



# Superstitious, magical, and paranormal beliefs: An integrative model

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## Abstract

Lack of conceptual clarity has hampered theory formation and research on superstitious, magical, and paranormal beliefs. This study offers a conceptual framework where these concepts are differentiated from other unfounded beliefs and defined identically as a confusion of core knowledge about physical, psychological, and biological phenomena. When testing this definition with questionnaire items ( $N = 239$ ), the results showed that superstitious individuals accepted more violations of core ontological distinctions than skeptics did and that ontological confusions discriminated believers from skeptics better than intuitive thinking, analytical thinking, or emotional instability. The findings justify the present conceptualization of superstitious, magical, and paranormal beliefs, and offer new theoretical propositions for the familiar everyday beliefs that are yet scientifically so poorly understood.

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## 1. Introduction

More than 40% of American people believe in devils, ghosts, and spiritual healing (National Science Foundation, 2002; Rice, 2003). Researchers, in turn, have characterized superstitious and magical thinking as an extremely discouraging research topic (Scheibe & Sarbin, 1965), a problem for which there is no ready solution (Campbell, 1996), and as

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“a label for a residual category—a garbage bin filled with various odds and ends that we do not otherwise know what to do with” (Nemeroff & Rozin, 2000, p. 1).

Superstitious and magical beliefs have certainly been examined, and a body of research has identified numerous correlates for them, ranging from personality traits, motivation, and cognition to emotional instability, demographics, and social influences (reviews: Vyse, 1997; Zusne & Jones, 1989). Despite the accumulating information, however, the overall picture of superstition is unclear and remains to be adequately described and explained.

We suggest that a lack of conceptual clarity has hampered theoretical progress. Because there is no agreement about what the domain entails, theoretically important assumptions have been difficult to make. Most importantly, whether and how the constructs superstition, magical beliefs, and paranormal (supernatural) beliefs differ from each other, and above all, how they differ from other groundless beliefs (e.g., “whales are fish”), is not known. Consequently, there is a strong need for a conceptual model that clarifies the meaning of magical, paranormal, and superstitious beliefs, and explains why well-educated Western people still believe in things that seem so irrational. The present study provides an initial step in this direction. Our aim was to offer new theoretical propositions, which serve to define the constructs and offer criteria for their application, and to analyze whether the definition can be empirically justified.

Very often, the definition of superstition, magical, or paranormal belief is either omitted or substituted by examples of such beliefs. Nonetheless, some definitions can be found in current scientific literature. Among the most influential definitions of magical thinking are the laws of sympathetic magic (Frazer, 1922/1963; Tylor, 1871/1974). The law of contagion holds that things that have once been in contact with each other continue to act upon each other at a distance after the physical contact has been severed. The law of similarity holds that superficial resemblance indicates, or causes, deep resemblance. During the last two decades, Rozin and Nemeroff have conducted a series of path-breaking studies and showed how the same laws manifest themselves among well-educated Western adults, for example, as reluctance to wear Hitler’s sweater (Nemeroff & Rozin, 2000; Rozin, Millman, & Nemeroff, 1986). However, the laws of sympathetic magic are neither intended nor sufficient to cover all superstitious, magical, and paranormal beliefs. Moreover, as the researchers themselves note, the distinction between the laws of magical thinking and reality, for example, between magical contagion and microbial contamination and between magical similarity and vaccination, is subtle and ambiguous (Frazer, 1922/1963; Nemeroff & Rozin, 2000).

Other authors have defined superstitious and magical beliefs more widely as false cognitions, for example, as limitations in cognitive processing (Shweder, 1977), beliefs that are barely articulated (Campbell, 1996), tenets founded on ignorance (Padgett & Jorgenson, 1982), and as causal beliefs that by conventional standards are invalid (Brugger & Graves, 1997). Undeniably, defining the beliefs as erroneous covers all superstitions and magical beliefs as diverse they may be. But the important question still remains: how do they differ from other unfounded beliefs?

A concept that might stand for this difference is paranormality. Many researchers have adopted Broad’s (1953) conceptualization of paranormality as a phenomenon that violates the fundamental and scientifically founded principles of nature. In our view, the defining property, and the core that differentiates superstitious, magical, and paranormal beliefs from other unfounded beliefs, can be better derived from recent studies on children’s cognitive development.

### 1.1. Core knowledge and superstition

According to developmental psychologists, there are three major sorts of knowledge that determine children's understanding of the world: intuitive physics, intuitive psychology, and with certain reservations, intuitive biology (Goswami, 2002; Wellman & Gelman, 1992, 1998). Part of this knowledge can be characterized as core knowledge in that children learn it without instruction, it provides a basis for further development, and it is based on domain specialized learning mechanisms (modules) about ecologically important entities and events (Carey, 1996; Leslie, 1994; Spelke, 2000). The vast majority of core knowledge develops by preschool age and it encompasses an intuitive comprehension of physical, biological, and psychological entities as well as different forms of processes these entities engage in.

Developmental studies show that core knowledge of physical entities includes the notion that the world is composed of material objects, which have volume and an independent existence in space (reviews: Carey & Spelke, 1994; Spelke, 2000; Wellman & Gelman, 1992, 1998). The core of intuitive knowledge about psychological entities, in turn, consists of knowledge that animate beings are intentional agents who have a mind. By the middle of the second year children understand that animate beings can reciprocate actions and have a capacity to move and initiate actions without external force (Carey & Spelke, 1994; Rakison & Poulin-Dubois, 2001; Wellman & Gelman, 1992). In addition, small children understand that the contents of mind, such as thoughts, beliefs, desires, and symbols, are not substantial and objective but non-material and mental, and that they do not have the properties they stand for (Johnson, 2000; Leslie, Friedman, & German, 2004; Piaget, 1929/1951; Wellman, 2002; Wellman & Gelman, 1998). For example, 3- and 4-year-old children understand that the thought of a dog does not have the material properties of a dog (Harris, Brown, Marriot, Whithall, & Harmer, 1991) and that the roads in a map do not need to be wide enough for cars (DeLoache, 2002).

As regards biological phenomena, it seems that at least notions like contamination and healing can be characterized as core knowledge (Wellman & Gelman, 1992). They represent a species-typical adaptation to the problem of food selection and rejection as well as illness avoidance (Rozin, 1990; Rozin & Fallon, 1987), and cultures that lack scientific understanding of disease transmission understand it intuitively (Kalish, 1999). Similarly, 4-year-olds know that abnormal behaviors are not contagious (Keil, 1994) and they can discriminate between contaminated and safe substances despite lack of visible evidence (Fallon, Rozin, & Pliner, 1984).

In addition, children learn early to honor the distinctions of different types of processes which physical, biological, and psychological entities are engaged in. Small children understand that material objects like balls can affect one another's motion only if they touch (Carey & Spelke, 1994; Wellman & Gelman, 1992), and they believe that physical events take place because an entity gives force (energy, power) to another entity (Leslie, 1994; Wang, Kaufman, & Baillargeon, 2003). In turn, already young infants understand people's actions to result from intentions, and by the age of four, children have learned to give intentional explanations for people's actions and non-intentional explanations for physical processes like gravitation and for biological processes such as how plants get their coloring (Malle, 1997; Schult & Wellman, 1997; Springer & Keil, 1991; Wellman & Gelman, 1998).

The same ideas that shape children's intuitive knowledge about the distinctive properties of the three ontological categories can be found in superstitions. However, in

superstitions the properties are not limited to one domain but conflated with each other and applied across categories. As a consequence, amazing entities and processes with extraordinary properties come into existence.

The fusion renders possible, among others, mental contents that have the attributes of physical or animate entities, resulting in the possibility that a thought can touch objects (psychokinesis) and move by itself (telepathy). Similarly, when contagion and healing are attributed to psychological phenomena we find that Hitler's personality can spread into his sweater (Nemeroff, 1995; Rozin et al., 1986) and that a curer can heal someone at a distance by force of his or her thoughts. Also, in this other world, entire good and bad minds, such as angels and devils, have independent existences and operate as animate entities by moving and initiating actions without external force. Also symbolic representations and the material objects they represent are confused in magical thinking, as Piaget (1929/1951) observed. Hence, symbols are assumed to have the same attributes as the material things they signify, leading to such phenomena as reluctance to drink from a cyanide-labeled bottle known to include only sucrose–water (Rozin et al., 1986), or beliefs that a physical object (e.g., foot of a rabbit) that someone has intended to stand for an emotion (e.g., happiness) actually carries happiness in its train.

In the magical world, we also find non-intentional physical and biological events turning into intentional ones. Intention may be seen to influence natural or random events such as in cases of rainmaking rites and modern craps players who roll the dice gently to coax a low number and more vigorously to encourage a high number (a review: Vyse, 1997). Moreover, in superstitions a force is an equally important factor as in lay physics but here force is regarded as a living and intentional entity. For example, feng shui teaches us that erroneous furnishings may absorb vital (*lat.* = life) force that leads us to crimes and divorce, and astrologers suggest that planets have living energy, which pushes and pulls on human beings in a purposeful way thus affecting our personality and well-being. Thus, in superstitious thinking biological and physical processes are no longer non-intentional but they are seen as having a purpose, that is, as directed toward certain goals and as being intentionally caused either by a specific or an unspecified intentional agent (Bering, 2003; Kelemen, 1999a).

The above argumentation implies that, despite differences in focus, the notions of superstition, magical thinking, and paranormal beliefs share the same ontological confusion and can thus be regarded synonymous. If properties of one ontological category are borrowed to characterize an entity in another ontological category, the following statement is not merely a falsehood but it is a category mistake (Carey, 1985; Chi, 1992; Keil, 1979, 1994). Accordingly, we define superstitious, magical, and paranormal beliefs as category mistakes where the core attributes of mental, physical, and biological entities and processes are confused with each other.

However, all category mistakes are not superstitions. For example, many adults regard physical force as a material substance (Reiner, Slotta, Chi, & Resnick, 2000), which it is not. What differentiates other category mistakes from superstitions is that in superstitions the category mistakes always include a confusion of *core* knowledge, and perhaps therefore lay people seem to recognize some beliefs as false beliefs and others as superstitions quite easily and implicitly.

Second, category mistakes can be perceived as superstitions only insofar as the statements are believed to be literally true. Thus, metaphorical and allegorical expressions that deliberately confuse the properties are not superstitions (e.g., "A well-functioning memory is a goldmine").

While preschool children understand surprisingly much about physical, biological, and psychological phenomena, they nevertheless make at first the same category mistakes that can be found in superstitions (Kelemen, 1999a, 1999b; Rosengren, Johnson, & Harris, 2000). However, equating adults' superstitions with small children's misconceptions does not imply that superstitious individuals are cognitively at the level of small children. The definition should be understood through the basic tenet of dual-process theories that people have two modes of processing information, intuitive and analytical reasoning, which rely on different databases and have different rules of operation (Evans, 2003; Pacini & Epstein, 1999; Sloman, 1996; Stanovich & West, 2000; Sun, 2004). According to the dual-process theories, analytical processes and rational knowledge do not replace intuitive processes and contents as children mature. Rather, both types of processes and knowledge exist and develop throughout one's life, and therefore two conflicting beliefs can coexist in an adult's mind, one more rational and verbally justifiable (e.g., "Death is final"), the other operating more automatically and being more resistant to logical arguments (e.g., "The soul continues to exist though the body may die").

In line with our argument that superstitions are based on early intuitions, previous studies have shown that superstitions are more strongly related to a tendency to rely on intuitive thinking than to analytical thinking (Aarnio & Lindeman, 2005; Epstein, Pacini, Denes Raj, & Heier, 1996; Wolfradt, Oubaid, Straube, Bischoff, & Mischo, 1999), and that the same magical beliefs that are typical to preschool children are implicitly preserved and activated among adults even though the representations have been devaluated in the face of more rational knowledge (Subbotsky, 2000, 2001).

To investigate whether the new conceptualization is warranted, we hypothesized that in comparison to skeptical individuals, superstitious individuals more often assign mental attributes to physical and biological entities and material attributes to mental entities, and confuse intentional processes with non-intentional processes. We also hypothesized that various types of superstitious, magical, and paranormal beliefs are similarly related to ontological confusions and that the ontological confusions are positively related to a tendency to rely on intuitive thinking. Finally, we expected that ontological confusions and intuitive thinking are more important correlates of superstitions, magical and paranormal beliefs than two other correlates that have repeatedly been suggested to account for the beliefs, namely low rational thinking and emotional instability (reviews: Vyse, 1997; Zusne & Jones, 1989).

## 2. Method

### 2.1. Participants

Two hundred and thirty-nine Finnish volunteers participated in the study: 96 female skeptics, 27 male skeptics, 88 female, and 28 male superstitious individuals. Their age range was 16–47 with a mean of 24.2 years. The great majority (94%) were full-time students who represented a wide variety of disciplines, including the natural, behavioural, medical, and social sciences, technique, business and trade, and services.

### 2.2. Procedure

The participants were recruited from a larger population ( $N = 3261$ ) of participants in a study on superstition, which was conducted one year earlier. We sent an invitation to those

whose overall superstition scores (see Section 2.3) were among the upper or lower 10% for their gender. The groups were balanced for gender because in the earlier study, women ( $M=2.16$ ) had higher superstition scores than men ( $M=1.94$ ),  $F(1, 3245)=106.44$ ,  $p<.001$ ,  $\eta^2=.032$ . The recruitment message contained a personal password and a hyperlink to the questionnaire on the Internet. The web survey was implemented as a Java Servlet, running on an Apache web server. Due to incomplete contact information, a total of 14% of the participants of the earlier study were eventually invited to take part. Fifty-three percent of them returned a completed questionnaire within the time limit.

### 2.3. Measures

#### 2.3.1. Ontological confusions

We constructed measures of ontological confusion by utilizing Chi and her associates' (Chi, 1992; Chi, Slotta, & de Leeuw, 1994) conceptualizations and assessment methods of ontological categories and their distinctions.

First, we examined the participants' conceptions of properties of different ontological entities by 34 statements in which attributes of one ontological category were assigned to another one. The participants were asked whether they understood the statements as metaphorically or literally true (1 = *only metaphorically*; 5 = *only literally*).

In 16 of the statements, material entities (artifacts, liquids, solids, and plants) held mental attributes (e.g., beliefs, desires, and kindness). Example statements include: "Old furniture know things about the past" and "When summer is warm, flowers want to bloom." These items constituted the measure of *mentalizing matter* ( $\alpha=.94$ ). Ten of the statements assessed *physicalizing mental* ( $\alpha=.88$ ) and they described mental phenomena (a thought, a human mind) with attributes of physical matter (e.g., has volume, affects a material entity if it touches it). Example statements include "An unstable human mind is disintegrating." Six statements assessed *biologizing mental* ( $\alpha=.84$ ) and they described mental phenomena (a thought, a human mind) with attributes of biological entities (e.g., is living, can be contaminated), for example, "An evil thought is contaminated." For comparison, there were also eight fully *metaphorical statements* (e.g., "A wailing wind is a flute";  $\alpha=.88$ ) and four fully *literal statements* (e.g., "Running water is fluid";  $\alpha=.86$ ).

Confusion between intentional and non-intentional events was analyzed by giving the participants descriptions of 18 non-intentional events that lead to personally relevant outcomes, and by asking whether they saw purpose in that event (1 = *the event had no purpose*, 5 = *the event clearly had a purpose*). Following the work of Chi and her associates (Chi, 1992; Chi et al., 1994), the 18 statements included three types of non-intentional events. Six of the events were *random* (e.g., dealing cards in a card game), six were *artificial* (e.g., a server failure), and six were *natural* events (e.g., fog). For each set of six events, positive, negative, and neutral outcomes were described. The positive and negative outcomes were derived from the Life Experience Survey (Sarason, Johnson, & Siegel, 1978). An example statement of a random event with a negative outcome is: "You play cards but get only clubs and spades and therefore run into large debts. Was there a purpose in getting those cards?" An example statement of an artificial event with a positive outcome includes: "The brakes of your car fail and you smash up with a stranger whom you will later marry. Did the brakes fail for a purpose?" An example statement of natural events with a neutral outcome is: "A lightning cuts down a big tree in the garden of your house but no harm is brought to you by this. Did the lightning have a purpose?" Sum scales of the statements

dealing with random ( $\alpha = .92$ ), artificial ( $\alpha = .93$ ), and natural events ( $\alpha = .94$ ) were constructed by averaging the items.

For comparison, there were also four statements, which described true intentional events (e.g., a kiss, running race, and bullying) with positive, neutral, and negative outcomes (e.g., a beginning of a romantic relationship, reduced working ability). However, the reliability of this scale was low ( $\alpha = .53$ ), possibly because the participants consistently assessed intentional events with positive outcomes to be more purposeful than the other events,  $F(1, 238) = 343.25, p < .001$ .

Also, a total score for *ontological confusions* was calculated by averaging all the related items. The reliability ( $\alpha$ ) was .92.

### 2.3.2. Beliefs

Information on participants' beliefs (and on intuitive and analytical thinking, and emotional instability) was acquired in an earlier study. Most beliefs were measured with the Revised Paranormal Belief Scale (Tobacyk, 2004), which is a slightly revised version of the most commonly used measure of superstitious, magical, paranormal, and religious beliefs (Tobacyk & Milford, 1983). Because the items on the RPBS cover only some aspects of superstitious and magical beliefs, it was supplemented with a number of items to cover a wider spectrum of beliefs. The 55 items were measured on a five-point rating scale (1 = *strongly disagree*, 5 = *strongly agree*).

*Belief in paranormal agents* ( $\alpha = .83$ ) was measured with 14 items on belief in witches, extraordinary life forms, and extraterrestrial life (e.g., "Ghosts exist"). Belief in the *paranormal abilities of human beings* ( $\alpha = .83$ ) was assessed with 10 items focusing on beliefs in telepathy, spiritualism, precognition, and psychokinesis (e.g., "A person's thoughts can influence the movement of a physical object"). *Religious beliefs* ( $\alpha = .88$ ) was gauged by the 4 items in RPBS (e.g., "I believe in God"). *Luck beliefs* ( $\alpha = .83$ ) were measured with 9 statements about omens of luck, rituals, and amulets (e.g., "Amulets, for instance a specific piece of jewelry, bring good luck"). Belief in *astrology* ( $\alpha = .89$ ) was operationalized with five items (e.g., "The position of the stars at the time of birth influences personality"). Belief in the claims of *feng shui* ( $\alpha = .89$ ) was measured with five items (e.g., "Furnishing according to the principles of feng shui balances your environment and thus affects your health and success in a positive way"). In addition, a mean score of all the items was used to measure *overall superstition* ( $\alpha = .96$ ).

*Analytical and intuitive thinking* were assessed by the Rational-Experiential Inventory (Pacini & Epstein, 1999). The inventory consists of two 20-item scales (1 = *strongly disagree*, 5 = *strongly agree*). The Rationality subscale ( $\alpha = .87$ ) assesses the extent to which an individual engages in and enjoys rational, analytic, effortful, affect-free, and logical thinking. The Experientiality subscale ( $\alpha = .88$ ) assesses the extent to which an individual engages in and enjoys automatic, preconscious, holistic, non-verbal, and associationistic thinking. Example items include: "I usually have clear, explainable reasons for my decisions" (analytical or rational thinking) and "I believe in trusting my hunches" (experiential or intuitive thinking).

*Emotional instability* was measured by the Neuroticism subscale of the Finnish version of the NEO Five-Factor Inventory (McCrae & Costa, 1987; Pulver, Allik, Pulkkinen, & Hamalainen, 1995). The subscale consists of 48 five-point items (1 = *strongly disagree*, 5 = *strongly agree*), which measure anxiety, depression, self-consciousness, vulnerability, impulsiveness, and hostility. The reliability ( $\alpha$ ) of the scale was .93.

### 3. Results

The results showed that, as hypothesized, the believers mentalized matter more ( $M=2.30$ ) than the skeptics ( $M=1.88$ ),  $F(1,237)=16.66$ ,  $p<.001$ ,  $\eta^2=.07$ , they physicalized mental more ( $M=2.84$ ) than the skeptics ( $M=2.34$ ),  $F(1,237)=26.44$ ,  $p<.001$ ,  $\eta^2=.10$ , and they biologized mental more ( $M=2.68$ ) than the skeptics ( $M=2.01$ ),  $F(1,237)=34.07$ ,  $p<.001$ ,  $\eta^2=.13$ . The believers did not differ from the skeptics when they assessed the truth of purely literal statements,  $F(1,237)=0.15$ , *ns*, or the purely metaphorical statements,  $F(1,237)=1.18$ , *ns*.

In addition, the believers also assigned more ( $M=2.82$ ) purpose to natural events than the skeptics ( $M=1.24$ ),  $F(1,235)=197.49$ ,  $p<.001$ ,  $\eta^2=.46$ ; more ( $M=2.75$ ) purpose to artificial events than the skeptics ( $M=1.28$ ),  $F(1,235)=169.53$ ,  $p<.001$ ,  $\eta^2=.42$ ; and more ( $M=3.00$ ) purpose to random events than the skeptics ( $M=1.40$ ),  $F(1,235)=200.62$ ,  $p<.001$ ,  $\eta^2=.46$ . The purpose of intentional events was assessed equally by the believers and the skeptics,  $F(1,237)=1.57$ , *ns*.

The results also showed that the believers relied more on intuitive thinking ( $M=3.69$ ) than the skeptics ( $M=2.99$ ),  $F(1,239)=97.51$ ,  $p<.001$ ,  $\eta^2=.29$ ; but less on analytical thinking ( $M=3.78$ ) than the skeptics ( $M=4.05$ ),  $F(1,239)=14.50$ ,  $p<.001$ ,  $\eta^2=.06$ ; and that they were emotionally less stable ( $M=2.62$ ) than the skeptics ( $M=2.86$ ),  $F(1,239)=9.68$ ,  $p<.01$ ,  $\eta^2=.04$ . No gender differences were found between the groups,  $\chi^2(1)=0.16$ , *ns*. This is intelligible, because the participants were selected from individuals whose overall superstition scores in the earlier study were among the upper or lower 10% for their gender.

To analyze how the ontological confusions relate to various types of beliefs, intuitive and analytical thinking, and emotional instability, correlations were obtained. Because only skeptics and believers were included in the sample, the originally continuous belief variables were not normally but bimodally distributed. Therefore, Spearman's rho, which transforms ratio level variables into rank-orders and thus linearizes the relationship, was used (Table 1).

Table 1

Spearman's rank-order correlations ( $r_s$ ) between beliefs, ontological confusions, intuitive and analytical thinking, and emotional instability

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
<i>Beliefs</i>														
1. Paranormal agents														
2. Paranormal abilities	.85													
3. Luck beliefs	.72	.75												
4. Astrology	.80	.82	.81											
5. Feng shui	.70	.72	.70	.75										
6. Religious beliefs	.78	.78	.69	.75	.67									
<i>Confusions</i>														
7. Physicalizing mental	.37	.40	.30	.31	.35	.33								
8. Biologizing mental	.41	.41	.37	.41	.42	.43	.75							
9. Mentalizing matter	.39	.41	.35	.37	.40	.39	.97	.88						
10. Purpose in random events	.62	.65	.61	.64	.64	.67	.44	.50	.49					
11. Purpose in artificial events	.62	.65	.59	.62	.63	.64	.43	.46	.47	.88				
12. Purpose in natural events	.66	.69	.61	.66	.66	.68	.42	.48	.48	.90	.93			
13. Intuitive thinking	.49	.51	.43	.54	.51	.43	.29	.34	.32	.39	.32	.37		
14. Analytical thinking	-.21	-.19	-.22	-.28	-.27	-.21	-.20	-.17	-.20	-.27	-.24	-.24	-.06	
15. Emotional instability	.22	.22	.23	.28	.22	.21	.10	.12	.11	.18	.16	.21	.18	-.33

$r_s \geq .13$ ,  $p < .05$ .  $r_s \geq .17$ ,  $p < .01$ .  $r_s \geq .20$ ,  $p < .001$ .

Table 2

Standardized discriminant function coefficients and pooled within-groups correlations (structure coefficients) for prediction of membership in superstitious or skeptic individuals

Variable	Discriminant function coefficients	Structure coefficients
Ontological confusions	.74	.82
Intuitive thinking	.56	.63
Analytical thinking	-.16	-.24
Emotional instability	.06	-.20

To find the best function that separates believers and skeptics, and to compare the importance of the predictors of group membership, a standard discriminant function analysis was performed using the total score of ontological confusions, intuitive and analytical thinking, and emotional instability as predictors of group membership. One discriminant function was calculated, with a  $\chi^2(4) = 168.69$ ,  $p < .001$  (Table 2). The loading matrix of correlations between predictors and the discriminant function suggests that the best predictor for distinguishing between superstitious and skeptics were ontological confusions, followed by intuitive thinking. Other predictors were not important because, by convention, correlations lower than .33 are not considered eligible (Tabachnick & Fidell, 1996).

The loadings reveal only the full correlation between the discriminant function and the predictors, and the variance shared with ontological confusions and group membership may thus be predictable from other predictors. The structure coefficients, in turn, show the unique contribution the predictors make. As can be seen from Table 2, after adjustment for other predictors, ontological confusions are still the most important predictors of being a skeptic or a believer.

#### 4. Discussion

Historically, researchers have considered beliefs in superstition, magic, and the paranormal in some indefinite way both as distinct and interrelated phenomena. Also, the definitions of the concepts have repeatedly been insufficient. The present study offered a unified conceptual framework where the concepts were differentiated from other unfounded beliefs and defined identically as an ontological confusion between the core attributes of mental, physical, and biological entities and processes. In addition, we examined whether superstitious individuals confuse the attributes of ontological categories, as the definition suggests.

The results gave justification for the definition. Compared with the skeptics, the superstitious individuals assigned more physical and biological attributes to mental phenomena. Thus, they understood such notions as a mind that can touch objects and an evil thought that may be contaminated more literally than the skeptics. Superstitious individuals also assigned more mental attributes to water, furniture, rocks, and other material things than skeptics did and accepted that entities like these may—literally, not only metaphorically—have psychological properties such as desires, knowledge, or a soul. In particular, superstitious individuals saw natural, random and artificial (i.e., non-intentional) events like fog or a server failure as having a purpose when the processes had led to episodes with a personally relevant outcome such as a marriage. The believers did not, however, differ from the skeptics when they assessed the literal truth of purely literal or purely metaphorical statements, or the purposefulness of truly intentional acts like kissing.

The results also showed that various manifestations of the beliefs, for example beliefs in astrology, feng shui and paranormal abilities of human beings, were associated with ontological confusions and with higher intuitive thinking, and—albeit only slightly—to lower analytical thinking and emotional instability. Because the believer and skeptic groups were beforehand balanced for gender, the effect of gender was not analyzed. However, it should be noted that women's lower analytical and higher intuitive thinking have been shown to be the generative mechanisms for women's higher endorsement of paranormal beliefs compared to men (Aarnio & Lindeman, 2005).

The discriminant analysis indicated that the best measures to distinguish believers from skeptics were ontological confusions, and secondarily intuitive thinking. Neither analytical thinking nor emotional stability could discriminate the groups from each other. These results support the argument that superstitions and other paranormal beliefs arise from the intuitive system and not from a malfunctioning analytical system and are in line with the earlier findings that people who rely more on intuitive thinking hold more superstitions than others (Epstein et al., 1996; Wolfradt et al., 1999). When assessing the importance of the measures' unique contribution, after variance associated with other predictors had been removed, susceptibility to ontological confusions remained the most important predictor of group membership. As a whole, then, the results are in line with the notion that ontological confusions are defining properties of superstitions, magical, and paranormal beliefs.

The new definition of superstition has evident benefits compared with the earlier definitions. For one thing, some of the earlier definitions have been too wide in that superstitions have been regarded equal to any unsupported notion. By pointing out the category mistake of core knowledge, the present definition enables us to identify how superstitions differ from other unfounded beliefs. Accordingly, many beliefs that have previously been regarded as paranormal, magical, or superstitious are simply unsubstantiated beliefs, not superstitions. These include, for example, belief in graphology or biorhythms. Likewise, beliefs obeying the laws of contagion and similarity are here regarded as superstitions only insofar as the idea of contagion is stretched beyond the biological domain and similarity is used to draw inferences about entities from different ontological domains. Thus, disgust towards a piece of clothing worn by a sick person is not a superstition whereas disgust towards clothes worn by Hitler is. Similarly, reasoning that whales are fish because of similar appearance and habitats is simply a false belief whereas a belief that needles stuck in a doll cause pain in the person the doll represents is a superstition.

On the other hand, so far no definition has been wide enough to cover all types of superstitions, magical and paranormal beliefs. The present definition, in contrast, makes it possible to understand that the beliefs can manifest itself in endless ways. They can range from primeval animism to the trendy (albeit ancient) idea that furniture and buildings have living energy, from children's beliefs that the moon is an animate being to educated adults' beliefs in astrology, and from animate paintings in Harry Potter's milieu to the magical ideas about contamination and external forces found among patients suffering from obsessive-compulsive disorder and schizophrenia. We suggest that confusion of core knowledge is the common denominator for all these, and that the prevailing culture as well as believers' explicit knowledge and other mental resources shape the more specific contents and manifestations of the beliefs.

In our view, the new conceptualization enables researchers to make more elaborated theoretical statements regarding superstition. So far, theoretical arguments have lacked

statements specific to superstitions. For example, one of the main reasons for the existence of superstitions has traditionally been taken to be people's search for causal explanations and organizing the world in a meaningful and consistent fashion to impose order and predictability on it (Malinowski, 1948/1992; Tambiah, 1990). However, because the same reasons also apply to numerous other endeavors, such as scientific work, the explanatory power of these statements for superstition has been weak.

The present study suggests that future theory formation and studies on superstition might benefit from addressing intuitive thinking and its knowledge base. Subsequent efforts may provide more powerful indications that superstitious individuals' knowledge about the world is inaccurate in that their early, as yet undeveloped intuitive conceptions about psychological, biological, and physical phenomena have retained their autonomous power and co-exist side by side with later acquired rational knowledge. While the role of insufficient or incorrect knowledge in superstitions has been acknowledged for long (Malinowski, 1948/1992; Piaget, 1929/1951), it is surprising that so far no research attention has been paid to superstitious individuals' knowledge about entities and processes in the world. In short, whereas developmental psychology research has focused on the strength of core knowledge among children, research on superstition would benefit from studies that address the vulnerabilities of this knowledge among adults.

In addition, future research might attempt to analyze whether superstitions can be understood in terms of a common essence. There is increasing evidence that children's conception about what unites members of the same category (e.g., dogs and cats) and what differentiates members of one category from another (e.g., toys and dogs) is based on the notion of an essence (Gelman, 2004; Johnson & Harris, 1994). Similarly, Meigs (1984) has suggested that a central theme in the versatile magical beliefs found among the Hua people in New Guinea is a common, vital essence, *nu*. This common essence parallels the view that in superstitions, there is typically an interconnected cosmos, a fundamental relation between a part and a whole, a human being and a universe, and a single event and the future (Malinowski, 1948/1992; Piaget, 1929/1951; Werner, 1948). Hence, it might be hypothesized that confusion between the core properties of ontological categories implies a notion of a common essence between the categories and thus leads to thinking in terms of connections and undivided totalities.

In many ways, the results are only preliminary. Most importantly, ontological confusions should be examined much more thoroughly in future studies. In addition, only verbalizable conceptions about the ontological categories of physical, biological, and mental phenomena were examined. Although the results showed that at least part of these conceptions are explicit and can be tapped with a questionnaire, our assumption is that majority of this knowledge is outside of conscious awareness, and are thus held at different levels of explicitness, ranging from spontaneous and indistinct "as if" feelings to explicit beliefs (Nemeroff & Rozin, 2000; Subbotsky, 2001). Therefore, in future studies, ontological conceptions should be examined with research methods focusing on implicit knowledge.

Moreover, only believers and skeptics were included in the study. We focused on extreme groups because we were concerned about the possibility that the middle group consists of habitual believers, that is, of individuals who actually do not believe in superstitions but take them as entertainment, or as Vyse (1997) have suggested, as habits that help pass the time. If this were the case, the middle group would be qualitatively different than the extreme groups. However, this is only speculation, and the results need replication on samples more representative of the general population. Finally, while the use of

correlational design is justified in research in its initial stages, future development of the propositions will require experimental designs.

Despite these limitations, we have provided a conceptual framework that integrates the existing heterogeneous definitions, links prior and present findings to theory, and opens avenues for future studies on the enchantment of superstition, magic, and the paranormal. What has been established is an initial understanding that it may be a question of vague category boundaries, as Woody Allen (1980, p. 15) already has found out: “There is no question that there is an unseen world. The problem is how far it is from midtown and how late is it open?”

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