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# Sophisticated credulity: Are old beliefs disguised by new terminology and selective learning?

Matthew A. Ramsey

*University of New Hampshire, Durham*

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SOPHISTICATED CREDULITY: ARE OLD BELIEFS DISGUISED BY NEW  
TERMINOLOGY AND SELECTIVE LEARNING?

BY

MATTHEW A. RAMSEY

BS, Dickinson State University, 2005

MA, University of New Hampshire, 2007

DISSERTATION

Submitted to the University of New Hampshire

in Partial Fulfillment of

the Requirements for the Degree of

Doctor of Philosophy

in

Social Psychology

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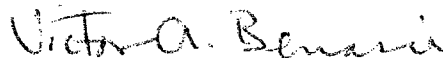
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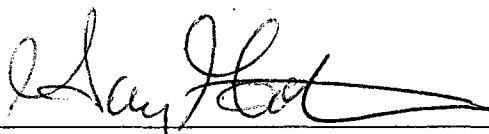
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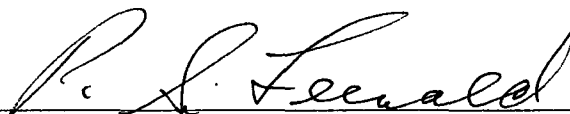
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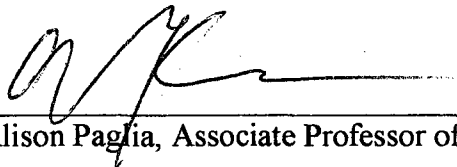
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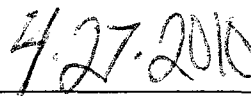
\_\_\_\_\_  
Gary Goldstein, Associate Professor of Psychology



\_\_\_\_\_  
Peter Fernald, Professor of Psychology



\_\_\_\_\_  
Alison Paglia, Associate Professor of Psychology



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Date

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## ABSTRACT

SOPHISTICATED CREDULITY: ARE OLD BELIEFS DISGUISED BY NEW  
TERMINOLOGY AND SELECTIVE LEARNING?

By

Matthew A. Ramsey

University of New Hampshire, May, 2010

The present research attempted to distinguish between traditional anomalistic belief (TAP) and pseudoscientific anomalistic belief (PSAP). In Study 1, I constructed the PSAP scale and then, to establish construct validity, examined its correlation to other measures related to TAP. In Studies 2 and 3, I examined how high and low TAP and PSAP believers differed in recalling information that either did, or did not support the existence of anomalistic phenomena. Participants read 12 abstracts on paranormal phenomena and were given T/F recall questions either immediately (Study 2) or following a four day delay period (Study 3). As expected, high and low PSAP believers had generally similar recall accuracy. However, the results for high and low TAP believers showed differences that were largely inconsistent with past research. In Study 4, I constructed a regard for science scale which was negatively associated with TAP belief, but not associated with PSAP belief. Changes to the methodology and proposals for future research are discussed.

## CHAPTER I

### ANOMALISTIC PHENOMENA

According to French (1992), no one factor underlies every aspect of paranormal phenomena. That is, belief in ghosts, big foot, extrasensory phenomena (ESP), and superstitions such as avoiding black cats (to name but a few examples) have varied antecedents (e.g., personal experiences, deficiencies in probabilistic judgments). Clearly, the belief that mental communication between two individuals is possible is quite different from the belief that felines of a particular color portend bad luck. Yet, at a fundamental level, both ideas are magical in nature and violate certain basic limiting principles which are defined as self-evident or established by scientific consensus (e.g., an effect cannot precede its cause) (Broad, 1953).

Zusne and Jones (1989) attempted to solve the seemingly intractable problem of grouping, on the one hand, very similar but, on the other hand, very different phenomena by terming all phenomena which seem to deal with the paranormal, supernatural, occult, and superstition as “anomalous” (p. 2). Essentially, anomalous phenomena are that which, if real, violate current scientific consensus (Wiseman & Watt, 2006). By defining such phenomena in this way, the possibility of reclassifying phenomena previously labeled as anomalous is contingent upon new scientific discoveries. This definition will suffice for the present paper, and terms such as occult, superstition, magic, and

paranormal should all be understood as describing a system of thinking that can be succinctly classified as anomalistic.

For decades researchers have reported that, despite increases in scientific education, belief in anomalistic phenomena is pervasive and on the rise (Coll & Taylor, 2004; Cromer, 1993; Martin, 1994; Russell & Jones, 1980; Shermer, 2003). The literature suggests that such widespread belief is present in the United States as well as Great Britain and other parts of the world (Auton, Pope & Seeger, 2003; “Belief in Pseudoscience,” 2002; Benassi, Singer & Reynolds, 1980; Gallup & Newport, 1991; Haraldsson, 1985; Jaroff, 1995; Newport & Strausberg, 2001; Sparks & Miller, 2001; Saenko, 2005). Indeed, the rise in popularity of cryptozoology (the study of creatures such as the Loch Ness monster, Sasquatch, etc.), psi phenomena (telepathy, ESP, clairvoyance), unidentified flying objects (UFOs), and the healing power of crystals (to name but a few) strongly suggests that, despite all of our scientific achievements, we are living in a superstitious age (Yates & Chandler, 2000).

The conflict between scientific and anomalistic modes of thinking is largely predicated on the concept of causality. In the former mode, events can only be influenced by observable and testable antecedents via observable and testable causal action. In the latter mode, however, supposed causality does not operate via methods that are supported by modern scientific evidence. For example, throwing salt over one’s shoulder is thought by some to portend good luck. There is cause (throwing salt) and effect (good luck) but no rationally supported mechanism relates the two. Further, there is a lack of a reliable association between salt throwing and luck. What goes up must always come down (due to observable and reliable gravitational forces on earth). However, even the most

superstitious among us would probably not claim that salt is always a reliable harbinger of good fortune.

### **How Are Anomalistic Beliefs Perpetuated?**

How, despite the current level of scientific understanding, is this general propensity to believe in unfounded claims (this credulity) perpetuated? Research indicates that many peoples' anomalistic beliefs come from the media and personal experiences (see Singer & Benassi 1981). As of this writing, a brief glance at the programming schedule of several major television networks (ABC, NBC, CBS and FOX) reveals over a half-dozen shows that regularly involve telekinesis, clairvoyance, mind-reading, levitation, demons, ghosts, cryptozoology, time-travel, aliens, magic and generally bad, or misrepresented, science (see also Frutkin, 2008; Sparks & Miller, 2001). However, one may question whether the anomalistic beliefs of adults are influenced by programs that are meant solely for entertainment purposes. Singer and Benassi (1981) asked participants to identify the sources of their anomalistic beliefs and, perhaps surprisingly, some individuals listed "scientific media." When questioned further, publications such as *National Enquirer* and *Reader's Digest* and "documentaries" such as the pro-occult *In Search of...* (a weekly television series which aired from 1976 to 1982), were cited as credible scientific sources. Today, Discovery Channel, a supposedly informative and reputable network, airs programs like *Ghost Lab* and *A Haunting*, the latter claiming to "[chronical] the terrifying true stories of the paranormal..." (Discovery Channel, 2009). Perhaps surprisingly, even the Animal Planet channel has programming dedicated to the realm of the paranormal and its relation to animals (Animal Planet, 2010). Although it would be difficult to argue that a single half-

hour sci-fi drama could strongly influence skeptical adults, the media's generally uncritical view of the occult may serve to perpetuate belief (Sparks & Miller, 2001).

However anomalistic beliefs come about, they are pervasive and persistent. Benassi, Singer, and Reynolds (1980) sought to evaluate the effect of prior belief on the witnessing of a performer described as an amateur psychic, a magician, or a magician who would be performing tricks that only gave him the *appearance* of being a genuine psychic. This latter condition was so worded in order to strongly bias viewers against the possibility that the performer had authentic powers. In Experiment 1, after viewing the performance participants were asked whether they thought the performer was genuinely psychic. Although the researchers checked to insure that the participants understood the difference between the word "magic" (a term suggesting mere stage trickery) and "psychic" (a term suggesting authentic paranormal powers), in all conditions a majority believed him to be authentically psychic and only 14% of participants in the psychic condition believed that he was not authentic. In Experiment 2, participants read a detailed description of the performer's demonstration and 59% reported that he was likely to be psychic. Participants were further asked if nonpsychic magicians could do the same feats as the performer and the majority agreed that they could (two participants denied that magicians could produce the same feats). They were then asked to estimate how many of those who performed these same feats were not authentic. Participants reported that the vast majority were likely to not be authentic. Finally, they were asked to reevaluate the performance and report whether they still believed that the individual was psychic. Despite the acknowledgement that nonpsychics could perform the same demonstrations with trickery and despite the acknowledgement that the vast majority of those claiming

psychic ability were likely to be fakes, 52% of participants persisted in their belief that the man was an authentic psychic (Benassi et al., 1980).

Individuals seem to be able to easily switch between anomalistic belief and rational thought depending on whether control can be achieved through conventional means or not (Singer & Benassi, 1981). For example, astrological beliefs increased in the years of the Depression in the US (Sales, 1973) and the practice of water dowsing is more prevalent in places where water is hard to find (Vogt & Hyman, 1959). The argument that uncertainty is a fertile breeding ground for superstition and occult belief is entirely consistent with the current economic crisis and the concurrent rise in visits to psychics (NBC.com, 2009; Singel, 2008).

Although the media endorses uncritical acceptance of paranormal phenomena, Singer and Benassi (1981) argued that centers of education should include the study of the paranormal in their curriculum in order to teach students to evaluate critically such claims. There seem to be barriers to addressing this need, however, as some scientists and educators may feel it beneath them to address the claims of occult proponents. Others may be worried that teaching students about the paranormal may, in fact, cause an increase in belief and further exacerbate the problem. Martin (1994) pointed out that this fear seems reminiscent of the opposition to the subject of communism being taught in schools which was based on the premise that students may have seen it as an endorsement of that system. In the early 1900s, research on anomalistic belief posited that increased instruction in the sciences would address what was seen as the natural consequence of a deficiency in education (Zusne & Jones, 1989). More recent research suggests that the proposed solution was somewhat naïve (Coll & Taylor, 2004; Saenko,

2005; Walker, Hoekstra, & Vogl, 2002; Zusne & Jones, 1989). In other words, for such beliefs to be effectively countered, the sentiment now seems to be that courses should be designed specifically to address them (e.g., Benassi & Goldstein, 2005; Jones & Zusne, 1981; Zapf, 1945).

### **Some Equivocal Findings**

When researchers discuss the “muddy waters” of paranormal belief and superstition they are referring to the fact that it is difficult to achieve consensus on the individual variables that constitute said belief (Irwin, 1993; Vyse, 1997). For example, some studies show gender differences (Gray, 1990; Williams, Francis & Robins, 2007), while others do not (Gray & Mill, 1990; Rogers, Davis & Fisk, 2009). Some might be inclined to think that people with deep religious beliefs also hold other paranormal or superstitious beliefs, but this is typically not the case. In fact, those endorsing fundamentalist beliefs (e.g., God and the devil exist, the miracles in the Bible actually happened) are less likely to report belief in typical psi phenomenon and this effect is even stronger in those who regularly attend church services (Aarnio & Lindeman, 2007; Bainbridge, 2004; Smith & Simmonds, 2006).

Deficiencies in human reasoning have been well documented (e.g., Allan & Jenkins, 1980; Ward & Jenkins, 1965; Kahneman & Tversky, 1973; Tversky & Kahneman, 1983) and a fundamental assumption concerning believers and skeptics is that they differ in cognitive functioning in general (Wiseman & Watt, 2006). Although researchers sometimes find that lower levels of superstition is associated with increasing levels of education (Messer & Griggs, 1989; Musch & Ehrenberg, 2002; Preece & Baxter, 2000), this is not always true (Coll & Taylor, 2004; Tart, Putoff & Targ, 1979;



Tobacyk, Miller, & Jones, 1984; Sparks, Hansen & Shaw, 1994; Vyse, 1997; Zusne & Jones, 1989). Sparks et al. (1994) found that among Purdue University students 70% believed in the existence of ghosts, 40% in the accuracy of palm reading, 37% in the accuracy of psychics, and 44% in the ability to occasionally use ESP, suggesting that even those with some college education are susceptible to anomalistic belief.

Although those with training in the humanities sometimes exhibit higher levels of anomalistic belief than those with training in the sciences (Otis & Alcock, 1982; Padgett, Benassi, & Singer, 1981), Coll and Taylor (2004) interviewed 18 scientists who were currently practicing a range of disciplines (physics, chemistry, geology, etc.) and asked them to indicate the extent to which they believed in things such as the ability for a broken mirrors to bring bad luck, the likelihood of aliens having visited our planet, and the reality of ghosts and ESP. Many were skeptical of what they considered to be “just superstitions” (p. 766; e.g., the number 13 is unlucky); however, the majority entertained the possibility of various phenomena such as aliens and ghosts, citing probability (i.e., the number of planets in our universe is such that it is likely that some have life) and personal experiences as reasons for their belief (see also McClenon, 1982).

Some studies have examined differences in academic performance and show variously that skeptics outperform believers (Messer & Griggs, 1989; Otis & Alcock, 1982; Pasachoff, Cohen, & Pasachoff, 1970), skeptics and believers perform equally (Thalbourne & Nofi, 1997), and that believers outperform skeptics (Emmons & Sobal, 1981; Haraldsson, 1985; Tobacyk, Miller, & Jones, 1984). Others have examined possible differences based on intelligence tests and have arrived at the same mixed results

(Jones, Russell, and Nickel 1977; Smith, Foster, & Stoven, 1998; Thalbourne & Nofi, 1997; Wiseman & Watt, 2002).

Perhaps a better way to assess the question of whether cognitive abilities are a distinguishing feature between skeptics and believers would be to examine how intelligence and training is applied to tests of critical thinking. Believers may be just as smart as skeptics, but may tend to use their intelligence in uncritical ways. Unfortunately, this work has also been inconclusive with some studies showing that disbelievers outperform believers (Alcock & Otis, 1980), whereas others have not replicated that finding (Royalty, 1995).

### **A Few Consistent Findings**

Despite the inconsistency of results across studies, there do seem to be some consistent findings. Anomalistic belief has been associated with individual differences in rationality/emotionality, tolerance for ambiguity, locus of control orientation, and depressive symptoms such that believers are higher in emotionality, less tolerant of ambiguity, exhibit an external locus of control orientation, and show more symptoms of depression (Aarnio & Lindeman, 2007; Lindeman & Aarnio, 2006; Groth-Marnat & Pegden, 1998). It could be that some individuals, who are otherwise intelligent and mentally healthy, hold certain paranormal beliefs that they explain by using pseudoscientific terminology—that is, terminology used in science and misapplied to phenomena generally agreed to be unfounded by rigorous scientific investigation (Coll & Taylor, 2004; Shermer, 2003; Tart, Puthoff & Targ, 1979; Wargo, 2008; Zusne & Jones, 1989). It may, in part, be this distinction that serves to “muddy the waters.” These individuals may possess a kind of sophisticated credulity—a belief that anomalistic

phenomena actually have causal (as opposed to magical) properties that science has yet to account for (Leeds & Murphy, 1980). Instead of professing belief in magic (an unsophisticated and outdated belief system), these believers may point to our continuing ignorance of the fundamental laws of nature (indeed, the nascent science of quantum mechanics is often cited) to support their claims which, objectively, are unsupported by scientific consensus (Tart, Putoff & Targ, 1979).

### **Pseudoscientific Belief**

Increasingly, breakthroughs in science seem like stories of magic and mysticism. For example, scientists have recently “teleported” data from one atom to another over a space of approximately one meter, without said data passing through any form of physical medium (LiveScience.com, 2009). Even scientific breakthroughs that are decades old are largely not understood by most people (e.g., how does electricity *actually* work?). In fact, French (1992) argued that although no convincing evidence in support of paranormal phenomena exists, there are no reasons why some such phenomena could not, in principle, occur. For the average person it might be difficult, and may even seem presumptuous, to distinguish between scientifically plausible and implausible ideas.

Little to no research has examined possible differences between these two types of believers (i.e., believers in traditional anomalistic phenomena [TAP] and believers in pseudoscientific anomalistic phenomena [PSAP]). Several scales measure belief in TAP, and no scales that measure belief in PSAP. In Study 1 I developed a scale that measured belief in PSAP. Next, to evaluate the validity of the scale, I examined whether believers in PSAP and TAP differ from each other in terms of other measures of personality. In Studies 2 and 3 I examined whether TAP and PSAP believers differ in their ability to

recall accurately information that either supports or does not support the existence of paranormal phenomena. Finally, in Study 4 I examined whether TAP and PSAP believers differ in their general support and enthusiasm of science.

## CHAPTER II

### STUDY 1

Consistent with past research (as cited above), I hypothesized that individuals with higher belief in TAP would be higher in emotionality (and lower in rationality), less tolerant of ambiguity, higher in belief in good luck, have an external locus of control, and have higher levels of depression relative to those with lower belief. However, I hypothesized that I would not find these relationships (or, such relationships would be attenuated) in individuals who are higher in PSAP belief. In other words, individuals who hold strong beliefs in PSAP may not show strong differences (on the measures previously mentioned) from those who are low believers. This may be because, although they share a belief in the paranormal with TAP believers, they take a fundamentally different (more rational) approach to such phenomena.

#### Method

##### Participants

Participants were 183 undergraduate psychology students (56 male, 126 female, one person did not indicate sex) enrolled in introductory psychology courses at a public

university in the northeastern United States participated in the study as part of a course requirement. The mean age of the participants was 19 ( $SD = 2$ ).

### Procedure

Participants completed an online survey consisting of several measures. Participants completed the same measures except that some ( $n = 89$ ) completed a shortened version of Tobacyk's (1988) Revised Paranormal Belief scale (RPB) [TAP condition] and others ( $n = 94$ ) completed a scale in which I reworded Tobacyk's items to include scientific terminology (e.g., I replaced "magic" with "energy") [PSAP condition]. Participants were randomly assigned to each of the groups. Appendix A contains all of the TAP items and Appendix B contains all of the PSAP items used in the present study.

### Measures

Paranormal belief was measured using either a shortened measure of the RPB or the measure in which I reworded the items. Each of these versions consists of 16-items and includes a 7-point rating scale (1 = *strongly disagree*, 7 = *strongly agree*). An example of the original RPB is: "Your mind or soul can leave your body and travel (astral projection)." An example of the reworded RPB is: "It is possible to focus your energy such that your consciousness can leave your body and travel."

Self-esteem was assessed with the Rosenberg Self-Esteem scale (RSE) (Rosenberg, 1965). This measure consists of 10-items and includes a 4-point rating scale (1 = *strongly disagree*, 4 = *strongly agree*). An example item is: "On the whole, I am satisfied with myself."

Depressive symptoms were assessed with the Center for Epidemiological Studies Depression Scale (CESD) (Radloff, 1977). This measure consists of 20-items that ask

about experiences that have occurred during the past week and includes a 4-point rating scale (0 = *rarely or none of the time*, 3 = *all of the time*). An example item is: “I was bothered by things that usually don't bother me.”

Analytical and intuitive thinking was assessed with the Rational-Experiential Inventory (REI) (Pacini & Epstein, 1999). This inventory consists of two 20-item scales, Rationality (Ratnl) and Experientiality (Exp), and includes a 5-point rating scale (1 = *strongly disagree*, 5 = *strongly agree*). Example items include: “I am much better at figuring things out logically than most people” (rational or analytical thinking) and “I often go by instincts when deciding on a course of action” (experiential or intuitive thinking).

Belief in luck was assessed with the Belief in Good Luck scale (BIGL) (Darke & Freedman, 1997). I used a shortened form of the original scale, dropping items that did not specifically mention the word luck. This shortened form consists of 10-items and includes a 6-point rating scale (1 = *strongly disagree*, 6 = *strongly agree*). An example item is: “I often feel like it's my lucky day.”

Tolerance for ambiguity was assessed with the scale of Tolerance-Intolerance of Ambiguity (TIA) (Budner, 1978). This measure consists of 16-items and uses a 7-point rating scale (1 = *strongly disagree*, 7 = *strongly agree*). An example item is: “An expert who doesn't come up with a definitive answer probably doesn't know too much.”

Locus of control was assessed with Levenson's Locus of Control scale (LLOC) (Levenson, 1973). Levenson's scale is made up of three subscales consisting of internality (Intrnl), chance (Chnce), and powerful others (Powful). Each subscale consists of 8-items and uses a 6-point rating scale (-3 = *disagree strongly*, +3 = *agree strongly*).

Example items include: “Whether or not I get to be a leader depends mostly on my ability” (internal), “Whether or not I get into a car accident is mostly a matter of luck” (chance), and “Getting what I want requires pleasing those people above me” (powerful others).

Participants were also asked about their level of education, age, ethnicity, gender, and GPA.

## Results

### Traditional Anomalistic Phenomena

I used the casewise diagnostics option under linear regression to identify outliers that were two standard deviations from the mean. After removing five participants, analyses were conducted for 84 participants. Belief in TAP was significantly correlated with CESD,  $r = .18, p = .05$ ; Ratnl,  $r = -.29, p = .004$ ; Exp,  $r = .25, p = .01$ ; Chnce,  $r = .18, p = .05$ . TAP had a Cronbach alpha of .80. Table 1 provides the full correlation matrix.

The overall multiple regression to predict TAP from BIGL, TIA, RSE, CESD, Ratnl, Exp, and the subscales of LLOC was statistically significant,  $F(9, 74) = 2.9, p = .005, R^2 = .26$ . When controlling for all other predictors, Ratnl significantly predicted TAP,  $t(74) = -2.39, p = .02, sr^2 = .06$ . In other words, individuals who scored highly on belief in TAP were more likely to be lower in rational thinking. Additionally, when controlling for all other predictors, Exp significantly predicted TAP,  $t(74) = 3.39, p = .001, sr^2 = .11$ . In other words, individuals who scored highly on belief in TAP were more likely to be higher in emotional thinking. Table 2 provides the individual betas and *SE* for each predictor.

### Pseudoscientific Paranormal Phenomena

I used the casewise diagnostics option under linear regression to identify outliers that were two standard deviations from the mean. After removing three participants, analyses were conducted for 91 participants. Belief in PSAP was significantly correlated with BIGL,  $r = .20, p = .03$ ; Exp,  $r = .34, p = .001$ , and the chance subscale of LLOC,  $r = .41, p < .001$ . PSAP was marginally correlated with TIA,  $r = .16, p = .06$ . PSAP had a Cronbach alpha of .80. Table 1 provides the full correlation matrix.

The overall multiple regression to predict PSAP from BIGL, TIA, RSE, CESD, Ratnl, Exp, and the subscales of LLOC (chance, internal, powerful others) was significant,  $F(9, 81) = 5.17, p < .001, R^2 = .37$ . When controlling for all other predictor variables, TIA significantly predicted PSAP,  $t(81) = 2.36, p = .02, sr^2 = .04$ . That is, higher tolerance for ambiguity was associated with higher levels of PSAP belief. When controlling for all other predictor variables, Exp significantly predicted PSAP,  $t(81) = 2.60, p = .01, sr^2 = .05$ . That is, higher levels of experientiality (relying on one's instincts) were associated with higher levels of PSAP belief. When controlling for all other predictor variables, the chance subscale of LLOC significantly predicted PSAP,  $t(81) = 3.55, p = .001, sr^2 = .10$ , which suggests that higher levels of the belief that one's life is largely governed by chance (and not by oneself) were associated with higher levels of PSAP belief. Finally, when controlling for all other predictor variables, Intrnl marginally predicted PSAP,  $t(81) = 1.90, p = .06, sr^2 = .03$ . In other words, a more internal locus of control orientation was marginally associated with higher levels of PSAP belief. Table 2 provides the individual betas and *SE* for each predictor.

### Discussion



Consistent with past research, higher belief in TAP was correlated with higher depressive symptoms, lower rationality, and higher experientiality (Aarnio & Lindeman, 2007; French, 1992; Rice, 2003; Wolfradt, Oubaid, Straube, Bischoff & Mischo, 1999; Vyse, 1997). Also, consistent with past research (see Vyse, 1997), the rest of the picture was not as straightforward. I did not find relationships between higher belief in TAP and higher belief in luck, lower tolerance for ambiguity and a generally external locus of control. Further, although present, the distinction between TAP and PSAP belief is somewhat unclear. As predicted, higher belief in PSAP was related to higher tolerance of ambiguity. Belief in PSAP was not correlated with rational thinking, thus further distinguishing itself from TAP belief (which was negatively correlated with rational thinking). However, my hypothesis would have been better supported if PSAP was positively correlated with rationality. Finally, higher belief in PSAP was related to higher belief in chance and higher reliance on “gut feelings” (experientiality) relative to those with lower PSAP belief. Both of these findings were contrary to my hypotheses.

Clearly, TAP and PSAP beliefs share similarities in that they are both concerned with anomalistic belief and, considering the dearth of evidence supporting the existence of such phenomena, it may not be surprising that both sets of believers are higher in their general reliance on “gut feelings” relative to low believers. The fact that TAP believers are significantly more likely to be low in rationality whereas PSAP believers are not may point to a fundamental difference between those two belief sets. I suspect that believers in TAP and PSAP have arrived at their respective beliefs via different routes (e.g., selective learning). If this is the case, they may exhibit differences in recall accuracy when given a memory task concerning anomalistic phenomena.

## CHAPTER III

### STUDY 2

The selective learning hypothesis suggests that one can continue to hold on to a particular belief in the face of disconfirming information if one simply disregards said information (Jones & Russell, 1980). The effect that prior beliefs and attitudes have on information retention has been examined in the context of pro- and anti-Communist sentiments (Levine & Murphy, 1943), racial segregation issues (Jones & Aneshansel, 1956; Jones & Kohler, 1958), pleasantness of particular words (Laird, 1923), controversial gender issues (Alper & Korchin, 1952) and more recently, paranormal phenomena (Jones & Russell, 1980; Russell & Jones, 1980; Wiseman & Morris, 1995). The literature regarding this more recent focus suggests differential information retention (i.e., selective learning) in those high in paranormal belief compared with those low in paranormal belief (Jones & Russell, 1980; Russell & Jones, 1980; Wiseman & Morris, 1995).

Russell and Jones (1980) identified participants as either high or low believers in paranormal phenomena and randomly assigned them to read an abstract that either did or did not support the existence of ESP. After reading the abstract, participants rated their levels of anxiety, hostility and depression and then completed a 15-item recall test. Accurate recall was negatively correlated with a high degree of paranormal belief when the abstract did not support the existence of ESP. In other words, individuals who were

identified as believers were less likely to be accurate than those identified as skeptics. Indeed, half of the believers reversed the author's conclusion that ESP was not supported. The authors argued that this result suggested a selective learning effect. Further, although both believers and skeptics reported experiencing emotional distress when exposed to counter-attitudinal information, this effect was particularly strong in believers. In a follow-up study, Jones and Russell (1980) sought to extend their findings by "directly measuring responses to belief-discrepant and belief-consistent demonstration[s] of ESP" (p. 309). Participants who were either high or low in paranormal belief saw a live demonstration where an experimenter attempted to guess which card was being held by his assistant. The demonstration either supported the existence of ESP (the psychic had a 60% accuracy rate) or did not support the existence of ESP (the psychic had a 20%, or chance, accuracy rate). When the demonstration was rigged to support ESP both skeptics and believers reported that ESP had occurred. However, when the demonstration was rigged to not support ESP some believers reported that ESP occurred whereas skeptics did not. This difference occurred even though participants were explicitly informed that a 20% accuracy rate should not be regarded as evidence of ESP.

Participants were then asked to guess the outcome of the cards (taking on the role previously held by the experimenter) and report, on a 7-point scale, their supposed personal level of ESP (i.e., their rate of success). Jones and Russell (1980) failed to find a significant occurrence of ESP in either believers or skeptics. However, analyses indicated that for skeptics, card guessing performance and self-reported ESP ability ratings were significantly correlated (that is, skeptics' low performance in card guessing correlated with their low self-reported ESP ability ratings), whereas for believers, the correlation

was nonsignificant (that is, believers did not differ from skeptics in their low card guessing performance but they believed that they did well).

Clearly, there is a difference between believers and skeptics such that believers are unable or unwilling to report outcomes that are inconsistent with their previously held beliefs (e.g., that ESP failed to occur), whereas skeptics are. The question remains, at what level is the distortion? That is, do believers fail to encode and store discrepant information properly; do they encode such information properly but fail to retrieve it; or do they exhibit a bias in reporting? Wiseman and Morris (1995) conducted two studies designed to explore these questions.

In Experiment 1, believers and skeptics viewed a taped demonstration of a magician who preformed an ESP trick (cards were guessed from a deck) and a psychokinesis trick (a fork was bent by gently stroking it). After the demonstrations participants were asked eight recall questions consisting of relevant (“The cutlery was touched by the psychic before the fork demonstration began”) and irrelevant (“At the end of the demonstration, the psychic returned any unbent cutlery to the pile”) probes (p. 116). Once the recall period was complete, participants were explicitly told that the demonstrations were not authentic and were then asked to complete a second set of eight recall questions consisting of important and unimportant probes. Wiseman and Morris (1995) found that after the first round of recall questions, skeptics recalled significantly more important information than believers but that there was no significant differences between groups after the second round of recall questions.

Additionally, there was no difference between groups in recall of unimportant items after either round. This finding supports the hypothesis that believers properly

encode and store attitude-discrepant information but that their biases lead them to deem this information as unimportant. The author's argued that believers and skeptics assign different levels of importance to information and, in the absence of strongly disconfirming evidence, they show differential retrieval. As a result of the disclosure that the demonstrations were not authentic, believers improved in their recall to the extent that they were still able to recall correctly the important information (Wiseman & Morris, 1995). The authors argued that the ability to retrieve information that had been encoded, but labeled 'unimportant,' is limited by time. According to the authors (Experiment 2), in order to give information deemed unimportant a chance to decay, they asked participants to write down explanations of the tricks before giving them the recall questions. They report that this delay was enough to block believer's access to information that had previously been deemed unimportant. That is, during the first recall period, skeptics recalled more important information than did believers (this finding was consistent with Experiment 1) and after being told the demonstrations were not authentic, this difference in recall persisted. These findings were consistent with Greenwald and Sakumura (1967) who predicted that learning and retention of attitude-relevant information will occur only when the information is consistent with the previously held attitude.

I hypothesize that, consistent with the findings of Russell and Jones (1980), higher belief in TAP will be associated with less accurate reporting when the abstract does not support the existence of paranormal phenomena (i.e., the information presented in the abstract is discrepant with the previously held attitude). Further, because I argue that individuals who possess higher belief in PSAP are more objective and rational than individuals who are higher in TAP belief, they will be accurate in reporting the outcome

of the abstract regardless of whether or not the information is discrepant with their previously held attitude. In other words, I expect to find a difference between TAP and PSAP believers such that those high in PSAP belief should have accuracy scores similar to low believers in TAP and PSAP.

## Method

### Participants

Participants were 78 undergraduate psychology students (9 male, 69 female) enrolled in introductory psychology courses at a public university in the northeastern United States. The mean age of participants was 19.2 ( $SD = 1.2$ ).

### Procedure and Measures

At Time 1, participants completed the same scales and demographic information described in Study 1. The only difference was that all participants completed both versions of the RPB. The order in which participants received either the TAP or PSAP measure was counterbalanced. Four days later (Time 2), participants read twelve bogus research abstracts that either did or did not support the existence of anomalistic phenomena (e.g., poltergeists, astrology, aliens) (cf. Russell & Jones, 1980). The abstracts are presented in Appendix C. Participants then answered several true/false questions about each abstract. The questions are presented in Appendix D. The critical question (dependent variable) required participants to indicate whether the abstract supported the existence of anomalistic phenomena (e.g., *Alien bodies were not removed for testing, thus disproving that there was paranormal activity*) whereas non-critical questions (filler items) asked about details given in each abstract (e.g., *The religious revival in Egryn, Wales occurred in 1905*). Abstracts were presented in two different

orders so that half of the participants read Abstract 1 to Abstract 12 sequentially (order one) and half read Abstract 12 to Abstract 1 sequentially (order two). Of the 12 abstracts, six supported the existence of anomalistic phenomena. For each order (one and two) I created two subsets (four subsets in total) in which I counterbalanced whether an abstract supported anomalistic activity so that, for example, half of the participants reading the Roswell account were told that alien bodies were removed for testing and half were told that there were no alien bodies. Finally, participants completed the dependent variables in the order that they read the abstracts. For each of the four subsets I counterbalanced whether the critical question was worded in the affirmative (e.g., *The authors concluded that there was support for the claim that ESP exists*) or in the negative (e.g., *The authors concluded that there was no support for the claim that ESP exists*). By using these methods it is possible to examine whether a bias exists such that individuals are more likely to answer in the affirmative regardless of what the abstract actually reported (see Wiseman & Morris, 1995).

#### Dependent Variables

There were four types of critical questions: 1) questions about abstracts that supported anomalistic phenomena in which the correct answer was “true,” [True Sup] 2) questions about abstracts that supported anomalistic phenomena in which the correct answer was “false,” [False Sup] 3) questions about abstracts that did not support anomalistic phenomena in which the correct answer was “true,” [True NoSup] and 4) questions about abstracts that did not support anomalistic phenomena in which the correct answer was “false” [False NoSup]. Each type of question appeared three times so that, for any given question type, a participant could get a maximum of three points.

## Results

The correlation between TAP and PSAP was  $r = .89, p < .001$ . The TAP and PSAP had Cronbach Alphas of .85 and .89, respectively.

I examined participants who fell in the lower (a score of 47 or lower) and upper (a score of 68 or higher) quartiles of TAP and the lower (a score of 48 or lower) and upper (a score of 68 or higher) quartiles of PSAP in order to obtain clearer differences between low and high believers.

### Traditional Anomalistic Phenomena

A mixed ANOVA examined the accuracy of participant responses on abstracts that either did or did not support the existence of anomalistic phenomena in which the correct answer was true [True Sup vs. True NoSup]. The repeated-measures factor was support/no support and the between-subjects factor was high/low belief. There were 19 low and 21 high believers. Boxplot analyses revealed no outliers. There was no main effect for type of support,  $F(1, 38) = .06, p = .81$ ; there was no main effect for level of belief,  $F(1, 38) = .2, p = .66$ . In addition, there was no interaction between type of support and level of belief,  $F(1, 38) = .39, p = .54$ . Table 3 provides means and standard deviations for the different groups of believers and their recall scores.

A mixed ANOVA examined the accuracy of participant responses on abstracts that either did or did not support the existence of anomalistic phenomena in which the correct answer was false [False Sup vs. False NoSup]. The repeated-measures factor was support/no support and the between-subjects factor was high/low belief. Boxplot analyses revealed three outliers. After removing these, there were 17 low and 20 high believers. There was no main effect for type of support,  $F(1, 35) = .98, p = .33$ ; there was no main



effect for level of belief,  $F(1, 35) = 1.9, p = .18$ . However, past research has suggested that high TAP believers would be more likely, relative to low believers, to report that anomalistic phenomena had been supported when it had not. Although not significant, the interaction was in the predicted direction,  $F(1, 35) = 2.16, p = .15$ . An independent-samples  $t$ -test revealed that, as predicted, there was no difference between low and high believers when the abstracts supported anomalistic phenomena,  $t(35) = .47, p = .64$ ; however, when abstracts did not support anomalistic phenomena, low believers were marginally more accurate relative to high believers,  $t(35) = 1.96, p = .06$ .

#### Pseudoscientific Paranormal Phenomena

A mixed ANOVA examined the accuracy of participant responses on abstracts that either did or did not support the existence of anomalistic phenomena in which the correct answer was true [True Sup vs. True NoSup]. The repeated-measures factor was support/no support and the between-subjects factor was high/low belief. There were 21 low and 20 high believers. Boxplot analyses revealed no outliers. There was no main effect of type of support,  $F(1, 39) = .00, p = .98$ ; there was a main effect of level of belief,  $F(1, 39) = 3.97, p = .05$ , partial  $\eta^2 = .09$ . Low believers outperformed believers under the no support condition,  $t(39) = 2.08, p = .04$ . In addition, there was no interaction between type of support and level of belief,  $F(1, 39) = .59, p = .45$ .

A mixed ANOVA examined the accuracy of participant responses on abstracts that either did or did not support the existence of anomalistic phenomena in which the correct answer was false [False Sup vs. False NoSup]. The repeated-measures factor was support/no support and the between-subjects factor was high/low belief. Boxplot analyses revealed three outliers. After removing these, there were 18 low and 20 high believers.

There was no main effect of type of support,  $F(1, 36) = 1.28, p = .27$ ; there was no main effect of level of belief,  $F(1, 36) = 2.18, p = .15$ . In addition, there was no interaction between type of support and level of belief,  $F(1, 36) = .62, p = .44$ .

### **Discussion**

Zusne and Jones (1989) identified several factors that influence the perseverance of anomalistic belief. Some examples include the influence of expectations, anomalous learning and misattributing extraordinary causes to ordinary events. The goal of Study 2 was to assess whether, in addition to these factors, selective learning may play a role (see also Jones & Russell, 1980; Russell & Jones, 1980; Wiseman & Morris, 1995). However, a ceiling effect appeared for all four critical question types making it difficult to interpret the data. That is, the highest point value one could achieve on the recall test for any given critical question type was three points. In all cases, mean scores never dropped below two points and in most cases, mean scores were much higher.

Consistent with past research, high and low believers in TAP did not perform differently when they read abstracts that supported the existence of anomalistic phenomena. Researchers have argued that believers do well on this type of task because the information provided by the abstract is congruent with their prior beliefs and low believers do well because, although the information is not congruent with their beliefs, they do not exhibit a bias in informational encoding and/or retrieval (Jones & Russell, 1980; Russell & Jones, 1980; Wiseman & Morris, 1995). I did not find a significant difference between high and low believers in TAP when the abstract did not support the existence of anomalistic phenomena and the correct answer was true. These findings contradict previous research and my hypothesis. However, when the abstract did not

support the existence of anomalistic phenomena and the correct answer was false, low believers tended to be more accurate than believers in TAP, though this result was only marginally significant.

I hypothesized that high and low believers in PSAP would not perform differently when reading abstracts that either did or did not support the existence of anomalistic phenomena. To that end, my hypothesis was partially supported. When the correct answer was false, there was no difference in performance between these two groups. However, when the correct answer was true, low believers outperformed high believers in PSAP regardless of whether the abstract did or did not support the existence of anomalistic phenomena. Although one could argue that low believers would have more accurate recall than PSAP believers when information does not support the existence of anomalistic phenomena (i.e., high PSAP believers may show similar biases as high TAP believers), there is no a priori reason to suspect that low believers would have more accurate recall (relative to PSAP believers) when the abstract supported the existence of anomalistic phenomena. Although I hypothesized that high PSAP believers would be more similar to low PSAP believers than to high TAP believers, a plausible alternative hypothesis is that high PSAP believers show a similar pattern to high TAP believers in that they are less accurate when it comes to abstracts that do not support the existence of anomalistic phenomena. Therefore, this result seems to be an aberration and should be interpreted cautiously.

In order to get a greater range of recall accuracy so as to assess any differences in selective learning between TAP and PSAP believers, in Study 3 I increased the time between reading and recall. With the increased length of time between reading and recall,

all participants should be less likely to score as accurately as they did in Study 2. I hypothesize that inaccuracies will be more likely to come from high TAP believers under conditions where the abstract does not support the existence of anomalistic phenomena.

## CHAPTER IV

### STUDY 3

Study 3 is a replication of Study 2 except that the time between abstract reading and question recall was increased by four days. As in Study 2, I hypothesized that higher belief in TAP would be associated with less accurate reporting when the abstract does not support the existence of anomalistic phenomena, and that belief in PSAP would be unrelated to reporting accuracy.

#### **Method**

##### **Participants**

Participants were 260 undergraduate psychology students (49 males, 209 females, 2 did not indicate gender) enrolled in introductory psychology courses at a public university in the northeastern United States. The mean age of participants was 18.8 ( $SD = 1.02$ ).

##### **Procedure and Measures**

The same procedures and measures that were used in Study 2 were used in this study with a few modifications. At Time 1, participants completed the same scales and demographic information described in Study 2. At that time they also read the 12

abstracts used in Study 2. However, the time between reading and recall was increased to four days (Time 2). At Time 2, participants were asked the same questions used in Study 2.

### Dependent variables

The same dependent variables used in Study 2 were used in this study except that I collapsed the abstracts from four (TrueSup, TrueNoSup, FalseSup, FalseNoSup) to two (Sup, NoSup) categories.

### Results

The correlation between TAP and PSAP was  $r = .88, p < .001$ . The TAP and PSAP scales had Cronbach Alphas of .84 and .86, respectively. Given that these two scales were highly correlated I used paired samples *t*-tests to create subscales. The TAP subscale was based only on those items for which means were significantly higher than the PSAP item counterpart, and vice versa. In addition, I dropped items that were explicitly religious in nature (e.g., mentioned God, the devil, heaven and hell) because of the lack of an analogous pseudoscientific explanation and because of past research indicating the difficulty of interpreting the religious/paranormal association. The final TAP was made up of the following items: “The soul continues to exist though the body may die,” “Your mind or soul can leave your body and travel (astral projection),” “Reincarnation does occur,” “Some psychics can accurately predict the future.” The final PSAP was made up of the following items: “By focusing the energy of their body, some individuals are able to levitate (lift) objects without physically touching them,” “Some animal that has been described as ‘The abominable snowman of Tibet’ exists,” “Planetary movements can influence humans and by carefully studying such movements, some

people can accurately predict the future,” “Some animal that has been described as ‘The Loch Ness monster of Scotland’ exists.” The final four-item TAP scale had a mean of 16 ( $SD = 4.88$ ) and the final four-item PSAP scale had a mean of 11.86 ( $SD = 4.8$ ). The correlation between these two scales was  $r = .46, p < .001$ . The TAP and PSAP scales had Cronbach Alphas of .66, and .67, respectively. Table 4 shows the full paired samples *t*-test analysis.

I examined participants who fell in the lower (a score of 12 or lower) and upper (a score of 18 or higher) quartiles of TAP and the lower (a score of 8 or lower) and upper (a score of 15 or higher) quartiles of PSAP in order to obtain clearer differences between low and high believers. (I also examined the continuous measures of TAP and PSAP and their relation to accuracy scores but the general pattern of results did not differ from the dichotomous method.)

#### Traditional Anomalistic Phenomena

A mixed ANOVA examined the accuracy of participant responses on abstracts that either did or did not support the existence of anomalistic phenomena [Sup vs. NoSup]. The repeated-measures factor was support/no support and the between-subjects factor was high/low belief. Boxplot analyses revealed no outliers. There were 51 low and 80 high believers. There was no main effect for type of support,  $F(1, 129) = 2.74, p = .10$ . There was no main effect for level of belief,  $F(1, 129) = 0.08, p = .78$ . There was a significant interaction between type of support and level of belief,  $F(1, 129) = 5.94, p = .012, \eta^2 = .044$ . When abstracts supported the existence of anomalistic phenomena, high TAP believers’ scores ( $M = 3.99, SD = 1.27$ ) tended to be higher than low believers’ ( $M = 3.59, SD = 1.25$ ),  $t(129) = -1.77, p = .08$ . When abstracts did not support the existence

of anomalistic phenomena, low believers' scores ( $M = 4.18, SD = 1.29$ ) tended to be higher than high believers' ( $M = 3.88, SD = 1.29$ ),  $t(129) = 1.30, p = .19$ .

### Pseudoscientific Paranormal Phenomena

A mixed ANOVA examined the accuracy of participant responses on abstracts that either did or did not support the existence of anomalistic phenomena [Sup vs. NoSup]. The repeated-measures factor was support/no support and the between-subjects factor was high/low belief. Boxplot analyses revealed three outliers and I removed them from the analysis. After removing these, there were 58 low and 70 high believers. There was a main effect for type of support,  $F(1, 126) = 3.99, p = .048, \eta^2 = .031$ . Participants were more accurate when abstracts did not support the existence of anomalistic phenomena ( $M = 3.91, SD = 1.37$ ) than when they did ( $M = 3.66, SD = 1.24$ ). There was no main effect for level of belief,  $F(1, 126) = .113, p = .74$ . There was a significant interaction between type of support and level of belief,  $F(1, 126) = 6.86, p = .01, \eta^2 = .052$ . When abstracts supported the existence of anomalistic phenomena, high PSAP believers' scores ( $M = 3.80, SD = 1.26$ ) tended to be higher than low believers' ( $M = 3.50, SD = 1.2$ ),  $t(126) = -1.37, p = .17$ . When abstracts did not support the existence of anomalistic phenomena, low believers' scores ( $M = 4.14, SD = 1.36$ ) tended to be higher than high believers' ( $M = 3.71, SD = 1.35$ ),  $t(126) = 1.76, p = .08$ . Table 5 provides means and standard deviations for the different groups of believers and their recall scores.

One of the issues with the TAP and PSAP measures was that participants could be low on both (skeptics), high on TAP and low on PSAP (believers in magic), high on PSAP and low on TAP (believers in pseudoscience), or high on TAP and PSAP (generally credulous people). By not removing those who are high on both scales it is

impossible to get a clear understanding of the pattern of results. Therefore, I removed all individuals who scored both in the top quartile of the TAP and PSAP scales (38 individuals) and reran the previously reported analyses.

#### Refined Traditional Anomalistic Phenomena

There were 51 low and 46 high believers. There was no main effect for type of support,  $F(1, 95) = 2.72, p = .10$ . There was no main effect for level of belief,  $F(1, 95) = .44, p = .51$ . There was a marginally significant interaction,  $F(1, 95) = 3.15, p = .08, \eta^2 = .032$ . When abstracts supported the existence of anomalistic phenomena high believers' scores ( $M = 4.02, SD = 1.24$ ) tended to be higher than low believers' ( $M = 3.59, SD = 1.25$ ),  $t(95) = -1.71, p = .09$ . When abstracts did not support the existence of anomalistic phenomena low TAP believers' scores ( $M = 4.18, SD = 1.29$ ) tended to be higher than high believers' ( $M = 4, SD = 1.3$ ),  $t(95) = .67, p = .51$ . Table 6 provides means and standard deviations for the different groups of believers and their recall scores for these refined analyses.

#### Refined Pseudoscientific Paranormal Phenomena

There were 58 low and 38 high believers. There was a main effect for type of support,  $F(1, 94) = 6.00, p = .02, \eta^2 = .06$ . Participants were more accurate when abstracts did not support the existence of anomalistic phenomena ( $M = 4.04, SD = 1.32$ ) than when they did ( $M = 3.58, SD = 1.19$ ). There was no main effect for level of belief,  $F(1, 94) = .007, p = .94$ . There was no interaction,  $F(1, 94) = 1.83, p = .18$ .

### Discussion

People continue to have high belief in anomalistic phenomena and, in Study 3, this was generally attributed to pseudoscientific belief. Table 7 provides descriptive



statistics for the question “To what extent do you believe in ‘paranormal phenomena’ (e.g., ESP, telekinesis)?” (Studies 1, 2, and 3).

By increasing the time between abstract reading and information recall to four days in Study 3, participants were, in general, not as accurate as participants in Study 2. Thus, the ceiling effect from the previous study was eliminated. However, this change in procedure did not lead to a full support of the hypotheses.

Individuals who were high in TAP belief had greater accuracy relative to low believers when abstracts supported the existence of anomalistic phenomena but this pattern was reversed when abstracts did not support anomalistic phenomena. This pattern held regardless of using the full or refined sample, although the interaction was weaker in the refined sample possibly due to a lower sample. This partially contradicts my findings from Study 2 and past research (Jones & Russell, 1980; Russell & Jones, 1980; Wiseman & Morris, 1995). In Study 2 (False Sup vs. False NoSup), I found that low believers were more accurate than high believers when abstracts did not support anomalistic phenomena; however, the two groups were equally accurate when abstracts supported anomalistic phenomena, a finding consistent with past research. However, high believers may be biased to remember abstracts as supportive when they were not and that bias may become stronger over time. If so, that would explain the findings of Study 3. The opposite finding would have been more difficult to explain (i.e., that high believers are more accurate relative to low believers under conditions of no support and low believers are more accurate relative to high believers under conditions of support).

The unrefined PSAP analysis showed similar results as the TAP analysis. That is, high believers were more accurate than low believers under conditions of support, and

low believers were more accurate than high believers under conditions of no support. One of the problems with creating a scale to distinguish pseudoscientific from traditional beliefs is that it is difficult to unambiguously frame a given anomalistic phenomena as scientifically, not magically, based. Clearly, the PSAP scale leaves room for a more magical interpretation by participants of the phenomena being mentioned than was intended. Thus, it is likely that the difference in accuracy scores between high and low PSAP believers was at least partially due to the fact that the high believers included some high believers in TAP. Indeed, when using a more refined analysis the interaction effect was not significant. Finally, participants, regardless of belief, were more accurate when abstracts did not support the existence of anomalistic phenomena relative to when they did. This result is not consistent with the research on traditional belief. However, it is consistent with the idea that high and low PSAP believers show similar memory biases.

## CHAPTER V

### STUDY 4

Researchers and educators have long been interested in the public's (especially students) attitudes toward science, mathematics, technology and engineering (Gokhale, Brauchle & Machina, 2009; Marshall, Blalock, Liu, Pruski, Toepperwein, Owen & Lichtenstein, 2007). It seems that the United States continues to lag behind several countries in the areas of science and math (Marshall et al., 2007). Further, although the demand for jobs in various scientific fields is projected to increase by 47% in the next

decade, the increase in labor force will be inadequate to meet that goal at the current rate (Gokhale, Brauchle & Machina, 2009). Many measures have been constructed to assess the links between attitudes about science, math, technology, and engineering and pursuing careers in those areas (Gogolin & Swartz, 1992; Gokhale, Brauchle & Machina, 2009; Marshall et al., 2007; Moore, 1973; Simpson & Troost, 1982). It follows that believers in TAP and PSAP take a different approach toward science given that these believers may explain anomalistic phenomena in either magical or scientific terms, respectively.

Differences between TAP and PSAP belief may exist in the form of enthusiasm for, trust in, and understanding of, sciences' concepts and practitioners. I hypothesize that high believers in PSAP have more positive attitudes towards science and scientists, are more involved with science (reading science articles, watching science programs), and are more likely to endorse science as the best method for studying anomalistic phenomena, relative to high believers in TAP. In order to test this, I first developed the Regard for Science Scale (RSS) and then examined the association between TAP and RSS and the association between PSAP and RSS.

## **Method**

### **Participants**

Participants were 203 undergraduate psychology students (46 male, 154 female, 3 did not indicate gender) enrolled in introductory psychology courses at a public university in the northeastern United States. The mean age of participants was 18.8 ( $SD = 1.05$ ). Participant data used in Study 4 were collected while running Study 3.

### **Procedure and Measures**

In addition to the measures described in Study 3, participants completed a survey that assessed their attitudes about science. The RSS was a 17-item measure with a 7-point rating scale (1 = *strongly disagree*, 7 = *strongly agree*). The RSS was scored so that higher ratings indicated more positive attitudes toward science. See Appendix C for all of the RSS items.

### **Results**

A pilot sample of  $n = 40$  participants was used to conduct a preliminary factor analysis on the RSS. The sample was taken from a larger pool of participants who completed Study 3 and were not used for further analysis. All items loaded on a single factor that accounted for 36.35% of the variance. No rotation was used. Items with a loading less than .5 were dropped from the final scale. Thus, the following six items were excluded: “Science is the best way to answer questions about the universe,” “I think that politicians should consult with scientists before making laws and policies,” “Most scientists are too narrow minded when it comes to paranormal phenomena,” “We can’t trust science because what is considered ‘true’ today may be disproven by new breakthroughs tomorrow,” “Most scientists are book smart but lack common sense,” “Things like mind reading and ghosts are supernatural occurrences that are outside the realm of science.” The final RSS ( $n = 203$ ) had a possible range of 12 to 84. The final RSS had a Cronbach reliability of .85.

The original sample contained  $N = 239$  participants. After removing individuals who were high on both PSAP and TAP (the PSAP and TAP scales in this study were constructed from the same items as study 3), the data appeared to be reasonably normally distributed ( $n = 203$ ). The TAP was significantly correlated to the RSS,  $r = -.24$ ,  $p < .001$ .

A hierarchical regression analysis was used to predict RSS from TAP and other variables that were used in Study 1 and assumed to be related to a general regard for science such as rationality (assumed to be positively related) and experientiality (assumed to be negatively related). The regression to predict RSS from TAP was significant,  $F(1, 202) = 11.86, p < .001, R^2 = .06$ . Next, the regression to predict RSS from TAP, Ratnl, Exp, TIA, BIGL, Chnce, Intrnl, and Powful was also significant,  $F(8, 202) = 9.79, p < .001, R^2 = .29$ . When controlling for all other predictor variables, TAP significantly predicted RSS,  $t(202) = -2.48, p = .014, sr^2 = .02$ . Higher belief in traditional anomalistic phenomena was associated with lower regard for science. When controlling for all other predictor variables, Ratnl significantly predicted RSS,  $t(202) = 5.21, p < .001, sr^2 = .09$ . Higher rationality was associated with higher regard for science. Finally, when controlling for all other predictor variables, Intrnl significantly predicted RSS,  $t(202) = 2.05, p = .04, sr^2 = .02$ . Individuals with an internal locus of control were more likely to have a high regard for science. No other variables were significant predictors. Table 8 provides the individual betas and *SE* for each predictor.

The PSAP and RSS were marginally correlated,  $r = -.10, p = .07$ . A regression analysis was used to predict RSS from PSAP. The results were not significant,  $F(1, 202) = 2.18, p = .14$ . Next, the regression to predict RSS from PSAP, Ratnl, Exp, TIA, BIGL, Chnce, Intrnl, and Powful was significant,  $F(8, 202) = 8.82, p < .001, R^2 = .27$ . When controlling for all other predictor variables, Ratnl significantly predicted RSS,  $t(202) = 5.65, p < .001, sr^2 = .12$ . Higher rationality was associated with higher regard for science. Finally, when controlling for all other predictor variables, Intrnl marginally predicted RSS,  $t(202) = 1.85, p = .07, sr^2 = .01$ . Individuals with an internal locus of control were

more likely to have a high regard for science. No other variables were significant predictors. Table 8 provides the individual betas and *SE* for each predictor.

### **Discussion**

To the extent that believers in TAP and PSAP differ in their interpretation of anomalistic phenomena, and to the extent that this difference is based on their attitudes toward science, I expected to show that TAP would be negatively associated with RSS and that PSAP would be positively associated with RSS. My hypothesis was partially supported. The more participants endorsed traditional beliefs in anomalistic phenomena, the lower their regard for science. Some researchers have suggested that people who have a high belief in anomalistic phenomena also have deficiencies in scientific reasoning and critical thinking. However, as previously mentioned, that idea does not have robust empirical support. One explanation of why high TAP believers may have a lower regard for science is because science is typically at odds with their belief system. Thus, they are more inclined to be skeptical of it and less likely to enjoy it than low-to-non believers.

However, the belief that anomalistic phenomena are real and have, or potentially have, scientific explanations was not associated with higher regard for science. Indeed, the direction was opposite from what I originally predicted. There may be several reasons for this result. One, PSAP belief is, ultimately, irrational and, by definition, false science. It may be that those who strongly endorse PSAP are skeptical of mainstream science, although to a lesser extent relative to high TAP believers. In Study 1, I found that PSAP was not significantly related to rationality whereas TAP was (though this relationship was negative). Study 4 is consistent with those findings to the extent that rationality serves as a proxy for science (indeed, rationality was strongly predictive of regard for science).

Second, the PSAP measure has, as previously stated, several issues. The lack of a positive association between PSAP and RSS could be due to problems with the PSAP scale that were mentioned in Study 3. I will employ a different measure of PSAP on any future studies that seek to explore possible differences between traditional and pseudoscientific believers.

## CHAPTER VI

### GENERAL DISCUSSION

There are practical reasons for trying to distinguish between TAP and PSAP beliefs. Researchers have noted that traditional intervention programs (most of which focus on increasing science knowledge, critical thinking, and, in a few cases, debunking paranormal claims) have been largely inadequate at dispelling anomalistic belief. If indeed there is a distinction between TAP and PSAP (and if this distinction has statistical and practical significance), then debunking belief in anomalistic claims, such as “witches are real,” may not have any meaningful impact on the comparatively sophisticated belief system of, for example, how psi phenomena works.

In Study 1, I examined how several individual difference variables correlated with measures of TAP and PSAP. Consistent with past research, I found that higher TAP belief was correlated with lower rationality, higher levels of experientiality, and higher levels of non-clinical depression and belief in chance/fate. Higher levels of PSAP belief were likewise correlated with higher belief in chance/fate and experientiality, but

regression analysis indicated that it was also associated with higher tolerance of ambiguity and higher internality, both of which are measures that are generally associated with skeptics.

In Study 2, I attempted to replicate previous research that showed a difference in recall accuracy between high and low believers on material that does not support the existence of anomalistic phenomena. In addition, I hypothesized that such differences would not exist between high and low believers in PSAP. My hypotheses were partially supported in that, in the False Sup vs. False NoSup condition, low believers were more accurate relative to high believers when the abstract was not supportive. In addition, I did not find an interaction under either PSAP condition (True Sup vs. True NoSup, or False Sup vs. False NoSup), indicating no difference in recall accuracy between high and low believers. However, because I was unable to completely replicate previous findings, and in order to further refine the PSAP scale and differentiate between TAP and PSAP believers, I included a four day time delay in Study 3 and removed individuals who were high on both belief measures.

In Study 3, I continued to have only partial support for my hypotheses. High believers in TAP were more accurate than low believers under support conditions (a finding not consistent with past research but not inexplicable), but low believers were more accurate than high believers under conditions of no support (consistent with past research). After removing individuals who scored highly on both measures of belief, high PSAP believers were as accurate as low believers under both conditions although all participants were generally more accurate when abstracts did not support the existence of



anomalous phenomena. Thus, the pattern of high and low PSAP believers was different than the pattern of high and low TAP believers.

Finally, in Study 4 I attempted to develop a scale that could potentially distinguish between TAP and PSAP believers on a variable that was central to the supposed distinction—namely, regard for science. Again, my hypotheses were partially supported. Higher belief in TAP was associated with lower regard for science, as predicted but belief in PSAP was not associated with regard for science. Belief in anomalous phenomena is diametrically opposed to science, and this opposition is readily apparent. The significant negative relation between the TAP and RSS is consistent with this idea. The relation between pseudoscientific belief and science is less distinct and this is evidenced in part by the fact that I did not find a significant association between the two. However, given the previously mentioned problems with the PSAP scale, future research should reexamine this relationship with a better scale.

#### Limitations and Future Directions

According to some, anomalous belief can be influenced by factors such as personality, interpersonal relationships, personal experiences, classical and operant conditioning, and errors in reasoning (French, 1992; Skinner, 1948; Vyse, 1997; Zusne & Jones 1989). There is also some evidence that anomalous belief is perpetuated by selective learning (Jones & Russell, 1980; Russell & Jones, 1980; Wiseman & Morris, 1995). However, the current studies only partially support that evidence. One of the goals of the present studies was to show, conclusively, that there exists a distinction between traditional and pseudoscientific ways of thinking about anomalous phenomena. That goal was not met. However, this line of research should not yet be abandoned.

First, the majority of participants in these studies indicated that they believed in certain anomalistic phenomena because of scientific, not magical, reasons. In Study 3, in particular, approximately 71% of believers indicated pseudoscientific explanations. Across Studies 1 through 3, approximately 52% indicated pseudoscientific explanations. It may be of interest to determine whether similar levels of magic vs. science explanations for anomalistic belief are present in the general population or whether only college students are more likely endorse pseudoscience over magic. Do people endorse pseudoscientific over magical explanations because they think it makes them sound more reasonable or intelligent? Second, if there is a clear distinction, it is of importance to be able to measure it for reasons previously stated (i.e., more effective education).

One of the most puzzling results from the present studies has been a lack of replication of past research concerning traditional belief and selective learning. French (1992) noted that different methods for assessing belief can lead to different outcomes and my methodology departed from Wiseman and Morris (1995), Jones and Russell (1980), and Russell and Jones (1980) in several ways. Wiseman and Morris (1995) created a measure of belief that only tapped psi phenomena, as opposed to a more general, wider range of anomalistic beliefs. In addition, their source material (taped demonstrations) dealt solely with psi phenomena (e.g., mentally bending a fork). Jones and Russell (1980) used a general measure of paranormal belief (the Belief in Paranormal Scale developed by Jones, Russell and Nickel, 1977), but they used a live demonstration of attempted ESP instead of abstracts. Russell and Jones (1980) used the Belief in Paranormal Scale and gave their participants an abstract that either did or did not support the existence of ESP. This latter method was most similar to the present studies except

that I included several more abstracts that covered a wide range of anomalistic phenomena.

Despite the differences in methods, these authors found that low believers were able to recall effectively both pro- and counter-attitudinal information whereas high believers were not as effective. Further, low and high believers did not differ when the information they received supported the existence of anomalistic phenomena. In particular, I have been unable to replicate this latter finding. That is, high TAP believers in the present studies were generally more accurate than low TAP believers when recalling information that supported anomalistic phenomena. This effect occurred in Study 3, and it is possible that the time delay triggered low/high believers' differential "response sets" (Wiseman & Morris, 1995, p. 119). High believers' response set might bias them toward reporting that the anomalistic phenomenon described in the abstract had occurred, whereas low believers' response set might bias them in the opposite way. Thus, when the abstract supported the occurrence of the anomalistic phenomenon high believers would be correct, and when the abstract did not support the occurrence of the anomalistic phenomenon low believers would be correct.

Irwin (1993) wrote about the need to get an "explicit consensus view" on the "nature and functions" of anomalistic belief (p. 1). The present research attempted to aid in that endeavor. Future research should explore the topic of anomalistic belief further, addressing the methodological concerns of the present research and looking into related avenues. A new PSAP belief scale should not include items relating to overtly religious concepts (e.g., God, the devil, heaven, hell) or overtly superstitious concepts (e.g., black cats bring bad luck, the number 13 is unlucky) because there is no clear way to frame

such concepts in scientific terms. However, belief of continued existence after death, although generally thought to be a religious theme, could be included because the idea that consciousness is somehow separate from the body has, to many PSAP believers, a ready scientific explanation (e.g., the enduring nature of thought energy, quantum mechanics). The new scale might ask responders whether they believe in a given phenomenon and, if yes, to indicate their reason using a scale with anchors of supernatural/magic on one end and science on the other.

Finally, any scale that is designed to tap PSAP belief should be aware of language that suggests greater or lesser personal agency. For example, one item from the TAP scale reads, “Your mind or soul can leave your body and travel (astral projection),” whereas the analogous item on the PSAP scale reads, “It is possible to focus your energy such that your consciousness can leave your body and travel.” The PSAP item is more suggestive of personal control than the TAP item. It is possible that individuals would rate those items differently depending on their level of perceived personal control (internal/external) and not specifically depending on their belief in pseudoscientific or magical explanations of anomalistic phenomena. Indeed, the results from the present study show that internal locus of control is marginally associated with PSAP, but not TAP, belief.

Not answered in the present research is what people think of others who give either magical or pseudoscientific explanations for their belief in anomalistic phenomena. Are their perceptions of others mediated by their own reasons for their belief? Do skeptics think more highly of a person who gives pseudoscientific, as opposed to magical, explanations or are both explanations viewed as equally naïve? In addition, are

people who are more open-minded toward anomalistic phenomena (regardless of explanation) viewed more or less positively than skeptics? Participants could be asked to write a short paragraph about a variety of mundane topics. The critical topic would involve putative anomalistic phenomena. After giving their own response, participants could be given a response supposedly generated by another participant that indicated that s/he was a high TAP believer, high PSAP believer, or a skeptic, and then asked to rate the person on several measures (e.g., intelligence, creativeness).

Emmons and Sobel (1981) discussed the finding that although women and men have similar overall levels of anomalistic belief, research consistently shows that, relative to men, women tend to be more skeptical of UFOs and creatures such as bigfoot (see also Coll & Taylor, 2004). It would be of interest to explore the factors behind this gender difference (and other possible differences in belief in various anomalistic phenomena). Emmons and Sobel (1981) suggested (but did not test) that women may be more likely to believe in phenomena like ESP because of their cultural association with “communicative awareness or ‘intuition’” (p. 55). Future research could examine whether belief in psychic abilities is moderated by level of perceived intuition and, further, if there are gender differences.

### Conclusion

The overarching goal of the present study was to construct measures that could distinguish between pseudoscientific and traditional anomalistic belief. I attempted to do this in three main ways. First, I reworded a well supported anomalistic belief scale (the RPB) so that it contained pseudoscientific (not magical) terminology and then examined its correlation with other, established measures. Second, I attempted to show that the

measures could distinguish between traditional and pseudoscientific believers on a memory task. In contrast to studies that either read or observed only one anomalous event, I used several abstracts on a variety of phenomena in order to increase reliability and generalizability. Overall, I found it difficult to distinguish between TAP and PSAP believers using the measures I constructed. Finally, because the fundamental difference between TAP and PSAP believers was hypothesized to be their regard for, and interest in, science, I developed the RSS. The RSS distinguished TAP and PSAP believers in that it was negatively associated with TAP, and positively associated (but not significantly so) with PSAP. The present research opens up avenues for future research.

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Table 1

*Correlations Between Scales and Traditional and Pseudoscientific Anomalistic Belief*

Subscale	BIGL	TIA	RSE	CESD	Ratnl	Exp	Chnce	Intrnl	Powful
Traditional Paranormal Belief (n = 84)									
TAP	.13	-.07	-.10	.18*	-.29**	.25**	.18*	-.03	-.05
BIGL		-.22*	.38***	-.38***	-.05	.12	.14	-.02	-.17
TIA			-.04	.12	.43***	.19*	-.12	-.06	-.09
RSE				-.75***	.23*	.23*	-.24**	.22*	-.38***
CESD					-.29**	-.26**	.18*	-.24*	.38***
Ratnl						.26**	-.26**	.19*	-.21*
Exp							-.18*	.30**	-.18*
Chnce								-.27**	.47***
Intrnl									-.08

Pseudoscientific Anomalistic Belief (n = 91)									
PSAP	.20*	.16	-.03	.09	-.13	.34**	.41***	.14	.12
BIGL		-.10	.21*	-.19*	-.10	.20*	.23**	.11	.03
TIA			.08	-.02	.36***	.14	-.20*	.17	-.24*
RSE				-.69***	.39***	.25**	-.34***	.30**	-.39***
CESD					-.29**	-.11	.14	-.24**	.25**
Ratnl						.24**	-.47***	.41***	-.41***
Exp							.03	.19*	-.26**
Chnce								-.19*	.52***
Intrnl									-.10

\* $p < .05$ . \*\* $p < .01$ . \*\*\* $p < .001$ . Traditional Anomalistic Phenomena (TAP), Pseudoscientific Anomalistic Phenomena (PSAP), Belief in Good Luck (BIGL), Tolerance/Intolerance for Ambiguity (TIA), Rosenberg Self-Esteem (RSE), Center for Epidemiological Studies Depression (CESD), Rationality (Ratnl), Experientiality (Exp), Chance (Chnce), Internal (Intrnl), Powerful Others (Powful).

Table 2  
*Regression Analysis for Variables Predicting Traditional and Pseudoscientific Anomalistic Belief*

Variable	<i>B</i>	<i>SE B</i>	$\beta$
Traditional Anomalistic Belief (n = 84)			
BIGL	0.29	0.25	0.14
TIA	0.01	0.16	0.01
RSES	0.13	0.37	0.05
CESD	0.38	0.23	0.26
Ratnl	- 0.35	0.15	- 0.29*
Exp	0.61	0.18	0.39***
Chnce	0.30	0.33	0.11
Intrnl	- 0.03	0.30	- 0.01
Powful	0.32	0.34	0.01

Pseudoscientific Anomalistic Belief (n = 91)

BIGL	0.09	0.21	0.04
TIA	0.38	0.16	0.23*
RSES	0.33	0.32	0.15
CESD	0.27	0.19	0.18
Ratnl	- 0.17	0.14	- 0.15
Exp	0.37	0.14	0.26**
Chnce	1.12	0.32	0.43***
Intrnl	0.54	0.28	0.19
Powful	- 0.22	0.24	- 0.01

\* $p < .05$ . \*\* $p < .01$ . \*\*\* $p < .001$ . Traditional Anomalistic Phenomena (TAP), Pseudoscientific Anomalistic Phenomena (PSAP), Belief in Good Luck (BIGL), Tolerance/Intolerance for Ambiguity (TIA), Rosenberg Self-Esteem (RSE), Center for Epidemiological Studies Depression (CESD), Rationality (Ratnl), Experientiality (Exp), Chance (Chnce), Internal (Intrnl), Powerful Others (Powful).

**Table 3**  
***Mean Correct Responses for High and Low Believers When the Correct Answer Was True/False and When Abstracts Did/Did Not Support Anomalistic Phenomena (Study 2)***

	TAP	PSAP
<u>True Sup</u>		
Low Belief	2.58 (.61)	2.52 (.68)
High Belief	2.43 (.68)	2.30 (.66)
<u>True NoSup</u>		
Low Belief	2.47 (.69)	2.62 (.67)
High Belief	2.48 (.60)	2.20 (.62)
<u>False Sup</u>		
Low Belief	2.47 (.72)	2.56 (.71)
High Belief	2.35 (.81)	2.10 (1.02)
<u>False NoSup</u>		
Low Belief	2.53 (.61)	2.28 (.67)
High Belief	2.05 (.89)	2.05 (.89)

Standard deviations are presented in parentheses. Traditional Anomalistic Phenomena (TAP), Pseudoscientific Anomalistic Phenomena (PSAP), True Support (True Sup), True No Support (True NoSup), False Support (False Sup), False No Support (False NoSup).



Table 4  
*Paired Samples t-tests between items on the TAP and PSAP scale*

<u>TAP – PSAP</u>	<u>t</u>	<u>p</u>
Item 1 (soul)	8.05	< .001
Item 2 (levitate)	-3.85	< .001
Item 3 (magic)	0.29	.77
Item 4 (astral)	2.38	.02
Item 5 (bigfoot)	-3.28	.001
Item 6 (astrology)	-2.25	.025
Item 7 (devil)	9.23	< .001
Item 8 (sleep)	-1.53	.13
Item 9 (Loch Ness)	-1.99	.05
Item 10 (God)	2.43	.02
Item 11 (reincarnation)	5.34	< .001
Item 12 (aliens)	-0.95	.35
Item 13 (psychic)	2.86	.005
Item 14 (Heaven)	6.89	< .001
Item 15 (mind)	0.03	.97
Item 16 (dead)	1.92	.06

Note. Items 7, 10, 14 were not used to construct the final TAP scale because they dealt with religious themes. See Appendix A and B for TAP and PSAP items, respectively.

Table 5  
*Mean Correct Responses for High and Low Believers When Abstracts Did/Did Not Support Anomalistic Phenomena (Study 3)*

---

	TAP	PSAP
<u>Sup</u>		
Low Belief	3.59 (1.25)	3.50 (1.20)
High Belief	3.99 (1.27)	3.80 (1.26)
<u>NoSup</u>		
Low Belief	4.18 (1.29)	4.14 (1.36)
High Belief	3.88 (1.29)	3.71 (1.35)

---

Standard deviations are presented in parentheses. Traditional Anomalistic Phenomena (TAP), Pseudoscientific Anomalistic Phenomena (PSAP), Support (Sup), No Support (NoSup).

**Table 6**  
*Refined Mean Correct Responses for High and Low Believers When Abstracts Did/Did Not Support Anomalistic Phenomena (Study 3)*

---

	TAP	PSAP
<u>Sup</u>		
Low Belief	3.59 (1.25)	3.50 (1.20)
High Belief	4.02 (1.24)	3.71 (1.16)
<u>NoSup</u>		
Low Belief	4.18 (1.29)	4.14 (1.36)
High Belief	4.00 (1.30)	3.89 (1.27)

---

Standard deviations are presented in parentheses. Traditional Anomalistic Phenomena (TAP), Pseudoscientific Anomalistic Phenomena (PSAP), Support (Sup), No Support (NoSup).

Table 7

*Number and Percentage of Participants Indicating Reasons for Their Response to “To what extent do you believe in ‘paranormal phenomena’ (e.g., ESP, telekinesis)?”*

<i>Study 1 (N = 183)</i>	<i>n</i>	<i>(%)</i>
<i>No Belief</i>	32	(17.5)
<i>Supernatural/Magic</i>	100	(54.6)
<i>Science</i>	51	(27.9)
<i>Study 2 (N = 78)</i>	<i>n</i>	<i>(%)</i>
<i>No Belief</i>	28	(35.9)
<i>Supernatural/Magic</i>	31	(39.7)
<i>Science</i>	19	(24.4)
<i>Study 3 (N = 260)</i>	<i>n</i>	<i>(%)</i>
<i>No Belief</i>	75	(28.8)
<i>Supernatural/Magic</i>	53	(20.4)
<i>Science</i>	132	(50.8)

Table 8  
*Regression Analysis for Variables Predicting Regard for Science Scale (Study 4)*

Variable	B	SE B	$\beta$
<b>Step 1</b>			
TAP	- 0.74	0.21	- 0.24***
<b>Step 2</b>			
TAP	- 0.51	0.20	- 0.16*
Ratnl	0.38	0.07	0.38***
Exp	- 0.09	0.08	- 0.08
TIA	0.13	0.08	0.11
BIGL	- 0.04	0.11	- 0.02
Chnce	0.01	0.16	0.002
Intrnl	0.35	0.17	0.14
Powful	0.01	0.14	0.01
<b>Step 1</b>			
PSAP	- 0.37	0.25	- 0.10

\* $p < .05$ . \*\* $p < .01$ . \*\*\* $p < .001$ . Traditional Anomalistic Phenomena (TAP), Rationality (Ratnl), Experientiality (Exp), Tolerance/Intolerance for Ambiguity (TIA), Belief in Good Luck (BIGL), (Chnce), Internal (Intrnl), Powerful Others (Powful), Pseudoscientific Anomalistic Phenomena (PSAP) Chance.

APPENDICES

**APPENDIX A**

**SHORTENED VERSION OF TABACYK'S (1988) REVISED PARANORMAL  
BELIEF SCALE**

1. The soul continues to exist though the body may die.
2. Some individuals are able to levitate (lift) objects through mental forces.
3. Black magic really exists.
4. Your mind or soul can leave your body and travel (astral projection).
5. The abominable snowman of Tibet exists.
6. Astrology is a way to accurately predict the future.
7. There is a devil.
8. During altered states, such as sleep or trances, the spirit can leave the body.
9. The Loch Ness monster of Scotland exists.
10. I believe in God
11. Reincarnation does occur.
12. There is life on other planets.
13. Some psychics can accurately predict the future.
14. There is a heaven and a hell.
15. Mind reading is not possible.
16. It is possible to communicate with the dead.



**APPENDIX B**

**PSEUDOSCIENTIFIC VERSION OF TOBACYK'S (1988) REVISED  
PARANORMAL BELIEF SCALE**

1. Some form of conscious energy continues to exist though the body may die.
2. By focusing the energy of their body, some individuals are able to levitate (lift) objects without physically touching them.
3. Some individuals can manipulate what physicists call quantum energies in ways that cause harm to others.
4. It is possible to focus your energy such that your consciousness can leave your body and travel.
5. Some animal that has been described as “The abominable snowman of Tibet” exists.
6. Planetary movements can influence humans and by carefully studying such movements, some people can accurately predict the future.
7. There is a supernatural being of malevolent evil that would like to harm humanity.
8. By altering one’s brain waves, such as through sleep or trances, one’s consciousness can leave the body.
9. Some animal that has been described as “The Loch Ness monster of Scotland” exists.
10. I believe in a being that is higher/more powerful than humans.
11. When a body physically dies, the person’s consciousness is reborn into a new body.
12. Based on what we know from physicists and astronomers, Earth cannot be the only planet in the Universe where life exists.
13. Some individuals are more open to what physicists call quantum energy signatures and can accurately predict the future.
14. Once the body dies physically, a person’s consciousness enters either a place of pure bliss or extreme torment.
15. Mentally connecting to another person’s thought energy is not possible.
16. Some people are open to the consciousnesses of those who have passed away and thus can communicate with them.

APPENDIX C

THE REGARD FOR SCIENCE SCALE

1. Science is the best way to answer questions about life
2. Most scientists are too narrow minded when it comes to paranormal phenomena  
(*reverse*)
3. I enjoy science
4. We can't trust science because what is considered 'true' today may be disproven by new breakthroughs tomorrow (*reverse*)
5. Without science our lives would be much worse off
6. Science is the best way to answer questions about the universe
7. I think that politicians should consult with scientists before making laws and policies
8. Most scientists are book smart but lack common sense (*reverse*)
9. A lot of what scientists claim is true probably is not (*reverse*)
10. Scientists do not tell the public the truth about a lot of their work (*reverse*)
11. I enjoy reading articles about scientific discoveries
12. I hold science in high regard
13. Things like mind reading and ghosts are supernatural occurrences that are outside the realm of science (*reverse*)
14. Science will never be able to explain things like ESP (*reverse*)
15. I like to watch science programs
16. People who rely too much on science miss the magic of everyday life (*reverse*)
17. I usually don't bother to think too much about science (*reverse*)

APPENDIX D

VIGNETTES

1. The Roswell Incident refers to an event that occurred in New Mexico in 1947 where the Air Force recovered material from an unidentified flying object. Numerous investigators have claimed that alien bodies and extraterrestrial materials were taken from the crash site; although the government issued an official report stating that the object was a weather balloon. Recently, a new report was issued by the Air Force stating that witnesses who reported that bodies were removed from the site were correct. The report added that alien bodies were removed for testing, thus further supporting that there was paranormal activity at Roswell. Because the crash occurred on July 4th, interested people gather in Roswell each year to view a large display of fireworks and other events, including a pavilion for displaying new findings.

2. At Oslo University, researchers investigated whether some unknown type of life force can leave and re-enter the body. In a tightly controlled experiment, 30 participants claiming to be able to project their non-physical beings were asked to project from one room to another and then to report what they saw in the other room. In the control condition, 25 participants were asked to guess the contents of the other room. Both the experimenter and the participants had no prior knowledge of the contents in the other room. Out of eight trials, projectors accurately identified significantly more target objects than control participants. The researchers plan to submit a paper of their findings to a leading peer-reviewed journal. Their long-goal plans are to obtain more funding to expand their department's research facilities.

3. Cattle mutilation refers to thousands of cases in every state where cattle have been found dead with no apparent explanation. The animals' blood is typically removed, yet no trace of it is found on the ground. The udders on females are often removed and the sexual organs on both sexes are removed with laser-precision cuts. In some cases, cattle are found on mountain tops lying in the snow with no visible tracks near the scene. The mutilations are clearly bizarre. Nevertheless, a likely causal explanation is human intervention, because no scientific evidence exists linking cattle mutilations to paranormal activity. Linda Howe, the foremost authority on cattle mutilations, states that scientists and veterinary surgeons are working together to obtain funding for surveillance to monitor mutilations in high activity areas.

4. Extrasensory perception (ESP) has been scientifically investigated for over 75 years. Supporters of ESP claim that scientific evidence supports the existence of ESP, but skeptics point to methodological flaws in those studies and claim that no scientific evidence of ESP exists. A recently published article in *Psychic Review* concluded that across 40 ESP studies, "receivers" achieved an average hit rate of 35% of the symbols that "senders" sent telepathically. By chance, the hit rates would be 25%. Because the 35% hit rate was statistically higher than chance, the authors concluded that there was support for the claim that ESP exists. These results among other works will be summarized in *Extrasensory Perception After 100 Years* edited by Susan Whitemore. The book is an extension of J. B. Rhine's best-seller forty years earlier.

5. Reporting of poltergeist activity typically consists of loud noises and moving objects. In Utah, these symptoms were recently reported by a young couple in May 2003. The events were gradual with small noises and movement of small objects, and eventually progressed to full bodied apparitions. The wife, who was always present in the home when the events occurred, appeared to be more affected than her husband. A team of psychologists visited the home several times and observed that there was a tremendous amount of stress. They concluded that couples counseling would be the key to stopping the ghostly activity. The disturbance received so much media coverage that the couple was flown to the Psychological Research Foundation in Durham, North Carolina to meet with the Director, Professor Robert Morris, Ph.D.

6. In 1905, during a religious revival in Egryn, Wales, witnesses reported various displays of illumination above and around the chapel. The Daily Mail described how three clergymen and numerous other witnesses saw a ball of fire rise from the ground and explode near the preacher, Mary Jones. Welsh scientists have a renewed interest in the event because of improved instrumentation that can measure major energy vortices around the planet. After an exhaustive investigation (which aired on BBC network), scientists concluded that the measurements revealed significant energy levels, thus the only explanation must be that the light was a result of geological influences. This is an example of how science can contribute to the knowledge and understanding of the role of nature and religion in the totality of human experiences.

7. The investigation of a homicide in Los Angeles carried on for over six months without any leads. Frustrated and feeling pressured, the lead investigator contacted a psychic who claimed to have exceptional clairvoyant powers. The psychic worked with the police department for two weeks providing the detectives with numerous clues, including that the victim was stabbed and buried in a location south of the city. The police investigated numerous locations based on all of the leads they received, and eventually they found the body. The lead investigator gave credit to the psychic whose clues led to discovering the body. With the case closed, the department can focus on the next series of homicides. However, the lead detective plans to travel upstate for a long weekend before starting on the next case.

8. A panel of scientific experts gathered in Paris last year to determine the validity of Uri Zolinyat's spoon bending performance. Zolinyat, who is popular in both Europe and Australia, has his own television show. On the show he claims that people can learn to tap their psychokinetic powers. The scientific panel first saw the televised performance live, then they viewed the taped performance so that they could play the tape in slow motion. The panel also inspected the spoon. After meeting for one week, the panel unanimously determined that the spoon was ordinary and that Zolinyat truly had psychokinetic abilities. Following the Paris event, the performer has a rigorous schedule.

He will tour in America beginning in Nevada and ending on the *Tonight Show* where he will perform many psychokinetic feats.

9. Two weeks before his assassination, Abraham Lincoln dreamt of a funeral at the White House. Mark Twain dreamt of his brother in a casket two weeks before his brother was killed in a boat explosion. Both of these events are examples of how some people claim they perceive events before they occur, known as precognition. Mary Stowell, Ph.D., an authority on the subject, recently published two articles that assessed the extent that reported dreams are fictitious, chance events, or evidence of precognition. Few associations were found between reported dreams and later events of participants, which provided no support for the existence of dream precognition. Stowell continues to investigate the phenomenon. Her present project explores the possibility of precognition in lucid dreaming, which are dreams in which dreamers are aware that they are dreaming.

10. Channeling is a psychic phenomenon whereby mediums relinquish their minds and bodies to a spiritual entity who takes over for the purpose of sending messages. The practice has been part of human experience as far back as human records go; for example, channeling appears in various religious texts. Modern interest in channeling was spurred by actress Shirley MacLaine in the 1980s. More recent is the television show, *Crossing Over*, hosted by John Edward who offers himself as a medium for the afterlife-relatives of audience members. Careful evaluation of his performances has revealed evidence that channeling occurs during his show. Edward, raised on Long Island, has maintained a management position in a leading health care facility in the Northeast, and has continued his research, and teaching in the field of parapsychology.

11. Over the past 40 years, there have been numerous reports of alleged miracles of religious statues that shed tears or blood. Recently, there was a media craze about the “miracle milk” in Delhi, India when for 24 hours the small stone statue of Ganeshji, the Hindu elephant-headed God of Wisdom, consumed milk from a spoon. This event like other reported miracles was reviewed by authorities. They determined that the statue was porous. This evidence can be interpreted as reason to believe that the milk miracle was not authentic, because the perceived drinking was actually caused by surface-effect capillary action. Nevertheless, over one million liters of milk were purchased in the 24-hour period as devotees flocked the nation’s temples. The man who first dreamt of the vision died soon after.

12. The appearance of McNaughtry’s clever historical and scientific analysis of astrology on the latest New York Times Top 10 Best-seller’s list for non-fiction is no surprise. He takes the reader on a ride through the centuries, beginning with Copernicus, through the Dark Ages, and into the 21st century. The author discusses the role that astrology played in the Vatican, in Nazi Germany, and in the White House. What makes this book extraordinary beyond the author’s collectivist style is that by using computerized models,



McNaughty provides evidence and he makes cogent arguments that dispel claims of predicting future events from astrological data. He states that the internet has played a large role in the recent increased interest in astrology, largely due to the ease of electronic delivery of personalized forecasts.

**APPENDIX E**

**RECALL QUESTIONS**

### Roswell Incident vignette

- \_\_\_\_\_ The Roswell Incident occurred in New Mexico
- \_\_\_\_\_ Alien bodies were removed for testing, thus further supporting that there was paranormal activity
- \_\_\_\_\_ The Roswell Incident occurred in 1967
- \_\_\_\_\_ The Air Force recovered material from an unidentified flying object
- \_\_\_\_\_ The official report originally stated that the object was farm equipment

### Leaving the body vignette

- \_\_\_\_\_ 30 participants in the experiment were asked to project from one room to another
- \_\_\_\_\_ Researchers at Stockholm University investigated the phenomenon of projection
- \_\_\_\_\_ In the control condition, 20 participant were asked to project their non-physical beings
- \_\_\_\_\_ Projectors identified significantly more target objects than control participants
- \_\_\_\_\_ Ten trials were run

### Cattle mutilation vignette

- \_\_\_\_\_ In cattle mutilations, the brains are typically removed
- \_\_\_\_\_ In some cases, cattle that are mutilated are found in swimming pools
- \_\_\_\_\_ A likely causal explanation of cattle mutilation is human intervention
- \_\_\_\_\_ In cattle mutilation, the sexual organs on both sexes are surgically switched
- \_\_\_\_\_ Cattle mutilations occur in every state

### ESP vignette

- \_\_\_\_\_ By chance, the hit rates of receivers would be 25%
- \_\_\_\_\_ Extrasensory perception has been scientifically investigated for no more than 35 years
- \_\_\_\_\_ The authors concluded that there was support for the claim that ESP exists
- \_\_\_\_\_ Across 40 ESP studies, receivers achieved an average hit rate of 35%
- \_\_\_\_\_ The recent article was published in Psychological Bulletin

### Poltergeist vignette

- \_\_\_\_\_ A team of physicists visited the couple's home several times

\_\_\_\_\_ The conclusion was that a couples counselor would be the key to stopping the ghostly activity

\_\_\_\_\_ Poltergeist is German for *mean ghosts*

\_\_\_\_\_ The wife was always present in the home when the events occurred

\_\_\_\_\_ The poltergeist symptoms occurred in Nevada

#### Mary Jones preacher vignette

\_\_\_\_\_ Improved instrumentation can measure major energy vortices around the planet

\_\_\_\_\_ The Daily Mail described how three nuns and numerous other witnesses saw a ball of fire

\_\_\_\_\_ Because the scientists found significant energy levels, the light must have been the result of geological influences

\_\_\_\_\_ The religious revival in Egryn, Wales occurred in 1905

\_\_\_\_\_ American scientists have renewed interest in the event

#### The psychic/detective vignette

\_\_\_\_\_ According to the psychic the victim was located south of the city

\_\_\_\_\_ The investigation of the homicide was in New York

\_\_\_\_\_ The psychic's clues lead to discovering the body

\_\_\_\_\_ The psychic worked with the police department for two years

\_\_\_\_\_ The victim was stabbed

#### Spoon bending vignette

\_\_\_\_\_ The panel also inspected the spoon

\_\_\_\_\_ The panel first saw the televised performance on video

\_\_\_\_\_ The panel of experts gathered in Geneva

\_\_\_\_\_ The panel unanimously determined that Zolinyat had psychokinetic abilities

\_\_\_\_\_ The panel determined that the spoon was fake

#### Dream precognition vignette

\_\_\_\_\_ In lucid dreaming, dreamers have no control of their dreams

\_\_\_\_\_ Mark Twain's brother was killed in a plane crash

\_\_\_\_\_ Stowell presently explores the possibility of precognition in lucid dreaming

\_\_\_\_\_ The lack of associations found provided no support for the existence of dream precognition

\_\_\_\_\_ Stowell published four articles

#### Channeling vignette

\_\_\_\_\_ The name of John Edward's television show is *Crossing Over*.

\_\_\_\_\_ Modern interest in channeling was spurred by actress Meryl Streep

\_\_\_\_\_ John Edward uses audience members as a medium for the afterlife-relatives of audience members

\_\_\_\_\_ Scientific evaluation of his performances has revealed evidence that channeling occurs during Edward's show.

\_\_\_\_\_ The purpose of channeling is for spiritual entities to send messages by taking over the minds and bodies of mediums

#### Milk miracle vignette

\_\_\_\_\_ The stone statue consumed milk from an urn

\_\_\_\_\_ Ganeshji is a Moslem statue

\_\_\_\_\_ The evidence provided can be interpreted as reason to believe that the milk miracle was not authentic

\_\_\_\_\_ Ganeshji drank milk for 24 days

\_\_\_\_\_ The miracle milk occurred in Delhi, India

#### Astrology vignette

\_\_\_\_\_ McNaughtry discusses the role that astrology played in the Vatican

\_\_\_\_\_ The author's book appeared on the latest Los Angeles Times Top 10 Best-seller's list

\_\_\_\_\_ The book begins the historical journey with Copernicus

\_\_\_\_\_ The author provides evidence that dispels claims of predicting future events from astrological data

\_\_\_\_\_ McNaughtry's book was fiction

APPENDIX F

IRB APPROVAL LETTERS



## UNIVERSITY of NEW HAMPSHIRE

March 9, 2010

Matthew Ramsey  
Psychology  
Durham, NH 03824

**Study:** Sophisticated Credulity: Are Old Beliefs Perpetuated by New Terminology?  
**Approval Date:** 10/2/08

The Psychology Departmental Review Committee, a subcommittee of the Institutional Review Board (IRB) for the Protection of Human Subjects in Research, reviewed and approved the protocol for your study as Exempt as described in Federal Regulations 45 CFR 46, Subsection 101 (b).

Approval is granted to conduct the project as described in your protocol. Changes in your protocol must be submitted to this committee for review and approval prior to their implementation.

The protection of human subjects in your study is an ongoing process for which you hold primary responsibility. In receiving approval for your protocol, you agree to conduct the project in accordance with the ethical principles and guidelines for the protection of human subjects in research, as described in the Belmont Report. The full text of the Belmont Report is available on the Office of Sponsored Research (OSR) webpage at <http://www.hhs.gov/ohrp/humansubjects/guidance/belmont.htm> or by request from the OSR.

There is no obligation for you to provide a report to this committee upon project completion unless you experience any unusual or unanticipated results with regard to the participation of human subjects. Please report such events to this office promptly as they occur.

If you have questions or concerns about your project or this approval, please feel free to contact a member of the Psychology Departmental Review Committee.

For the IRB,

Julie F. Simpson  
Manager

cc: File



## UNIVERSITY of NEW HAMPSHIRE

March 9, 2010

Matthew Ramsey  
Psychology  
Durham, NH 03824

**Study:** Sophisticated Credulity: Are Old Beliefs Perpetuated by Selective Attention?  
**Approval Date:** 1/23/09

The Psychology Departmental Review Committee, a subcommittee of the Institutional Review Board (IRB) for the Protection of Human Subjects in Research, reviewed and approved the protocol for your study as Exempt as described in Federal Regulations 45 CFR 46, Subsection 101 (b).

Approval is granted to conduct the project as described in your protocol. Changes in your protocol must be submitted to this committee for review and approval prior to their implementation.

The protection of human subjects in your study is an ongoing process for which you hold primary responsibility. In receiving approval for your protocol, you agree to conduct the project in accordance with the ethical principles and guidelines for the protection of human subjects in research, as described in the Belmont Report. The full text of the Belmont Report is available on the Office of Sponsored Research (OSR) webpage at <http://www.hhs.gov/ohrp/humansubjects/guidance/belmont.htm> or by request from the OSR.

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If you have questions or concerns about your project or this approval, please feel free to contact a member of the Psychology Departmental Review Committee.

For the IRB,

Julie F. Simpson  
Manager

cc: File





## UNIVERSITY of NEW HAMPSHIRE

March 9, 2010

Matthew Ramsey  
Psychology  
Durham, NH 03824

**Study:** Sophisticated Credulity: Are Old Beliefs Perpetuated by New Terminology?  
**Approval Date:** 9/8/09

The Psychology Departmental Review Committee, a subcommittee of the Institutional Review Board (IRB) for the Protection of Human Subjects in Research, reviewed and approved the protocol for your study as Exempt as described in Federal Regulations 45 CFR 46, Subsection 101 (b).

Approval is granted to conduct the project as described in your protocol. Changes in your protocol must be submitted to this committee for review and approval prior to their implementation.

The protection of human subjects in your study is an ongoing process for which you hold primary responsibility. In receiving approval for your protocol, you agree to conduct the project in accordance with the ethical principles and guidelines for the protection of human subjects in research, as described in the Belmont Report. The full text of the Belmont Report is available on the Office of Sponsored Research (OSR) webpage at <http://www.hhs.gov/ohrp/humansubjects/guidance/belmont.htm> or by request from the OSR.

There is no obligation for you to provide a report to this committee upon project completion unless you experience any unusual or unanticipated results with regard to the participation of human subjects. Please report such events to this office promptly as they occur.

If you have questions or concerns about your project or this approval, please feel free to contact a member of the Psychology Departmental Review Committee.

For the IRB,

A handwritten signature in cursive script that reads "Julie F. Simpson".

Julie F. Simpson  
Manager

cc: File



## UNIVERSITY of NEW HAMPSHIRE

March 9, 2010

Matthew Ramsey  
Psychology  
Durham, NH 03824

**Study:** Sophisticated Credulity  
**Approval Date:** 2/8/10

The Psychology Departmental Review Committee, a subcommittee of the Institutional Review Board (IRB) for the Protection of Human Subjects In Research, reviewed and approved the protocol for your study as Exempt as described in Federal Regulations 45 CFR 46, Subsection 101 (b).

Approval is granted to conduct the project as described in your protocol. Changes in your protocol must be submitted to this committee for review and approval prior to their implementation.

The protection of human subjects in your study is an ongoing process for which you hold primary responsibility. In receiving approval for your protocol, you agree to conduct the project in accordance with the ethical principles and guidelines for the protection of human subjects in research, as described in the Belmont Report. The full text of the Belmont Report is available on the Office of Sponsored Research (OSR) webpage at <http://www.hhs.gov/ohrp/humansubjects/guidance/belmont.htm> or by request from the OSR.

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If you have questions or concerns about your project or this approval, please feel free to contact a member of the Psychology Departmental Review Committee.

For the IRB,

Julie F. Simpson  
Manager

cc: File