

Magical Thinking

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This chapter examines the concept of magical thinking and how this form of thought develops over the course of childhood and is maintained in adulthood. Rather than assuming magical thinking to be a remnant of childhood and an immature mind, it is suggested that a number of universal cognitive processes lead to the emergence of magical thinking in early childhood and its maintenance into adulthood. This chapter suggests that magical thinking reaches a peak in childhood partly because of the emergence of pretense and imagination as well as substantial cultural support for magical beliefs in children. Although this form of thinking declines somewhat in later childhood and adulthood, unconscious cognitive processes serve to maintain magical thinking throughout the life span. The chapter also explores the relation between magical thinking and religious thoughts and beliefs, superstition, and other forms of strange beliefs in adulthood.

Key Words: cognitive biases, cognitive development, essentialism, magical belief, magical thinking, similarity and contagion

Every day we are confronted with a variety of events for which we clearly know the cause. We're hungry because we were in a hurry and missed breakfast. Sue realizes that John is mad at her because she forgot to meet him after work. But for other events the causes are less evident. Why does the house creak at night? Is it because of changes in the weather conditions, strong winds, or some other cause? Could it be a ghost? Why did the streetlight go off just as we walked by? Was it because of a burned out bulb, faulty wiring, or is it caused in some way by our physical presence? How do we explain the myriad of events that we witness on a daily basis, especially those for which no discernable cause is observed?

This search for causality in everyday life, for both mundane and mysterious events, seems to be a universal cognitive process. How particular individuals reason about different events and make reference to different types of explanation seems to depend on

a variety of factors, including innate biases, socio-cultural support for particular types of explanations, and individual differences in the willingness to accept one or more possible explanations (see chapters 3 and 22). Our goal in the current chapter is to provide a review of the literature on the development of one form of reasoning, magical thinking, a form of reasoning that takes a nonscientific perspective with respect to mysterious and anomalous events. In doing so, we relate magical thinking to other forms of cognition and explore the situations and contexts that appear to activate magical thinking. Why is it for example that individuals feel uncomfortable handling the clothes of a dead person, especially, if the individual performed some heinous crime? Why is it that we tend to avoid locations where some bad event has occurred, such as a murder? And why is it that we take causal credit for the occurrence of seemingly random events? Many

researchers attribute the feelings, thoughts, and behaviors associated with these types of events to magical thinking.

But what really is magical thinking? Although magical thinking has been the focus of both anthropological (Lévy-Bruhl, 1948; 1966; Malinowski, 1954; Tambiah, 1990) and psychological (Piaget, 1929, 1930; Subbotsky, 1985, 1992, 2004) inquiries for many years, there is no clearly agreed upon definition of what is meant by the term. For this reason we begin our review with an exploration of both traditional and more current perspectives on magical thinking and then offer our own perspective on how this particular term should be defined. Afterward we consider whether magical thinking is still a commonplace activity in the everyday lives of both children and adults. We then explore the research on the development of magical thinking in children. Although never quite a main focus of developmental psychologists, this topic was extensively explored by Piaget (1929, 1930), and research in this area has recently seen resurgence. In this section we also examine the relation between magical thinking and the emergence of pretense and the imagination in childhood. We suggest that these three behaviors—magical thinking, imagination, and pretense—appear to emerge in concert in late infancy and early childhood and provide a mutually supportive environment enabling each to flourish in their own right. We also examine how magical thinking might be related to other forms of thinking. Specifically, we explore the relation among magical thinking, pretense, and imagination and creativity; between magical and religious thinking; between magical thinking and superstition; and last the relation between magical thinking and psychopathology. We end the chapter with a summary and some thoughts on future directions for research in this area.

Magical Thinking Defined

On the surface, the term *magical thinking* seems quite easy to define. It is a phrase that is used in both common everyday language and more esoteric academic discussions. In common usage the term *magic* is tied to a wide range of events, from a beautiful sunset or rainbow to seemingly unexplainable phenomena or events. The label is also used for particular individuals who think or behave in certain ways. Magic has also been used to label thinking that is characterized to be illogical or irrational. Indeed, for many preschool teachers, especially those schooled in a Piagetian view of development,

magical thinking, in terms of illogical and irrational thought, is considered a general characteristic of young children (Rosengren, Miller, Gutierrez, & Schein, in press). Others, such as Joan Didion, have used the term to describe seemingly irrational thoughts and behaviors that in her case dominated her days following the sudden and unexpected death of her husband (Didion, 2005). But these uses of *magic* generally go beyond merely thinking or acting irrationally. That is, they seem at some level to connect to a set of beliefs that treat certain individuals, events, or occurrences as “special” and “out of the ordinary.” We will return to this issue shortly.

Similar uses of the term *magical thinking* are found in the fields of anthropology and psychology, although there is quite a lot of variation in how this term has been used. As Mayr (1982, p. 44) has pointed out, many of the controversies in the history of science can be attributed to scientists in different, opposing camps using the same term for very different concepts. Much of the early research examining magical thinking characterized the thought processes of preindustrialized “primitive” cultures (Frazer, 1911) and children (Piaget, 1929) as magical, dominated by illogical, irrational thoughts and beliefs (Rosengren & Hickling, 2000). By this definition any thought process that is not logical, systematic, or scientific might be characterized as magical. This is not that dissimilar to the definition provided by Eckblad and Chapman (1983, p. 215), who suggested that magical thinking involves “belief in forms of causation that by conventional standards are invalid.”

In our view there are a number of problems with this definition of magical thinking. First, this perspective uses *magical thinking* as a pejorative label for thinking that differs either from that of educated adults in technologically advanced societies or the majority of society in general. This pejorative view was quite common in the study of magic from an anthropological perspective before the 1970s. With an increase in more relativistic cultural accounts, such as situated cultural cognition, and distancing from notions of primitivism, the study of magic in different cultures declined substantially (Sorensen, 2007). Second, this definition ignores the fact that even in technological advanced societies many decisions are not based on rational and logical thought (Gilovich, Griffin, & Kahneman, 2002; Tversky & Kahneman, 1974, 1979). For example, when gambling, people often place too much importance on one aspect of an event, which produces an error in predicting future outcomes of that event. These

decisions appear to be made on the basis of cognitive biases and heuristic. Although these kinds of decisions are not based on formal logic or reason, they are not generally labeled as magical.

A third critique of the traditional view of magical thinking is that it ignores the fact that thinking that appears irrational or illogical to an educated adult may be the result of lack of knowledge or experience in a particular domain or different types of knowledge or experience. For example, under most circumstances most adults will agree that $1 + 1 = 2$. This is a basic number fact that children acquire at a very early age (Wynn, 1990; Wynn, Bloom, & Chiang, 2002). However, if we consider drops of water, adding two drops together yields one slightly larger drop. In this case, the answer “one” is sensible, even though in most circumstances it would seem irrational or illogical. A child’s response may seem illogical or irrational, based on logic that seemingly defies the normal situation, but in reality may stem from reasoning based on different knowledge or a different context.

We suggest that a seemingly irrational or illogical statement, such as $1 + 1 = 1$, should not be labeled as magical thinking unless two conditions are met. The first condition is that the child (or adult) must realize that under normal situations the world works in a particular way. That is, in the everyday world adding one item with another yields two items. The second condition is that the child (or adult) holds a *belief* that in some situations the world can be “altered” so the normal causal relations are in some way circumvented by some other, “special” process or processes that lead to an “alternative” outcome that varies from the norm. That is, they must believe that some sort of *supernatural* or *alternative causal power* exists that can render $1 + 1 = 1$. It is this additional belief in some “unnatural” or “supernatural” process that we argue should be the defining property of magical thinking.

We also argue that reasoning that goes against the norm or established mindset of science should not be necessarily labeled as magical thinking. A fairly large number of individuals hold beliefs that reject the “majority” view of scientists. Although rejection of evolution or climate change in the face of overwhelming scientific evidence in support for both of these phenomena might seem illogical or irrational, we suggest that individuals who hold these divergent views would rarely if ever be labeled as “magical” in their thinking.

At the frontiers of science, individuals may also hold views that vary greatly or even contradict the

conventional wisdom of the majority of scientists. Although the cutting edge of science may be labeled as “magical,” as in Arthur C. Clarke’s third law (“Any sufficiently advanced technology is indistinguishable from magic,” Clarke, 1962), we suggest that very few individuals engaging in the rigorous process of scientific inquiry would be labeled as engaging in magical thinking. Thus, there is something more to magical thinking than being ignorant, thinking illogically or irrationally, or holding beliefs that go against the established science of the day.

Piaget’s View of Magical Thinking

Piaget provided one of the most comprehensive definitions of magical thinking (1929, 1930). He argued that magical thinking dominated young children’s thinking, and suggested that their everyday thoughts could be characterized by a number of distinct types of errors in everyday causal attributions. One type of error described by Piaget as part of magical thinking was when children confused cause–effect relations. A child’s mistaken assumption that two random events were linked causally, such as the case of the individual assuming he or she is the cause of a streetlight turning off after merely walking by, would have been characterized as magical thinking.

Piaget used the term *magic by participation* to describe three forms of magical thinking that involved thoughts, objects, and events with no actual causal link. For example, *magic by participation between thoughts and things* was used by Piaget to describe situations in which children believed their thoughts could alter reality. He used the expression *magic by participation between actions and things* to describe a child’s belief that the performance of an action, such as saying a word or waving a hand, could alter reality. The third form of participation, *magic by participation between objects*, was used to describe a child’s belief that one object could influence another object when no natural, logical causal relationship was present between the objects. The notion that one’s razor would never get dull if stored under a glass pyramid is an example of this type of participation. The final form of participation, *magic by participation of purpose*, incorporates animistic beliefs, whereby the child endows the inanimate world with animate properties and in some extreme forms believes the will or purpose of the object can be controlled by the child. A classic Piagetian example of this is a child believing that the sun, clouds, or moon is purposefully following him or her as the child walks by (see chapter 18).

An essential aspect of Piaget's notions of participation is the idea that children hold a *belief* that the participatory relation is causal. A number of other researchers have also cited the importance of belief in some sort of underlying causality. For example, Pronin and colleagues have suggested that magical thinking is the "belief in the ability to influence events at a distance with no known physical explanation" (Pronin, Wegner, McCarthy, & Rodriguez, 2006, p. 218). This view is very similar to Piaget's first form of participation. We suggest that belief in the efficacy of a nontypical causal link is central to classifying a thought as magical. But it does not go far enough. Rather, we argue that it is a *particular* type of belief, a belief in the existence of alternative forms of causality operating in the world, which works to bring about events that violate the normal causal order of the world. This belief constraint on the definition removes from the magical thinking category most instances of decision making based on emotion, or "reasoning without knowledge of, or on the basis of some sort of misconception about causality, or about natural laws more generally" (Woolley, 1997, p. 991). Rather, as Woolley continues, we need to consider "... belief in an entity or process that is unsupported by what we generally consider to be the principles of nature... Thus one might think of these phenomena as violating, or at least being inconsistent with our naïve theories of the world" (p. 991). Here the notion of "belief" goes beyond the idea that the two random events are connected causally and extends to a particular type of "belief" in alternative forms of causality.

Nemeroff and Rozin's View of Magical Thinking

Belief is also central to the definition of magical thinking provided by Nemeroff and Rozin (2000), who have presented one of the more detailed definitions of magical thinking to date. They suggest that magical thinking should be viewed as "... the cognitive intuition or belief in the existence of imperceptible forces or essences that transcend the usual boundary between the mental/symbolic and physical/material realities, in a way [that] (1) diverges from the received wisdom of the technocratic elite, (2) serves important functions, and (3) follows the principles of similarity and contagion" (p. 5). Although we find many aspects of this definition compelling, we feel that not all cases of magical thinking necessarily serve a clear function for the individual, nor do they always involve principles of similarity and contagion. For example, we suggest

that in many circumstances a young child's belief in the reality of certain fantasy figures (e.g., Santa Claus, the Tooth Fairy) and their actions brought about by atypical forms of causality could be characterized as involving magical thinking. It is not clear that belief in these figures or in their special powers necessarily follows the principles of similarity and contagion. We explore the concepts of similarity and contagion in more detail in a later section. We also explore the notion of essences, as we suggest that this concept deserves particular focus, as a belief in essences is likely an unconscious process that may serve as a "built-in bias" in human reasoning more generally.

Our View of Magical Thinking

To summarize our view of magical thinking, if a child merely lacks particular knowledge, is confused, or incorrect about some event or situation, we should refrain from labeling his or her thinking as magical. An individual's thinking can't merely be wrong, confused, irrational, driven by emotions, based on inaccurate knowledge, or different from our own or the conventional wisdom to be labeled magical thinking. If this were sufficient, the thought processes of many consumers and theoretical physicists would need to be labeled as magical. Rather, we suggest that for thought to be labeled as magical an individual must (1) realize that objects and events in the world generally follow a certain pattern or order governed by the laws of nature (or physics); (2) realize that the observed object or event in some way "violates" or "contradicts" the normal order of things in the world; and (3) hold a belief in some form of supernatural or alternative form of causality that extends beyond those that govern the natural world. An important point is that the belief need not be conscious for thinking to be labeled "magical." In fact, some researchers, such as Subbotsky (2000a,b,c), argue that magical thinking in most cases is not under conscious control.

Our definition of magical thinking removes the pejorative aspect of many past views of this behavior and provides a clearer demarcation between magical thinking and other forms of thought. We explore particular links to other forms of cognition in later sections of the chapter.

Relation Between Magical Thinking and Magical Belief

Earlier we suggested that part of the requirements for characterizing thought as magical was an accompanying belief in the idea that some sort of

alternative form of causality was possible. By alternative form of causality we mean one that is not part of accepted scientific explanations and one that is generally not used to describe everyday phenomena in the world. Zusne and Jones (1989, p. 229) suggest that beliefs are cognitions that refer to what an individual regards as true or false, and the beliefs serve to help the individual make sense of the world around him or her. That is, these beliefs guide interpretations and help remove ambiguity. One's beliefs can often be viewed negatively as irrational or illogical because they are personal, and generally operate without any type of external validation (Zusne & Jones, 1989). Although beliefs can be explicit in nature, as in a stated "belief in God," many beliefs, especially magical ones, are intuitive and implicit (Nemeroff & Rozin, 1994). It is these intuitive magical beliefs, such as those that operate with the laws of contagion and similarity that we suggest are at the core of magical thinking and are discussed in the next section.

Magical Thinking in Everyday Life

To what extent is magical thinking present in the everyday life of children and adults? In this section, we present a brief overview of sympathetic magic, one form of magical thinking that is thought to be ubiquitous in the thought of both children and adults. We also discuss the role of this form of magical thinking to everyday life. In particular, we examine how it influences feelings of disgust in American culture and general eating preferences.

Sympathetic Magic: Similarity and the Contagion Concept in Magical Thinking

Sympathetic magic is comprised of the laws of similarity, opposites, and contagion, with the second considered a subset of the first (Frazer, 1911; Nemeroff & Rozin, 2000). Importantly, these laws continue to operate and influence one another throughout the life span, regardless of scientific training that should eliminate some of their most salient and tangible effects. Similarity and contagion are central to the magical beliefs of various divergent cultures and ethnic groups and are considered the basis for universal primitive human thought. That is, these forms of magical thinking have been hypothesized to provide useful heuristics that guide individuals' behaviors in ways that promote the evolutionary value for survival (Boden & Berenbaum, 2004; Frazer, 1911; Mauss, 1972; see Nemeroff & Rozin, 1994, for cultural details).

SIMILARITY

The law of similarity specifies that objects that resemble one another share certain fundamental properties that are sufficient to link the objects causally. This causal link is thought to take the form of an underlying essence that gives rise to the overall similarity of the two entities. With the law of similarity, appearance equates reality in a proximal/distal relationship with deep roots in humans' past. Evaluating each plant for poisonous content is far more dangerous than classifying all plants as poisonous that resemble one known to be dangerous. This is not to relegate and overgeneralize the law of similarity as an ancient heuristic, as we shall see, but instead to identify it as a useful magical law for establishing causal inferences that has deep evolutionary roots.

CONTAGION

The law of contagion also involves the notion of an underlying essence, but this law concerns the transfer of physical, moral, or behavioral properties from source to recipient through some form of contact, direct or indirect (Nemeroff & Rozin, 1992, 2000; Rozin, Millman, & Nemeroff, 1986). It is this law that is thought to influence one's reluctance to don the sweater previously owned by some despised, diseased, or mentally ill individual. This law also is thought to operate indirectly, as in the case of action performed on a voodoo doll. Here the action is believed to be magically transferred from source to recipient. However, the law of contagion is slightly more complex in that physical contact between the source and recipient also establishes a continual link or contract between the two through which further essence can be transmitted.

In addition, contagious contact may be made through intermediary and even twice-removed objects, such as a pair of gloves instead of direct essence transmission between source and recipient. This transmission is more commonly exemplified by the aversion of Westerners to wearing second-hand clothing from stores, despite more attractive prices than found in first-hand stores (Rozin, Markwith, & McCauley, 1994). Here, the aversion to essence manifests in a quantifiable price gap. This aversion remains, even after thorough washing or sterilization of the "offending" garment or object. Together, the laws of sympathetic magic form a highly intuitive concept that can permeate even pronounced and thorough scientific training (Nemeroff & Rozin, 1992).

RESEARCH ON SIMILARITY AND CONTAGION

Rozin, Millman, and Nemeroff (1986) have demonstrated these two laws in daily Western life by comparing responses to disgusting, dangerous, or valued objects using both direct response and questionnaires. In one such study, the role of contagion and similarity were explored. Specifically, participants' responses to roach contamination of a glass of water, labeling the glass of water as cyanide, and imitation dog feces were examined. They found that individuals generally avoided substances that resembled either disgusting or dangerous substances even though the substances were only water or other harmless substances. This is a case of magical thinking based on similarity. They also found significant reluctance of participants to come into contact or ingest substances that had been contaminated by something disgusting (a roach or spit), even if the substance was completely sterilized. Similar reluctance was found in participants' willingness to put on clothing that had been worn by a disliked person. These effects are quite strong. The mere label "cyanide" placed on a glass of water filled from the tap in the participants' full view is enough to activate an avoidance response. Generally, these researchers (Rozin & Zellner, 1985; Rozin et al., 1986) have found stronger effects for negative contagion (transfer of an essence from something disgusting or disliked) than for positive contagion (transfer of an essence from some liked or positive source). Humans may have a bias, whether innate or conceptual, which increases the disgust of negative items while minimizing the effect of positive items. It would seem adaptive to have a stronger negative bias, as this would lead individuals to avoid potentially harmful substances. Erroneously avoiding something will not kill you. In contrast, not approaching something with a positive association is less likely to lead to a negative outcome. Recent evidence suggests that different domains of disgust elicited by merely written words activate specific brain regions (frontal, temporal, and limbic networks), suggesting an automatic response to particular stimuli (Moll, de Oliveira-Souza, Moll, Ignácio, Bramati, Caparelli-Dáquer, & Eslinger, 2005). Again this suggests that unconscious processes may drive aspects of magical thinking.

The principles of contagion and similarity have also been shown by Nemeroff and Rozin to influence the eating practices observed in many cultures and religions. In one study, Nemeroff and Rozin (1992) explored individual differences in the susceptibility of Jewish participants to be influenced

by magical thinking. By focusing on Jewish adults, Nemeroff and Rozin (1992) were able to explore how sympathetic magic interacts with individual differences in adherence to kosher laws. They found that magical thinking often overrode kosher labels. Specifically, a simple label often was enough to render kosher, contamination-free food, inedible. Variation among the participants in the sensitivity to contagion and similarity effects suggests that the two laws may at times work independently of each other. Interestingly, highly observant Jews had strong magical reactions to disgust, but not to kosher nonviolations. Here, Nemeroff and Rozin note that the attentiveness to contamination may cause an overconcern that may serve to strengthen specific rule sets. Also, individuals who are more sensitive to feelings of disgust may exhibit a greater propensity toward observing certain food rules supported by the culture. In this way the magical laws may serve to increase compliance with particular cultural or religious norms or obligations.

Aspects of the principle of contagion can be found in modern germ theory, showing that at times magical thought can align with current scientific views. Indeed, in medieval Europe intellectuals viewed natural magic as a branch of science focused on discovering the hidden powers of nature (Kieckhefer, 1989). The similarity of the disease transmission involving germs with the magical law of contagion suggests further support for the idea that contagion beliefs are highly adaptive for survival against microbial contaminants such as bacteria and viruses. This also may account for the negativity bias discussed earlier. Furthermore, Nemeroff and Rozin (1994) have found that people differentiate different sources of contagion, treating physical sources of contagion differently from interpersonal–moral sources of contagion. To illustrate, a more severe aversion can be found to second-hand garments with moral or behavioral contagions than to physical contagions.

Individuals also expect these different forms of contagion to produce divergent consequences. Although the physical contagion can be bleached out of the object and properly disinfected, the moral and behavioral contagions of objects are much more difficult to eliminate and generally require some type of ritual that may not be effective in completely eliminating the moral contagion. For example, some religious fundamentalists purify themselves in ritual ceremony weekly in fear of becoming contaminated again by moral containment or in fear of not having completely removed it the previous week. What

these findings suggest is that physical sources tend to follow the contagion model, whereas interpersonal sources of contagion tended to invoke reactions more in accordance with the law of similarity. Also, responses indicated that individuals act as if there is a personal–soul–essence concept. The researchers suggest that physical–substance contagion effects that remain after cleansing may be symbolic in part. This symbolic aspect of contagion, in which a word or idea carries the “essence,” also suggests that the boundary between physical and interpersonal contagion may not be clear-cut, and these two forms of contagion may both operate across different domains.

Clearly, contagion continues to operate in our thinking even in the modern world because of its survival value in some instances. Implicit models of this can be found in studies of disgust. Rozin et al. (1986, 1989) have extensively explored contagion in the interpersonal domain among college students. They found that evidence of magical thinking remains despite high levels of education and scientific training. These results provide further evidence that magical thinking does not stem from irrational or uneducated individuals. Rather, it suggests that implicit models of contagion appear to be a common aspect of cognition even in highly educated, scientifically trained adults. It should also be noted that germ theory, a scientifically valid notion of illness contagion, could be classified as an example of an explicit exemplification of interpersonal-contagion, lending further support to the idea that magical contagion may have both evolutionary roots and improve one’s chances for survival.

The Development of Magical Thinking

How does magical thinking develop? Where does it come from? Is it a universal aspect of human behavior? Obviously the answers to these questions depend on one’s definition of magical thinking. We begin this section with some of the traditional perspectives on the development of magical thinking and then provide our own account that attempts to integrate ideas from diverse aspects of development and culture describe of the origins and development of magical thinking.

Piaget’s View of the Development of Magical Thinking

Piaget viewed magical thinking as a universal aspect of young children’s cognition. For him, children’s early magical thinking was gradually replaced with more logical, even scientific thinking

as children’s cognitive structures matured in interaction with experiences via the processes of assimilation, accommodation, and equilibration. In this replacement model, children’s thinking was transformed in a stagelike fashion. With each major developmental step magical thinking is driven farther and farther out of the child’s mind until she reaches the rational, logical level of adults. This accomplishment was thought to occur sometime around age 12 with the onset of formal operational thinking (Piaget, 1929).

Piaget also referred to a different type of magical thinking, mainly culturally supported magical beliefs. These include beliefs in entities such as Santa Claus, the Tooth Fairy, witches, ghosts, and goblins (see chapter 5). Because much of his focus was on uncovering universals in cognitive development, he was much less interested in these beliefs, which he viewed as culturally dependent. For this reason he did not devote any time explicitly examining children’s beliefs in these magical entities.

THE SECULAR HYPOTHESIS

In many ways, Piaget’s theory captures at the individual level what the secular hypothesis captures at the level of culture. Specifically, one of the main ideas behind the secular hypothesis (Norris & Inglehart, 2004) is that as cultures become more scientifically and technologically advanced, scientific thought and rationality eventually drive out and replace all magical or illogical thought. Indeed, much of the early research on superstitious beliefs and behaviors was conducted under the assumption that these beliefs were caused by failures in education. With expanded access and training in science and mathematics education, it was thought that these beliefs and behaviors would fade from existence (Zusne & Jones, 1989, p. 231). There does appear to be some evidence supporting the notion that traditional superstitious beliefs have decreased over the years (Zusne & Jones, 1989). That is, fewer people today seem to believe in the efficacy of lucky numbers, rubbing a rabbit’s foot, or the dangers of a black cat crossing one’s path. At the same time as this decrease, however, they suggest that there has been a complementary increase in more cognitively complex beliefs (Zusne & Jones, 1989). These more complex beliefs, such as those in extrasensory perception (ESP) or auras, often have the illusion of scientific support, or individuals holding such beliefs have the expectation that science will eventually provide either a natural (e.g., more evolved minds in the case of ESP) or supernatural

explanation (e.g., find that ghosts really do exist). At present, the data seem to suggest that magical and even irrational thought seem to be quite resistant to replacement or extinction. Magic does not seem to be something relegated to our or others “primitive” past or thought, but appears to be relatively ubiquitous in all historical periods, cultural settings, and even modern society (Luhrman, 1989; Sorenson, 2007). In our view this provides further evidence in support of the idea that aspects of magical thinking operate as unconscious biases that are universal aspects of human cognition.

Subbotsky’s Coexistence View of the Development of Magical Thinking

A more recent account of the development of magical thinking is that of Subbotsky (2010). His starting point is a Piagetian view of magical thinking, defined as involving sympathetic magic and notions of participation. However, rather than suggesting that magical thinking is replaced by scientific thought, Subbotsky argues strongly that magical thinking is merely driven underground by social and cultural pressures that place a greater value on science, logic, and rational thought. Specifically, he suggests that in late childhood, magical thinking becomes suppressed but never extinguished.

In a series of clever experiments Subbotsky shows that both children and adults, given the right context or situation, can be shown to act as if they believe magic is real. For example, in a number of studies, Subbotsky (1994, 1996, 1997) primed his participants with either a story or an example of magical events, produced a seemingly impossible outcome, and then placed the participants in a situation in which they could exhibit behavior indicative of magical beliefs. In one such study, Subbotsky presented children with a story about a magical box that could cut a postage stamp in half when a particular magic word was uttered. He then showed the children an actual box and told them it was the box in the story. He then left the room and observed surreptitiously whether children would utter the magic word. Many six- to nine-year-olds did exactly that in an attempt to test the magic of the box.

In later studies Subbotsky found that both children and adults were generally unwilling to place a valued object in the box after being shown that it could “magically” destroy objects when a magic word was uttered. This behavior, the reluctance to utter a magic word or allow the experimenter to place a valued object (one’s driver’s license) into the “magical box,” has been interpreted by Subbotsky as

indicating that magical thinking never is completely driven out of the human mind. This conclusion is supported by many adult’s justification expressing credulity regarding the existence of magical processes in the world following experimental manipulation.

Subbotsky’s view on magical thinking and its development is shared to a large extent by Woolley and her colleagues (Woolley, 1997; Woolley, Browne, & Boerger, 2006), who suggest that magical thinking remains abundant in today’s culture in the minds of both children and adults. She and her colleagues have argued that certain factors influence the dominance of both magical thoughts and beliefs, including the particular context and social cost of either believing or not believing. They have also found that children with a greater fantasy orientation are more likely to adopt a belief in a novel fantasy entity (the Candy Witch; Woolly, Boerger, & Markman, 2004). One implication of these results is that both context, especially the current social situation, and particular individual differences, may influence the occurrence of different forms of magical thinking. Thus, one should perhaps not think of magical thinking as a general orientation toward the world, as Piaget thought, but as a type of thought that varies in likelihood as a function of age, as well as individual and situational factors.

An Integrated Account of the Development of Magical Thinking

Our own view is that magical thinking arises out of a number of universal cognitive processes. This view is not all that different than Zusne and Jones’ (1989, p. 250) view that magical thinking stems from the nature of the human cognitive architecture and thus is a universal cognitive process. In particular, they have suggested that magical thinking arises from the misattribution of causal factors to a particular event when in fact the attributed causes play no role in the actual event. They also think that magical thinking stems from a universal cognitive process that involves what they refer to as the “reification of the subjective.” This idea is tied historically to notions of magic that place a large emphasis on symbolic thought. The notion is that the ability to experience subjective experiences arises from symbolic thought, which in turn enables an individual to think of oneself as separate and distinct from the world. It is this separate sense of self that is thought to open up the realm of reality to extend the self out into the world in dreams, spirits, or transformed bodies. Zusne and Jones suggest that magical thinking involves endowing the subjective self with the

properties of the objective world. This is what they mean by *reification of subjective*. They suggest that this reification may be expressed by the use of magic spells, incantations, wishing for desired outcomes, or beliefs that different forms of energy can emanate from the human mind.

Our own view of the development of magical thinking draws on some of these ideas, but places less emphasis on misattributions and the role of symbolism. We also extend Zusne and Jones' (1989) ideas by providing greater detail about the cognitive process that may underlie the emergence and maintenance of magical thinking.

SEARCH FOR CAUSALITY

One particularly important cognitive process involved in magical thinking is the human mind's tendency to causally link events close in time and proximity even when the events are clearly random. This tendency has been documented in numerous research investigations tracing back to the work of Michotte (1962), who showed that adults treat white dots moving around a projection screen as causally influencing one another. This notion that children and adults search for and assign causality in numerous domains and situations is a central assumption of the theory-theory approach to cognitive development (Gopnik & Wellman, 1994; Wellman & Gelman, 1992). We suggest that this innate drive to search for and assign causal links to events is one of the key processes involved in the development and maintenance of magical thinking.

TENDENCY TO ESSENTIALIZE

A second universal cognitive process that we view as central to the development and maintenance of magical thinking is a basic tendency to essentialize. The concept of psychological essentialism is the notion that individuals treat objects and entities in the world as if they have an underlying core nature or "essence" that determines the properties and characteristics of that object or entity (Medin & Ortony, 1989). Essentialism appears to play a key role in a number of aspects of magical thinking. Specifically, it can be seen as playing the pivotal role in the magical principles of similarity and contagion discussed earlier. With respect to the principle of similarity, similar objects are perceived to share some underlying essence that creates a magical connection between them. In the case of the contagion principle, the idea is that the essence of an individual or disease gets transferred when an object, such as a sweater of deceased individual, is

passed on to another person. Gelman (2003) has argued that the tendency to essentialize the world is likely a universal aspect of human cognition.

ROLE OF CAUSALITY AND ESSENTIALISM IN MAGICAL THINKING

We suggest that these two processes, the search for causality and the tendency to essentialize, are present in early infancy and are maintained throughout life. This is one reason why stereotypes are difficult to override or eliminate, even with extensive knowledge and training. We also suggest that these basic human tendencies to search for causality and to essentialize are at the core of sympathetic magic and the belief that our mere presence influenced the streetlight to go off or why we feel disgust at the thought of the wearing Hitler's sweater, even after frequent washing.

THE ROLE OF KNOWLEDGE

These two processes, the search for causality and the tendency to essentialize, are not by themselves sufficient for the development of magical thinking. We suggest that a third process is also instrumental in the development of magical thinking, that of knowledge acquisition. This is another process that is clearly present from birth. Indeed, infants are particularly good at absorbing knowledge. The knowledge acquired in infancy and beyond, coupled with the drive to make causal linkages, and the tendency to essentialize, enables the infant, child, or adult to categorize events into distinct domains. It is the formation of the foundational domains of physics, psychology, and biology, which enable the child and adult to reason rationally about the world of inanimate objects, psychological entities, and biological things (Wellman & Gelman, 1992). But as children acquire new knowledge, they sometimes miscategorize entities and events. Children may treat nonliving things as alive or treat nonsentient beings or entities as motivated by thoughts, desires, and intentions. These are the classic Piagetian examples of magical thinking in young children. We, however, suggest that they should be classified as such, if and only if the children recognize that categorizing nonliving entities as living ones and nonsentient entities as sentient ones violates the nature of the everyday world. If they do not, then we argue that these are no more than examples of individuals who lack specific knowledge failing to categorize correctly or misattributing an entity to the wrong causal foundational domain. Similarly, if children misattribute life properties, thoughts, and

or feelings to nonbiological or psychological entities we shouldn't label them as thinking magically. To gain the label of magical thinking, children must know something about the physical, biological, and psychological worlds and treat events as somehow transcending the rules of normal physics, psychology, or biology.

With age and experience, children acquire greater knowledge of the physical, natural, and psychological worlds and become keenly aware of perceived violations. These violations may arise at the boundaries—where misattributing animacy may have some survival value (Guthrie, 1993), from the interaction of the processes discussed in the preceding section (causality, essentialism), or from the observation of strange (an insect that looks like a stick) or wonderful (a rainbow) events that appear to defy everyday reasoning.

CULTURAL SUPPORT FOR MAGICAL THINKING

An additional process involved in the development and maintenance of magical thinking involves cultural support for an alternative belief system that transcends everyday reasoning in the foundational domains. For children growing up in the dominant culture in the United States, cultural support for a variety of magical beliefs is quite common. Parents actively support beliefs in magic and magical entities (Rosengren & Hickling, 1994; Rosengren, Hickling, Kalish, & Gelman, 1994), and young preschool children appear surprisingly open to the acquisition of new magical characters, such as the Candy Witch (Woolley, Boerger, & Markman, 2004). Research by Rosengren et al. (Rosengren & Hickling, 1994; Rosengren et al., 1994) has shown that in the United States, middle class parents tend to actively support beliefs in magic in children younger than five. Once children enter formal schooling, the family and cultural support for magic declines and parents either turn back the child's questions regarding magic (e.g., "What do you think, is magic real?" Rosengren & Hickling, 2000) or begin to actively deny the existence of magic in the real world (e.g., "There is no such thing as real magic, it's just a trick.").

The period of greatest cultural support for magical beliefs, ages three to five or six in the United States, occurs at the same time children are acquiring a lot of new information about the world. Before age three, children often lack the knowledge of what is and is not possible in the real world. This is one reason why professional magicians generally do not like to perform in front of children under the age of three and why children under the age of the three can

be convinced that a machine can physically shrink objects or even an entire room (DeLoache, Miller, & Rosengren, 1997). The work by Rosengren and Hickling (2000) suggests that as children gain more knowledge about the physical world they begin to distinguish particular events that violate their expectations of how things normally function. Parents, teachers, or other adults often label these events as "magic," leading to the emergence of a special category of "magic" somewhere around the age of three. Support for magic by parents and the larger culture coupled with increasing developments in the realm of the imagination help this magical category grow and become more well defined. For this reason, there appears to be a peak in the magical beliefs of children between the ages of three and six. Even in children of this age range, however, magical thinking is neither ubiquitous nor the dominant form of cognitive interaction with the world, as Piaget had thought. Rather, research suggests that in most situations children's default form of reasoning is based on natural and physical causality that conforms to what is normally considered possible and typical in the world. It is only when children's everyday causal expectations are violated or cultural support is provided, that magical thinking prevails (Rosengren & Hickling, 1994, 2000).

For most children in the mainstream culture of the United States, belief in magic changes into the understanding that what appears to be magic is brought about by tricks and deception (Rosengren & Hickling, 2000; Woolley, 1994). But as both Subbotsky and Woolley suggest, magical thinking does not appear to be extinguished, even if magical entities such as magicians, Santa Claus, and the Tooth Fairy are demoted from the realm of reality to the realm of pretense and the imagination. Rather, the magical principles of similarity and contagion coupled with the search for causality (even when there is no causal link) and the tendency to essentialize maintain a certain level of magical thinking in older children and adults. We suggest that this later type of magical thinking is present throughout the life span, lurking under the surface in even the most rational of minds. Magical thinking can be brought back to the surface in a variety of different ways (Subbotsky, 2010).

Magical Thinking and Its Relation to Other Cognitive Processes

In this section we explore how magical thinking relates to other forms of cognition, including pretense and the imagination. We also briefly explore

the role of magical thinking in creativity. We then examine possible links between magical thinking and religious thought. Finally, we explore possible links between magical thinking in adulthood to superstitious beliefs and psychopathology.

Magic, Pretense, and the Imagination

How does magical thinking relate to pretense and the imagination? There are a number of similarities between these different cognitive processes. In particular, each of these processes tends to open up the realm of what is possible. In magical thinking, impossible causal connections or mechanisms are thought to be possible. In pretense, one object is symbolically transformed into another. In the imagination, reality may be extended in a myriad of ways beyond the physical, biological, or psychological world. Each of these processes appears to emerge in the minds of children around the same time, although pretense and imagination may predate the emergence of a clear conceptualization of magic. Each of these processes also likely stems from some of the other cognitive processes discussed earlier, as well as alongside the emergence of symbolic thought (see chapter 12).

We suggest that these different cognitive processes serve to mutually support and enhance one another. For most children, the boundaries between the real and pretend or the real and imagined are well defined. For example, by age two, children appear to be able to distinguish a pretend entity from a real one (Leslie, 1987). By age three, there is evidence that children can distinguish real from imagined (Wellman & Estes, 1986). Leslie has suggested that children serve to cordon off pretense from reality, enabling them to reason about the pretend and real world separately with few misattributions from pretense into reality. It appears that the same occurs in the realms of the imagination and magic. That is, children appear to cordon off magical events from typical ones, just as they appear to cordon off pretense from reality, and the imagined from the real. What is different from magical thinking is that for children between the ages of about three and six (in the United States and likely in some other cultures), magical causes are a part of reality (although they are not typical). That is, with magic, certain events are treated as distinct, separate, or special, and are included in the realm of what is possible, just not what is typical.

Magical Thinking and Creativity

Throughout the life span it is likely that magical thinking serves to foster imagination and creativity.

Subbotsky (2010) suggests that “ancient forms of the magical thinking live on in dreams and imagination,” and he suggests that magical thinking plays a central role in the creativity that is present in literature, the arts, and movies. Indeed, he views magical thinking as opening up the realm of what is possible, and by doing so magical thinking serves to stimulate and foster creativity. Recently, he tested this idea by presenting children with scenes of magic from movies and examining whether children exposed to magical ideas in movies express greater creativity than children who observed non-magical scenes from the same movies. This research appears to support the idea that magical thinking may serve to increase creativity, but more research is needed in this area. At issue here is whether it is actually magical thinking that stimulates creativity or whether it is imagination involving some magical elements that actually fosters creativity. The general idea is that considering alternative forms of causality may enable individuals to broaden the perspective and hence respond on a given task in a more creative manner.

Magical Thinking and Religion

Many psychologists and anthropologists include religious thoughts and beliefs in the realm of magical thinking (see chapter 3). Indeed, a wide range of scholars has examined the relation between magic and religion across a variety of disciplines (i.e., Boyer, 1994; Kieckhefer, 1989; Neusner, Ferichs, & Flesner, 1989; Sorensen, 2007).

Clearly, belief in the existence of God, angels, and miracles fits the definition of magical thinking outlined in a previous section. Neusner et al. point out that the term *magic*, as used in the context of religion, is often meant in a pejorative sense, in which it is used to label the religious leaders of some other group “magicians.” Similarly, many psychologists and scientists more generally treat religion as a form of magical thinking, suggesting that to embrace religious beliefs is irrational, illogical, and nonscientific. Here we briefly review a number of different views on the relation between magic and religion.

SIMILARITIES BETWEEN RELIGIOUS AND MAGICAL THINKING

Boyer and Walker (2000) have suggested that magic and religion share similar fundamental ontologies. They suggest that these two forms of thinking may start out as one single form. With age and experience, undifferentiated magical beliefs separate

into, on the one hand, institutionalized magical beliefs in the form of various religions, and on the other hand, a set of noninstitutionalized magical beliefs. The institutionalized beliefs include notions of God and other spiritual beings and particular rituals and practices that are believed by the practitioners to have sacred values and certain causal powers to bring about some sort of meaningful change (i.e., heal a sick child). The central role of some sort of deity and the role of sacred values appear to provide a distinct form of causality that serves to further differentiate religious thinking from magical thinking.

A similar argument to that of Boyer and Walker (2006) has been made by Woolley (2000), who has described parallels between making a wish and praying. Both making a wish and praying involve mental processes, often accompanied by language that is generally performed so as to bring about some sort of meaningful change. Both of these processes also involve belief in some sort of alternative form of causality. Research by Woolley and her colleagues (Woolley & Phelps, 2001; Woolley, Phelps, Davis, & Mandell, 1999) suggests that these two processes become differentiated some time between the ages of four and eight years of age, with a tendency with increasing age for children to restrict the efficacy of wishes to stories but to show an increasing belief in the efficacy of prayer.

Like magical thinking, the emergence of religious thoughts and beliefs are also substantially influenced by cultural support. Many religious concepts are highly abstract and embedded in rich knowledge frameworks that provide an elaborate symbolic context for religious experiences. For this reason, many religious concepts and ideas may be acquired at a later developmental point than those related to magic and potentially continue to increase past the time many magical beliefs become suppressed. For example, Harris and Giménez (2005) have found the belief in the afterlife increases between the ages of seven and eleven. This is a time when few children in the United States would endorse the existence of real magic in the natural world.

DIFFERENTIATING MAGICAL AND RELIGIOUS THINKING

Other support for differentiating magical thinking from religious thinking comes from the work on testimony. Harris and Koenig (2006; see chapter 3) argue that children are quite sensitive to variations in the consistency, coherence, and plausibility of others' testimony. They also suggest that testimony

is particularly useful for learning about things that are generally unobservable. Because of the institutionalization of religion, children are likely to view religious thought and beliefs as relatively consistent and coherent. This is particularly true in the United States, where the vast majority of the culture expresses belief in God and tends to practice some form of organized religion (Evans, 2000; Gallup, 2009; Poling & Evans, 2004). In contrast, magical beliefs and thinking are likely to be more idiosyncratic and less coherent in most individuals in this same culture because of lack of widespread cultural support for magic except during particular times in early childhood. Thus, we suggest that at least in the mainstream culture in the United States, magical and religious thinking could be viewed as relatively distinct. However, there is also considerable overlap between these concepts. For example, Sorensen (2007) has suggested that although magic is involved in most religious rituals, religion covers a much wider range of human behavior than magic. It is also likely that nature of this overlap is highly dependent on the culture and religion that is being examined.

Magical Thinking and Other Forms of Thought and Behavior

SUPERSTITION

One area in which magical thinking remains strong in adults is superstition. According to Zusne and Jones (1989), to act superstitiously is to "momentarily become a small magician." Like the term *magical thinking*, *superstition* has been variously defined, often with a pejorative connotation (Lindeman & Aarnio, 2007; Vyse, 1997). Lindeman and Aarnio (2007) argue that superstitious, magical, and paranormal beliefs should all be viewed as category mistakes in which the core attributes of foundational theories (physics, biology, and psychology; Wellman & Gelman, 1992) are confused with one another. In their view, the way to distinguish these particular category mistakes arises from the confusion of core knowledge. We argue for the same reasons that we used for magical thinking that category mistakes by themselves should not be categorized as magic unless they are accompanied by a belief in some alternative form of causality. That is, we view superstitions as one form of magical thinking in which individuals hold beliefs, either idiosyncratic or cultural, that certain actions or behaviors will influence the outcome of some event by some sort of supernatural means.

Superstitious behavior can be readily observed in many situations. For example, in many athletic events, especially those in which highly skilled performance can be viewed as only slightly better than chance, athletes engage in a variety of superstitious behaviors (Vyse, 1997). Often athletes will only wear certain clothes on a game day, refuse to wash certain items of clothing during a particular streak of good performance, or perform rituals before a game or particular event within a game. All of these behaviors are done with the notion that they might potentially influence the outcome. Each of these behaviors involves a number of characteristics we have described with respect to magical thinking. First, they often involve aspects of similarity and contagion. Either individuals perform a ritual that in some way connects them to a higher power (e.g., a batter performing the sign of the cross before stepping up to the plate in a baseball game) or they preserve the “essence” of their recent good performance by refusing to wash a particular garment until the winning streak is broken. These behaviors also perpetuate the belief that some alternative form of causality might influence the outcome of the event.

Superstitious reasoning is not reserved for sporting events, but appears to be quite common in the everyday lives of children and adults. Children may avoid cracks on the sidewalks for fear of influencing their mother’s health, avoid black cats because they might bring bad luck, or carry lucky charms to help them in particular situations. Many of these behaviors share an important aspect of cultural transmission that we suggest is a key process in the emergence of magical thinking more generally. But other superstitious behaviors seem highly idiosyncratic (Vyse, 1997), suggesting that many of these behaviors and practices stem from the unconscious cognitive processes involved in magical thinking more generally. For example, we recently encountered a student who insisted on taking every exam with a particular pen that he used to take notes in class and he used as he studied for the exam. It was as if the pen carried the essence of the information from learning and studying into the exam. Idiosyncratic superstitions are also likely to occur when incomplete meanings of rituals are passed down from parents and adults within a culture to children.

Researchers have also shown that individuals engage in superstitious behaviors under conditions of high stress and/or uncertainty and low levels of perceived control (Keinan, 1994; Malinowski, 1954; Whitson, & Gallinsky, 2008). Superstitions are thought to regulate stress and uncertainty and

provide a general feeling of control in chaotic or unpredictable situations (Keinan, 2002; Schippers & Van Lange, 2006; Womack, 1992). Subbotsky (personal communication) has argued that these same conditions foster magical thinking more generally. There is some indication that in particular task situations, superstitious behavior may actually benefit performance. For example, Buhrman and Zaugg (1981) found that in competitive basketball, the teams that perform the best exhibit more superstitious behaviors than less competitive teams. Likewise, superior players on those superior teams also exhibit greater superstitious behaviors than their teammates. Although routine, ritual movements before performance does appear to improve overall levels of motor performance in tasks such as a basketball free throw (Lobmeyer & Wasserman, 1986), superstitious behaviors are thought to provide added benefits through their magical connection (Damisch, Stoberock, & Mussweiler, 2010).

Damisch et al. have shown that activation of superstitions related to luck (e.g., providing someone with a “lucky” golf ball or having a personal good luck charm present) improves success at a putting task, a motor dexterity task, and a memory task. These researchers suggest that superstitious behaviors lead to an increase in perceived self-efficacy, which in turn leads to greater persistence in the task. Although these results are intriguing, this research was generally conducted with individuals who hold relatively strong superstitious beliefs. For individuals who profess not to be superstitious, activation of these types of beliefs might serve to decrease the overall levels of performance. This suggests that examining the role of implicit and explicit superstitious beliefs might be an interesting area of further investigation. It also suggests that it might be interesting to determine whether magical thinking in general leads to performance benefits in situations in which magical thinking might enhance the perception of control.

Magical Thinking and Peculiar Beliefs

Magical thinking and superstition have also been linked with peculiar thoughts and beliefs in adults more generally (Berenbaum, Boden, & Baker, 2009; Boden & Berenbaum, 2004). Peculiar beliefs have been defined as those beliefs that the established scientific community do not view to be veridical (Berenbaum, Kerns, & Raghavan, 2000). Generally, paranormal beliefs fit within this category.

As with many beliefs, a spectrum of intensity exists. In one form, peculiar beliefs can result in

paranormal beliefs, such as belief in ghosts, the existence of extra terrestrials, alien abductions, and ESP. Like magical thinking, these beliefs are not consistent with current empirical observations in the world—and are thought to be unscientific. However, although some of these beliefs and thoughts can be viewed as magical, in our view others do not meet the criteria for magical thinking. That is, we suggest that certain paranormal beliefs typically associated with parapsychology, such as psychokinesis and ESP, are substantially different from magical beliefs in that individuals who hold these particular beliefs often think that these phenomena do exist in the natural world, and believe that they can be explained by some natural explanation. For example, believers in the notion that individuals can move or alter objects with their minds (psychokinesis) or read others' thoughts (ESP) often suggest that these behaviors stem from a highly evolved mind, rather than some supernatural form of causality. Interestingly, psychologists are the least likely to advocate the reality of these extraordinary powers (Zusne & Jones, 1989), and tend to treat them in a pejorative fashion. Likewise, many individuals who advocate the existence of aliens or report alien abductions do not treat these events as supernatural, but within the realm of possibility based on the idea that because humans evolved on this planet, other beings might have evolved in a different form on other distant planets.

The notion that scientific investigation could one day show that individuals have greater mental powers than has been assumed or that aliens exist extend the normal views of mental and biological processes, but they do not necessarily embrace the same type of belief in an alternative form of causality that we suggest is at the heart of magical thinking. Indeed, although the majority of evidence does not support the existence of either psi (anomalous processes of information or energy transfer) or aliens, researchers continue to use the scientific method to investigate their possible existence in psychology (Bem & Honorton, 1994) and in the Search for Extraterrestrial Intelligence (SETI) project in astronomy (Tarter, 2001).

Magical Thinking and Psychopathology

In more extreme forms, magical and peculiar beliefs may be labeled as delusional (Berenbaum, 1996) and have been linked to various forms of pathology (Eckblad & Chapman, 1983). But even in less extreme forms, these beliefs, including belief in such things as ghosts, good luck charms, and

ESP, have been linked to a variety of forms of psychopathology (American Psychiatric Association, 2000). For example, magical thinking in the form of thought–action fusion has been related to anxiety disorders and obsessive–compulsive disorders (Berle & Starcevic, 2005; Muris, Meesters, Rassin, Merckelbach, & Campbell, 2001). Thought–action fusion is a cognitive distortion that results in the belief that certain negative events are brought about by intrusive thoughts (Rachman & Shafran, 1999). These researchers report on one young woman who was afraid that her unwanted thoughts about her parents dying could cause a car accident through magical “vibes” (p. 82). Other researchers have found that individuals with an excessive focus on weight and body shape sometimes hold similar magical beliefs about food (Garner & Bemis, 1992).

Magical thinking has also been associated with schizophrenia (Claridge & Broks, 1984; Hewitt & Claridge, 1989; Lee, Cogle, & Telch, 2005). Claridge and Broks (1984) found magical thinking to be one of three primary factors resulting from a factor analysis of the Schizotypal Personality Scale along with factors related to paranoid ideation and unusual perceptual experiences. Similar results have been found by other researchers looking at adults (Joseph & Peters, 1995; Wolfradt & Straube, 1998), although some researchers have identified additional factors (Rawlings, Claridge, & Freeman, 2001).

The majority of research examining magical thinking and psychopathology has been conducted with adults. One of the few studies to examine this relationship in children and adolescents was conducted by Bolton, Dearsley, Madronal-Luque, and Baron-Cohen (2002). They used the a Magical Thinking Questionnaire adapted from an earlier questionnaire designed to assess thought–action fusion (Muris, Meesters, Rassin, Merckelbach, & Campbell, 2001) and found that in children and adolescents' obsessive–compulsive thoughts and actions were associated with magical thinking. These researchers found that this relation did not change from childhood to adolescence, suggesting that there may be continuity from childhood to adulthood in magical thinking, at least in populations diagnosed with a psychological disorder.

Clearly, the research indicates that certain forms of psychopathology appear to involve magical thinking to some extent. However, this conclusion must be tempered a bit, as magical thinking is often part of the diagnostic criteria for determining the existence of a particular disorder. In addition, the

AQ:
There is a mismatch in the reference "Garner & Bemis, 1982". The date is 1992 in the citation where as in the list it is 1982. Kindly check.

scales used to assess magical thinking and particular disorders often assess a wide range of peculiar beliefs, all treated as magical, as they are considered non-veridical and inconsistent with subcultural norms. However, we suggest that some of the beliefs assessed are not necessarily magical (e.g., beliefs in ESP, feelings of unexplainable senses of danger). Finally, it is not at all clear how the magical thinking of children, psychologically healthy adults, and individuals with particular psychological disorders are related. On the surface they share similar qualities, yet they clearly differ under the surface. The issue is whether they differ on a continuum, similar to peculiar beliefs in general, or whether they are categorically different.

Conclusion

The Future of Magical Thinking

Much of the research and scholarship investigating magical thinking in general, and superstitious beliefs more specifically, has been conducted under the assumption that these types of thoughts and beliefs were caused by errors in thinking, potentially brought about by failures in education or psychopathology. At least with psychologically healthy children and adults, the notion has been that by providing them with expanded access to science and mathematics education, magical thinking and beliefs eventually would be eliminated. This appears to be an overly optimistic view. At present, magical thinking appears to be just as prevalent today as in times past. The specific manifestations of magical thinking and particular beliefs common in different cultures may have shifted over time, but the fact that magical thinking still exists in the minds of both children and adults cannot be refuted.

Our own view is that magical thinking is here to stay because it stems to a large extent from our cognitive architecture. This cognitive architecture leads us to search for causality, even when no actual causal link between a behavior and an outcome exists. It also leads us to essentialize, making us susceptible to the sympathetic magic of contagion and similarity. These cognitive processes coupled with the acquisition of a special category of magic, one that includes objects and events that violate our causal expectations about how the world normally works, serve to nurture magical thinking in young children and then maintain it over the course of our lives. These processes bias initial reactions to particular phenomena, ones that violate the norm and likely increase under times of stress or high emotional investment. Some individuals may work hard at

driving out irrational thoughts and behaviors, but even the most rational of individuals might think twice about buying a house where someone has been murdered or experience some “irrational” feelings if told that the sweater they had just been asked to put on was formerly owned by a notorious criminal. At best, we can be aware of our tendency to think magically and use reason to counteract the influence of these cognitive biases.

Future Directions

Research on magical thinking has waxed and waned over the years. Before the late 1970s research on magical thinking was an active area of research by anthropologists and psychologists. In the late 1970s to the 1990s there appeared to be little interest in this area of research in either discipline, although interest remained strong among clinical psychologists interested in particular psychological disorders. Since that time there has been a renewed interest among both cognitive developmentalists in psychology and anthropologists interested in the role of ritual in various cultures in the study of magical thinking. This renewed interest has opened up new avenues of research and spotlighted areas that need further investigation.

One of the most interesting directions for future research would be to examine how magical thinking in children relates to various forms of adult thought in both psychologically healthy individuals and those with particular psychological disorders. Specifically, it would be useful to explore more carefully how magical thinking in childhood relates to alternative or strange beliefs in adulthood and the emergence of different forms of pathology. This research direction would involve investigating the source and nature of individual differences in magical thinking in young children and tracking continuity and change in magical thinking over developmental time. At present, cross-sectional studies have shed some light on the developmental time course of magical thinking, but have failed to provide much information about continuity of magical thinking in some individuals.

Relatedly, it would be important to determine if the magical thinking of children relates on a continuum with that of psychologically healthy adults and individuals with particular disorders or whether the nature of magical thinking in these populations is categorically different. One of the challenges of pursuing this issue involves developing better measures of magical thinking that are based on stronger theoretical grounds. A related challenge would be for researchers focusing on these different populations

to agree on how magical thinking should be defined. As we have suggested, magic as a pejorative label for individuals who think “differently” should be avoided and the belief in some form of alternative form of causality outside the domain of scientific inquiry should be central to this definition. We hope our definition of magical thinking prevails because it removes the pejorative aspect of the magical label and more clearly defines what should or should not be characterized as magical. Our definition also serves to redefine magic as situated in the particular beliefs of a culture. As more and more research shows that cognition is highly influenced by culture (e.g., Nisbett, 2003) it is even more important to clarify the definition of magical thinking.

Clearly, culture influences the beliefs that are considered to be natural and supernatural. Thus, what may be magical thought in one culture may not in fact be magical in another. Being sensitive to cultural differences, rather than labeling these differences as magical in the pejorative sense, will help us to understand more clearly how and when magical thinking might aid or hinder performance in a given task or situation. Thus, an additional direction for future work would be to explore cultural variation in magical thinking. We suggest that it would be fruitful to reopen this area of research with a goal of understanding how culture shapes cognition in important ways and explicitly explore the social transmission of aspects of magical thinking.

Another interesting direction for future research would be to explore the relation between magical and other forms of thinking. In particular, magical and scientific thinking are often thought of as incompatible. Recent research suggests that different types of explanation (magical, religious, scientific) can be used to reason about the same phenomena (Evans, Legare, & Rosengren, 2011). This use of multiple explanations appears to be evident in the thinking about illness (Legare & Gelman, 2008), the origins of life (Evans, 2000), and death (Harris & Giménez, 2005; Rosengren, Miller, Gutierrez, Chow, Schein, & Anderson, in preparation). What is not at all clear is how children and adults choose a particular form of explanation in a given situation, and under what conditions these different types of explanations are combined to form some kind of blended or synthetic explanation.

Finally, the role of magical thinking in supporting creativity and imagination should be investigated more fully. Does thinking magically enable individuals to be more creative? If so, what best ways to stimulate this connection? Are there other

potential benefits to thinking magically? Like the magical thought involved in superstition, does magical thinking sometimes enhance performance? And are there individuals or situations in which thinking magically leads to decreases in performance? Does too much stimulation of magical thinking lead to strange beliefs that negatively affect one’s ability to function in the real world?

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