherence.

Extraversion is significantly correlated with success in tests of extrasensory perception (e.g., Honorton, Ferrari, & Bem, 1998; Schmeidler, 1982; review by Palmer, 1978). A meta-analysis of 60 studies reported a small but highly significant correlation between ESP performance and extraversion (Honorton, Ferrari, & Bem, 1998). Several investigations have reported significant associations between paranormal beliefs and extraversion (Eysenck, 1967; Thalbourne, 1981; Thalbourne & Haraldsson, 1980), and between precognitive experiences and extraversion (Rattet & Bursik, 2001). Hypnotizability is significantly correlated with extraversion (Green, 2004). Extraversion is significantly related to transliminality (Thalbourne, Bartemucci, Delin, Fox, & Nofi, 1997).

Historically, altered states of consciousness (e.g., dreams, hypnosis, drug-induced states) have been considered to be conducive to ESP (review by Alvarado, 1998). Various altered states of consciousness, induced by hypnosis, sensory deprivation or the ganzfeld procedure, meditation, progressive relaxation, hypnagogic states, and dreaming have been found to be conducive to ESP ability (e.g., review by Honorton, 1977). Hypnosis has been found to facilitate ESP performance better than a normal waking

state or self-relaxation (reviews by Stanford, 1987, 1992; meta-analysis by Stanford & Stein, 1994). Enhanced psi abilities with hypnosis are associated with hypnotizability, the hypnotic context, or an interaction between the two (Cardena, 2006; Cardena, Lehmann, Jonsson, Terhune, & Fabre, 2007). Spontaneous extrasensory experiences are associated with a higher frequency of dream recall (Haraldsson, Gudmundsdotir, Ragnarsson, Loftsson, & Jonsson, 1977; Palmer, 1979), and dream recall was significantly correlated with ESP ability in laboratory studies (Honorton, 1972, Palmer, 1978, 1982). REM sleep-related experiences (e.g., dream recall, vivid dreams, etc.) and a general susceptibility to altered states of consciousness are related to transliminality, and hypnotizability is associated with transliminality (Cooper & Thalbourne, 2004).

Many of the reported correlates of psi performance are closely related to transliminality, and several studies have reported significant associations between transliminality and performance on ESP tasks. Transliminality-relevant measures significantly predicted scores on a precognition task (Thalbourne, 1996, 2000b). Transliminality, absorption, and hypnotizability were strongly correlated with hits in a clairvoyance-like task, but only if participants were in a hypnotic state induced with OBE instructions (Del Prete & Tressoldi, 2005). A combination of hypnosis and special induction instructions tailored for the ESP task (emphasizing the capacity to visualize a remote picture or emphasizing out-of-body experience) facilitated ESP performance in participants with medium to high absorption or transliminality scores (Tressoldi & Del Prete, 2007). Self-rated success in a psi task was significantly correlated with thinness of boundaries (Richards, 1996). The construct of thinness of boundaries (Hartmann, 1991) is strongly associated with transliminality (Thalbourne & Maltby, 2008). Together, all of these findings suggest that transliminality is a key trait dimension underlying psi abilities.

Do Paranormal Phenomena Violate the “Laws of Physics”?

An impartial approach to scientific inquiry suggests that the possibility be considered that at least some paranormal experiences may be veridical, that is, experiences of genuine paranormal phenomena. Skeptics contest the empirical evidence from parapsychological investigations that such phenomena actually exist (e.g., Bressan, 2002; Krippner & Friedman, 2010; Stanovich, 2004), or suggest that paranormal phenomena are incompatible with “current” theories of physics (e.g., Musch & Ehrenberg, 2002). However, others regard the empirical evidence for psi (telepathy, clairvoyance, precognition, and psychokinesis) as methodologically sophisticated, well replicated, and confirmed meta-analytically (e.g., Bosch, Steinkamp, & Boller, 2006; Irwin, 1999; Milton 1997; Radin, 1997; Radin, Nelson, Dobyns, & Houtkooper, 2006; Storm, Tressoldi, & Risio, 2010; Tart, 1977/2001). An impartial and open-minded scientist must follow where

the data lead. If a theoretical paradigm dictates that certain phenomena cannot possibly exist, and those phenomena clearly and demonstrably do exist, then the old ("classical") paradigm must be integrated into a more complete and encompassing paradigm. While it is true that paranormal phenomena are incompatible with the "laws" of classical Newtonian-Cartesian physics, governing "physical" reality (four-dimensional space-time containing matter and energy), more current theories of quantum and relativistic physics, superstring theory, M-theory, and cosmology are not limited to considerations of phenomena within our four-dimensional universe, but also consider multidimensional, nonlocal, and holographic models of reality that fundamentally challenge core ontological assumptions of classical (material-reductionist) science and the "core knowledge" of ordinary waking consciousness (e.g., Greene, 1999; Kaku, 1994; Talbot, 1991; Wolf, 1988, 1989, 1994, 1996). In David Bohm's theory (Bohm, 1980), the explicate (visible, tangible) order of existence, our four-dimensional physical reality, arises from and is directed by implicate orders of existence, that is, "hidden variables," the nonlocal realm of the quantum potential. Superimplicate orders of existence are realms of information rather than physical existence, which in higher derivatives may constitute "consciousness." The philosophical implications of the New Physics may be more compatible with Idealism than Materialism (Goswami, 1995), that is, consciousness rather than physical matter/energy is ontologically primary. If consciousness is transdimensional in nature (not restricted to the four-dimensional level of material reality) then the material-reductionist assumption that consciousness depends on and is an epiphenomenon of brain function must be false. Certainly, the processes of consciousness are closely correlated with brain function, but this does not necessitate the assumption of reductionism. The dynamic highly complex holographically patterned information processing network constituting consciousness may be maintained in media other than the brain, perhaps in quantum potential interference patterns in superimplicate orders or transdimensional levels of existence (higher orders of dimensionality than the four-dimensional physical realm). Processes of consciousness operating in the nonlocal superimplicate levels of existence or higher dimensional levels interact with the four-dimensional explicate level of reality, usually within the brain, but occasionally with material systems outside the brain, giving rise to transient, infrequent, low probability phenomena which appear to violate "local" laws governing four-dimensional existence, in much the same way that the inhabitants of Flatland would find the actions of a three-dimensional being to violate the physical laws of their two-dimensional world (Kaku, 1994). These anomalous events are typically interpreted in terms of spiritual or paranormal processes. These phenomena are "supernatural" only if one restricts the definition of "natural" to the four-dimensional physical existence apprehended by ordinary waking human consciousness. Other levels of existence (higher dimensional realms, superimplicate

orders) are not only possible, but strongly suggested by the mathematics of recent unified field theories, that is, superstring and M-theory. More current theories of physics overturn many of the core assumptions of the classical scientific paradigm, making room for paranormal (and “spiritual”) phenomena within the scope of legitimate scientific inquiry. The worldview suggested by new physical theories may share much with the worldviews of shamanism (Wolf, 1991), Buddhism (Ricard & Thuan, 2001), Taoism (Capra, 1985), and spiritualism (Friedman, 1990), which all share positive beliefs about the reality of a wide range of paranormal phenomena and the reality of spiritual levels of existence.

The Evolution of Psi Ability

The reductionist evolutionary account requires that we accept the notion that the vast majority of humans who ever lived have been delusional, and that their reality distortion was adaptive because it alleviated death anxiety, or produced some other beneficial and adaptive consequence, despite the falsehood of these beliefs. The development and maintenance of such delusions involves the largely unconscious operation of various cognitive biases and tendencies to avoid or discount disconfirmatory evidence or arguments (e.g., Persinger, 2009). The supposition that religious belief is associated with lower death anxiety has received extensive though perhaps somewhat limited and inconsistent empirical support, and there is no direct evidence that death anxiety compromises reproductive success or fecundity. There is indirect evidence that belief in the paranormal and paranormal experience is associated with increased fecundity, possibly mediated by a group of interrelated traits including positive schizotypy, hypnotizability, fantasy-proneness, and creativity, together comprising the superordinate trait dimension of transliminality. Several of the component characteristics of transliminality show moderate to high heritability, and there is some evidence that they are associated with adaptive benefits. Several of the constituent characteristics of transliminality are associated with increased interhemispheric communication and enlarged corpus callosa. Genes involved in callosal neurodevelopment and schizophrenia spectrum disorders may be worth investigating as candidate transliminality genes. Belief in the paranormal is strongly associated with paranormal experiences and abilities, which would have obvious adaptive advantages if such abilities were real. Extensive parapsychological research provides compelling evidence that telepathy, clairvoyance, precognition, psychokinesis, and communication with the dead are real phenomena. Psi abilities, like paranormal beliefs, are associated with transliminality and its constituent characteristics. The emerging quantum relativistic multidimensional holographic paradigm is capable of encompassing these findings, which challenge the core ontological assumptions of the classical Newtonian-Cartesian material-reductionist paradigm.

Thus, we have several competing theories of the evolution of beliefs in God, spirit, and the paranormal. The material-reductionist theories posit that the vast majority of people are delusional; their delusions (false beliefs) are formed and maintained by largely unconscious (unobservable) biases and cognitive distortions; and those reality distortions are adaptive due to an association with reduced death anxiety, enhanced social cohesion, enhanced hypnotic suggestibility, or some other mediating factor. The alternative "direct benefit" theory posits that such beliefs evolved simply because they are true and their associated abilities have very obvious adaptive value. Occam's Razor suggests that the simpler explanation tends to be the right one. With respect to accounting for the universality and ubiquity of spiritual and paranormal beliefs in an evolutionary framework, it may be that, compared to the goats, the sheep may have a simpler and more direct model that is consistent with a broader range of empirical evidence (i.e., parapsychology), is not incompatible with the extant research supporting the terror-management function of religious belief or other evolutionary accounts, requires fewer tenuous assumptions (e.g., regarding mass delusion, or an inverse relation between death anxiety and fecundity), and does not require the irrational discounting of an entire field of scientific inquiry (parapsychology) as fraudulent, on the basis of doctrinal ontological assumptions grounded in an outdated nineteenth-century paradigm.

The direct benefits evolutionary theory can be empirically tested by examining the fecundity or reproductive success of individuals with experimentally demonstrated high levels of psi abilities. The number of offspring surviving to reproductive age would be the critical variable to examine, although other variables such as number of sexual partners (for males), frequency of sexual contact, and a range of measures of health and well-being would also be relevant. Such evidence may be more readily obtained in cultural contexts favorable to paranormal belief and experience. The direct benefits theory has been rejected by others because there is no evidence that psi abilities are increasing from generation to generation. However, it is possible that the selective processes favoring psi abilities are not operative in modern secular societies, although they may have been responsible for the evolution of beliefs in God, spirit, and the paranormal throughout millennia of shamanistic hunter-gatherer social organization. It is also possible that the genetic factors contributing to psi abilities are in equilibrium, sufficient to maintain the prevalence of psi abilities, without increase or decrease across generations. These genetic factors may constitute a balanced polymorphism, with a balance between advantageous and deleterious phenotypes, resulting in steady prevalence rates of both. The search for genetic factors related to psi abilities could begin with those polymorphisms and genetic loci already linked to schizophrenia spectrum disorders and the neurodevelopment of the corpus callosum. Evidence that psi abilities and associated beliefs in the paranormal and spiritual have

direct adaptive value does not imply that characteristics associated with the absence of these abilities and beliefs has none. It is likely that believers and nonbelievers have different cognitive styles (associated with right and left hemisphericity, respectively), each of which may have different but equally adaptive advantages.

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Abstracts in Other Languages

Spanish

LA EVOLUCIÓN DE LAS CREENCIAS EN DIOS, EL ESPÍRITU Y LO PARANORMAL, III: BENEFICIOS DIRECTOS DE LAS CAPACIDADES PARANORMALES

RESUMEN: La esquizotipia positiva (distorsión de la realidad) y otros componentes de la transliminalidad pueden constituir un polimorfismo genético equilibrado en el que los efectos desfavorables de las condiciones asociadas a los extremos de la dimensión de rasgo se compensan por las ventajas asociadas a niveles más moderados de la expresión del rasgo. La esquizotipia positiva y la creatividad están asociadas con el éxito en el apareamiento. Los familiares de los individuos psicóticos tienen niveles elevados de esquizotipia y un estudio reciente encontró que los familiares de los psicópatas tienen una mayor fecundidad. La evolución de las creencias en Dios, el espíritu, y los fenómenos paranormales pueden estar mediados no por la reducción de ansiedad ante la muerte, sino por un conjunto de rasgos adaptativos relacionados entre sí, en particular la creatividad, la esquizotipia positiva y la hipnotizabilidad, que son componentes de la dimensión subyacente de rasgo de la transliminalidad. Las creencias en lo paranormal están relacionadas con experiencias paranormales así como con habilidades paranormales, que, si son verdícas, tendrían una ventaja adaptativa directa. Los correlatos de las capacidades paranormales se solapan con los componentes característicos de la transliminalidad. Las creencias en los fenómenos espirituales y paranormales pueden haber evolucionado, simplemente porque esas creencias son de alguna manera ciertas y los rasgos y habilidades asociados son muy adaptativos.

French

L'EVOLUTION DES CROYANCES EN DIEU, AUX ESPRITS ET AU PARANORMAL, III : BENEFICES DIRECTS DES CAPACITES PARANORMALES

RESUME : La schizotypie positive (distorsion de la réalité) et d'autres composants de la transliminalité peut constituer un polymorphisme génétique équilibré dans lequel les effets désavantageux des conditions associées avec les extrémités du trait dimensionnel sont contrebalancés par les avantages associés avec des niveaux modérés de l'expression du trait. La schizotypie positive et la créativité sont associés avec des succès d'accouplement. Les proches d'individus psychotiques ont des niveaux élevés de schizotypie, et une étude récente montre que les proches de psychotiques ont une meilleure fécondité. L'évolution des croyances en Dieu, aux esprits et aux phénomènes paranormaux pourrait être médiatisée non pas par la réduction de l'anxiété pour la mort, mais plutôt par un ensemble de traits

adaptatifs inter-reliés dont la créativité, la schizotypie positive, l'hypnotisabilité, qui sont des composants d'un trait dimensionnel premier de transliminalité. Les croyances paranormales sont reliées aux expériences paranormales tout comme les capacités paranormales qui, lorsqu'elles sont véridiques, devraient avoir un avantage adaptatif. Les corrélations des capacités paranormales se superposent avec les composants caractéristiques de la transliminalité. Les croyances dans la spiritualité et les phénomènes paranormaux ont pu évoluer simplement parce que de telles croyances sont vraies d'une certaine façon, et que les traits et les capacités associés sont hautement adaptatifs.

German

DIE EVOLUTION DES GLAUBENS AN GOTT,
GEIST UND DAS PARANORMALE, III: DIREKTER
NUTZEN PARANORMALER FÄHIGKEITEN

ZUSAMMENFASSUNG: Positive Schizotypie (Realitätsverzerrung) könnte zusammen mit anderen Komponenten von Transliminalität einen genetisch ausbalancierten Polymorphismus darstellen, bei dem sich die nachteiligen Effekte der Bedingungen, die mit extremen Ausprägungen der Traitdimension einhergehen, durch die Vorteile, die eher mäßige Traitausprägungen bieten, die Waage halten. Positive Schizotypie und Kreativität gehen mit Fortpflanzungserfolg einher. Die Verwandtschaft von Psychotikern weist erhöhte Schizotypiewerte auf, und eine neuere Studie belegt, dass Verwandte von Psychotikern eine erhöhte Fruchtbarkeit aufweisen. Die Evolution des Glaubens an Gott, Geist und paranormale Phänomene könnte nicht durch eine reduzierte Angst vor dem Tod gefördert werden, sondern eher durch das Zusammenspiel adaptiver Traits, die Kreativität, positive Schizotypie und Hypnotisierbarkeit umfassen, die Komponenten der übergeordneten Traitdimension Transliminalität darstellen. Paranormale Glaubenshaltungen haben sowohl mit paranormalen Erfahrungen wie auch paranormalen Fähigkeiten zu tun, die, wenn sie echt sind, einen unmittelbaren Anpassungsvorteil hätten. Korrelate paranormaler Fähigkeiten überschneiden sich mit charakteristischen Komponenten von Transliminalität. Der Glaube an spirituelle und paranormale Phänomene könnte sich einfach deshalb entwickelt haben, weil ein solcher Glaube in bestimmter Hinsicht echt ist und die damit verknüpften Traits und Fähigkeiten einen hohen Anpassungswert aufweisen.