

Exploring the Relationship between Magical Thought, Scientific Thought, and Religiosity: A Pilot Test

Futoshi Kobayashi

本研究の目的は各人の魔法的思考(非科学的思考)、科学的思考、そして信仰の度合いの相関関係を調査することである。本研究では、米国中西部在住の132名のアメリカ人大学生被験者の年齢、性別、信仰の度合い、そして三種の日常的な状況と三種の生死を賭けた究極の状況下で彼らがどのような行動をとるかに関する意見がデータとして採取された。結果として魔法的思考(非科学的思考)は科学的思考よりも生死を賭けた究極の状況下で現れやすい反面、科学的思考は魔法的思考(非科学的思考)よりも日常的な状況下で現れやすい事実が確認された。また、信仰の度合いは魔法的思考(非科学的思考)と正に相関したが、科学的思考との関連性は発見されなかった。さらに本研究の限界と未来に行い得る次なる研究の方向性も検討された。

The purpose of this pilot study was to explore the relationship between magical thought, scientific thought, and one's degree of religiosity. Participants were 132 American undergraduate college students in the Midwest, who provided information pertaining to their age, gender, religiosity, and their open-ended responses to three ultimate situations and three normal situations. The results indicated that magical thoughts were more likely to appear in the ultimate situations than scientific thoughts, whereas scientific thoughts were more likely to appear in the normal situations than magical thoughts. Also, religiosity was positively correlated to one's magical thought but not correlated to scientific thought. The limitations of this study and possible future research directions were discussed.

Galileo Galilei (1564-1642) published the *Dialogue Concerning the Two Chief World Systems* in order to compare the heliocentric system of Copernicus and the geocentric system of Aristotle and Ptolemy. Because of this publication, he was condemned by the Pope and spent the rest of his life under house arrest. Although Galileo lost politically, he still believed that the heliocentric system of Copernicus was the correct model to explain the movements of heavenly bodies (James, 2004). The case of Galileo is used in scientific literature as the ultimate example of the tyranny of religion over science (Edelman, 1992; Moy, 2003; Shermer, 2003).

Since the time of Galileo, the general public often assumes that science and religion are antagonistic rivals when it comes to explaining the nature of the universe. However, many early scientists tried to understand the universe as God's creation; this motivation facilitated scientific inquiry (Myers, 2005). Johannes Kepler (1571-1630) thought that God's created universe was always working towards perfect harmony and order, thus leading him to his precise calculations (James, 2004). Although religion encourages magical thought (e.g., prayer), religion has not always discouraged scientists from conducting scientific and logical inquiries through history.

Today, several prominent scientists use an evolutionary perspective in order to explain religion (Atran & Norenzayan, 2004; Boyer, 2001; Click, 1992; Dawkins,

1989, 1998; Kirkpatrick, 1999, Pinker, 1997; Shermer, 1997, 2003). Although their approaches are different from each other, these scientists agree that evolution created the basic framework of the human mind, which then allowed for the conception of supernatural worlds and agents. Each culture then determined the specifics of different religions. In other words, human religions were created by both evolution and culture.

Dawkins (1998) assumed that in order to increase their survival rate, children acquired, through evolution, the ability to believe what they hear. For example: If a child did not believe when a parent told him or her "This mushroom is poisonous" and ate it, the child may not have survived. Humans also evolved to find patterns in their surroundings to increase their survival rate. If a person found a relationship between a certain substance and sickness, the person avoided that particular substance in the future. Dawkins (1998) used B.F. Skinner's experiment in order to explain how religion might have emerged in human life. Skinner (1948) created superstitious behavior in pigeons by using a specific reinforcement schedule. In his experiment, Skinner gave pigeons food according to a fixed interval of reinforcement schedule so the pigeons' actions had no relationship with the food delivery. But, he found that each pigeon started to exhibit a unique behavior (e.g., shook its head to the left suddenly) just before the delivery of the food. Skinner guessed the unique behavior was superstitious behavior because the pigeons seemed to assume that the behavior would cause the food delivery. Indeed, later research also found that similar fixed interval reinforcement schedules could produce superstitious behavior in seven out of twelve preschool children (Wagner & Morris, 1987) and in three out of twenty undergraduate college students (Ono, 1987). In a similar vein, gambling addicts also exhibit their own unique behaviors before gambling. Some gamblers talk to the slot machines, others fondle or hit the machines (Dawkins, 1998). A farmer offering a sacrifice to a god in return for rain is using the same kind of thinking (Dawkins, 1998).

Whenever we encounter a coincidence in two things or events, we tend to infer a causal relationship between the two. In modern times, we are faced with a tremendous amount of information (Dawkins, 1998). Because we hear about and experience numerous cases of coincidence in our own and other people's lives, we tend to think there is some supernatural explanation for each coincidence (i.e., magical thought). Like Dawkins, Shermer (1997, 2003) also assumed that humans evolved to seek patterns in their surroundings in order to increase their survival rates. The same thought process that finds patterns in the surroundings may have also created magical thought. Humans have a strong urge to find patterns anywhere and not all two incidents have a causal relationship (Shermer, 1997, 2003). Magical thought is defined in this study as cognition that assumes a causal relationship between two incidents, even though there is no such relationship. Magical thought might have emerged as a by-product of evolution.

In addition, cognitive psychologists recently proposed the possible existence of two independent cognitive systems (Evans & Over, 1999; Sloman, 1996). Sloman (1996) proposed that humans have two forms of reasoning: the automatic associative system that is based on personal experience; and the rule-based system that is based on clear logic. Evans and Over (1999) also proposed two systems in thinking: System 1 that is unconscious, automatic, early evolved, pragmatic, and implicit thinking; and System 2 that is conscious, later evolved, logical, and explicit thinking.

In a classic anthropological study, Malinowski (1925/1954) studied people in northeast Melanesia and found that their superstitious behavior appeared whenever

the Melanesians faced uncertainty and danger. Superstitious behavior was not observed whenever Melanesians handled situations that were safe and could be understood by rules. In this study, scientific thought is defined as cognition that follows a rational logic based on known rules and data.

Layng (2003) claimed that both magical and scientific thought are still used in contemporary American life, for example the use of prayer and modern surgery for critical illness. Pinker (1997) also claimed that:

“Religion is a desperate measure that people resort to when the stakes are high and they have exhausted usual techniques for the causation of success - medicines, strategies, courtship, and in the case of weather, nothing” (p.556).

In summary, magical thought is more likely to appear in cognition than scientific thought in order to solve the problems that cannot be solved by known rules and data. However, scientific thought is more likely to appear in cognition than magical thought in order to solve the problems that can be solved by known rules and data. The present study tested such claims using three vignettes each presenting an ultimate situation question (i.e., a problem that cannot be solved by known rules and data) and another three vignettes each presenting a normal situation question (i.e., a problem that can be solved by known rules and data). In addition, the relationship between religiosity and these two kinds of thought was also investigated by using a valid religiosity measure by Rohrbaugh and Jessor (1975). The present study had several different hypotheses listed below:

1. The sum of the magical thought score from three ultimate situation questions would be higher than the sum of the scientific thought score from three ultimate situation questions.
2. The sum of the scientific thought score from three normal situation questions would be higher than the sum of the magical thought score from three normal situation questions.
3. The sum of the scientific thought score from three normal situation questions would be higher than that from three ultimate situation questions.
4. The sum of the magical thought score from three ultimate situation questions would be higher than that from three normal situation questions.
5. There would be a positive correlation between one's religiosity score and the sum of magical thought score.
6. There would be no correlation between one's religiosity score and the sum of scientific thought score.

Method

Participants

The participants were 132 American undergraduate college students (88 females and 44 males) from a small University in the Midwest. The average age of these students was 20.9 (SD = 4.21) years, ranging from 17 to 45.

Materials

The Magical and Scientific Thoughts Measure. The author first wrote up four normal situations and four ultimate situations in order to elicit scientific thought and magical thought respectively. These situations were used to make a survey. A native English speaker revised these eight situation vignettes into more conventional American scenes. Then, two adults answered the survey and indicated

the expected results. After submission to the Institutional Review Board (IRB), the IRB recommended the removal of two questions among these eight situation vignettes because these two were too realistic and might have been psychologically harmful to some participants. The author followed the recommendation and deleted the two questions. The final version asked the participant's age and gender and what the participant would do in facing the six different real-life situation vignettes. In the final version, there were three vignettes presenting an ultimate situation question and another three vignettes presenting a normal situation question. Each vignette question was scored with both a scientific thought score and a magical thought score. Whenever scientific thought appeared, it was encoded as 1 in the scientific thought score. If it did not appear, it was encoded as 0 in the scientific thought score. The same method was applied to the magical thought score calculation.

The Religiosity Measure. Rohrbach and Jessor (1975) created the eight items to measure four different dimensions of religiosity (ritual, consequential, ideological, and experiential) and each item was scored from 0 (least religious) to 4 (most religious). The sum of each item indicates one's religiosity that ranges from 0 to 32. The higher the score becomes, the more religious a person is. This scale has well established reliability and validity (Hill & Wood, 1999).

Procedure

After receiving approval from the IRB, the author asked his Psychology 101 class and classes that were taught by other instructors for volunteers to participate in the present study. Extra credit was given to the research participants as an incentive. After reading and signing the informed consent, each participant answered the two measurements.

Manipulation Check

According to the intention of the author, three vignettes presenting an ultimate situation question (i.e., a problem that cannot be solved by known rules and data) were supposed to elicit magical thought more frequently than scientific thought and another three vignettes presenting a normal situation question (i.e., a problem that can be solved by known rules and data) were supposed to elicit scientific thought more frequently than magical thought.

As seen in the appendix, Question 3, 5, and 7 were designed to be ultimate situation questions and Questions 4, 6, and 8 were designed to be normal situation questions. Regarding Question 3, frequency of magical thought ($M = .54$) was significantly higher than that of scientific thought ($M = .09$, $t(128) = 8.149$, $p < .0001$). Regarding Question 5, frequency of magical thought ($M = .54$) was significantly higher than that of scientific thought ($M = .19$, $t(130) = 5.647$, $p < .0001$). Regarding Question 7, frequency of magical thought ($M = .62$) was significantly higher than scientific thought ($M = .33$, $t(129) = 4.391$, $p < .0001$). Thus, the expected results were found in all three ultimate situation questions. The expected results were also found in all normal situation questions. Regarding Question 4, frequency of scientific thought ($M = .97$) was significantly higher than that of magical thought ($M = .02$, $t(131) = 42.392$, $p < .0001$). Regarding Question 6, frequency of scientific thought ($M = .92$) was significantly higher than that of magical thought ($M = .15$, $t(130) = 18.375$, $p < .0001$). Regarding Question 8, frequency of scientific thought ($M = .88$) was significantly higher than that of magical thought ($M = .04$, $t(129) = 23.955$, $p < .0001$). Therefore, all six questions indicated the expected results.

Results

Regarding hypothesis 1, the sum of the magical thought scores from the three ultimate situation questions ($M = 1.70$) was found to be higher than the sum of scientific thought score from three ultimate situation questions ($M = .61$, $t(126) = 8.427$, $p < .0001$). This indicates that magical thoughts were more likely to appear than scientific thoughts in these three ultimate situations.

Regarding hypothesis 2, the sum of the scientific thought scores from three normal situation questions ($M = 2.78$) was found to be higher than the sum of magical thought scores from three normal situation questions ($M = .21$, $t(129) = 32.645$, $p < .0001$). This indicates that scientific thoughts were more likely to appear than magical thoughts in these three normal situations.

Regarding hypothesis 3, the sum of the scientific thought scores from three normal situation questions ($M = 2.78$) was found to be higher than that from three ultimate situation questions ($M = .61$, $t(126) = 28.632$, $p < .0001$). This indicates that scientific thoughts were more likely to appear in these three normal situations than those in these three ultimate situations.

Regarding hypothesis 4, the sum of the magical thought scores from three ultimate situation questions ($M = 1.69$) was found to be higher than that from three normal situation questions ($M = .20$, $t(126) = 16.243$, $p < .0001$). This indicates that magical thoughts were more likely to appear in these three ultimate situations than those in these three normal situations.

Regarding hypothesis 5, a positive correlation was found between the religiosity score and the magical thought score ($r = .394$, $p < .01$).

Regarding hypothesis 6, no correlation was found between the religiosity score and the scientific thought score ($r = -.055$, $p = .539$).

Discussion

Based on the clearly supported first four hypotheses, American college students tend to think scientifically in normal situations but also tend to think magically in ultimate situations. It means that contemporary American college students produce both scientific and magical thoughts based on the nature of the problem. The participants in this pilot study were more likely to think scientifically than magically in normal situations, but when they faced ultimate situations, they produced more magical thoughts than scientific thoughts. In addition, religiosity and magical thought were positively correlated but scientific thought was not correlated to religiosity. From these results, it is possible to hypothesize that the same person can have either magical or scientific thoughts depending on the nature of the problem. Although highly religious people tend to have more magical thoughts, highly religious people can also have highly scientific thoughts. Future researchers can investigate both scientific and magical thoughts as independent thought processes, using a more neuroscientific approach. For example, it may be possible to conduct fMRI scans on subjects who are conducting scientific or magical thoughts in the future to see which parts of the brains are activated for either magical or scientific thought. Theoretically, the evolutionary perspective of religion assumes that culture plays an important role in shaping human religious thoughts. The United States is known as a very religious country compared to other countries. For future research, similar studies could be conducted in different countries which are considered less religious.

There are several limitations in this pilot study. First, this study investigated only three normal and three ultimate situations. In the future, a larger variety of

normal and ultimate situations should be used. Second, this study used a convenience sample and contained many more female subjects (66.7%) than male subjects (33.3%). In the future, a random sample that contains a similar number of female and male subjects should be used. Third, the sample size ($n = 132$) was small, thus it is assumed to be a pilot study. A larger study should be conducted in the future. Fourth, the current magical and scientific thoughts measure can be revised from the responses of this study in order to have better outcomes. Fifth, the author coded the answers to either scientific or magical in this study. Multiple evaluators, who are unaware of the hypotheses, should score each vignette in future research.

Although this pilot study clearly has limitations, it has suggested that both magical and scientific thoughts are part of normal human cognition because they appeared differently depending on the nature of the problem. Thus, these thoughts might occur independently of each other.

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Appendix

The Magical and Scientific Thoughts Measure

Please print clearly when you answer the questions below.
There are 8 different questions.

Question 1. Please circle your gender.

1. Woman
2. Man

Question 2. Please write down your current age.

() years-old

Question 3.

Your finances seem hopeless right now. The Power Ball jackpot is up to 15 million dollars. You decide to spend one of your very last dollars on a ticket. What do you do to increase your chances of winning?

Question 4.

You decided to attend your 20 year high school reunion. In order to look a bit more like you did 20 years ago, you decide to lose a few pounds. What do you do?

Question 5.

While on vacation with several of your friends, you all decide to go hiking. The weather suddenly turns ugly and you become separated. Back at the trail head, you are at first relieved to see that your friends have made it back safely, but quickly

realize that one of them is still missing. She is an experienced hiker, so you fear that she hasn't made it back because she has been injured. The temperature is dropping and your friend is only wearing shorts and a T-shirt. As the rescue team prepares for a search, the rain changes to snow. If your friend is not found soon she will freeze to death. As the temperature continues to drop, and snow continues to fall, you must wait at the rescue station for news of your friend. What do you do?

Question 6.

Your three year old son hates to go shopping, but you took him to the mall anyway. He has, of course, wandered off again. You don't see him nearby, and he doesn't answer when you call. What do you do?

Question 7.

Your plane is malfunctioning. There is no engine noise anymore, the oxygen masks are down, and it is falling rapidly. All around you people are screaming and crying. You look at the emergency exit door, but you don't know if opening it will help or make the situation worse and anyway, by the time you open it the plane will have hit the ground. What do you do?

Question 8.

You want to fly to visit your family in New York for Thanksgiving. You need to get the lowest round trip air fair possible as your funds are a little tight right now, but you also know that this is the busiest travel time of the year. What do you do?

~ That's all. Thank you very much for your cooperation. ~