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Boundaries in the Mind: Past Research and Future Directions

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Boundaries of one kind or another are of obvious importance in our lives. What we will discuss here is the concept of the thickness of boundaries — thin versus thick boundaries as a dimension of personality. The concept was developed as a dimension of personality, and we will review many studies relating thickness of boundaries with a variety of other personality measures, as well as other psychological measures, in normal as well as clinical populations. We will discuss a great deal of work relating boundaries to measures of sleep and dreaming. We will examine boundaries in clinical populations and in persons who have unusual mystical or paranormal experiences. We will discuss the fact that although thick vs. thin boundaries is basically a personality dimension or trait measure, there are nonetheless also intra-individual differences in boundary functioning. We all function in a more thick boundary manner at certain times and in a more thin boundary manner at other times. We will address, or at least approach, an understanding of the biology of boundaries, and we will examine some broader implications of the concept of boundaries.

I. The Concept of Boundaries in the Mind — Thin and Thick Boundaries

The basic underlying notion is a fairly obvious one. No matter how we think of the content of our minds — whether we think in everyday terms of thoughts, feelings, memories; in cognitive psychology terms of perceptual, semantic and memory processes (or "modules"); or perhaps in psychoanalytic terms of ego, id, superego, defenses, etc. — we are speaking of parts, or regions or processes, which in some sense can be considered separate from one another, and yet which are obviously connected. The boundaries between them are not absolute separations. The boundaries can be relatively thick or solid on the one hand, and relatively thin or permeable on the other hand.

Psychologists have discussed and explored many different aspects of boundaries including perceptual boundaries, boundaries related to thoughts and feelings, boundaries between states of awareness or consciousness, sleep-dream-wake boundaries, boundaries related to memory, body boundaries, interpersonal boundaries, boundaries related to sexual identity and other forms of identity, group boundaries, and boundaries in opinions and judgements (table 1). All of this has been discussed in great detail elsewhere (Hartmann, 1991).

The concept of thick versus thin boundaries as a personality measure becomes most clear if we examine the many kinds of boundaries, as in table 1, and consider extreme examples for clarity. A person who has very thick boundaries in all senses would be someone with a sharp sense of focus, who can easily concentrate on one thing while ignoring others. This person does not experience synesthesia, keeps thoughts and feelings entirely separate ("I don't let my feelings get in the way of my thinking"), and is absolutely clear about when s/he is awake, or asleep or dreaming, experiencing no in between states. This person has a clear sense of the separation of past, present, and future ("that was then, this is now"), has a very definite sense of space around him/herself ("this is my space, this is yours"), and will have a very clear, delineated sense of sexual identity ("I am a man, you are a woman, vive la différence"), group identity ("this is my group, we do such and such; other groups are totally different) and will tend to see the world in terms of black versus white, us versus them, good versus evil.

A person at the other extreme, a person with thin boundaries in all senses, may experience synesthesia, will tend to let a lot of sensory material in at once, and may have difficulty focusing on one part of the input. This person will tend to be aware of thoughts and feelings together ("I can't imagine a thought without a feeling"), and will often experience states of being half-awake and half-asleep, or will become deeply immersed in daydreaming or in reverie, so that sometimes the boundary between real life and fantasy may be unclear. There will be less sense of clear body boundary and personal space. This person may be very aware of the past, and have it blend with the present ("I am grown-up, but in a lot of ways I'm still a child"). Similarly, this person will accept mixtures in sexual identity ("I am a man, but there's a lot of feminine in me too"). He or she will not feel solidly a member of one group, but rather be an individual taking part transiently in many groups, or perhaps a "citizen of the world." In judgments or opinions about the world, this person will tend to think in terms of shades of gray, rather than black and white ("it all depends, s/he's good in some ways and bad in others," "it's different at different times," and so on).

These of course are extremes. Most of us are somewhere in between, a mixture of thin and thick boundaries, but this gives a flavor of the personality dimension running from very thick to very thin, which has recently been quantified using the Boundary Questionnaire (see below).

II. Precursors of the Boundary Concept

Nothing under the sun is entirely new. The concept of thin and thick boundaries is related in some way to a number of previous dimensions and dichotomies. For instance, William James (1907) divided people into "tough minded empiricists," and "tender minded rationalists." Kurt Lewin, in the 1930s diagramed the mind as a number of regions acting on one another, separated by divisions of various thickness (Lewin, 1936). Freud discussed boundaries only a few times, especially when he speaks of the stimulus barrier or "reitzschutz" — a protective shield against stimulation. He referred to the entire ego as initially a body-ego derived from the body surface (Freud, 1923). Many of Freud's followers did explore boundaries in more detail (see for instance Federn,, 1952). There is an entire literature on "ego boundaries" which definitely form part of what we are speaking of here. In the psychoanalytic literature, solid ego boundaries are considered a kind of ideal, and the emphasis is on defects and weaknesses in ego boundaries which lead to psychosis or other pathological conditions (this is quite different from the view of thin and thick boundaries as a value-free personality dimension, which we develop below). A French psychoanalyst, Anzieu has worked clinically with the concept of the "ego skin" (moi pau) as an "envelope for the ego," (Anzieu, 1987). He is obviously speaking of boundaries too.

Clinical psychoanalysts have generally made no attempts to quantify these boundary measures. Such attempts have however been made by such as Blatt, and Ritzler (1974) using the Rorschach test. Peter Landis has studied ego boundaries in detail and developed some ingenious tests for ego and interpersonal boundaries (Landis,1970). All of these measures can be related to thin versus thick boundaries. Fisher and Cleveland (1968) have worked extensively with two measures, "Barrier," and "Penetration," based on the Rorschach test. Theoretically, "Barrier" ought to be closely related to thick boundaries and "Penetration" to thin boundaries. However, empirically, this is not the case. The "Barrier" and "penetration" measures

turn out not to be opposites (Fisher and Cleveland, 1968), and further, neither seems closely related to thick and thin boundaries (Fisher, 1992, unpublished manuscript).

Rokeach (1960), in his work on the "open and closed mind," was clearly dealing with an aspect of boundaries as were Adorno and his colleagues in their classical work on the "authoritarian personality" (Adorno, Frenkel-Brunswik,, Levinson,. & Sanford, 1950). The "closed mind" and the "authoritarian personality" definitely describe aspects of people with very thick boundaries.

Finally, thick and thin boundaries may be relevant to different styles of organizing mental contents. In different ways, Mednick (1962), Spence (1964) and Broadbent (1971) distinguish between a conscious, logical, hierarchical style of conceptual organization, on the one hand, and a preconscious, connotative, parallel processing style of conceptual organization on the other. Each style may serve important defensive as well as adaptive purposes. By being neat, explicit, and well organized, people with thick boundaries can reduce the chances of different concepts becoming confused with each other; perhaps at the cost of not seeing novel connections between them (Mednick, 1962). Thick boundaries can be used defensively to avoid seeing connections between related ideas. While thin boundaries between concepts permit novel and sometimes creative associations between normally unrelated ideas, thin boundaries may be implicated in confused and autistic thinking. In this regard, a cognitive style, category width, (Gardner, Holzman, Klein, Linton,, and Spence, 1959) has to do with the number of diverse objects a person can tolerate as belonging to the same category or group. To consider two different things as belonging to the same group, the conceptual boundaries between them must be relaxed. Thus, we believe that thin and thick boundaries represent an important and pervasive personality dimension.

The Boundary Questionnaire (BQ)

The BQ is a 138-item questionnaire including items about many different aspects of boundaries (Hartmann, 1989, 1991; Hartmann,, Harrison,, Bevis, Hurwitz, Holevas, Dawani, 1987). Table 2 gives some illustrative items. Hartmann et al., (1987), which are divided into 12 categories (as indicated in table 3). The Boundary Questionnaire has now been taken by over 2000 persons in our own studies and several thousand more in a number of other investigations, many of which are mentioned below. The response format for each question runs from '0' (= not at all) to '4' (= very much so). Approximately two thirds of the items are phrased so that full endorsement (very much so) indicates a 'thin' boundary, and the remaining items are phrased so that 'very much so' indicates a thick boundary. To score the test, the answer-values of the thick 'items' are reversed, and all of the scaled answers are added to produce a Sumbound score. In a sample of 866 subjects, gathered from various sources (specific thin and thick-boundary groups, college students) the correlations of Sumbound with all of the items were positive. The alpha reliability for the test is 0.925. All 138 items load positively on the first principal component, and the Armor theta reliability (Armor, 1973-4) is 0.927. Since 'agreement-set', the tendency to agree, was controlled by reversing the scoring direction of one third of the questions, the uniformly positive loadings attest to the idea that there is one (over-arching) principle underlying subjects' responses to all 138 questions. The BQ has good test-retest reliability over six months (r's of about .77 in two samples and Kunzendorf & Mauerer 1988-89, Funkhauser, Würmle, Comu, & Bahro 2001).

An exploratory factor-analysis was done on the correlations among the 138 questions, using principal-components factor-extraction. Using Cattell's (1946) 'scree' test, and subsequent interpretability as criteria, thirteen factors, accounting for 37.3% of the variance, were preserved for rotation using the Normal Varimax criterion. The 13th eigenvalue was 1.65. Items loading 0.25 or above on a given factor were regarded as belonging to it. The first 12 rotated factors were easily interpreted; the 13th was uninterpretable, its 8 items accounting for less than 1% of the total variance. The content of each factor is summarized in

Table 3 (from Harrison, Hartmann, and Bevis 1989 personal communication).

To determine the stability of the factor solution, we re-factored the BQ for 364 college students in the sample only, and found an almost-identical factor-structure. Factor-loadings for this sub-sample were within 0.02 of those found for the total group (Harrison et al, unpublished). Even more recently, a new factor analysis on 500 students has replicated the original results with an almost identical factor structure (Zborowski, 2001, Personal Communication).

Boundary scores can be obtained for each of the individual categories and factors. However, the most used measure has been the overall boundary score called Sumbound, in which high numbers signify thinness. In the first 1000 subjects studied, the range has been 120-454, the mean value 271 ± 50.

III. Who has Thick or Thin Boundaries

A number of interesting findings have emerged as to who may be characterized by thick or thin boundaries.

First, even though the items were very carefully written to have no gender bias, women consistently score significantly "thinner" (one half of a standard deviation) than men, and there is also a slight age effect: older subjects score slightly thicker than younger subjects (Harrison et. al.. 1987 Personal Communication, Hartmann, 1991). However, no long-term studies have been done as yet to determine how boundaries develop and change over the years within a single person.

Significantly thinner boundaries compared to control groups have been found in art students (Beal, 1989, Hartmann, 1991), music students, and mixed groups of creative persons (Beal, 1989), frequent dream recallers (Hartmann, 1991, Hartmann Elkin, & Garg 1991), adults with nightmares (Hartmann, 1991, Levin, Galin, & Zywiak 1991; Galvin, 1993), adolescents with nightmares (Cowen and Levin, 1995), "lucid dreamers" (Galvin, 1993), male as well as female fashion models (Ryan 2000), persons with unusual mystical experiences (Krippner,, Wickramasekera, Wickramasekera, & Winstead, 1998), and persons with a diagnosis of Borderline Personality Disorder, Schizoid Personality Disorder or Schizotypal Personality

Disorder (Hartmann, 1991). Interestingly, although art students have much thinner boundaries than average, this is not true of established artists, who have boundary scores in the normal range (Beal, 1989).

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

IV. The Relationship of the BQ to Other Personality Measures

When the BQ was first used in 1985, it appeared to be a new dimension of personality, not clearly related to any of the then standard personality measures. Thus, there are only low and non-significant correlations between BQ and Eysenck's personality dimensions, although one study found some relationship between thin boundaries and Neuroticism in a small group (Sand and Levin, 1996). There were also no clear relationships to Cloninger's three dimensions of personality.

The BQ did show some relationships with MMPI scales (Hartmann, 1991). In 299 subjects, relationships found were very consistent with what we had predicted on the basis of the definition of boundaries. Sumbound correlated positively ($r = 0.32$) with the F ("atypical response") scale, and this appeared to be a valid relationship. Subjects scoring thinner on the Boundary Questionnaire did frequently report and discuss the unusual experiences described on the F scale, for instance, "I have a nightmare every few days." Sumbound showed a negative relationship ($r = -0.37$) with the K scale, which measures "defensiveness," which can be considered an aspect of thick boundaries. Sumbound correlated positively ($r = 0.41$) with Pa (paranoia), which is not surprising, since it is accepted that Pa in normal groups measures a kind of sensitivity rather than blatant paranoia. Finally, Sumbound correlated positively ($r = 0.40$) with the Mf scale in males — consistent with the view that thin boundaries involves the ability for males to be interpersonally sensitive, and to see feminine elements in themselves. Although these were highly significant correlations, all $p < .001$, the modest size of the correlation suggests that the BQ is obviously measuring something different than these individual MMPI scales.

Significant positive correlations have been reported between Sumbound on the BQ and several measures of hypnotizability and suggestibility (Barrett, 1989, Rader, Kunzendorf, and Carrabino 1996), as well as measures of creativity (Levin, Galen, & Zywisk 1991). An especially strong correlation (r = 0.67) has been found between Sumbound and Tellegen's Absorption Scale (Barrett 1989). Again, these relationships were as predicted from our description of thin boundaries, above.

On the Rorschach test, subjects with thinner boundaries were found to have significantly higher boundary disturbance scores, and also significantly lower form quality scores (Levin, Gilmartin, & Lamontonaro 1998-1999). Recent studies have established a relationship between thin boundaries and a number of other measures relating to personality, including certain forms of anxiety. An especially strong relationship is found between Sumbound and Insecure Attachment, measured on the Bell Object Relations and Reality Testing Inventory (Bell , Billington & Becker 1986). (Hartmann and Zborowski, 2001). Thin boundaries are also positively related to measures of connection-seeking, at least in women (Bevis, 1986). And there is a high correlation (r = 0.51) between thin boundaries and rated openness in an interview study (Zborowski, Hartmann, & Newsom 2001 Manuscript submitted for publication).

There have been two separate investigations relating the Boundary Questionnaire to the Meyers-Briggs Inventory. In both studies the most striking finding was a positive correlation(r between 0.4 to 0.5) between Sumbound and "Intuition," and a somewhat smaller correlation with "Feeling" (Erhman and Oxford, 1995, Barbuto & Plummer 1998, 2000).

A few preliminary studies suggested that the BQ was unrelated to Norman's basic Five-Factor structure of personality. However the Five Factor Model has evolved, and the more recent model championed by Costa and McRae (1992), includes, as one of the five dimensions, "Openness to Experience." McRae (1994) has recently reported a very high correlation (r = 0.73) between thinness of boundaries on the BQ (Sumbound) and Openness to Experience. We have attempted to further examine this surprisingly high correlation. Indeed the Boundary Questionnaire includes at least two items "I am a very open person" and "I am a very

sensitive person" which plainly relate to items in "Openness to Experience." And in fact, factor VI of the BQ was named "open-ness" long before the relationship of the BQ to "Openness to Experience" was known. A detailed examination of the items in the "Openness to Experience" scale is also revealing. The items involve several aspects of boundaries, but emphasize the desirable or positive aspects of thin boundaries. For instance, "I have a lot of intellectual curiosity," "I often enjoy playing with theories or abstract ideas," and (scored negatively) "I have little interest in speculating on the nature of the universe or the human condition." Openness to Experience does *not* include any of the less attractive aspects of thin boundaries, such as feeling overwhelmed by input, vulnerability, becoming over-involved in a maladaptive way, etc. Thin Boundaries and Openness to Experience are obviously closely related, but in our opinion thick versus thin boundaries represents a broader and perhaps more useful measure since it is neutral or value-free and covers both adaptive and maladaptive features.

In this connection it is interesting that BQ shows close to 0 correlation with the Marlowe-Crowne Social Desirability scale (Earle 1992). Overall, neither thin nor thick boundaries are considered more desirable than their opposite. However, a careful examination of the answers and a series of interviews has convinced us that by and large people consider their own type of boundary structure as most desirable. Thus, people with very thick boundaries tend to use terms for others with thick boundaries such as "solid," "reliable," "lots of perseverance," etc., while they characterize people with thin boundaries as "flaky," "far out," "unreliable." People who themselves score very thin on the BQ speak of those with thick boundaries as "dull," "rigid," "unimaginative," while they think of those with thin boundaries as "exciting," "creative," "innovative."

V. Thin Boundaries and Unusual Sensitivities

There are a number of suggestive studies indicating that people with thin boundaries may be not only creative and open, but may have a series of other interesting and so far poorly understood characteristics. For instance, there appears to be a relationship between thin boundaries and multiple chemical sensitivities

(Jawer, 2001). There is also a correlation between thin boundaries and a belief in or tendency to experience paranormal phenomena. Factor V of the BQ — see table 3 — appears to pick up this aspect of thin boundaries and has been labeled "clairvoyance.". Groups of people who characterize themselves as shamans or psychics score thin on the BQ (Krippner, Wickramasekera, Wickramasekera, & Winstead, 1998). Thalbourne and his collaborators, in their studies of persons who experience paranormal phenomena, have devised a "Transliminality scale" to measure these traits (Lange, Thalbourne, Houran, & Storm 2000; Thalbourne, 1991). Preliminary analysis suggests a high correlation (r = 068) between thin boundaries and the Transliminality Scale.

These relationships may be worth exploring further, since two very different hypotheses may explain them. The most parsimonious view would be that all "paranormal" phenomena are imaginary, and that people with thin boundaries simply have better or looser imaginations, are more suggestible, or are more sensitive with a tendency to elaborate creatively on their sensitivities. On the other hand, we could consider the possibility that phenomena such as telepathy, now considered paranormal could be related to transmission of information using perhaps portions of the electromagnetic spectrum which we are not usually able to detect. Under unusual circumstances our ability to detect such information could be altered slightly, and quite possibly there might be inter-individual differences in the ability to detect information of this kind. If so, it is possible that persons with thin boundaries who are sensitive in so many other ways, may also be sensitive to detecting such portions of the spectrum.

Along these lines, the psychologist Daryl Bem, who was until recently a skeptic about any kind of paranormal experiences, carefully reviewed all quantitative studies of these phenomena and came to the conclusion that there is indeed be something worth studying. Bem and Honorton (1994) in a paper called "Does PSI Exist?" interpret the overall statistical results as suggesting that there is a small positive effect, especially in studies of telepathy and clairvoyance, which they can not attribute to chance, poor study design, etc. They also comment that the results are most positive when the subjects used are artists or creative people (in other words, probably people with thin boundaries). Certainly nothing is proven, but we

suggest that anyone considering a careful quantitative study of “psi” or paranormal phenomena should consider using people with thin boundaries as subjects.

VI. Clinical Boundaries — Boundaries in Psychotherapy

Although psychotherapists have been making use of concepts such as ego-boundaries and interpersonal boundaries for many years, there has not been much quantitative study or much attempt to relate therapy to the BQ. One small survey suggests that people with high Sumbound scores (thin boundaries) are much more likely to value psychotherapy, to have been involved in psychotherapy, and to have benefited from psychotherapy (Hartmann, 1996). One paper discussed thick and thin boundaries in relation to “boundary violations” in therapy. The conclusion is that victims of sexual boundary violations tended to be persons (usually women) with thin boundaries. Interestingly, it appeared that the violators of boundaries (therapists who had sex with their patients) could be divided into two distinct groups, one group with unusually thin boundaries, and another group with very thick boundaries. The first group consisted of therapists who were themselves somewhat confused and unclear about rules and limits in psychotherapy and elsewhere. The second group consisted of therapists who were not confused, but knew exactly what they were doing. They were solid, “thick-boundary” people who lacked empathy, and were not able to appreciate the pain and suffering that might be experienced by the patient involved in the boundary violation (Hartmann, 1997).

We have repeatedly found that an explicit discussion of boundaries can be very useful in psychodynamic therapy. This is especially the case in patients who have relatively thin boundaries, or at least thin boundaries in some areas, and are painfully aware of this when it is called to their attention. It is often useful for them to think of their problems in terms of boundaries being thin in certain areas, and perhaps needing thickening. Further, they appreciate the fact that they are in this sense similar to art students and other creative persons. The same patients often react poorly to being labeled with diagnoses such as “Borderline Personality Disorder,” or “Schizotypal Personality Disorder” which have a great many negative connotations for the patient and sometimes the therapist.

VII. Boundaries and Dreams

There have been a large number of studies relating boundaries to various aspects of dreams. First of all, there is a clear and significant positive relationship between thinness of boundaries and amount of dream recall in various normal and clinical samples (Hartmann, 1991, Hartmann Elkin, &Garg 1991; Hartmann, Rosen, & Rand 1998; Kunzendorf, Hartmann, Cohen, & Cutler 1997; Levin et al 1998-99; Schredl, Kleinferchner, & Gell, 1996; Schredl, Schafer, & Hoffman 1999;). This relationship holds in an adolescent population as well (Cowen and Levin, 1995). In most studies, dream recall was measured by a single question, but a study involving dream diaries obtained similar results (Schredl et.al. 1996). This relationship has been replicated a number of times, and holds true even when all items on the BQ relating to dreams, daydreams, sleep, and waking are removed (Hartmann, 1991). In the past it has been strikingly difficult to obtain consistent relationships of dream recall with any personality measures. In fact, the positive relationship with thinness on the BQ is at present the only well-replicated correlate of dream recall. Although the results are highly significant, the magnitude of the r's (usually 0.2 to 0.5) indicates that, obviously, much variance is left to be explained. Part of this variance is certainly "noise in the system" — the fact that simply asking people a single question about how often they recall a dream is a very rough measure. Many people — probably the majority — have thought little about their dreams or amount of dream recall, and their answer to the question is only a wild guess. In fact, one study showed that the correlation between dream recall and thinness on the BQ is much higher in persons who are especially interested in their dreams — members of the Association for the Study of Dreams. The correlation between BQ score and dream recall was 0.58 in this subgroup (N = 42), whereas it was 0.40 in the larger, unselected group of 600 persons (Hartmann, 1991).

Dream recall shows a significant positive correlation not only with the overall BQ score SumBound, but with each of the twelve categories of boundaries. Also, a group of frequent dream recallers (seven dreams or more per week) scores significantly higher on SumBound and on each of the twelve categories of the BQ than a group of persons who say they do not recall dreams (Hartmann,1991; Hartmann, et al, 1991).

Further, the BQ is related to aspects of the content of dreams: dreams of subjects with thin boundaries are scored as more vivid, more dreamlike, more emotional, and having more interactions between characters (Hartmann et al, 1991; Hartmann et al. 1998). Similar findings on dream content are reported by Schredl et al. 1996). In another study, Sumbound was positively correlated with the emotional intensity, bizarreness, and "morbid content" of dreams (Zborowski, McNamara, Hartmann, Murphy & Mattle 1998).

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

Galvin (1993) found that lucid dreamers — persons who frequently realize they are dreaming during their dreams — have thin boundaries with scores in about the same range as nightmare sufferers. However, the two groups differ on factor 10 of the BQ: the nightmare group is more "overinvolved."

Aside from the relationship with dreaming, there are also some intriguing preliminary findings suggesting relationships between boundaries and other aspects of sleep and sleep disorders. Overall, there is a small but significant correlation between thinness of boundaries and length of sleep (Hartmann, 1991). Indeed, persons classically described as "short sleepers" — people who get along on 6 hours or less of sleep per night, do not catch up, and do not have any complaints of insomnia — appear to have many characteristics of people with thick boundaries, though the BQ was not available at the time of the sleep studies (Hartmann, Baekland, & Zwilling 1972).

Among people with sleep disorders, we have mentioned that those who have frequent nightmares have unusually thin boundaries (Hartmann, 1984, 1991). This relationship has been studied and confirmed (Zborowski et al, 1998). However, persons who have a very different condition, night terrors — early night frightening awakenings without dreams — as well as those with sleepwalking (sometimes associated with night terrors) tend to have thick boundaries. Patients suffering from bruxism (tooth-grinding) tend to have thicker boundaries than average, as do patients with sleep apnea, as mentioned (Hartmann, 1991, 1992).

VIII. Boundary Changes Within an Individual: the Focused-Waking-to-Dreaming Continuum

We have chiefly discussed thin vs. thick boundaries as a personality trait, and in fact most studies have focused on boundaries in this way. However, it is interesting to note that thickness of boundaries may also vary within an individual at different times or in different states. We have studied this variation, especially as related to the *focused waking to dreaming* continuum as follows.

In the studies above and the usual conceptualization, dreaming is treated as though it were totally separate from waking. However, a great deal of data suggests that it is useful to think of a continuum running from focused waking on one end to dreaming at the other end (fig 1). This is discussed in detail elsewhere (Hartmann, 1998). At the left-hand "focused waking" end of the continuum, the mind deals with words, mathematical symbols, logical relationships, tending to use sequential processing (A—>B—>C—>D), making connections in a serial fashion. At the dreaming end, the mind is hyperconnective, using loose associations, merging, condensation and so on, making connections in a parallel or auto-associative fashion. The continuum has a clear relationship with boundaries in the senses we have discussed above. When we are wide awake engaged in focused waking activities, such as doing an arithmetic problem, or chasing down a fly ball in the outfield, we are functioning in a thick boundary manner. We try to "think clearly" and make clear separations. We carefully separate "task" from "non-task," and one task from another. When we move towards daydreaming and eventually dreaming, categories merge, and we combine and relate things in all sorts of unusually ways. Freud's first and most important mechanism of

the “dreamwork,” known as *condensation*, is exactly this — a combining of separate items, a blurring of boundaries. Thus, we all have thinner boundaries when we are dreaming. In this sense, the continuum from thick boundaries to thin boundaries, can be considered not only as a personality trait, but also a within-person state measure. A number of studies suggest that content from waking, especially at the reverie or daydreaming portions of waking, are not entirely differentiable from dreaming. One study demonstrated the relationship with the BQ. It showed that overall students’ dreams were scored as more “bizarre” and “dreamlike” on standard scales than students’ daydreams. However, students who scored thin on the BQ showed a shift to the right relative to thicker students, so that the daydreams of students who scored thin were scored just as “bizarre” and as “dreamlike” as the dreams (night dreams) of students who scored thick (Kunzendorf et al, 1997).

Another study showed that in general subjects had more difficulty distinguishing visual pulses from auditory pulses under hypnosis than while wide awake. This difference was stronger in subjects scoring “thin” on the boundary questionnaire (Kunzendorf and Maurer, 1988-89).

IX. Boundaries and the Brain

If thin versus thick boundaries represents a clear-cut personality dimension and also an aspect of mental state functioning, one would predict that thick versus thin boundary functioning should be detectable on the biological level, in terms of brain function and activity. In simple terms, one might suggest that thin boundaries, relative to thick boundaries, might be associated with more hyperconnectivity, perhaps a more rapid spread of activation in the forebrain, or more “in-between states.” It has not been easy to study boundaries biologically, but a few beginnings have been made. For instance, in examining the polysomnograms (all night sleep records) of persons with very thick or very thin boundaries, we were struck by the fact that people with thick boundaries appeared to have more clear-cut states of waking, NREM sleep, and REM sleep, whereas the records those with thin boundaries showed more in-between states, or difficult-to-define states. Several researchers have had this impression, but it has not yet been validated in a completely blind fashion with agreed-upon definitions of in-between states. Along similar lines, a study by Watson (1985) investigated phasic integrating potentials (PIPs), which are sharp spikes

recorded in humans and animals, occurring chiefly during REM sleep—and in fact considered an index of the basic neurophysiology of REM sleep—but occasionally at other times as well. Watson found a strong, positive correlation (r = .52) between the number of PIPs outside of REM sleep and thinness of boundaries. In other words, people with thinner boundaries in a psychological sense, also had thinner boundaries between REM and NREM sleep: the brain activity characteristic of REM sleep often "escaped" into NREM sleep. More work along these lines is definitely needed.

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

There has been one study in which a number of neuropsychological tests were administered to persons scoring either very thin or very thick on the BQ. Such tests are generally used to detect brain damage, so of course large differences cannot be expected in these normal subjects. Yet significant differences were found in some interesting areas. Subjects scoring thick showed more evidence of perseveration (continuing in a task or strategy when asked to change) and a more systematic approach to constructing figures. Thin boundary subjects were significantly better at changing strategies or adopting new strategies on a number of tests (Garg and Hartmann 1993). Such differences are suggestive of differences in functioning of the frontal cortex. To the best of our knowledge there have as yet been no studies using imaging techniques such as PET or fMRI, which might be expected to show such differences more clearly.

There are also definite hints of a neuropharmacology and neurochemistry of boundaries, though with no controlled studies as yet. Based on several hundred interviews with research subjects and patients taking a number of psychoactive medications, it is clear that certain medications produce a temporary thickening of boundaries. These include the stimulants and some anti-depressants. Persons with thin boundaries taking such medications repeatedly describe the effects as, "I feel less pulled-apart," "I feel focused," "I feel ready

to work on things," "I do less daydreaming," "I'm more concentrated," "I feel tougher," "I can pull my thoughts together better," "instead of being pulled in ten different directions, I can move in one straight line." These "thickening" effects appear more prominent in people who have thin boundaries, regardless of whether they are normal subjects in studies, or patients with a variety of diagnoses.

On the other hand, the effects of psychedelic drugs, especially LSD, can be interpreted as a temporary thinning of boundaries, with effects that include synesthesia, vivid changing imagery, dreamlike states, many thoughts or feelings simultaneously. One woman who scored very thin on the BQ said of an LSD experience, "I can see why some people might like or need this sort of loosening or merging, but it's not for me. I'm too much like that anyway, without drugs."

These clinical or anecdotal results suggest the probable importance of the biogenic amines in boundaries. They suggest especially that increased norepinephrine (and perhaps dopamine) in the cortex can produce a thickening of boundaries, whereas a lack of norepinephrine can produce thinner boundaries. This is consistent with the fact that the lack of norepinephrine in the cortex is one of the clearest characteristics of REM sleep, when most dreaming occurs. All of this can be considered only a small beginning to an investigation of the biology of boundaries.

Overall, thick vs. thin boundaries appears to be a robust personality measure which can be considered an important dimension of personality. This measure is related to, but may in some ways be broader and more useful than, the personality dimension "Openness to Experience." We have discussed many correlates of thick and thin boundaries, and have also emphasized the relationship of thick and thin boundaries to the continuum running from focused waking thought to dreaming. In this sense, people with thick boundaries spend more time and find themselves more comfortable at the left-hand end of our continuum involved in focused waking. They can be considered "thought people," whereas the people with thinner boundaries are more comfortable at the other end of the continuum and can be thought of as "dream people," although these terms are obviously an over-simplification.

X. Broader Implications of Boundaries for Society and Humanity

Beyond the implications for personality, behavior, etc. mentioned above, we would like to discuss here some broader speculations about boundaries in the mind. These are very difficult to investigate in controlled studies, and are offered principally as "food for thought."

1. Boundaries have a great deal to do with not only the organization of our thinking, but of our societies. For instance, if we think about law, we can see a very thick boundary position: "this is legal, that is illegal," "this man is either innocent or guilty, that's all there is to it," as opposed to a more thin boundary position involving shades of grey, mitigating circumstances, partial responsibility, etc.

2. This difference can be seen not only in law but more generally in ethics. The thick position is that there is clear-cut good and clear-cut evil, while the thinner view involves shades of grey and "situation ethics."

3. Quite likely aesthetics is influenced by boundaries in a somewhat similar way. The thick boundary position would be "this is beautiful, this is ugly; there are rules that tell you exactly which is which; that's all there is to it." The thin boundary position might be more like, "it's hard to tell, it all depends," or "I can see something beautiful in this even though it looks ugly overall," "it's hard to judge," or perhaps that the artist can transform ugliness into beauty. For instance, Rodin states, "what is commonly called ugliness in nature can in art become full of great beauty" (Gsell, 1971).

4. Other philosophical categories can likewise be seen differently from a thick or thin boundary position. Even basic building blocks of metaphysics such as "real" vs. "unreal" or "true" vs. "false" may be seen in absolute terms, or in a more relativistic fashion. In an overall sense, thick boundaries can be visualized as black vs. white, while thin boundaries can be thought of as various shades of grey.

5. In general, we suggest that thick boundaries are more helpful at times of war, threat, or danger. In fact societies or groups that feel threatened or in constant danger, for whatever reason, tend to develop thicker boundaries. Thin boundaries are more helpful, or perhaps simply more possible, when there is less danger and we can "let go." Along political lines, it is possible to think of war and peace in very thick boundary terms. A "thick boundary peace" consists of establishing precisely the interests, the duties, the territory of the two sides, and making appropriately clear agreements: "this is mine, this is yours; we'll set up all the walls, regulations, etc. that may be necessary." A "thin boundary peace" would be more along the lines of joint occupations of areas, joint assemblies, flexibility, a gradual realization that "we" are not really so different from "them," and eventually a situation where it doesn't matter much to whom a particular bit of territory belongs. This latter position is considered far-out and idealistic by much of the world, but it has occurred for instance within the United States or within Switzerland where there are continuing disagreements between states (or cantons) as to who owns exactly what territory, what river rights, etc., but it is not anything to make war about. It is no longer a matter of life or death. This has also occurred recently in Western Europe, where countries which not long ago were bitter enemies now allow citizens to cross borders without even requiring papers.

6. In an adaptive sense, there are advantages to thin as well as thick boundaries. For the survival of an individual, it is certainly important to be able to concentrate and engage in focused waking activity, but also at times to be able to daydream or dream. For a corporation, it may be useful to have a creative genius/inventor with an initial idea, or several at different times, but then to have more thick boundary types to develop, organize, market, etc. Likewise for society as a whole, it is perhaps optimal to contain and value individuals with thin as well as individuals with thick boundaries.

Table 1. Types of Boundaries

Perceptual boundaries
Between sensory inputs
Sensory focus or "bandwidth"
Around perceptual entities
Boundaries related to thoughts and feelings
Between two thoughts or two feelings
Between thought and feeling
Around thoughts and feelings (free association)
Boundaries between states of awareness or states of consciousness
Sleep-dream-wake boundaries
Between sleep and waking
Between dreaming and waking
In and around the dream
Daydreaming
Boundaries related to play
Boundaries related to memory
Early memories
Recent memories and memory organization
Personal past
Future plans
Boundaries around oneself (body boundaries)
Barriers against stimuli
The skin as a boundary
Posture and musculature as boundaries
Personal space
Interpersonal boundaries
Boundaries between conscious and unconscious and between id, ego, and superego
Defense mechanisms as boundaries
Boundaries related to identity
Sexual identity
Age identity: Between adult and child
Constancy of identity
Group boundaries
Boundaries in organizing one's life
Boundaries in environmental preferences
Boundaries in opinion and judgments
Boundaries in decision making and action

Table 2. Boundary Questionnaire: Examples of Items

Category 1: Sleep/Dream/Waking
1. When I awake in the morning, I am not sure whether I am really awake for a few minutes.
37. I spend a lot of time daydreaming, fantasizing, or in reverie.
Category 2: Unusual Experiences
61. At times I have felt as if I were coming apart.
100. I have had déjà vu experiences.
Category 3: Thoughts/Feelings/Moods
15. Sometimes I don't know whether I am thinking or feeling.
74. I can easily imagine myself to be an ani8mal or what it might be like to be an animal.
Category 4: Childhood/Adolescence/Adult
4. I am very close to my childhood feelings.
40. I have definite plans for my future. I can lay out pretty well what I expect year by year for the next few years.
Category 5: Interpersonal
53. When I get involved with someone, we sometimes get too close.
103. I am a very open person.
Category 6: Sensitivity
6. I am very sensitive to other people's feelings.
42. I am unusually sensitive to loud noises and bright lights.
Category 7: Neat/Exact/Precise
19. I keep my desk and work table neat and well organized.
43. I am good at keeping accounts and keeping track of my money.
Category 8: Edges/Lines/Clothing
32. I like heavy, solid clothing.
44. I like stories that have a definite beginning, middle, and end.
Category 9: Opinions re Children, etc.
33. Children and adults have a lot in common. They should give themselves a chance to be together without any strict roles.
56. I think a good teacher must remain in part a child.
Category 10: Organizations
10. In an organization, everyone should have a definite place and a specific role.
58. A good relationship is one in which everything is clearly deefined and spelled out.
Category 11: Peoples/Nations/Groups
11. People of different nations are basically very much alike.
105. There are no sharp dividing lines between normal people, people with problems, and people who are considered psychotic or crazy.
Category 12: Beauty/Truth
36. Either you are telling the truth or you are lying; that's all there is to it.
76. When I am in a new situation, I try to find out precisely what is going on and what the rules are as soon as possible.

Table 3. Summary of the Factor Analysis (from Harrison et al. 1989)

Factor I-13, Primary Process Thinking:

The 51 items in this factor (all keyed in the 'thin' boundary direction) describe a person who has many experiences of merging; of fluctuating identity; whose imagery is so vivid it is hard to distinguish from reality; who experiences synaesthesia; the merging of objects with self and with each other. 49 of the items are keyed 'True'. Theta reliability (see Armor 1973-4) = .92.

Factor II-13, Preference for Explicit Boundaries*:

The 37 items on this factor (36 keyed in the 'thick' boundary direction) express a preference for clear borders whether it is in nation, cities, houses, pictures, stories, or relationships. A secondary emphasis is on neatness. 34 of the items are keyed 'True'. Theta = .87.

Factor III-13, Identification with Children:

The 19 items in this factor (18 keyed 'thin') describe a person who feels, in part, like a child; identifies with children and enjoys them. All of the items are keyed 'True'. Theta = .75.

Factor IV-13, Fragility:

The 13 items in this factor (12 keyed 'thin') express sensitivity to hurt, a difficult and complicated childhood and adolescence, fears of falling apart and fears of being overwhelmed by interpersonal involvement. 12 keyed 'True'. Theta = .75.

Factor V-13, Clairvoyance:

The 16 items on this factor (14 keyed 'thin') include beliefs in one's clairvoyant powers including knowing others' unexpressed thoughts and feelings, having premonitory dreams, and experiencing very vivid memories and imagery. These items also suggest a strong sense of self-identity from childhood through old age. 15 of the items are keyed 'True'. Theta = .70.

Factor VI-13, Open-ness:

The 11 items on this factor (all keyed 'thin') describe a person who believes in being open to the world, trusting others, and disclosing personal experience. 10 of the 11 items are keyed 'True'. Theta = .70.

Table 3. Summary of Factor Analysis, continued

Factor VII-13, Organized Planfulness*:

The 15 items on this factor (all keyed 'thick') describe a well-organized, methodical, planful person who keeps track of everything. 13 of the questions are keyed 'True'. Theta = .67.

Factor VIII-13, Belief in Impenetrable Inter-group Boundaries*:

The 10 items on this factor (all keyed 'thick') describe a person who believes in inter group segregation whether a group is defined by nationality, race, age, or gender. 8 of the questions are keyed 'T'. Theta = .65.

Factor IX-13, Flexibility:

The 12 items (10 keyed 'thin') in this factor have four themes: those of wishing to shape one's own space, job, life; recognizing separateness in close relationships (2 items); appreciating without analyzing (2 items); and believing that people are more the same than they are different. All 12 are keyed 'True'. Theta = .57.

Factor X-13, Overinvolvement:

The six items in this factor (all keyed 'thin') are concerned with the difficulty of making transitions from one state to another — whether it is from being asleep to being awake, from listening to music or playing a game to ordinary states of consciousness. 5 of the 6 items are keyed 'True'. Theta = .57.

Factor XI-13, Preference for Simple Geoemetric Forms*:

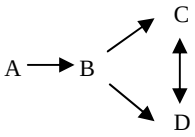
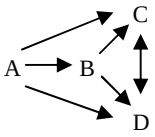
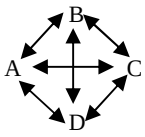
The 5 items in this factor (all keyed 'thick') describe a person who likes straight lines, and would like to work as a navigator or an engineer. All 5 items are keyed 'True'.; Theta = .56

Factor XII-13, Isolation of Affect*:

Two of the 5 items in this factor (all keyed 'thick') describe a person who explicitly believes in the segregation of thinking from feeling and facors rationality over emotion. 3 of the questions are keyed 'True'. Theta = .56.

Factor XIII-13, Uninterpretable.

Figure 1. A wake-dreaming continuum

	Focused Waking thought	Looser, Less-structured Waking thought	Reverie free association daydreaming	Dreaming
What dealt with?	Percepts: Math symbols signs, words	fewer words, signs, more visual-spatial imagery		almost pure imagery
How?	logical relationship — If A then B	less logic, more noting or picturing of similarities, More metaphor		almost pure picture - metaphor
Self-reflection:	highly self-reflective — "I know I am sitting here reading."	less self-reflective, more "caught up" in the process, the imagery		in "typical dreams" total thereness, no self-reflection
Boundaries:	solid divisions, Categorizations, thick boundaries	less rigid categorization, thinner boundaries		merging condensation loosening of categories, thin boundaries
Sequence of ideas or images:				
Processing:	relatively serial; net functions chiefly as a feed-forward net.		net functions more as an auto-associative net.	
Subsystems:	activity chiefly within structured		activity less within, across or outside of structured subsystems.	

References

Adorno, T., Frenkel-Brunswik, E., Levinson, D. & Sanford, R. (1950). *The authoritarian personality*. New York: Harper.

Anzieu, D. (1987). *Le Moi peau*. Paris: Monod Press.

Armor, D. (1973-4). Theta reliability and factor scaling. In H. Costner, Ed., *Sociological Methodology*, San Francisco: Jossey-Bass.

Barbuto, J., & Plummer, B. (1998). Mental boundaries as a new dimension of personality: a comparison of Hartmann's boundaries in the mind and Jung's psychological types. *Journal of Social Behavior and Personality*, *13*, 421-436.

Barbuto, J. & Plummer, B. (2000). Mental boundaries and Jung's psychological types: a profile analysis. *Journal of Psychological Type*, *54*, 17-21.

Barrett, D. (1989). The relationship of thin vs. thick boundaries to hypnotic susceptibility. Paper presented at the meetings of the Eastern Psychological Association. Boston, MA. April, 1989.

Beal, S. (1989). The boundary characteristics of artists. (Unpublished doctoral dissertation, Boston University).

Bell, M., Billington, R., & Becker, B. (1986). A scale for the assessment of object relations: reliability, validity, and factorial invariance. *Journal of Clinical Psychology*,*42*, 733-741.

Bem, D., & Honorton, C. (1994). Does Psi exist? Replicable evidence for an anomalous process of information transfer. *Psychological Bulletin*. *115*, 4-27.

Bevis, J. (1986) Connectedness versus separateness: understanding male/female differences in self and relationship. (Unpublished doctoral dissertation, Boston University).

Blatt, S., & Ritzler, B. (1974). Thought disorder and boundary disturbance in psychosis. *Journal of Consulting and Clinical Psychology*, *42*, 370-381.

Broadbent, D. (1971). William James Lectures. In Broadbent, D. (1973) *In Defense of Empirical Psychology*. London: Methuen.

Costa, P., & McCrae, R. (1992). *Revised NEO Personality Inventory (NEO-PI_R) and NEO Five-Factor Inventory (NEO-FFI) Professional Manual*. Odessa, FL: Psychological Assessment Resources.

Cowen, D. & Levin, R. (1995). The use of the Hartmann Boundary Questionnaire with an adolescent population. *Dreaming*, *5*, 105-114.

Earle, J. (1992) Social desirability and thin boundaries. Unpublished manuscript.

Ehrman, M., & Oxford, R. (1995). Cognition plus: correlates of language learning success. *The Modern Language Journal*, *79*, 67-89.

Federn, P. (1952). *Ego psychology & the psychoses*. New York: Basic Books.

Fisher, S. (1992) Personal Communications..

Fisher, S., & Cleveland, S. (1968). *Body image & personality* (2nd ed.). New York: Dover.

Freud, S. (1923). The ego and the id. In *The st&ard edition of the complete psychological works of Sigmund Freud*, vol. 19 (pp. 3-66). London: Hogarth Press.

Funkhauser, A, Würmle, O., Cornu, C., & Bahro, M. (2001). Dream life & intrapsychic boundaries in the elderly. *Dreaming*, 11, 83-88.

Galvin, F. (1993). The effect of lucid dream training upon the frequency & severity of nightmares Unpublished Doctoral dissertation, Boston University..

Gardner, R., Holzman, P., Klein, G., Linton, H., & Spence, D. (1959). Cognitive control: a study of individual consistencies in cognitive behavior. *Psychological Issues*, Monograph 4. New York: International Universities Press.

Garg, M., & Hartmann, E. (1993) Neuropsychology of persons with thick or thin boundaries. Unpublished manuscript..

Gsell, P. (1971). *Rodin on Art*. New York: Horizon Press.

Harrison, R., Hartmann, E., & Bevis, J. (1989) The Hartmann Boundary Questionnaire: a measure of thin & thick boundaries. Manuscript submitted for publication.

Hartmann, E. (1989). Boundaries of dreams, boundaries of dreamers: thin & thick boundaries as a new personality dimension. *Psychiaric Journal of the University of Ottawa, 14*, 557-560.

Hartmann, E. (1991). *Boundaries in the Mind*. New York: Basic Books.

Hartmann, E. (1992). Boundaries in the mind: boundary structure related to sleep & sleep disorders. *Sleep Research, 21*, 126.

Hartmann, E. (1996). Outline for a theory on the nature & functions of dreaming. *Dreaming, 6*, 265-271.

Hartmann, E. (1997). The concept of boundaries in counseling & psychotherapy. *British Journal of Guidance & Counseling, 25*, 147-162.

Hartmann, E. (1998). *Dreams & Nightmares*. New York: Plenum Press (1998), Perseus (2000).

Hartmann, E., Baekel&, F., & Zwilling, G. (1972). Psychological differences between long & short sleepers. *Arch Gen Psychiat, 26*, 463-468.

Hartmann, E., Harrison, R., Bevis, J., Hurwitz, I., Holevas, A., & Dawani, H. (1987). The Boundary Questionnaire: a measure of thin & thick boundaries derived from work with nightmare sufferers. *Sleep Research, 16*, 274.

Hartmann, E. Elkin, R., & Garg, M.(1991). Personality & Dreaming: the dreams of people with very thick or very thin boundaries. *Dreaming* 1, 311-324.

Hartmann, E., Rosen, R., Grace, N. (1998). Contextualizing images in dreams & daydreams. *Sleep, 21S*, 279.

Hartmann, E., Rosen, R., R&, W. (1998). Personality & dreaming: boundary structure & dreams. *Dreaming, 8*, 31-40.

Hartmann, E., & Zborowski, M. (2001). Dreams: correlates of the Contextualizing Image. *Sleep, 24S*, A174.

Hartmann, E., Zborowski, M., McNamara, P., Rosen, R., & Grace, N. (1999). Contextualizing images in dreams: relationship to the emotional state of the dreamer. *Sleep, 22S*, 131.

Hartmann, E., Zborowski, M., & Kunzendorf, R. (2001). Contextualizing images in dreams: more intense aafter abuse & trauma. *Dreaming*, 11, 115-126..

James, W. (1907). *Pragmatism: A New Name for Some Old Ways of Thinking*. New York: Washington Square Press, 1983.

Jawer, M. (2001) *The Emotional Gateway: The Dynamics of Feeling & their Link to Paranormal Perception*. Manuscript submitted for publication.

Krippner, S., Wickramasekera, I., Wickramasekera, J., & Winstead, C. (1998). The Ramtha phenomenon: psychological, phenomenological, & geomagnetic data. *The Journal of the American Society for Psychical Research*, *92*, 1-24.

Kunzendorf, R., & Maurer, J. (1988-89). Hypnotic attenutation of the 'boundaries' between emotional, visual, & auditory sensations. *Imagination, Cognition & Personality*, *8*(3), 225-234.

Kunzendorf, R., Hartmann, E., Cohen, R., & Cutler, J. (1997). Bizarreness of the dreams and daydreams reported by individuals with thin and thick boundaries. *Dreaming*, *7*, 265-271.

Landis, B. (1970). Ego boundaries. *Psychological Issues*, *6*(4), Monograph #24. New York: International Universities Press.

Lange, R., Thalbourne, M., Houran, J., & Storm, L. (2000). The revised Transliminality Scale: reliability and validity data from a Rasch top-down purification procedure. *Consciousness and Cognition*, *9*, 591-617.

Levin, R., Galen, J. & Zywiak, B. (1991) Nightmares, Boundaries, and Creativity. *Dreaming* 1, 63-74.

Levin, R., & Fireman, G. (1993). Psychoanalytic studies on the experience of schizophrenia. In Masling, J. & Bornstein, R., eds., *Psychoanalytic Perspectives on Psychopathology* (pp. 139-189). Washington, D.C.: APA Press.

Levin,R., Gilmartin, L., & Lamontanaro, L. (1998-99). Cognitive style and perception: the relationship of boundary thinness to visual-spatial processing in dreaming and waking thought. *Imagination, cognition, and personality*, *18*(1), 25-41.

Lewin, K. (1936). *Principles of topological psychology*. New York: McGraw-Hill.

McCrae, R. (1994). Openness to experience: expanding the boundaries of factor V. *European Journal of Personality*, *8*, 251-272.

Mednick, S. (1962). The associative basis of the creative process. *Psychological Review*, *69*, 220-232.

Rader, C., Kunzendorf, R., & Carrabino, C. (1996). The relation of imagery vividness, absorption, reality boundaries and synesthesia to hypnotic states and traits. In: *Hypnosis and Imagination*, Kunzendorf R., Spanos, N., Wallace, B., eds. New York: Baywood Publishing Company. pp. 99-121.

Rokeach, M. (1960). *The Open and Closed Mind*. New York: Basic Books.

Ryan, C. (2000). Personality of fashion models. (Unpublished master's thesis, Saybrook Graduate School, San Francisco).

Sand, S. & Levin, R. (1996). Concordance between Hartmann's Boundary Questionnaire and the Eysenck Personality Inventory. *Perceptual and Motor Skills*, *82*, 192-194.

Schredl, M., Kleinferchner, P., & Gell, T. (1996). Dreaming and personality: thick vs. thin boundaries. *Dreaming*, *6*, 219-223.

Schredl, M., Schäfer, G., Hofmann, F., & Jacob, S. (1999). Dream content and personality: thick vs. thin boundaries. *Dreaming*, *9*, 257.

Spence, D. (1964). Conscious and preconscious influences on recall: another example of the restricting effects of awareness. *Journal of Abnormal and Social Psychology*, *68*, 92-99.

Thalbourne, M. (1991). The psychology of mystical experience. *Exceptional Human Experience*, *9*, 168-186.

Thalbourne, M. (1996). Belief in life after death: psychological origins and influences. *Personality and Individual Differences*, *21*, 1043-1045.

Watson, R. (July, 1985). Phasic integrated potentials and ego boundary deficit. Paper presented to a joint meeting of the Sleep Research Society and the Association of Sleep Disorders Centers. Seattle, Washington.

Zborowski, M., McNamara, P., Hartmann, E., Murphy, M., & Mattle, L. (1998). Boundary structure related to sleep measures and to dream content. *Sleep*, *21S*, 284.

Zborowski, M., Hartmann, E., & Newsom, M. (2001) The Hartmann Boundary Questionnaire: two studies examining personality correlates and interpersonal behavior.. Submitted for publicatioon. .