

# **Paranormal, superstitious, magical, and religious beliefs**

**Kia Aarnio**



Department of Psychology  
University of Helsinki, Finland

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Supervisor    Marjaana Lindeman, PhD  
                    Department of Psychology  
                    University of Helsinki  
                    Finland

Reviewers     Professor Stuart Vyse  
                    Department of Psychology  
                    Connecticut College  
                    USA

                    Timo Kaitaro, PhD  
                    Department of Law  
                    University of Joensuu  
                    Finland

Opponent      Professor Pekka Niemi  
                    Department of Psychology  
                    University of Turku  
                    Finland

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## **ABSTRACT**

A lack of conceptual clarity and multivariate studies has impeded research on paranormal, superstitious, and magical beliefs. In this series of studies a new conceptual framework of these beliefs was presented. A general belief in the paranormal was shown to lead to specific paranormal, superstitious, and magical beliefs. The beliefs were defined equally as category mistakes where the core attributes of psychological, physical, and biological phenomena are confused with each other. This definition was supported by an empirical examination: Paranormal believers confused more core knowledge than skeptics.

A multivariate study revealed that the best predictors of paranormal beliefs were intuitive thinking and a humanistic world view, while low analytical thinking was a less important predictor. Another study showed that women's greater belief in the paranormal compared to men was partially explained by women's higher intuitive and lower analytical thinking. Additionally, it was shown that university students were originally more skeptical than vocational school students, but university studies did not increase skepticism. The finding that paranormal beliefs mainly arise from an intuitive system, instead of a malfunctioning analytical system, explains why the beliefs do not vanish with the increase of education, scientific knowledge, and rational thinking.

Religious and paranormal beliefs share important qualities and generally, they were positively related. The most religious people, however, abandoned paranormal beliefs. Religious people and paranormal believers differed from the skeptics similarly by being more intuitive, having experienced more mystical phenomena, and having peers and parents with more positive attitudes toward the supernatural. Religious people had, however, higher conservation and benevolence values than paranormal believers.

The new conceptual framework presented in this series of studies integrates research on paranormal, superstitious, magical, and religious beliefs. Hopefully it will enable researchers to develop more elaborated hypotheses and theoretical statements about paranormal beliefs in the future.

## TIIVISTELMÄ

Paranormaalien, taikauskoisten ja maagisten uskomusten tutkimusta ovat vaivanneet käsitteiden epäselvyys sekä monimuuttujatutkimusten puute. Tämän väitöskirjan tutkimuksissa esitettiin uusi käsitteellinen kehys paranormaaleille uskomuksille. Yleisen uskon paranormaaleihin ilmiöihin osoitettiin johtavan spesifeihin paranormaaleihin, taikauskoisiin ja maagisiin uskomuksiin. Nämä uskomukset määriteltiin yhtäläisesti kategoriavirheiksi, joissa psykologisten, fyysisten ja biologisten ilmiöiden ydinpiirteitä sekoitetaan keskenään. Empiirinen tutkimus tuki tätä määritelmää: Paranormaaleihin ilmiöihin uskovat sekoittivat ydintietoa enemmän kuin skeptikot.

Monimuuttujatutkimuksessa paranormaaleja uskomuksia selittivät parhaiten intuitiivinen ajattelu ja humanistinen maailmankuva, kun taas vähäinen analyttinen ajattelu oli heikompi selittävä tekijä. Toisessa tutkimuksessa osoitettiin, että naisten runsaammat paranormaalit uskomukset miehiin verrattuna selittyivät osittain naisten runsaammalla intuitiivisella ajattelulla ja vähäisemmällä analyttisellä ajattelulla. Lisäksi osoitettiin yliopisto-opiskelijoiden olevan lähtökohtaisesti skeptisempiä kuin ammattikoululaisten, mutta yliopistokoulutuksen olevan lisäämättä skeptisyyttä. Paranormaalien uskomusten liittyminen ennemminkin intuitiiviseen ajatteluun kuin huonoon analyttiseen ajatteluun selittää miksi paranormaalit uskomukset eivät häviä koulutuksen, tieteellisen tiedon ja rationaalisen ajattelun myötä.

Vaikka uskonnollisissa ja paranormaaleissa uskomuksissa on samankaltaisia piirteitä ja yleisesti ottaen ne olivat positiivisessa yhteydessä, kaikkein uskonnollisimmat ihmiset torjuivat paranormaalit uskomukset. Uskonnolliset ja paranormaaleihin ilmiöihin uskovat ihmiset erosivat samalla tavoin skeptikoista: He olivat intuitiivisempia, enemmän mystisiä kokemuksia kohdanneita ja heidän lähipiirinsä suhtautui myönteisemmin yliluonnollisiin ilmiöihin. Uskonnolliset ihmiset arvostivat kuitenkin enemmän konservaatiota ja hyväntahtoisuutta kuin paranormaaleihin ilmiöihin uskovat.

Tässä väitöskirjassa esitetty paranormaalien uskomusten uusi käsitteellinen kehys yhdistää paranormaalien, taikauskoisten, maagisten ja uskonnollisten uskomusten tutkimusta. Tulevaisuudessa se toivottavasti mahdollistaa tarkempien hypoteesien ja teoreettisten väittämien muotoilun paranormaaleista uskomuksista.

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## LIST OF ORIGINAL PUBLICATIONS

I Lindeman & Aarnio. (2006). Paranormal beliefs: Their dimensionality and correlates, *European Journal of Personality*, 20(7), 585-602.

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II Lindeman & Aarnio. (2007). Superstitious, magical, and paranormal beliefs: An integrative model, *Journal of Research in Personality*, 41(4), 731-744.

III Aarnio & Lindeman. (2007). Religious people and paranormal believers: Alike or different?, *Journal of Individual Differences*, 28(1), 1-9.

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IV Aarnio & Lindeman. (2005). Paranormal beliefs, education, and thinking styles, *Personality and Individual Differences*, 39(7), 1227-1236.

V Aarnio & Lindeman. (2004). Magical food and health beliefs: a portrait of believers and functions of the beliefs, *Appetite*, 43(1), 65-74.

The Publications are referred to by their Roman numerals in the text.

# 1 INTRODUCTION

Superstitions, magical and paranormal beliefs, as well as religious beliefs, were predicted to fade away with the rise of rationality, science, and technology (Frazer, 1922/1963; Mauss, 1950/2001). This prediction has not, however, been proved right. People still knock on wood to shed themselves from bad luck, believe in astrology, telepathy, and guardian angels, and are fascinated by mysticism. The incidence of beliefs is surprisingly high: Three-fourths of Americans subscribe to at least one paranormal belief (The National Science Foundation, 2006), and even though Finns are more skeptical than Americans (Tobacyk & Pirttilä-Backman, 1992), one-thirds of Finns believe in telepathy (Finnish Society for Scientific Information, 2004).

Although paranormal beliefs are prevalent and their correlates have been studied extensively, psychology of the beliefs is yet poorly understood. This partly stems from the lack of an adequate definition of paranormal beliefs, magical beliefs, and superstition. Beliefs in scientifically impossible entities and processes such as amulets, witches, and fortune-telling are all called superstitions, magical beliefs, or paranormal beliefs. Neither a clear distinction between them, nor a common definition exists. Some important questions addressed in this series of studies were: Does general belief lead to specific beliefs or do the beliefs form independent subsets? What is the most adequate way of defining superstitious, magical, and paranormal beliefs?

The poor understanding of paranormal believers also stems from simple research designs: Usually, only a few correlates have been studied simultaneously. We tried to tackle this problem by including a large number of possible determinants and examining their relative importance. Our studies sought answers to questions such as: Why is paranormal belief so sustained even in educated Western people? Who are most prone to these kinds of beliefs? What kind of relationship exists between religious beliefs and paranormal beliefs? Our aim was to understand the nature of paranormal beliefs and the minds of paranormal believers, and to enable more specific hypotheses about paranormal beliefs in future studies.

## **1.1. Defining paranormal beliefs**

### **1.1.1. Earlier definitions of paranormal beliefs**

The terms magical, paranormal, supernatural, and religious beliefs as well as superstition are often used non-synonymously. Researchers have traditionally spoken of magical thinking with regard to primitive tribes and children (Frazer, 1922/1963; Lévy-Bruhl, 1949/1975). Magic has also been characterized as a socially shared phenomenon, in contrast to individual-level superstitions (Mauss, 1950/2001), which have primarily been thought to include amulets, rituals, and omens (e.g., Keinan, 2002). Instead, the term paranormal has most often been used on agents such as ghosts and extraterrestrials and on people's claimed abilities such as psychokinesis and telepathy (e.g., Rice, 2003). Sometimes a difference has been made between paranormal and supernatural beliefs, as religious people have disclaimed paranormal beliefs outside of Christian doctrine but have supported doctrinal supernatural beliefs such as belief in the efficacy of prayer (Beck & Miller, 2001). Further, religious beliefs have been noted to differ from paranormal beliefs on the grounds that faith in religious beliefs does not require empirical proof (Stark, 2001; Woolley, 1997).

There are numerous definitions for magical and paranormal beliefs and superstitions, none of which are adequate. Among the most influential definitions of magical thinking are the laws of sympathetic magic. These two laws, the law of similarity and the law of contagion, were originally enunciated by early anthropologists (Frazer, 1922/1963; Mauss, 1950/2001; Tylor, 1871/1974). In the last couple of decades, American psychologists Rozin and Nemeroff have shown how these laws are expressed in the thoughts and behavior of contemporary Western people (reviews: Nemeroff & Rozin, 2000; Rozin & Nemeroff, 1990). The law of similarity is in effect when an image is regarded as the object it represents or appearance is regarded as reality. Examples of present day beliefs and behavior that obey the law of similarity are belief in the efficacy of tearing up a photo of a person to harm him or her, and disgust reaction toward eating chocolate fudge in the shape of dog feces. The law of contagion is in effect when something in even minimal contact is believed to have a lasting contagious impact on

the contacted object or person. Examples of the law of contagion are reluctance to drink one's own saliva in fear of getting polluted or to use a clean sweater previously worn by a morally dubious person such as a convicted murderer. Contagion may also be positive, as in the case of possessing an object previously owned by a celebrity, but positive contagion is felt less strongly than negative contamination (Nemeroff & Rozin, 1994). Belief in magical contagion has been shown to be highly resistant to change, even after efforts at purifying the contaminated object (Hejmadi, Rozin, & Siegal, 2004; Nemeroff & Rozin, 1994). The magical laws cover verbal claims as well as emotional and behavioral reactions: Believers themselves may consider their thoughts irrational but emotion and behavior can overcome knowledge (Rozin, Millman, & Nemeroff, 1986). For example, knowing that there is no real danger of contagion in eating one's favorite soup which has been stirred with a brand new fly swatter still makes the soup appear disgusting and contaminated to many. Magical contagion has been differentiated from real life contagion in that the array of contagious things, their amounts, and their ways of contagion have been considered to be much broader in magical contagion (Nemeroff & Rozin, 2000). In this definition, however, the line between magical and real contagion is blurry and thus a belief may later turn out to be scientifically valid as happened in the case of germ theory. Neither is this definition intended to explain the difference – if there is one – between magical beliefs and paranormal beliefs and superstitions.

In their definition of magical beliefs or superstitions, some researchers have emphasized that the beliefs include a concrete act towards a definite purpose (Campbell, 1996; Malinowski, 1948/1984; Stark, 2001). Examples of these are avoidance of number 13 and crossing one's fingers. This kind of definition leaves many superstitions and paranormal beliefs outside, as there is no act included in, for example, belief in witches.

Some researchers have defined magical thinking as violation of everyday causal principles that depend on folk physics and psychology (Bolton, Dearsley, Madronal-Luque, & Baron-Cohen, 2002). Along similar lines, magical thinking has been characterized as correlational thinking coupled with a search for meaningful connections (Shweder, 1977). Paranormal beliefs that fulfill these kinds of definitions are, for example, beliefs in lunacy and in the effectiveness of rain dances. However, all

paranormal beliefs are not about causality: for example belief in the existence of ghosts does not necessarily mean belief in any magical causality.

Paranormal phenomena have also been defined as violating “our naive theories of the world” (Woolley, 1997) or “basic limiting principles which are commonly accepted either as self-evident or as established by overwhelming and uniformly favorable empirical evidence” (Broad, 1953). Superstitions have also been defined as groundless beliefs and practices that are inconsistent with the degree of enlightenment reached by scientists and the general public (Vyse, 1997). Unfortunately, “naive theories of the world” and “basic limiting principles” are left without a definition. Moreover, these definitions require each paranormal belief to be assessed in view of the believer’s knowledge level and the knowledge level of the culture the believer lives in.

Superstitious, magical, and paranormal beliefs have also been defined very broadly as irrational practices (Jahoda, 1970) or metaphysical beliefs (James & Wells, 2002). But these kinds of definitions do not differentiate paranormal beliefs from other false beliefs such as the belief that only genetically modified tomatoes include genes.

Yet superstitious, magical, paranormal, supernatural, and religious beliefs are at least partly overlapping. In effect, magical thinking has been asserted to be the basis of superstitions (Keinan, 2002; Zusne & Jones, 1989) and equivalent to paranormal beliefs (Brugger & Graves, 1997). The terms paranormal and supernatural are often used interchangeably (e.g., Randall & Desrosiers, 1980; Rice, 2003), and superstitions as well as religious beliefs have been conceptualized as part of paranormal beliefs (Tobacyk & Milford, 1983).

The aim in this series of studies was to examine whether paranormal, magical, and superstitious beliefs should be defined identically and what is an adequate definition. In the study reported in Publication I, we analyzed the factor structure of superstitious, paranormal, and magical beliefs. The beliefs have repeatedly formed several factors in factor analytic studies and therefore make up a multidimensional construct (e.g., Grimmer & White, 1990; Randall & Desrosiers, 1980; Tobacyk & Milford, 1983). What has not been examined, however, is whether the factors are independent or whether they manifest a higher-order construct. The former would mean that the beliefs form independent subsets and should be defined separately, while the latter option would

reflect a general tendency to believe in the paranormal and make a common definition possible.

### **1.1.2. A new definition of paranormal beliefs**

*We define beliefs in superstition, magic, the paranormal, and the supernatural identically as category mistakes where the core attributes of mental, physical, and biological entities or processes are confused with each other.* From this point onwards, the term paranormal belief is used to refer to all these beliefs. Our definition derives from theories of cognitive development: Core knowledge means concepts and bodies of knowledge that children learn without explicit instruction and that create, form, and constrain their other conceptual understandings (Spelke, 2000; Wellman & Gelman, 1998). For example, children first become aware of the core concept of object permanence, and only later in school learn non-core concepts such as evolution. The most important systems of core knowledge are intuitive comprehensions of psychology, physics, and biology. Already toddlers know that states of mind are mental, immaterial, and subjective, while states of the physical world are material and objective (Leslie, Friedman, & German, 2004; Wellman & Gelman, 1998).

Core psychological knowledge comprises desires, actions, and beliefs (Wellman & Gelman, 1998). The basic idea is that people act in certain ways because they believe their actions will result in desired outcomes. Intentional actions are – in everyday usage of the word – purposeful, but they also reflect an intentional state of mind (desires, beliefs). Children learn to give intentional, psychological explanations for intended actions by the age of four years (Schult & Wellman, 1997; Wellman & Gelman, 1998).

Core physical knowledge comprises understanding of physical objects and their movements such that objects have an independent existence in space, they have volume, and they cannot move through physical obstructions (Spelke, 2000; Wellman & Gelman, 1992; Wellman & Gelman, 1998). By four years, children have learned to give physical, non-intentional explanations for physically-caused movements (Schult & Wellman, 1997; Wellman & Gelman, 1998).

The gathering of core biological knowledge starts from an understanding of the distinction between living and non-living things, which already infants can make

(Wellman & Gelman, 1998). However, the appreciation of a distinct biological domain is said to arise only at age 4 or 5 when children acquire a basic understanding of specifically biological causal forces such as growth, reproduction, inheritance, illness, and healing. Thus, at that age children no longer attribute these biological processes to belief-desire or mechanical causation (Schult & Wellman, 1997).

In our definition, we suggest that beliefs that confuse core attributes of psychological, physical, and biological entities or processes with each other are paranormal beliefs. That is, in paranormal beliefs the core attributes are not limited to one domain but conflated with each other and applied across categories. In category mistakes, an entity or process is classified to a wrong category (Chi, 1992). When the category mistake includes core knowledge, we call it a paranormal belief.

When a person makes a category mistake confusing core attributes, physical entities may have psychological or biological attributes and mental entities may have biological or physical attributes. For example, proponents of feng shui claim energy (a physical process) to be living (a biological attribute) or good (a psychological attribute), and self-proclaimed witches assert that they can physically hurt somebody by their thoughts and incantations (psychological phenomena). Similarly, ghosts and angels are believed to be entities with a mind but without a body. A superstitious person may also confuse mental representations and the material objects they represent as when believing in good luck properties (psychological attributes) of an amulet (a physical object). Further, paranormal believers may see non-intentional physical and biological events as having a purpose, that is, being intentional events (Bering, 2003; Kelemen, 1999), as in the belief that breaking a mirror is an omen of bad luck.

All category mistakes are not paranormal beliefs: many people wrongly assume that such abstract, process-based concepts as force, electricity, heat, or light are actual substances, behave like material objects, or are somehow the inherent properties of objects (Reiner, Slotta, Chi, & Resnick, 2000). For example, a physics novice may consider force to be a property of moving objects. This is a category mistake (physical process taken as a physical object) but as it does not include core knowledge, it does not evidence paranormal belief. Further, metaphorical and allegorical expressions that deliberately confuse the properties are not paranormal beliefs. By our definition, beliefs obeying the law of contagion are regarded paranormal only insofar as the idea of



contagion is stretched beyond the biological domain, and beliefs obeying the law of similarity are regarded as paranormal beliefs only in cases where similarity is used to draw inferences about entities or processes from different domains. Our definition solves the problem of the boundary between magical and real contagion: It is not the amounts or the ways of contagion that matter but whether contagion is applied outside biological domain. Magical food and health beliefs, which were examined in the studies reported in Publications **I** and **V**, are therefore part of paranormal beliefs as far as the above conditions hold.

We studied whether our definition gets empirical support (**II**). We hypothesized that paranormal believers make more category mistakes than skeptics by materializing mental entities, mentalizing material entities, and by seeing purpose in non-intentional processes. Further, we assumed that different paranormal beliefs are similarly connected to the category mistakes.

## **1.2. The relationship between religious and other paranormal beliefs**

The most common Christian religious beliefs – belief in God, the Devil, Heaven and Hell, and life after death – include category mistakes that confuse core knowledge, so according to our definition they are part of paranormal beliefs. Because of the different positions of religious and non-religious paranormal beliefs in our society, and because of the long-lasting theoretical debate about their relationship (Durkheim, 1915/1964; Frazer, 1922/1963; Malinowski, 1948/1984; Mauss, 1950/2001), in one study we analyzed religious beliefs and other paranormal beliefs separately to find out how they are related (**III**).

In empirical studies, religious and other paranormal beliefs have been both positively related (Goode, 2000; Orenstein, 2002; Rudski, 2003; Sjöberg & af Wählberg, 2002) and negatively related or unrelated (MacDonald, 2000; Rice, 2003). A positive relationship has been proposed by some theorists because both belief types deal with phenomena that are beyond scientific explanations (a review: Goode, 2000). The negative relationship has been explained by the rejection of the paranormal by the

official Christian doctrine, leading highly religious people to discard non-religious paranormal beliefs (Emmons & Sobal, 1981; Goode, 2000; Rice, 2003). We therefore assumed that instead of being straightforward, the relationship may vary with individual's level of religiousness (**III**).

### **1.3. Correlates of paranormal and religious beliefs**

Beside the lack of an adequate definition of paranormal beliefs there has been another hindrance in the way of a psychological understanding of them. Namely, existing studies on paranormal beliefs have mostly examined only a few determinants at a time and the relative importance of various determinants has not been studied. Further, psychological similarities and dissimilarities between religious people and paranormal believers are unknown, as their characteristics have usually been analyzed separately and only a few correlates at a time. Even though religious beliefs may be definable in the same way as non-religious paranormal beliefs, it is likely that there exist differences between people who believe in God, those who believe in the magical claims of feng shui, and those who believe in both, due to differences in fostering these beliefs in society.

Various possible correlates of paranormal and religious beliefs were analyzed in this series of studies. They included demographics, thinking styles, affective factors, worldview, values, peer and parental attitudes, life events, and education. In the study reported in Publication **I**, we conducted a multivariate study in which a host of possible determinants were included and their relative importance for paranormal beliefs was examined. In the study reported in Publication **II**, in addition to testing the new definition, we studied whether core knowledge confusions are related to an intuitive thinking style. The purpose of the study reported in Publication **III** was to find out the similarities and dissimilarities between religious people and paranormal believers. In the study reported in Publication **IV**, we investigated the relationships between paranormal beliefs, thinking styles, and educational variables.

### **1.3.1. Gender and age**

The clearest demographic correlate of paranormal beliefs is gender. Most paranormal beliefs, including religious beliefs, are more often held by women than men (Goode, 2000; Stark, 2002; Vyse, 1997), and this was also expected in these studies (**I**, **III**, **IV**). The relation between paranormal beliefs and other demographics such as age have been examined but clear patterns have not been detected (Rice, 2003; Vyse, 1997). We examined the relationship between paranormal beliefs and age in the studies reported in Publications **I** and **IV**.

### **1.3.2. Thinking styles**

Analytical, rational thinking is one of the two thinking styles proposed by dual-processing theorists (Epstein, 1994; Evans, 2003; Sloman, 1996; Stanovich & West, 2000). It is logical, verbalizable, relatively slow, and conscious reasoning based on evidence. The other thinking style is intuition, which is associative, non-verbalizable, automatic, mostly preconscious thinking, in which information is assessed based on personal experiences. The two thinking styles are considered to function independently but in interaction and there are individual differences in the preferences to use them (Epstein, Pacini, Denes-Raj, & Heier, 1996).

Magical thinking resembles intuitive thinking in that it, too, is associative and relies on subjective evidence (Nemeroff & Rozin, 2000). It is often a gut feeling, an intuition that makes paranormal beliefs seem viable. Not surprisingly then, paranormal beliefs and intuitive thinking have been shown to be positively connected in previous studies (Epstein et al., 1996; Wolfradt et al., 1999). Analytical thinking, on the contrary, is unlike magical thinking. Accordingly, poor critical thinking and low rationality have been positively related to paranormal beliefs (Gray & Mill, 1990; Musch & Ehrenberg, 2002), although contradictory results have also been obtained (Bressan, 2002; Roe, 1999). Religious beliefs, too, have been proposed to indicate poor rational thinking (Frazer, 1922/1963; Mauss, 1950/2001). We thus hypothesized that paranormal beliefs

(I-IV) and religious beliefs (III) are positively related to intuitive thinking and negatively connected with analytical thinking.

We also predicted that the thinking styles mediate gender difference in paranormal beliefs (IV). As women have been shown to have generally more paranormal beliefs than men (Vyse, 1997) and as preliminary evidence indicates that women prefer intuitive thinking more and analytical thinking less than men (Lieberman, 2000; Pacini & Epstein, 1999), we predicted that these gender differences in thinking styles would be found and that they would mediate the gender difference in paranormal beliefs (IV).

We also hypothesized that intuitive thinking is positively related to core knowledge confusions (II), which we proposed to be the defining characteristics of paranormal beliefs. Thus, adults believing in the paranormal who confuse core knowledge are not assumed to be at the same level of rationality as children but to rely strongly on their intuitions.

### **1.3.3. Affective factors**

The importance of affective traits and reactions in paranormal beliefs has been proposed by several researchers (Frazer, 1922/1963; Malinowski, 1948/1984; Mauss, 1950/2001; Nemeroff & Rozin, 2000). In line with these suggestions, we studied the relationships between paranormal beliefs and affective factors such as affective attention and behavioral inhibition and activation, as well as the personality trait of emotional stability.

In general, emotions influence one's judgments strongly when one pays much attention to them (Gohm & Clore, 2000). Thus, we predicted that attention to affective experiences, that is, a tendency to focus on and analyze one's affective experiences (Swinkels & Giuliano, 1995) would be associated with high levels of paranormal belief (I).

Individuals differ in their motivational tendencies, namely, in their sensitivity to avoid negative events and to approach positive events (Carver, Sutton, & Scheier, 2000; Carver & White, 1994). These two action tendencies, behavioral inhibition and behavioral approach, are independent of each other. As many paranormal beliefs, such as avoiding walking under ladders or trying to enhance performance by wearing an

amulet, are geared towards avoidance or approach (Malinowski, 1948/1984; Stark, 2001; Zusne & Jones, 1989), we hypothesized that behavioral inhibition and behavioral activation are positively related to paranormal beliefs (I).

Further, the personality trait of emotional instability, or neuroticism, has been positively related to belief in the paranormal (Wiseman & Watt, 2004; Vyse, 1997). Thus, paranormal believers have been characterized as anxious and depressed. Religious beliefs have primarily been unrelated to neuroticism (Hills, Francis, Argyle, & Jackson, 2004; Saroglou, 2002). Thus, we predicted that emotional instability is positively related to paranormal beliefs (I-III) but unrelated to religious beliefs (III).

#### **1.3.4. Negative life events and desire for control**

Negative, uncontrollable life events have been proposed to be among the most important motivators of paranormal beliefs (Malinowski, 1948/1984; Vyse, 1997). For example, economical difficulties and uncertain life situations have been connected with paranormal beliefs (Keinan, 1994, 2002; Padgett & Jorgenson, 1982). Likewise, people have been shown to put their faith in religious beliefs in times of crises (Pargament, 2002).

Negative life events may reduce a sense of control and therefore lead to an increased desire for control. Research has pointed out that people with a strong need for control hold more paranormal beliefs than others (Zebb & Moore, 2003), especially in stressful situations (Keinan, 2002).

Thus, we predicted that paranormal believers (I, III) and religious believers (III) have experienced more negative life events than other people. Further, it was hypothesized that desire for control is positively related to paranormal beliefs (I) and that desire for control mediates the effect of negative life events on these beliefs (I).

#### **1.3.5. Humanistic worldview**

Beliefs are part of a larger ideology and worldview (de St. Aubin, 1999). We assumed that paranormal beliefs are part of a humanistic/holistic worldview (I), which includes a

wide variety of value-laden aspects of personality such as assumptions about human nature (people are good by nature) and liberal political orientation (de St. Aubin, 1996; Tomkins, 1963). Most of these characteristics have not been studied in relation to paranormal beliefs, with the exception of liberal orientation, which has been shown to be more typical of paranormal believers than of others (Goode, 2000). However, there are other reasons for assuming that paranormal beliefs are part of a humanistic belief system. Namely, unity between people and all other things is seen both in a humanistic ideology (de St. Aubin, 1999; Tomkins, 1963) and in paranormal belief systems (Nemeroff & Rozin, 2000; Tambiah, 1990).

### **1.3.6. Mystical experiences and peer and parental attitudes**

Magic and religion have been conceptualized as part of ‘the world of mysticism’, opposite to that of ‘the natural world’ (Lévy-Bruhl, 1949/1975; Tambiah, 1990). Experiences that are interpreted as mystical are considered to attest the existence of the mystical world. In empirical studies, mystical experiences have been shown to be more prevalent among people with paranormal and religious beliefs than among skeptics (Hay & Morisy, 1978; MacDonald, 2000; Thalbourne & Delin, 2000). We hypothesized that mystical experiences as defined by people themselves are positively related to paranormal and religious beliefs (III). This assumption was stretched to include both one’s own and close others’ alleged experiences, as others’ experiences have been convincingly argued to affect individual’s beliefs (Vyse, 1997).

An individual often adopts and maintains beliefs that his or her family, friends, or other social group members hold. Religious education and parents’ religiosity are indeed positively connected with an individual’s religiosity (Flor & Knapp, 2001; McCullough, Tsang, & Brion, 2003; Okagaki & Bevis, 1999). It has also been proposed that parents’ and friends’ paranormal beliefs lead an individual to similar beliefs (Vyse, 1997). We therefore hypothesized that parents’ and peers’ positive attitude towards mystical, supernatural phenomena earlier in one’s life and at present is positively related to an individual’s paranormal (I, III) and religious beliefs (III).

### **1.3.7. Values**

Besides the social transmittance of religion, the social character of religion is manifested in its social traditions and values (de St. Aubin, 1999; Schwartz & Huismans, 1995). The results of extensive research have consistently shown that religious people are conservative, as they value tradition, conformity, and to a lesser extent, security, over stimulation and self-direction (a meta-analysis: Saroglou, Delpierre, & Dernelle, 2004). According to Schwartz (1992), these values form the other one of the two bipolar value dimensions, namely, the conservation – openness to change –dimension. The other value dimension is self-transcendence – self-enhancement, and it contains the rest of the ten universal values, namely, universalism and benevolence on the self-transcendence side, and power, achievement, and partially, hedonism on the self-enhancement side. Religious people have been shown to value self-transcendence, especially benevolence, more than non-religious people (Saroglou et al., 2004). In the study reported in Publication **III**, we examined the relationships between paranormal and religious beliefs and the two value dimensions, as well as the ten values. Regarding religious beliefs, we predicted that the earlier findings would be replicated. Values of paranormal believers had not been studied before; thus, regarding paranormal beliefs, no hypotheses were set.

### **1.3.8. Education**

It is unknown whether paranormal beliefs can be reduced by education, and if they can whether one should teach critical thinking skills in general or certain subjects more specifically. In some studies, a low educational level has been connected to paranormal beliefs (Otis & Alcock, 1982; Za'rour, 1972), but in general the results have been inconsistent (The National Science Foundation, 2006; Vyse, 1997). Field of education has also been related to paranormal beliefs: students of natural and social sciences have most often been found to have less paranormal beliefs than students of arts and humanities (Gray & Mill, 1990; Grimmer & White, 1992; Pasachoff, Cohen, & Pasachoff, 1970; Za'rour, 1972). However, the results are far from settled, and only a

limited amount of university disciplines has been studied. Further, the differences between university students of different disciplines may not be due to differences in education per se, as paranormal beliefs have not been connected with length of university education (Jahoda, 1968; Parida, 1962; Pasachoff et al., 1970; Salter & Routledge, 1971). Thus, we studied whether students of university and vocational school differ in paranormal beliefs, whether there are disciplinary differences in paranormal beliefs, and how duration of present education is related to paranormal beliefs (IV).

The generative mechanisms by which education influences paranormal beliefs are unknown. It has been suggested that learning of critical thinking skills, that is, becoming a more analytical thinker, were the explanation (Otis & Alcock, 1982; Vyse, 1997; Za'rour, 1972). If analytical thinking, as well as educational level and length of education, are negatively connected to paranormal beliefs, analytical thinking may explain the relationship between education and paranormal beliefs. Thus, we predicted these kinds of mediation effects (IV).

Additionally, as it has been suggested that the disciplinary differences in paranormal beliefs are explained by increase in critical thinking in students of sciences compared to students of arts and humanities (Otis & Alcock, 1982; Za'rour, 1972), we examined whether disciplinary differences in paranormal beliefs are mediated by analytical thinking (IV). Further, as paranormal beliefs, intuitive thinking, and creativity have been suggested to share some important qualities (Gianotti et al., 2001), we hypothesized that disciplinary differences in paranormal beliefs between assumedly more (e.g., art and humanities) and less (e.g., sciences) creative disciplines are mediated by intuitive thinking (IV). The results to these questions help to clarify what, if anything, should one teach to decrease paranormal beliefs: general thinking skills or specific subjects.

#### **1.4. Correlates and functions of magical food and health beliefs**

Research on magical beliefs that follow the laws of similarity and contagion has often included beliefs about food and health, as contagious effects are often thought to be



transmitted by ingestion (Hejmadi et al., 2004; Nemeroff & Rozin, 2000). Examples of these kinds of beliefs are claims that “you are what you eat” or that “the water content of one’s diet should be 70 % because human bodies are 70 % water”. The focus of research has been on showing the beliefs existence and forms (Nemeroff & Rozin, 2000) but individual differences are poorly understood. Knowledge of people who are most prone to unfounded nutritional and health beliefs would, however, help to offer these people more grounded information as a basis of their nutritional and health choices. The aim of the study reported in Publication V was to explore who believes in magical food and health (MFH) beliefs, and further, what functions do these beliefs serve.

The functions of MFH beliefs were examined to better understand why some people hold such unfounded beliefs (V). Functions of magical beliefs have been proposed but never empirically investigated (Malinowski, 1948/1984; Nemeroff & Rozin, 2000; Tambiah, 1990). Our hypotheses were based on research on magical and paranormal beliefs and the function research on attitudes.

One of the most important functions of magical beliefs proposed by researchers is that of controlling the world around (Malinowski, 1948/1984; Vyse, 1997), and therefore MFH beliefs may provide control into food and health issues. Other possible functions are those of social identity, value-expressive, self-esteem, defensive, and utilitarian (Herek, 1987; Shavitt, 1989, 1990). A belief serves a social identity function if it fosters identification with a reference group, and a value-expressive function if it expresses one’s central values and self-concept. Self-esteem function is served by a belief that connects the believer with something positive and therefore bolsters his or her self-esteem. A belief may also serve a defensive function if it distances the believer from something threatening, or it may serve a utilitarian function if it guides one’s behavior toward rewards and away from punishments.

We hypothesized that magical beliefs about food and health relate to certain factors specific to food and health, namely, to eating status, attitude toward alternative medicine, and eating disorder symptoms (V). Compared to omnivores, vegetarians were predicted to hold more MFH beliefs because research has indicated that they have more magical beliefs about bodily functions and animal products (Beardsworth & Keil, 1992; Lindeman, Keski-Vaara, & Roschier, 2000). Positive attitude toward alternative medicine

was predicted to connect with MFH beliefs because the proponents of alternative medicine use concepts that follow, at least partially, the magical laws of contagion and similarity. This is demonstrated in homeopathy, in which trace amounts are considered to affect even more powerfully than proper amounts, and in stone therapy, in which stones are supposed to convey ‘healing energy’ like it were a contagious substance. People with eating disorder symptoms were assumed to have more MFH beliefs than others because they have been shown to be highly sensitive to contagion (Nemeroff & Cavanaugh, 1999).

Other correlates were also hypothesized to connect to MFH beliefs based on research on paranormal beliefs, namely, female gender, intuitive thinking, negative life events, and desire for control (V). The rationale for these hypotheses was given in chapter 1.3, where research on paranormal beliefs was presented.

## 2 RESEARCH QUESTIONS

Do paranormal beliefs form independent subsets or manifest a higher-order construct (I)?

Is it grounded to define magical, paranormal, and superstitious beliefs as category mistakes that confuse core knowledge (II)?

How paranormal beliefs and religious beliefs are related (III)?

What are the strongest correlates of paranormal beliefs (I)?

What are the similarities and dissimilarities between paranormal believers and religious people (III)?

How paranormal beliefs, education, and thinking styles are related (IV)?

What are the correlates and functions of magical food and health beliefs (V)?

## 3 METHODS

### 3.1. Participants

The questionnaire responses of 3261 Finnish participants formed the data of the studies reported in Publications **I**, **III**, **IV**, and **V** (study 1). Seventy-four percent of these participants were women. The participants' age ranged from 15 to 60 ( $M = 24$ ;  $SD = 5$ ). Seventy-four percent were university students from the disciplines of philosophy, psychology, social and natural sciences, forestry, medicine and other medical disciplines, technology, law, art, humanities, architecture, education, theology, and business, and 22 % were vocational school students majoring in agriculture, service, technology, business, art, and health and education. The rest of the participants were employed. In the study reported in Publication **IV**, these 120 non-students were excluded ( $N = 3141$ ). Accordingly, in that study 77 % of the participants were university students and 23 % were vocational school students, but otherwise their demographics were similar to the participants of the other studies.

In the study reported in Publication **II**, the participants ( $N = 239$ ) were selected from those of Publication **I**. Ten percent of the women and men who had scored especially high or low on the paranormal belief scale compared to other female and male respondents, respectively, were contacted. Of those reached, 53 % completed the questionnaire (female skeptics,  $n = 96$ ; female believers,  $n = 88$ ; male skeptics,  $n = 27$ , male believers,  $n = 28$ ). Their demographics (age, gender, and educational level) were approximately the same as the participants' of the study of Publication **I**.

The participants of study 2 of Publication **V** ( $N = 189$ ) were Finnish people of whom 75 % were university students and the rest employed. Their age ranged from 18 to 60 ( $M = 27$ ;  $SD = 9$ ); 84 % of them were women.

**Table 1****Correlates by Publications**

Correlate	I	II	III	IV	V
Affective attention	X				
Alternative medicine					X
Analytical thinking	X	X	X	X	
Behavioral activation scale	X				
Behavioral inhibition scale	X				
Core knowledge confusions		X			
Desire for control	X				X
Diet					X
Discipline				X	
Eating disorder symptoms					X*
Educational level				X	
Emotional instability	X	X	X		
Gender	X		X	X	X
Humanism	X				
Intuitive thinking	X	X	X	X	X
Length of present education				X	
Mystical experiences			X		
Negative life events	X		X		X
Parental attitude	X		X		
Peer attitude	X		X		
Values			X		

\* Study 2 only

*Note.* The dependent variable of Publications I, II, and IV was paranormal beliefs (including religious beliefs and in Publication I also magical food and health beliefs), the dependent variables of Publication III were religious beliefs and paranormal beliefs (excluding religious beliefs), and the dependent variable of Publication V was magical food and health beliefs.

## 3.2. Procedure

The participants of the first study in Publication V and in the studies of Publications I, III, and IV were mainly recruited via electronic mailing lists from six universities and ten vocational schools around Finland. The recruitment messages included a hyperlink to an Internet questionnaire, which was placed in a hidden directory. The participants of the study reported in Publication II were approached individually by e-mail, and referred to a password-protected Internet questionnaire.

The participants of study 2 in Publication V were approached at their lectures at the university or at a student cafeteria. They filled in paper questionnaires and returned them at a later lecture or by mail.

## 3.3. Measures

If not otherwise stated, the scales used in these studies have a 5-point Likert-type scoring with one indicating strong disagreement with the statement. Table 1 summarizes the correlates, which were examined in each Publication.

### 3.3.1. Beliefs

*Paranormal beliefs (I-IV)* were measured with 26-item Revised Paranormal Belief Scale (RPBS: Tobacyk, 2004; original scale by Tobacyk & Milford, 1983). RPBS consists of seven subscales: Traditional religious beliefs, Witchcraft, Spiritualism, Extraordinary life forms, Psi, Precognition, and Superstition (called Luck beliefs or Omens of luck in Publications I, II, and IV). In Publication III, the paranormal belief measure excluded the subscale of Traditional religious beliefs, as the subscale was used as a separate measure. Additionally, in studies reported in Publications I and II paranormal belief items generated for this series of studies were used. The RPBS subscale of extraordinary life forms was supplemented with four items on belief in ghosts and spirits, and one of RPBS's items (viz. "There is life on other planets") was

extended to a new 8-item subscale of extraterrestrial life. Furthermore, subscales tapping belief in amulets, rituals, astrology, lunar effects, and the magical claims of feng shui were formulated. In Publication I, paranormal belief measure included magical food and health beliefs (see below). In the study reported in Publication II, six belief categories were examined: paranormal agents, paranormal abilities, luck beliefs, astrology, feng shui, and religious beliefs. In all Publications, a sum score of paranormal beliefs was used besides the subscales or factors.

*Magical beliefs about food and health (I, V)* were measured with a similarly named scale (MFH, Lindeman et al., 2000). The items concern specific beliefs that animal products contaminate food or personality and other magical beliefs about food and health. All of the 17 items follow the magical laws of contagion or similarity, but it should be noted that a few of them do not conform to our definition of paranormal beliefs.

*Religious beliefs (III)* measure was the RPBS subscale of Traditional religious beliefs, which includes four items on belief in God, Devil, Heaven and Hell, and life after death.

### **3.3.2. Core knowledge confusions**

The extent to which the participants attributed mental attributes to material entities and material attributes to mental entities were measured (II) with scales of *Mentalizing matter* and *Materializing mental*, which were formulated according to the work of Chi and her colleagues (1992; Chi, Slotta, & de Leeuw, 1994). An example of the 16-item Mentalizing matter scale is: “Some old buildings have a soul” and an example of the 18-item Materializing mental scale is: “Sometimes a thought touches objects”. Also 12 fully literal or metaphorical statements were included, such as “An anxious person is a prisoner”. The participants’ task was to define whether the items were purely metaphorical (1), purely literal (5), or something there between.

Whether the participants attributed *purpose to non-intentional and intentional events* was measured with 18 and 4 statements, respectively (II). These statements were also formulated according to the work of Chi and her colleagues (1992; Chi et al., 1994). The statements concerning non-intentional events depicted random, artificial, and

natural events with positive, negative, or neutral outcomes. An example of a positive random event is “You run across a formerly heart-throb abroad and you start going out together. Was there a purpose in your encounter?” An example of a negative artificial event is “The brakes of your car fail and you crash getting seriously injured. Did the brakes fail for a purpose?” and an example of a neutral natural event is “A lightning strike topples a big tree in your garden, but causes no other harm. Did the lightning have a purpose?” The outcomes of the intentional events were also positive, negative, or neutral. An example of an intentional event with a positive outcome is: “You do your utmost for a job interview and receive the job. Did the investment have a purpose?” All the statements were evaluated on a scale ranging from (1) the event clearly had no purpose to (5) the event clearly had a purpose.

### **3.3.3. Thinking styles**

*Intuitive thinking (I-V)* and *analytical thinking (I-IV)* were measured by Rational-Experiential Inventory (Pacini & Epstein, 1999). The items of the inventory are formulated based on dual-processing theories. Example items of intuitive and analytical thinking, respectively, are “Intuition can be a very good way to solve problems” and “I enjoy solving problems that require hard thinking”.

### **3.3.4. Affective factors**

*Attention to affective experiences (I)* was gauged by Mood Monitoring subscale of the Mood Awareness Scale (Swinkels & Giuliano, 1995). An example item is: “I often evaluate my mood”.

*Behavioral inhibition (I)* and *behavioral activation (I)*, that is, avoidance of negative experiences and approach of positive experiences, were measured with 4-point BIS- and BAS -scales (Carver & White, 1994). An example item of the former is “I worry about making mistakes” and of the latter “When I’m doing well at something, I love to keep at it”.



*Emotional instability (I-III)*, more specifically anxiety, depression, hostility, self-consciousness, vulnerability, and impulsiveness were measured with the Neuroticism subscale of the Finnish version of the NEO Five-Factor Inventory (McCrae & Costa, 1987; Pulver, Allik, Pulkkinen, & Hamalainen, 1995).

### **3.3.5. Negative life events and desire for control**

The participants were asked to indicate the number of experienced *negative life events* (I, III, and V). Examples of possible crises and traumas were provided, such as economical difficulties, divorce, serious illness of a close relative or friend, and a life-threatening situation.

*Desire for control* was measured (I and V) with a 7-point scale, the Desirability of Control Scale (Burger & Cooper, 1979). A representative item is “I enjoy making my own decisions”.

### **3.3.6. Humanistic worldview**

*A humanistic worldview* (I) was examined with a short version of the Humanism subscale of the Modified Polarity Scale (de St. Aubin, 1996; Tomkins, 1963). An example of the items is “You must always leave yourself open to your own feelings – alien as they may sometimes seem”.

### **3.3.7. Mystical experiences and peer and parental attitudes**

*Mystical experiences* (III) were gauged by asking whether the respondent or someone close to him or her had experienced “something unexplainable, mystical”, that is, “things that he or she finds lacking a natural, rational explanation”. Response alternatives for oneself ranged from 1 (never) to 5 (very often), and for close others from 1 (nobody) to 5 (very many).

*Peer and parental attitudes (I and III)* toward “mystical, supernatural phenomena” were inquired by questions generated for these studies. The response alternatives for mother’s attitude and father’s attitude ranged from “very disbelievingly” (1) to “very seriously” (5). The questions about present and childhood friends’ attitudes were measured in the number of friends who take or took these phenomena seriously (1 = none, 5 = numerous, *i.e.*, over 5 people). In the study reported in Publication III, the items on peer and parental attitudes were averaged into a sum score.

### **3.3.8. Values**

*Values (III)* were measured with an abbreviated Value Survey (Lindeman & Verkasalo, 2005; original scale by Schwartz, 1992). The respondents were presented with ten values and descriptions of each, and asked to indicate how much importance they put on each value as a life-guiding principle. The ten values are *power, achievement, hedonism, stimulation, self-direction, universalism, benevolence, tradition, conformity, and security*. Description of the conformity value, for example, includes value items such as obedience, honoring parents and elders, self-discipline, and politeness. The six response alternatives were –1 (“against my values”), and from 1 (“not at all important”) to 5 (“supremely important”). Weighted averages were calculated for the two main value dimensions, namely, conservation and self-transcendence, and the value dimensions were primarily used in the analyses instead of the ten values.

### **3.3.9. Food and health related measures**

*Eating disorder symptoms (V, study 2)* were measured with an abbreviated version of the Eating Attitude Test (EAT, Garner, Olmsted, Bohr, & Garfinkel, 1982). The 6-point scale was transformed into a 4-point scale.

*Attitude toward alternative medicine (V)* was inquired by presenting various alternative medicines and treatments to the respondents and by asking them to indicate whether they were familiar with them and what they thought about them. In study 1, the response alternatives ranged from 0 (I don’t know the therapy, scored as 1), through 1

(unbelief) to 5 (strong belief). In study 2, the response alternatives were: 1 = I have never tried this treatment / the treatment is not familiar to me, 2 = I have received this treatment, and 3 = I would like to try this treatment one day. The responses of 2 and 3 were counted as one score each, and a summed score was used in the analyses.

The respondents were asked to indicate their *eating status* (V), namely, whether they were omnivores, avoided red meat, only ate fish and vegetarian food, or were vegetarians or vegans. The latter three were labeled as vegetarians, and the others as non-vegetarians.

### **3.3.10. Functions of magical food and health beliefs**

*Functions of MFH beliefs* (V, study 2) were measured with a Function scale constructed for this study. The scale was developed on the basis of earlier function scales (Herek, 1987; Shavitt, 1990). The participants who had indicated some belief in MFH beliefs (n = 59) were asked to answer 36 items (six items for each of the six functions) about the possible functions their beliefs serve. The six functions were those of control, social identity, value-expressive, self-esteem, defensive, and utilitarian. For example, control function was prompted by items such as “Because of these beliefs, my opinions about food and health are clear”, and value-expressive function was asked with items such as “My beliefs are essentially associated with my personal identity”. The participants answered all of the 36 items three times: when considering beliefs about meat as a personality contaminant, beliefs about meat as a vegetarian food contaminant, and general magical beliefs. However, since the answers were similar for all of the three subscales, the answers were combined.

## 4 RESULTS

### 4.1. Dimensionality of paranormal beliefs

The structure of paranormal beliefs was tested by Structural Equation Modelling (I). All the beliefs correlated with each other ( $r = .13-.72$ ,  $p < .001$ , with the lowest correlation being between religious beliefs and feng shui). The most prevalent beliefs were those of religion ( $M = 2.89$ ), rituals ( $M = 2.46$ ), lunar effects ( $M = 2.33$ ), spiritualism ( $M = 2.21$ ), precognition ( $M = 2.11$ ), and psi ( $M = 2.07$ ), followed by witchcraft ( $M = 1.99$ ), amulets ( $M = 1.87$ ), extraordinary life forms ( $M = 1.86$ ), MFH beliefs ( $M = 1.83$ ), feng shui ( $M = 1.69$ ), astrology ( $M = 1.63$ ), and omens of luck ( $M = 1.37$ ). A four-construct-measurement model for the 13 observed belief variables turned out to be the best fit. The four factors were labeled as Agents (including belief variables of spiritualism, extraordinary life forms, precognition, psi, witchcraft, extraterrestrial beings, and religious beliefs), Signs (amulets, rituals, and omens of luck), Vital power (astrology, lunar effects, and feng shui; beliefs in 'vital power' or 'living energy' attribute psychological and biological attributes to the physical process of energy), and Food (magical food and health beliefs). As all four factors correlated with each other (*estimates* .46 - .85), a model positing a higher-order factor was tested. The higher order factor, Magico-religious beliefs, explained all of the variation in the Vital power factor and half to two thirds of the variation in Agents, Signs, and Food. Thus, it is possible to define various paranormal, magical, and superstitious beliefs identically.

### 4.2. Testing the new definition of paranormal beliefs

The results of the study reported in Publication II showed that paranormal believers mentalized matter and materialized mental more than the skeptics ( $\eta^2 = .07-.13$ ), but the groups did not differ in their assessments of purely literal and metaphorical statements. The believers also assigned more purpose to non-intentional events than the skeptics ( $\eta^2 = .42-.46$ ), but the groups did not differ in their assessments of truly intentional

events. All the reported correlations of Publication II are Spearman's rank-order correlations, because only the most skeptical participants and the strongest paranormal believers were recruited for the study. The correlations between all the six types of paranormal beliefs (paranormal agents, paranormal abilities, luck beliefs, astrology, feng shui, and religious beliefs) and all the confusions (physicalizing mental, biologizing mental, mentalizing matter, purpose in random events, purpose in artificial events, purpose in natural events) were highly positive ( $r$ 's = .30-.68,  $p < .001$ ).

As compared to the skeptics, the paranormal believers were more intuitive ( $\eta^2 = .29$ ), somewhat less analytical ( $\eta^2 = .06$ ), and emotionally less stable ( $\eta^2 = .04$ ). Intuitive thinking was positively correlated ( $r$ 's = .29-.37,  $p < .001$ ) and analytical thinking was negatively correlated ( $r$ 's = -.17 – (-.27),  $p < .01$ ) to all the confusions, while emotional stability and confusions were unrelated or weakly positively related depending on the type of confusion ( $r$ 's = .10,  $ns$  - .21,  $p < .001$ ). A standard discriminant function analysis showed that the best predictor for distinguishing the paranormal believers and skeptics was core knowledge confusions (*discriminant function coefficient* .74) and the second best was intuitive thinking (*discriminant function coefficient* .56). Analytical thinking and emotional instability could not discriminate the groups from each other. This result held after variance associated with other predictors was removed.

### **4.3. The relationship between religious and other paranormal beliefs**

A hierarchical cluster analysis was conducted on religious and other paranormal beliefs (III). The selected four-cluster solution included the groups of skeptics ( $n = 1615$ ), religious believers ( $n = 1157$ ), paranormal believers ( $n = 375$ ), and double believers ( $n = 114$ ). The skeptics had a mean paranormal belief score of 1.5 and a mean religious belief score of 2.0, while the respective scores for the religious believers were 2.2 and 4.0, for the paranormal believers 2.5 and 2.2, and for the double believers 3.4 and 4.2.

Religious and paranormal beliefs correlated positively in the total sample ( $r = .42$ ,  $p < .001$ ) and in the groups of skeptics ( $r = .43$ ,  $p < .001$ ) and paranormal believers ( $r =$

.42,  $p < .001$ ), negatively among the religious believers ( $r = -.41$ ,  $p < .001$ ), and were unrelated in the double believer group ( $r = .15$ ,  $ns$ ).

#### **4.4. Correlates of paranormal and religious beliefs**

In the Structural Equation Modelling analysis described in chapter 4.1., the role of the antecedent variables to Magico-religious beliefs, and to three of the lower-order factors that were not fully explained by the higher-order factor, was tested (I). Magico-religious beliefs were positively predicted by intuitive thinking ( $r = .37$ ,  $p < .001$ ), humanistic worldview ( $r = .33$ ,  $p < .001$ ), low analytical thinking ( $r = -.19$ ,  $p < .001$ ), emotional instability ( $r = .20$ ,  $p < .001$ ), peer attitudes ( $r = .24$ ,  $p < .001$ ), parental attitudes ( $r = .20$ ,  $p < .001$ ), female gender ( $r = -.19$ ,  $p < .001$ ), negative life events ( $r = .16$ ,  $p < .001$ ), behavioral inhibition ( $r = .12$ ,  $p < .001$ ), and attention to affective experiences ( $r = .14$ ,  $p < .001$ ). Age, behavioral activation, and desire for control did not predict Magico-religious beliefs. The lower-order factors were each uniquely predicted by few correlates after the impact of Magico-religious beliefs was accounted for ( $r = .05$ ,  $p < .01 - .22$ ,  $p < .001$ ), but the explained variances were low. These results further support the use of one term in reference to various beliefs.

The three believer groups – the paranormal believers, the religious believers, and the double believers – were similar with regard each other and dissimilar with regard the skeptics in most of the examined determinants (III). A non-parametric  $\chi^2$  test showed that there were gender differences between the groups, so that the group of skeptics comprised a higher percentage of the male participants than of the female participants and the reverse was true of the believer groups. Further, one-way analyses of variances (ANOVAs) showed that the groups differed in mystical experiences ( $\eta^2 = .170$ ) with the skeptics having witnessed the lowest number of mystical experiences, in peer and parental attitudes towards supernatural phenomena ( $\eta^2 = .103$ ) with the skeptics having the most skeptical parents and friends, in intuitive thinking ( $\eta^2 = .073$ ) with the skeptics being the least intuitive, in analytical thinking ( $\eta^2 = .014$ ) with the skeptics being the most analytical, and in emotional stability ( $\eta^2 = .020$ ) with the skeptics being least neurotic. Additionally, the groups differed in negative life events ( $\eta^2 = .011$ ): the

paranormal believers and double believers had experienced more negative life events than the skeptics. The groups also differed with regard conservation values ( $\eta^2 = .037$ ) and self-transcendence values ( $\eta^2 = .057$ ), but it was the religious who hold more of these values than the other believer groups or the skeptics.

#### **4.5. The relationship between education, thinking styles, and paranormal beliefs**

The results of the study reported in Publication **IV** were as predicted: One-way ANOVAs showed, first, that women held more paranormal beliefs than men ( $\eta^2 = .028$ ). Second, vocational school students had more faith in the paranormal than university students ( $\eta^2 = .024$ ). Third, intuitive thinking was positively ( $r = .34, p < .001$ ) and analytical thinking weakly negatively correlated ( $r = -.14, p < .001$ ) with paranormal beliefs. Fourth, ANOVAs showed that women were more intuitive ( $\eta^2 = .031$ ) and less analytical thinkers ( $\eta^2 = .014$ ) than men, and univariate analysis of covariance (ANCOVA) showed that the gender difference in paranormal beliefs was partially mediated by the thinking styles (a reduction in  $\eta^2$  from .028 to .024 and to .014, when analytical or intuitive thinking was a covariate, respectively). Fifth, ANOVA showed that vocational school students preferred analytical thinking less than university students ( $\eta^2 = .049$ ), and ANCOVA showed that this partly mediated the difference in paranormal beliefs among the students of different educational levels (a reduction in  $\eta^2$  from .049 to .016). Sixth, length of education was weakly negatively related to belief in the paranormal ( $r = -.09, p < .001$ ). Analytical thinking mediated this relationship only minimally ( $r = -.08, p < .001$  after the effect of analytical thinking was partialled out).

Further, there were disciplinary differences in paranormal beliefs. For example, the most skeptical female university students studied philosophy or psychology, and differed from the least skeptical female university students, who majored in business and theology. Among the female vocational school students, those of service had more faith in the paranormal than those of technology. Against our hypotheses, however, thinking styles did not mediate the disciplinary differences in paranormal beliefs among men or women.

#### 4.6. Correlates and functions of magical food and health beliefs

In the first study of Publication V, magical food and health (MFH) beliefs were positively correlated with positive attitude toward alternative medicine ( $r = .44, p < .001$ ), vegetarianism ( $r = .38, p < .001$ ), intuitive thinking ( $r = .26, p < .001$ ), female gender ( $r = -.17, p < .001$ ), and negative life events ( $r = .11, p < .001$ ). These variables also predicted MFH beliefs in a multiple regression analysis ( $R^2 = 0.33$ ). Desire for control also predicted MFH beliefs but as it did not correlate with them, it was regarded as a suppressor variable. As desire for control did not correlate with MFH beliefs, it could not mediate the effect of negative life events on MFH beliefs.

In the second study with many fewer participants than in the first study (V), MFH beliefs were positively correlated with positive attitude toward alternative medicine ( $r = .39, p < .001$ ), vegetarianism ( $r = .32, p < .001$ ), eating disorder symptoms ( $r = .24, p < .001$ ), and intuitive thinking ( $r = .21, p < .01$ ). These variables also predicted MFH beliefs in a multiple regression analysis ( $R^2 = 0.34$ ), although intuitive thinking was only a marginally significant predictor. Gender, negative life events, and desire for control did neither correlate with nor predict MFH beliefs, indicating that there was no mediating effect between negative life events and MFH beliefs by desire for control.

One-way within-participants ANOVA showed that the importance of the six functions for MFH beliefs varied ( $\eta^2 = .371$ ). Pair-wise comparisons indicated that the value-expressive function ( $M = 2.99$ ) was rated as the most important one served by MFH beliefs, followed by control ( $M = 2.72$ ), utilitarian ( $M = 2.53$ ), and self-esteem ( $M = 2.34$ ) functions. The least important functions were the functions of defensive ( $M = 2.06$ ) and social identity ( $M = 1.94$ ).



## 5 DISCUSSION

It has been debated whether paranormal, superstitious, and magical beliefs refer to one or several different phenomena. Their previous definitions have been either very broad or too limited. We showed that a higher-order factor underlies the various beliefs and explains a great deal of the variation in the lower-order factors. This means that a general tendency to believe in the paranormal leads to specific paranormal, superstitious, and magical beliefs, which should be reflected in their definition. We presented such a new definition: paranormal beliefs are category mistakes where the core attributes of mental, physical, and biological entities or processes are confused with each other. As an example, belief in psychokinesis means believing that one can move a physical object without touching it, that is, in a 'psychic' (mental) way. The new definition got support from our empirical examination, as paranormal believers confused more core knowledge than skeptics. Furthermore, the amount of core knowledge confusions a person made was the best way of predicting whether he or she was a paranormal believer or a skeptic. In a recent study, our participants with many paranormal beliefs attributed intentionality to biological and physical objects and events more than their skeptical counterparts (Lindeman & Saher, 2007), giving support to our definition.

The new definition is broad as it encompasses superstitions, magical thinking, paranormal and religious beliefs. It helps to explain why the various types of beliefs and their endless variations, from baseball player's lucky socks to newspaper horoscopes, seem interrelated. At the same time, the new definition is exact, as it leaves outside beliefs that are just unfounded, not paranormal. False beliefs such as taking a bat for a bird are not paranormal beliefs but category mistakes that do not confuse core knowledge (Chi, 1992). The new definition also excludes some beliefs that have previously been regarded as paranormal, magical, or superstitious but which are, on closer look, simply unproved beliefs. For example, belief in graphology is not a paranormal belief as the assumption that a person's handwriting reveals something of his or her personality is constricted to one domain (psychology), and is therefore a

potential subject of scientific research. We obviously exclude metaphors and literal statements from the definition, as the confusions there are deliberate. Further, dualistic statements that are evident in psychophysiology or in placebo effects should not be regarded as paranormal beliefs (Nemeroff & Rozin, 2000). The concept of paranormal should, however, be used with regard to extreme dualistic statements such as claiming that a person's mind affects another person's body, or that a mind, such as a ghost, exists without a body.

Some claims of alternative medicine conform to the new definition of paranormal beliefs. For example, reiki healers claim to channel psychic energy into the sick person without touching the patient, which is a claim of mentalizing the physical. Belief in some alternative treatments has been suggested to belong to paranormal beliefs (Grimmer & White, 1990). This view was supported in our study in which magical food and health beliefs increased together with belief in alternative medicine, and in a recent study that found a positive relationship between belief in alternative medicine and general belief in the paranormal (Saher & Lindeman, 2005).

Many religious beliefs are included in the new definition. Religious beliefs have, however, a special place in the Western culture. This was manifested in our result that university and vocational school students had the same degrees of religious beliefs, although university students subscribed less to all other kinds of paranormal beliefs. Religious beliefs were also the most endorsed of all paranormal beliefs in the studies. We got support for our hypothesis that religious beliefs are related to non-religious paranormal beliefs in different ways, depending on a person's level of religiosity. In general, the more paranormal beliefs one had, the more religious beliefs one had. However, the relationship was reversed for a group of highly religious people: The more religious they were, the less they believed in the paranormal. Possibly the highly religious people reject paranormal beliefs because they follow the doctrine. Additionally, a very small group of 'double believers' were found who highly endorsed both paranormal and religious beliefs but whose beliefs were unrelated with each other. They might believe against the doctrine and can therefore also hold non-religious paranormal beliefs.

Besides the definitional problems, scientific research on paranormal beliefs has been slowed down by lack of multivariate studies. We investigated demographic, cognitive,

affective, personality, and social variables simultaneously, and the results emphasized the importance of cognitive factors as explanations of paranormal beliefs.

Unlike earlier anthropologists assumed (Frazer, 1922/1963; Mauss, 1950/2001; Shweder, 1977), thinking does not develop from irrational, magical thinking to rational, scientific reasoning. Paranormal and religious beliefs exist side by side with science both in a societal level and in the minds of individuals (Nemeroff & Rozin, 2000). This is understandable via dual-processing theories, according to which people have two independent modes of thinking, analytical and intuitive (Evans, 2003; Sloman, 1996; Stanovich & West, 2000). As a matter of fact, in our studies intuitive thinking was one of the most important determinants of paranormal and religious beliefs, while low analytical thinking was considerably less important. These results were in agreement with our hypotheses which were based on earlier results on the positive connection between paranormal beliefs and intuitive thinking (Epstein et al., 1996; Wolfradt et al., 1999) and paranormal beliefs and low analytical thinking (Gray & Mill, 1990; Musch & Ehrenberg, 2002). The results on the latter connection have, however, been inconsistent, as reasoning skills and critical thinking have also been unrelated to paranormal beliefs (Bressan, 2002; Roe, 1999; a review: Wiseman & Watt, 2006). The dual-processing view and our results explain these inconsistencies: Beliefs arise from an intuitive system, not so much from a malfunctioning analytical system (Epstein et al., 1996; Stanovich & West, 2000). This notion was also supported by the recent work of Lindeman and Saher (2007) who found that paranormal believers and skeptics did not differ in their scientific knowledge about energy but that in addition to correct knowledge, paranormal believers also hold paranormal ideas about it, such as energy as a living or vital force. This is possible given that the thinking styles are independent, allowing one to hold two contrasting views about the same issue.

Our results showed that education and paranormal beliefs were only minimally related, which fits with the dual-processing view (Evans, 2003) and the findings of several other researchers (Blagrove, French, & Jones, 2006; Goode, 2000; Orenstein, 2002). Many researchers have, however, assumed that education reduces paranormal beliefs by developing critical thinking skills (e.g., Otis & Alcock, 1982; Za'rour, 1972). Our results showed that indeed university students had less paranormal beliefs than vocational school students, and that analytical thinking partly explained this difference.

However, as duration of university education affected the beliefs only marginally, differences in analytical thinking already before enrolling on higher education seem to account for the educational level difference. Further, as disciplinary differences in paranormal beliefs were not explained by the thinking styles, and length of present education was minimally connected to beliefs, it seems that also disciplinary differences are due to differences that precede higher education, as already suggested by Vyse (1997). For example, it seems that when applying to university, the most skeptical individuals are interested in disciplines like medicine and psychology, and less critical individuals are more interested in disciplines like education and theology. The inconsistency of earlier results on the disciplinary differences (for example, the differences between the results of Jahoda, 1968; Pasachoff et al., 1970; and Salter & Routledge, 1971) may be explained by the result that the differences were rather small, and somewhat dissimilar for male and female students.

The importance of intuitive thinking over analytical thinking and knowledge explains why education has such a minor impact on beliefs. The same explanation fits the problem of 'half-belief'. Many people who act superstitiously, for example knock on wood or cross their fingers for good luck, deny belief in the efficacy of their actions, yet feel uneasy when their superstitious ritual is impeded (Burger & Lynn, 2005; Vyse, 1997). One explanation for this contradiction is that these individuals do not really believe in the paranormal but they rely on superstitious rituals because they feel compelled to do something in an otherwise uncontrollable situation (Campbell, 1996). Based on dual-processing theories and our results it seems that these people intellectually disclaim the effectiveness of superstitious rituals but their urge to act in a superstitious manner arises from their intuitive mode (for a similar suggestion, see: Pronin, Wegner, McCarthy, & Rodriguez, 2006). Likewise, the contradiction between knowing (analytical thinking) and feeling (intuitive thinking) is present in many beliefs that follow the magical laws of contagion and similarity: For example, a person knows that chocolate in the shape of dog feces is not feces in reality, yet evaluates it as disgusting and inedible (Rozin et al., 1986).

In our study, gender differences in thinking styles, namely, women's higher intuitiveness and lower analytical thinking compared to men, partly explained the gender difference in paranormal beliefs. Research has frequently shown women to be

the more superstitious gender but explanations for this difference have been wanting (Goode, 2000; Vyse, 1997).

The common assumptions that uncontrollable events and desire for control are important predictors of paranormal beliefs (Campbell, 1996; Keinan, 1994, 2002; Malinowski, 1948/1984) and religious beliefs (Pargament, 2002; Schwartz & Huismans, 1995) were unsupported in our studies. People did regard control function to be important for their magical food and health beliefs but, on hindsight, it must be said that control function is probably an important function of most beliefs and pursuits in the world, including scientific work (Stark, 2001). The earlier results on the emergency of paranormal beliefs in stressful conditions (Keinan, 1994, 2002) may be explained by the fact that when working memory and analytical thinking capacity are encumbered, people rely more on their intuitions and prior beliefs (Evans, 2003). Possibly our studies failed to show the higher prevalence of paranormal beliefs among people with more stressful life experiences, as we inquired about the cumulated negative life events people had experienced instead of their current stress levels.

Although it has repeatedly been suggested that affective factors greatly contribute to the adoption and maintenance of paranormal beliefs (Frazer, 1922/1963; Mauss, 1950/2001; Nemeroff & Rozin, 2000), this series of studies indicated that the affective factors of attention to affective experiences, behavioral inhibition, and behavioral activation are unimportant determinants of paranormal beliefs. This leads to a need to revise an earlier conclusion drawn in Publication V. Namely, we suggested that magical food and health beliefs are more prevalent among vegetarians, people with eating disorder symptoms, and believers in alternative medicine because these people affectively avoid something. However, since behavioral inhibition was unrelated to the higher-order factor of Magico-religious beliefs and to the lower-order factor of Magical food and health beliefs in the study reported in Publication I, the earlier suggestion was not supported.

Further, although emotional instability was more common among paranormal believers than among skeptics, like in earlier studies (Wiseman & Watt, 2004; Vyse, 1997), and religious people were more neurotic than skeptics contrary to earlier findings (Hills et al., 2004; Saroglou, 2002), the differences between the believer groups were

small. Thus, affective factors appear to be unimportant predictors of paranormal beliefs, as compared to cognitive factors.

Parents' and friends' positive attitudes to the supernatural were somewhat important determinants of paranormal and religious beliefs, in accordance with earlier findings on the meaning of religious education and parents' religiosity on an individual's religiosity (Flor & Knapp, 2001; McCullough et al., 2003; Okagaki & Bevis, 1999). It should be pointed out, however, that the relationship was partially explained by the common variance shared by other determinants, meaning that parents and friends also have an impact on the other measured factors.

The social character of religion was further manifested in the values that religious people held: Like in previous studies (a meta-analysis: Saroglou et al., 2004), our religious participants had more conservative values of tradition, conformity, and security than other participants. They also had more self-transcendence values, especially benevolence. These results are understandable as religion encourages believers to accept the social order, to control self-indulgent tendencies, and to refrain from questioning and innovation (Schwartz & Huismans, 1995). The paranormal believers in our study had less conservative values, that is, more openness values than other participants. Thus, they valued self-direction and stimulation. This is an interesting and novel finding, which helps to understand why certain people adopt and maintain religious beliefs and others paranormal beliefs. The importance of values in the formation of beliefs was further demonstrated by the finding that the value-expressive function was the most important function of magical food and health beliefs.

Although the determinants of the higher-order Magico-religious factor and the lower-order factors were generally the same, the lower-order factors were uniquely, although weakly predicted by some variables. This means that some variables predict only a part of paranormal beliefs. For example, a relationship was found between magical food and health beliefs, vegetarianism, and eating disorder symptoms, even though there is no reason to expect them to be predictors of paranormal beliefs in general. Thus, when studying some specific type of paranormal belief, it is recommendable to use the specific belief as a dependent variable instead of the higher-order paranormal belief factor.

Finally, mystical experiences were more prevalent among paranormal believers and religious believers than among the skeptics, as expected. The interpretation of these results is complicated by the fuzzy line between paranormal and religious beliefs and mystical experiences. At least some mystical (supernatural, paranormal, religious) experiences are just the experiential part of paranormal and religious beliefs. For example, while belief in ghosts and predictions of psychics are paranormal beliefs (Tobacyk, 2004), having seen a ghost or having had a premonition are termed mystical experiences (Rattet & Bursik, 2001; Wolfradt et al., 1999). Some mystical experiences are, however, different from paranormal experiences. These include feelings of unity (Argyle & Hills, 2000), which, again, characterize a humanistic worldview (de St. Aubin, 1999; Tomkins, 1963). A humanistic world view was an important determinant of paranormal beliefs in our study, supporting our hypothesis and the view that feelings of unity, or absorption, are central in paranormal belief systems (Bressan, 2002; Nemeroff & Rozin, 2000). When everything is connected, psychological properties may be transferred by biological means to physical objects, as demonstrated by the belief that Hitler's evilness could have contaminated his sweater, or physical processes may have biological properties and be intentional, as exemplified by astrologers' claim that planets have living energy that moves people in an intentional way. Thus, paranormal believers' feelings of unity and connectedness fit well with our conceptual framework, in which we state that paranormal believers confuse mental, physical, and biological phenomena with each other.

Defining paranormal beliefs as certain kind of category boundary violations and linking them to intuitive thinking incorporates this series of studies into other researchers' work on paranormal beliefs. Namely, several researchers have presented the idea that paranormal believers make boundary violations outside of full conscious awareness. Firstly, Thalbourne and associates introduced the term *transliminality*, a tendency for psychological material to cross the thresholds of consciousness (Lange, Thalbourne, Houran, & Storm, 2000; Thalbourne & Delin, 2000; Thalbourne & Houran, 2000). *Transliminality* seems to derive from hyperconnectivity or enhanced interconnectedness, and includes for example mystical experiences, absorption, fantasy proneness, and magical ideation (a schizotypal tendency to assume hidden meanings in random configurations and to insist in a causal determination of coincidences: Mohr,

Bracha, & Brugger, 2003). It is strongly connected with paranormal beliefs but unrelated with intelligence or critical thinking skills (Lange et al., 2000). Secondly, hyperconnectivity or loose association is also considered a distinctive feature of paranormal beliefs by a researcher group primarily interested in the study of schizophrenia spectrum disorders. They have shown that, compared to non-believers, paranormal believers associate unrelated or indirectly related words more easily (Gianotti et al., 2001; Mohr et al., 2001), accept more untested hypotheses (Brugger & Graves, 1997), and regard more coincidences as meaningful (Brugger, Regard, Landis, & Graves, 1995). Such associative activity, or – in terms of dual-processing theories – intuitive thinking may turn out to be a basis for crossing thresholds (transliminality) or making certain kind of category mistakes (holding paranormal beliefs).

Then, a picture of paranormal believers emerges: For them, all things seem united, connected, and associated with each other. Boundaries exist neither between living and non-living things (Lange et al., 2000; Nemeroff & Rozin, 2000; Tambiah, 1990), nor between psychological, biological, and physical phenomena. When everything is connected, there are no coincidences. Thus, paranormal believers interpret everything as intentional and meaningful (Bressan, 2002; Brugger et al., 1995; Shweder, 1977; Wiseman & Watt, 2006). Meaningful associations may be indicative of either creativeness or delusions and hallucinations (Brugger & Graves, 1997; Gianotti et al., 2001; Mohr et al., 2001). Paranormal believers experience absorption and dissociation (Wolfradt, 1997), are prone to fantasies and easily hypnotizable (Thalbourne & Houran, 2000), that is, they easily cross boundaries of consciousness, which may indicate an ease of intuitive thinking. Our results showed that paranormal believers value openness to experiences, for example novelty, creativity, and curiosity (a prediction of a positive relationship between openness to experiences and transliminality, see Lange et al., 2000). This picture of paranormal believers seems compelling but clearly more research is needed in specifying the exact relationships between core knowledge confusions and transliminality, as well as loose associations and intuitive thinking, and mystical experiences, absorption, feelings of unity, and a humanistic world view.

There are several limitations in this series of studies. First, only self-report measures were used. Second, although feelings of unity are central in a humanistic world view (de St. Aubin, 1996; Tomkins, 1963), they were measured only indirectly. Third, it is



unknown whether our participants' mystical experiences included feelings of unity or other types of experiences, as the types were not specified in our question. Fourth, since we did not differentiate paranormal and religious mystical experiences from each other or analyze separately the social transmittance of paranormal and religious beliefs, it is impossible to compare the importance of mystical experiences to and social transmittance of paranormal and religious beliefs. Fifth, the effect of negative life events on paranormal and religious beliefs may be stronger when the adversities are recent, and various things may moderate the effect on beliefs (Pargament, 2002). Sixth, the effect of education on paranormal beliefs would benefit from longitudinal research. Seventh, the participants of these studies were mostly rather skeptical students. The results therefore need replication with samples that are more representative of the general population. Eighth, the results on the functions of magical food and health beliefs are tentative due to the small number of participants who responded to the function measure and the fact that only conscious functions were tapped.

Finally, although the new conceptual framework of paranormal beliefs received preliminary support from the empirical examination, only conscious conceptions about the categories of psychological, biological, and physical phenomena were examined. Because it is likely that many such conceptions are outside conscious awareness, future research should use experimental designs that employ implicit measures of core knowledge confusions. In addition, a weakness of the present conceptualization of paranormal beliefs is that core knowledge has not been defined in a straightforward way. The research on the subject is new but vigorous, so hopefully a more settled definition will be formed. As research on core knowledge proceeds, we will be able to make even more precise descriptions and empirical predictions on paranormal beliefs.

Although paranormal beliefs are prevalent, their psychological understanding has been weak and fragmented. An important finding of this series of studies was showing that paranormal beliefs mainly arise from an intuitive system, instead of a malfunctioning analytical system. Thus, they do not vanish with the increase of education, scientific knowledge, or rational thinking. Another important contribution was the new conceptual framework, in which paranormal, superstitious, and magical beliefs were defined as category mistakes where the core attributes of psychological, physical, and biological phenomena are confused with each other. This formulation and

our results from multivariate studies enabled us to integrate existing research about a variety of beliefs. The new conceptual framework will hopefully allow researchers to develop more elaborated hypotheses and theoretical statements about paranormal beliefs in the future.

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