

# We are not alone: The meaning motive, religiosity, and belief in extraterrestrial intelligence

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**Abstract** We tested the proposals that paranormal beliefs about extraterrestrial intelligence (ETI) are motivated, in part, by the need for meaning and that this existential motive helps explain the inverse relationship between religiosity and ETI beliefs. In Study 1, we experimentally establish that the motive to find meaning in life increases ETI beliefs. In Study 2, we replicate previous research demonstrating that low religiosity is associated with greater ETI beliefs. In Studies 3–4 we tested and found support for a model linking low religiosity to low presence of meaning, high search for meaning, and greater ETI beliefs. In all, our findings offer a motivational account of why people endorse paranormal beliefs about intelligent alien beings observing and influencing the lives of humans.

**Keywords** Meaning · Religiosity · Atheism · Extraterrestrial intelligence

## Introduction

A number of scholars have argued that humans are naturally religious as a result of cognitive capacities that facilitate mentalizing the internal states and intentions of others (Atran 2002; Barrett 2000; Bloom 2007; Boyer 2001; Willard and Norenzayan 2013). Religion involves magical thinking—cognitions and beliefs that violate an empirically-based understanding of the natural world. More precisely, religious magical thinking invokes agency and intentionality as explanations of natural phenomena (e.g.,

God created the Earth to sustain life) and life outcomes (e.g., positive events are the result of answered prayers).

Based on this idea of natural theism, recent research has advanced the proposal that atheists, despite consciously rejecting religious magical beliefs such as the existence of a deity, are still influenced by magical thinking and are inclined to engage in this type of thinking when they lack the cognitive resources needed to override it. For example, Lindeman et al. (2014) found that having atheists verbally dare God to harm people increased physiological arousal to a greater extent than having them verbally wish harm on others. In that research, atheists did not self-report any discomfort with invoking God as the agent of harm but at a physiological level they exhibited signs of distress. Kelenen et al. (2013) found that largely non-religious physical scientists made teleological errors (i.e., invoking design where there is none) when they were not given sufficient time to rationally think about the validity of a teleological statement (e.g., trees produce oxygen so that animals can breathe). Heywood and Bering (2013) similarly found that most atheists struggled to not use teleological language when describing autobiographical events.

Though normal cognitive processes and biases may promote magical thinking, they do not sufficiently explain why people subscribe to magical beliefs such as religious worldviews that invoke supernatural agents (Banerjee and Bloom 2013). One reason adults may continue to invest in certain magical beliefs once that have reached full cognitive development and have received substantial education that should override or reduce the tendency to engage in magical thinking is that these beliefs contribute to perceptions of meaning in life (Batson and Stocks 2004; Emmons 2005). Perceiving life as meaningful is a vital component of adaptive psychological functioning (Hicks and Routledge 2013). People who perceive their lives as meaningful enjoy greater

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psychological adjustment (Heintzelman and King 2014; Park et al. 2010; Steger and Frazier 2005), are better able to cope with stressful life experiences (Park 2010), and live healthier (Steger et al. 2009) and longer lives (Boyle et al. 2009; Hill and Turiano 2014; Krause 2009). In short, meaning is an important motive for humans.

Religion has long been linked to perceptions of life as meaningful (Batson and Stocks 2004; Hicks and King 2008; Steger and Frazier 2005). Religion confers meaning, in part, because it challenges the belief that humans are insignificant beings in an objectively meaningless universe (Vail et al. 2010). Instead, religion promotes a magical teleological belief that humans were created with intention and are part of a meaningful cosmic drama. In support of this idea of meaning-motivated magical beliefs, studies reveal that experimental manipulations that activate the need for meaning (e.g., thinking about death, being reminded of how cosmically insignificant humans are) increase teleological beliefs (Davis et al. 2011), belief in supernatural agents such as God (Norenzayan and Hansen 2006) and belief in miraculous events involving supernatural agents (Routledge et al. in press). In other words, studies demonstrate that the magical nature of religious beliefs at least partially accounts for why religion is a meaning-making resource.

Studies further indicate that magical concepts related to religion serve an existential function for atheists (Heflick and Goldenberg 2012; Jong et al. 2012). For example, Jong and colleagues (2012) found that among believers and atheists alike, the existential threat of thinking about death increased the association between magical religious words (e.g., God, soul, Hell) and synonyms of “real” (e.g., real, existent, actual) in an implicit cognitive association task (Bluemke and Friese 2008). Further, Heflick and Goldenberg (2012) found that presenting atheists with arguments for life after death mitigated their need to affirm meaning in a non-religious domain following existential threat. Importantly, in both of these studies, atheist participants did not explicitly endorse religious belief. In other words, atheists may receive existential benefits from religious magical beliefs at an intuitive level.

In sum, both cognitive and motivational processes influence magical thinking. Social cognitive processes provide the underlying foundation and capacity for religious belief. Psychological motives such as the need for meaning build upon this natural proclivity toward magical thinking because beliefs that offer magical explanations of natural phenomena help promote the view that life has grander purpose and meaning. Furthermore, even non-religious individuals are influenced by magical beliefs and reap existential benefits from these beliefs at an intuitive level. This poses the questions: Are there explicit magical beliefs not associated with traditional religious beliefs that, like

religion, serve an existential function by contributing to perceptions of meaning in life? Further, does the need for meaning motivate those who tend to not identify as religious to invest in magical beliefs not associated with traditional religious beliefs?

Paranormal beliefs concerning extraterrestrial intelligence (ETI) are considered magical beliefs because they are not supported by any compelling evidence and defy existing knowledge (King et al. 2007; Shermer 2011). For instance, these beliefs often involve intellectually superior aliens monitoring human behavior, government conspiracies or cover-ups, and even reinterpretations of historical events (e.g., aliens built the pyramids; Swami et al. 2009). Such beliefs also typically include the acceptance of technology that is far beyond human grasp such as spacecrafts capable of travelling great distances and equipment that allows aliens to covertly monitor, manipulate, and even abduct humans (Clancy 2005; Shermer 2011). It is important to note that we specifically focused on such paranormal ETI beliefs in the present work. People may express openness to the possibility of life on other worlds and have interest in searching for such life using scientifically rigorous methods, and these kinds of thoughts and curiosities would not necessarily qualify as magical as they do not represent a commitment to specific beliefs that lack scientific evidence (Swami et al. 2009). However, ETI beliefs advocating the existence of technologically superior intelligent beings visiting and influencing actions on our planet and cover-up conspiracies about such alien visitations are magical because they are not supported by empirical evidence. That is, these kinds of ETI beliefs are similar to religious beliefs in that they require a leap of faith (Shermer 2011).

Paranormal ETI beliefs may offer an alternative to traditional forms of magical beliefs (i.e., religion). First, though traditional religious beliefs are on the decline in the United States (“America’s Changing Religious Landscape” 2015), paranormal beliefs such as belief in ETI visitors may be increasing. For instance, according to the National UFO Reporting Center (<http://www.nufo.org>), the number of reported UFO sightings has been steadily increasing over the last 20 years and recent polls indicate that nearly 50% of Americans believe in ETI (Gallup and Newport 1991; Spiegel 2013). In addition, though men are less likely than women to be religious (Trzebiatowska and Bruce 2012; Winseman 2002), some studies find that men are more likely than women to believe in ETI (e.g., Goode 2000; Patry and Pelletier 2001; Rice 2003). Findings such as these suggest that when people do not identify with traditional religious beliefs they are more inclined to turn to other types of magical beliefs. More direct support for the idea that belief in ETI offers an alternative to religion can be found in studies indicating that paranormal ETI beliefs (e.g., aliens from another world have visited Earth)

are associated with low religiosity (Swami et al. 2010). But why would people who reject the magical world of religion turn to other magical beliefs such as beliefs related to extraterrestrials visiting Earth and monitoring and manipulating humans?

We propose that paranormal ETI beliefs serve an existential function: the promotion of perceived meaning in life. In this way, we view belief in ETI as serving a function similar to religion without relying on the traditional religious doctrines that some people have deliberately rejected. As noted, paranormal ETI beliefs are typically considered magical beliefs because they are not supported by credible evidence (King et al. 2007; Shermer 2011). However, unlike religion, these kinds of paranormal beliefs do not necessarily invoke the supernatural. That is, accepting ETI beliefs does not require one to believe in supernatural forces or agents that are incompatible with a scientific understanding of the world. Instead, narratives about ETI often invoke scientific and technological ideas and jargon, thus superficially making these beliefs appear more consistent with a scientific worldview. Since religious disbelief is focused on rejecting supernatural agents (God, angels, demons), magical beliefs that do not implicate the supernatural may be more palatable to those who do not self-identify as religious. Critically, the existence of ETI would indicate that humans are not alone in the universe and may thus confer a sense that human existence is purposeful and not merely due to chance. In her qualitative analysis of UFO abduction stories, Clancy (2005) described the experiences of supposed abduction victims as appearing motivated by spiritual needs to feel significant and meaningful. Likewise, Shermer (2011) highlighted that ETI beliefs typically involve a view of extraterrestrials as Godlike beings in that they are intellectually and technologically advanced and able to monitor and influence the lives of humans. In this way, the existence of ETI could make humans feel like they are part of a larger and more meaningful cosmic drama (Jung 1959). Describing the meaning-making potential of belief in ETI, Shermer (2011, p. 205) asserts, “ETIs are secular gods – deities for atheists.” However, to date no empirical studies have tested an existential motivational account of paranormal beliefs about ETI.

The present research builds upon past work linking paranormal ETI beliefs to low religiosity (Swami et al. 2010) by proposing and testing an existential function of such beliefs. We specifically propose that the need to perceive life as meaningful motivates ETI beliefs and that this motivational account helps explain why those less inclined to affirm meaning via traditional religious beliefs are more likely to hold ETI beliefs. In Study 1, we experimentally tested the critical hypothesis that the need for meaning motivates ETI beliefs by threatening meaning and assessing paranormal ETI beliefs. If ETI beliefs promote meaning

then people should be more open to these beliefs when the need for meaning is triggered by a meaning threat.

After establishing a causal effect of meaning on ETI beliefs, in the subsequent studies, we explored the relation between religiosity and ETI beliefs and tested the proposal that the meaning motive is responsible, in part, for the association between low religiosity and high ETI beliefs. Specifically, in Study 2, we first sought to conceptually replicate previous research linking paranormal ETI beliefs to low levels of religiosity. In Studies 3 and 4, we tested a model connecting low religiosity, the need for meaning, and ETI beliefs. We hypothesized that the association between low religiosity and ETI beliefs would be mediated by a lack of meaning (low presence of meaning) and the desire to find meaning (high search for meaning).

## Study 1

Our critical proposal in the present work is that the need to find meaning in life motivates ETI beliefs. Thus, in Study 1, we manipulated meaning with an established meaning threat manipulation that motivates efforts to find meaning (Routledge et al. 2011), and subsequently measured paranormal ETI beliefs. We hypothesized that experimentally heightening the need for meaning would increase paranormal ETI beliefs.

## Method

### Participants and procedure

Participants were 274 undergraduate students (129 female,  $M_{age} = 20.32$ ,  $SD_{age} = 11.88$ ) from a large Midwestern university. They completed the experiment online in exchange for course credit and were provided with debriefing information following the completion of all materials.

## Materials

### Meaning manipulation

Meaning was manipulated using a method developed by Routledge and colleagues (2011) in which participants are asked to read a philosophical essay arguing that human life is ultimately meaningless and cosmically insignificant. Participants in the control condition read an essay about the limitations of computers. Both essays were largely, but not exclusively, drawn from Park (2001). Participants were instructed to “read the following extract from an essay written by the philosopher Dr. James Park of Oxford

University.” The inclusion of the doctorate and highly regarded British university was intended to project a degree of credibility, although Dr. Park is not actually at Oxford University. Both essays are similar in length, and research has demonstrated that both essays are perceived as similar in how engaging and interesting they are, but that the meaning threat essay significantly decreases perceptions of meaning relative to the computer essay (Routledge et al. 2011). A number of studies have used this manipulation and found that it increases meaning-making efforts (e.g., Routledge et al., Routledge et al. in press, 2011).

### ETI belief measure

We assessed paranormal ETI beliefs by having participants rate their agreement on a 9-point scale (1 = *completely disagree*, 9 = *completely agree*) with three items created by the researchers but based on a previous similar measure (Swami et al. 2009). These items were: “There is intelligent life on other planets in the universe”, “UFOs are real”, and “The government has information about the existence of aliens that is being kept secret from the general public”; Cronbach’s  $\alpha = 0.85$ ;  $M = 4.33$ ,  $SD = 2.21$ ).

### Results

In support of our hypothesis there was a significant difference between conditions on the ETI belief variable such that participants in the meaning threat condition ( $M = 4.71$ ,  $SD = 2.24$ ) evidenced higher ETI belief than participants in the control condition ( $M = 3.96$ ,  $SD = 2.13$ ),  $F(1, 272) = 8.01$ ,  $p = 0.005$ ,  $\eta_p^2 = 0.03$ . There was a main effect for gender such that males ( $M = 4.80$ ,  $SD = 2.21$ ) believe in ETI more than females ( $M = 3.82$ ,  $SD = 2.10$ ),  $F(1, 272) = 13.87$ ,  $p < .001$ ,  $\eta_p^2 = 0.05$ , but there was no significant interaction between gender and the meaning manipulation,  $F(1, 270) = 0.01$ ,  $p = .91$ ,  $\eta_p^2 = .00$ .

### Discussion

The results of Study 1 provide experimental evidence that the need for meaning motivates ETI belief as participants in a meaning threat condition reported higher levels of belief in ETI than participants in control condition. Having established experimentally a link between the meaning motive and ETI belief, our next goal was to test a meaning motivational account of the relation between low religiosity and high ETI belief. First, in Study 2, we sought to verify this relation.

## Study 2

Though past research indicates that paranormal ETI beliefs (e.g., aliens from another world have visited Earth) are associated with low religiosity (Swami et al. 2010), in Study 2, we sought further evidence for the notion that people who do not identify with traditional religious belief systems are more attracted to paranormal ETI beliefs. To this end, we assessed religiosity both as a categorical and continuous variable. Because of the nature of our data collection (i.e., use of a department-wide screening) we were able to access a large sample, which helped provide sufficient numbers of atheists and agnostics for a categorical test of whether non-religious and religious individuals differ in their belief in ETI. Based on past research, we predicted an inverse relationship between religiosity as measured as a continuous variable and ETI beliefs. In addition, we predicted that people who report being atheist or agnostic would be more inclined to hold ETI beliefs than those who report being part of a religious group (i.e., Christian).

### Method

#### Participants and procedure

Participants were 537 undergraduate students (293 female,  $M_{\text{age}} = 19.36$ ,  $SD_{\text{age}} = 2.03$ ) from a large departmental survey administered to Introductory Psychology students at a Midwestern university. Participants completed the screening online at the beginning of the academic semester and all scales included in the screening were randomized. Our total sample of 537 participants resulted from us not including non-Christian religious groups in our analysis. Specifically, sample sizes from such groups were too small to make meaningful comparisons. That is, only five participants identified as Muslim, 10 as Buddhist, and three as Hindu. Forty-seven participants did not indicate religious affiliation and were therefore also not included. Thus, the final sample of 537 participants represented three groups: Christian ( $N = 463$ ), Atheist ( $N = 38$ ) and Agnostic ( $N = 36$ ).

### Materials

#### ETI belief measure

We assessed paranormal ETI beliefs with the same measure used in Study 1 ( $\alpha = 0.85$ ;  $M = 4.88$ ,  $SD = 2.11$ ).

## Religiosity

In the department screening religiosity was measured in two ways. As a continuous variable, religiosity was assessed with three items. These items were: “My religious beliefs are what lie behind my whole approach to life” (1 = *definitely not true of me*, 6 = *definitely true of me*; Koenig and Büssing 2010), “In general, would you say that you are a religious person?” (1 = *not very religious*, 6 = *very religious*; House 1994), and “How important are religious or spiritual beliefs in your day-to-day life?” (1 = *not very important*, 6 = *very important*; Cronbach’s  $\alpha = 0.93$ ;  $M = 3.74$ ,  $SD = 1.47$ ). As a categorical variable, religiosity was assessed by having participants tick a box indicating their religious affiliation from a list of options. As noted, because of small numbers of non-Christian religious participants, we only included three groups in our analysis: Christians, Atheists, and Agnostics.

## Results

There was a marginal gender effect on religiosity such that females ( $M = 3.85$ ,  $SD = 1.45$ ) reported higher religiosity than males ( $M = 3.61$ ,  $SD = 1.50$ ),  $F(1, 535) = 3.72$ ,  $p = .05$ ,  $\eta_p^2 = 0.007$ . As in Study 1, males ( $M = 5.24$ ,  $SD = 2.16$ ) were significantly more likely to believe in ETI than females ( $M = 4.59$ ,  $SD = 2.03$ ),  $F(1, 535) = 13.03$ ,  $p < .001$ ,  $\eta_p^2 = 0.02$ . Replicating past research (Swami et al. 2010), there was a significant inverse correlation between religiosity and ETI belief ( $r = -.27$ ,  $p < .001$ ). In addition, there was a significant effect of religious affiliation on ETI belief  $F(2, 534) = 8.12$ ,  $p < .001$ ,  $\eta_p^2 = 0.03$ . Post hoc Fisher’s Least Significant Difference (LSD) tests revealed that atheist ( $M = 5.61$ ,  $SD = 1.94$ ) and agnostic ( $M = 5.96$ ,  $SD = 1.82$ ) groups did not differ significantly from one another in ETI belief ( $p = .47$ ). However, compared to Christians ( $M = 4.74$ ,  $SD = 2.11$ ), both atheists ( $p = .01$ ) and agnostics ( $p < .001$ ) reported significantly higher levels of ETI belief. Since atheists and agnostics did not significantly differ on ETI belief, we combined those two groups and tested the difference between Christians and non-religious (agnostics and atheists) participants on ETI beliefs. Non-religious participants ( $M = 5.80$ ,  $SD = 1.88$ ) reported significantly higher levels of ETI belief than Christian participants ( $M = 4.74$ ,  $SD = 2.11$ ),  $F(1, 535) = 15.74$ ,  $p < .001$ ,  $\eta_p^2 = 0.02$ . Further, adding the 18 non-Christian but religious participants back into the sample to create a religious group (i.e., Christians, Muslim, Buddhist, and Hindu) did not change the observed effect. Non-religious participants ( $M = 5.80$ ,  $SD = 1.88$ ) scored significantly higher on ETI belief than religious participants ( $M = 4.75$ ,  $SD = 2.10$ ),  $F(1, 553) = 15.62$ ,  $p < .001$ ,  $\eta_p^2 = 0.03$ . In other words, regardless of how these different groups are formed and compared, those who do not

identify with a religion believe in ETI to a greater extent than those who do identify as religious. In all, using two distinct measures of religiosity, these data confirm the less people self-identify as religious, the more likely they are to endorse ETI beliefs such as the belief that UFOs are real and that the government is hiding evidence of their existence.

## Study 3

Having established experimentally that the need for meaning motivates ETI beliefs and that the less religious people are the more they hold ETI beliefs, in our final studies we sought to test a model linking low religiosity to paranormal ETI beliefs via the need for meaning. We hypothesized a serial mediation model in which low religiosity would be associated with low presence of meaning (i.e., deficits in meaning), which would in turn correspond with high search for meaning (i.e., a desire to find meaning), and finally higher search would in turn be associated with high levels of paranormal ETI belief. The ordering of the proposed model is grounded in theory and supported by research. Specifically, the placement of presence of meaning before search for meaning is consistent with the theoretical notion that search for meaning is sometimes (though not always) a response to crisis of meaning or lack of meaning (Baumeister 1991; Klinger 1998; Steger et al. 2008). The ordering is also supported by research demonstrating that experimental manipulations that activate the need for meaning (e.g., thinking about death, being reminded of how cosmically insignificant humans are) increase compensatory efforts to find meaning (e.g., Routledge, Roylance et al. in press; Routledge et al. 2011). Finally, the ordering is consistent with research demonstrating that traumatic events that undermine perceptions of meaning in life instigate the search for meaning (Janoff-Bulman 1992; Updegraff et al. 2008). A visual of the proposed model can be found in Fig. 1.

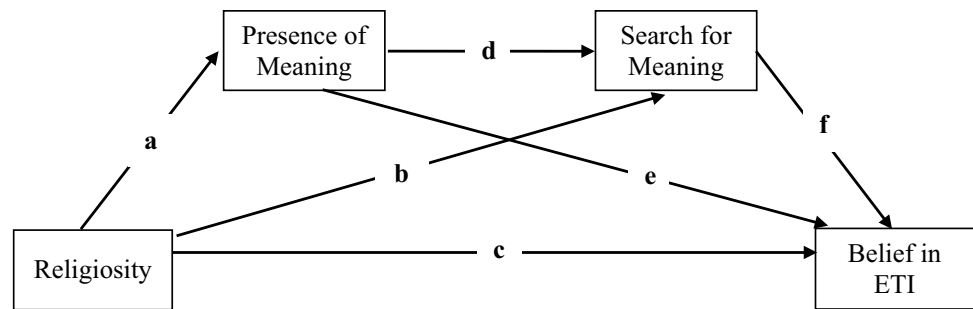
In addition, in this study, we wanted to test for specificity and thus included measures related to other magical beliefs (i.e., religious magical beliefs) and general well-being. We predicted that ETI beliefs would be specifically related to the need for meaning and not general well-being and that these beliefs would be distinct from magical beliefs related to religion.

## Method

### Participants, procedure, and materials

Participants were 129 undergraduate introductory psychology students (46 females,  $M_{\text{age}} = 19.65$ ,  $SD_{\text{age}} = 1.51$ ) from a Midwestern university who participated in exchange for

**Fig. 1** Path model from Studies 3 and 4 indicating that low religiosity predicts greater belief in ETI through lower presence of meaning and higher search for meaning. Path coefficients can be found in Table 3



course credit. Participants were informed the study concerned personality and attitudes, completed all materials in private cubicles, and were fully debriefed after the study session.

### Religiosity

Religiosity was assessed with five items taken from the Duke University Religion Index (Koenig & Bussing 2010; sample item: “In my life, I experience the presence of the Divine”; 1 = *definitely untrue*, 6 = *definitely true*) and Rohrbach and Jessor (1975; sample item: “In general, would you say you are a religious person?”; 1 = *not at all*, 6 = *very much*). These five items formed a reliable index (Cronbach’s  $\alpha = 0.90$ ).

### Meaning

Participants completed both the presence and search for meaning in life subscales of the Meaning in Life Questionnaire (Steger et al. 2006). The presence subscale assesses the extent to which people currently feel like their lives are meaningful (sample item: “My life has a clear sense of purpose”; 1 = *absolutely untrue*, 7 = *absolutely true*; Cronbach’s  $\alpha = 0.90$ ). The search subscale assesses the extent to which people are currently seeking meaning in life (sample item: “I am searching for meaning in my life”; 1 = *absolutely untrue*, 7 = *absolutely true*; Cronbach’s  $\alpha = 0.93$ ).

### Well-being

Well-being was assessed with the five item Satisfaction with Life scale (SWLS; Diener et al. 1985; sample item: “I am satisfied with my life”; 1 = *strongly disagree*, 7 = *strongly agree*; Cronbach’s  $\alpha = 0.82$ ).

### ETI belief

We assessed paranormal ETI beliefs by having participants rate their agreement on a 9-point scale (1 = *completely disagree*, 9 = *completely agree*) with the three items used in Studies 1 and 2 (Cronbach’s  $\alpha = 0.84$ ).

### Religious supernatural belief

We assessed religious supernatural beliefs by having participants rate their agreement on a 9-point scale (1 = *completely disagree*, 9 = *completely agree*) with three items created by the researchers to assess belief in supernatural agents and events related to traditional religious narratives. These items were: “Demon possession is real”, “People sometimes receive signs from God”, and “Miracles are real” (Cronbach’s  $\alpha = 0.81$ ).

## Results and discussion

Correlation results provided further support that belief in ETI serves an existential function (see Table 1). Lower presence of meaning and higher search for meaning were associated with greater belief in ETI. As in Study 2, ETI belief was significantly inversely correlated with religiosity. Evidencing specificity, ETI beliefs were uncorrelated with religious supernatural beliefs and uncorrelated with satisfaction with life.

A gender effect was observed such that males ( $M = 5.11$ ,  $SD = 2.18$ ) believed in ETI more than females ( $M = 3.97$ ,  $SD = 2.32$ ),  $F(1, 127) = 7.79$ ,  $p = .006$ ,  $\eta_p^2 = 0.06$ , but gender did not moderate any relationship between meaning variables and ETI beliefs ( $ps > 0.72$ ). There was also a gender effect on religiosity such that females ( $M = 4.14$ ,  $SD = 1.25$ ) scored higher than males ( $M = 3.59$ ,  $SD = 1.45$ ),  $F(1, 127) = 4.80$ ,  $p = .03$ ,  $\eta_p^2 = 0.04$ . Likewise, there was a marginally significant effect on religious supernatural beliefs such that females ( $M = 6.30$ ,  $SD = 2.05$ ) were more likely to believe in religious supernatural agents and events than males ( $M = 5.55$ ,  $SD = 2.37$ ),  $F(1, 125) = 3.22$ ,  $p = .08$ ,  $\eta_p^2 = 0.03$ . There were no gender effects on meaning, search for meaning, or satisfaction with life ( $ps > 0.32$ ).

Considering the relationships observed between religiosity, meaning variables, and belief in ETI (see Table 1), to test our hypothesis we tested a sequential mediation model. We specifically tested the model that low religiosity leads to low meaning which in turn leads to high search for meaning and subsequently higher belief in ETI. We calculated

**Table 1** Zero-order correlations in Study 3

Measure	1	2	3	4	5	6	<i>M</i>	<i>SD</i>	Range
Religiosity	–						3.79	1.40	5.00
Presence of meaning	0.39**	–					4.88	1.18	5.00
Search for meaning	–0.07	–0.32**	–				4.60	1.45	6.00
Belief in ETI	–0.24*	–0.29**	0.28**	–			4.71	2.29	8.00
Supernatural religious beliefs	0.67**	0.24*	0.06	0.05	–		5.82	2.29	8.00
Satisfaction with life	0.06	0.44**	–0.28**	–0.10	0.02	–	4.83	1.11	5.00

\* $p < .05$ . \*\* $p < .001$

95% bootstrapped confidence intervals and bootstrapped standard errors for direct and indirect effects (10,000 bootstrap samples) using the PROCESS macro for SPSS (Hayes 2013; model 6) (see Fig. 1). We present the tests of the direct and indirect effects in Table 3. Three direct effects were significant. Lower levels of religiosity predicted less presence of meaning (Path a), less presence of meaning in turn predicted more search for meaning (a relationship that remained significant after controlling for religiosity; Path d). Higher levels of search for meaning predicted greater belief in ETI (a relationship that remained significant after controlling for religiosity and presence of meaning; Path f). Also, high levels of religiosity were associated with lower belief in ETI in the zero order, but the relationship between religiosity and belief in ETI dipped to marginal significance when presence of meaning and search for meaning were controlled for (Path c). The test of the indirect effects revealed one significant indirect effect. Low religiosity predicted greater ETI beliefs indirectly through decreased presence of meaning and increased search for meaning (Path  $a \times d \times f$ ).

In sum, participants who indicated that their lives lacked meaning or that they were searching for meaning reported the highest supernatural ETI beliefs. In addition, a significant indirect path from religiosity to belief in ETI suggests that low religiosity may inspire belief in ETI by leaving people vulnerable to low meaning and motivated to search for meaning. ETI beliefs were unrelated to supernatural religious beliefs, thus indicating that they are a distinct form of magical thinking. In addition, meaning variables but not general well-being were associated with ETI beliefs, thus demonstrating specificity to an existential motive for these beliefs.

## Study 4

The purpose of Study 4 was to replicate the sequential model from Study 3 using a different measure of ETI beliefs (Swami et al. 2009) and one that has been used in past work linking low religiosity to high ETI beliefs (Swami et al. 2010).

## Method

### Participants, procedure, and materials

Participants were 206 undergraduate introductory psychology students (130 females,  $M_{\text{age}} = 19.00$ ,  $SD_{\text{age}} = 2.16$ ) from a Midwestern university who participated in exchange for course credit. Participants were informed the study concerned personality and attitudes, completed all materials in private cubicles, and were fully debriefed after the study session.

### Religiosity

Religiosity was assessed using two items. These items were: “In general, would you say that you are a religious person?” (1 = *not very religious*, 6 = *very religious*), and “How important are religious or spiritual beliefs in your day-to-day life?” (1 = *not very important*, 6 = *very important*; Cronbach’s  $\alpha = 0.99$ ; House 1994).

### Meaning

As in Study 3, meaning was assessed with the presence and search for meaning in life subscales of the Meaning in Life Questionnaire (Steger et al. 2006; Presence subscale: Cronbach’s  $\alpha = 0.93$ ; Search subscale: Cronbach’s  $\alpha = 0.94$ ).

### ETI Belief

To assess paranormal ETI beliefs we administered the 11 item alien visitation and cover-up subscale from the Extraterrestrial Beliefs Scale (Swami et al. 2009). This subscale consists of items such as “Unidentified flying objects (UFOs) observed in the skies are in fact sightings of the spacecraft of intelligent extraterrestrials” and “Intelligent extraterrestrial life has visited Earth”. We chose this subscale because it specifically assesses paranormal ETI beliefs. Participants were instructed to indicate their level of agreement with these items on a 7-point scale (1 = *disagree*, 7 = *agree*). The measure formed a highly reliable index (Cronbach’s  $\alpha = 0.93$ ).

**Results and discussion**

Correlation results suggest that belief in ETI serves an existential function (see Table 2). Higher search for meaning were associated with greater belief in ETI. However, in contrast to Study 3, the relation between presence of meaning and ETI beliefs did not reach statistical significance. ETI belief was significantly inversely correlated with religiosity.

A marginally significant gender effect was observed such that males ( $M=3.66, SD=1.23$ ) believed in ETI more than females ( $M=3.33, SD=1.28$ ),  $F(1, 204)=3.34, p=.07, \eta_p^2=0.02$ . Gender did not moderate any relationship between meaning variables and ETI beliefs ( $ps>0.21$ ). There was also a marginally significant gender effect on religiosity such that females ( $M=4.00, SD=1.54$ ) scored higher than males ( $M=3.59, SD=1.57$ ),  $F(1, 204)=3.31, p=.07, \eta_p^2=0.02$ . Finally, there was a significant gender effect on presence of meaning such that females ( $M=5.50, SD=1.27$ ) reported higher presence of meaning than males ( $M=5.04, SD=1.36$ ),  $F(1, 204)=5.82, p=.02, \eta_p^2=0.03$ . There was no gender effect on search for meaning ( $p=.66$ ).

As in Study 3, we tested the model that low religiosity leads to low meaning which in turn leads to high search for meaning and subsequently higher belief in ETI by calculating 95% bootstrapped confidence intervals and bootstrapped standard errors for direct and indirect effects (10,000 bootstrap samples) using the PROCESS macro for SPSS (Hayes 2013; model 6) (see Fig. 1). We present the tests of the direct and indirect effects in Table 3 alongside the Study 3 tests. Four direct effects were significant. Lower levels of religiosity predicted less presence of meaning (Path a), less presence of meaning in turn predicted more search for meaning (a relationship that remained significant after controlling for religiosity; Path d). Higher levels of search for meaning predicted greater belief in ETI (a relationship that remained significant after controlling for religiosity and presence of meaning; Path f). Also, high levels of religiosity were associated with lower belief in ETI (a relationship that remained significant when presence of meaning and search for meaning were controlled for; Path c). The test of the indirect effects revealed one significant indirect effect. Low religiosity predicted greater ETI beliefs indirectly through decreased presence of meaning and increased search for meaning (Path a  $\times$  d  $\times$  f).

**Table 2** Zero-order correlations in Study 4

Measure	1	2	3	4	<i>M</i>	<i>SD</i>	Range
Religiosity	–				3.85	1.56	5.00
Presence of meaning	0.31	–			5.33	1.32	6.00
Search for meaning	–0.03*	–0.38**	–		4.27	1.75	6.00
Belief in ETI	–0.16*	–0.09	0.18**	–	3.47	1.27	5.73

\* $p<0.05$ ; \*\* $p<.001$

**Table 3** Tests of direct and indirect effects in the Fig. 1 serial mediation models in Study 3 and Study 4

Effect	Path	Study 3			Study 4		
		Coeff	SE	95% CI	Coeff	SE	95% CI
<b>Direct effects</b>							
Religiosity→Presence of meaning*	a	0.33	0.07	[0.19, 0.46]	0.26	0.06	[0.15, 0.37]
Religiosity→Search for meaning	b	0.07	0.09	[–0.12, 0.26]	0.11	0.08	[–0.04, 0.26]
Religiosity→ETI belief	c	–0.28	0.15	[–0.57, 0.02]	–0.13	0.06	[–0.25, –0.01]
Presence of meaning→Search for meaning*	d	–0.43	0.11	[–0.65, –0.20]	–0.54	0.09	[–0.72, –0.37]
Presence of meaning→ETI belief	e	–0.29	0.18	[–0.66, 0.07]	0.03	0.08	[–0.12, 0.18]
Search for meaning → ETI belief*	f	0.35	0.14	[0.07, 0.62]	0.13	0.05	[0.03, 0.24]
<b>Indirect effects</b>							
Religiosity→Presence of meaning→ETI belief	a $\times$ e	–0.10	0.08	[–0.30, 0.02]	–0.003	0.03	[–0.04, 0.06]
Religiosity→Search for meaning→ETI belief	b $\times$ f	0.02	0.04	[–0.04, 0.11]	0.01	0.01	[–0.002, 0.05]
Religiosity→Presence of meaning→Search for meaning→ETI belief*	a $\times$ d $\times$ f	–0.05	0.03	[–0.14, –0.01]	–0.02	0.01	[–0.05, –0.003]

The letters in the column “Path” correspond with the labels from Fig. 1

Coeff unstandardized path coefficient, SE bootstrapped standard error, CI bootstrapped confidence interval

\*Denotes a statistically significant pathway



In sum, Study 4 replicated the model tested in Study 3 using a distinct measure of ETI beliefs (Swami et al. 2009). Study 4 provides further support that low religiosity may inspire belief in ETI, in part, by leaving people vulnerable to low meaning and motivated to search for meaning.

## General discussion

There is no compelling scientific evidence supporting paranormal ETI beliefs concerning UFOs and alien visitors or cover-ups. Thus, to hold such beliefs requires a leap of faith, a willingness to believe without evidence. In this way, these kinds of ETI beliefs are similar (though certainly not identical) to religious beliefs. In the present research, we tested the assertion that belief in ETI, like religious belief, is at least partially motivated by the need for meaning. In support of our proposal, we first established experimentally that compromised meaning increases belief in ETI (Study 1) and this relationship was further confirmed non-experimentally in Studies 3 and 4 in which a lack of meaning and a desire to find it were associated with greater belief in ETI in mediation models. Our next goal was to determine if this meaning motive helped account for the inverse relation between religiosity and ETI belief. Indeed, we observed that belief in ETI was inversely related to religiosity (Studies 2–4). In Study 2 we provided a rigorous test of this inverse relationship by using both continuous and categorical measures of religiosity. Atheists and agnostics reported higher ETI belief than religious participants. Critically, we found evidence for a mediational model linking low religiosity to a lack of meaning, a desire to find meaning, and high ETI belief (Studies 3 & 4). It is also worth noting that no relationship was found between general well-being and belief in ETI (Study 3). Thus, ETI beliefs are not motivated by a desire to feel more satisfied with life. They are motivated by a desire to find meaning in life. In addition, belief in ETI was unrelated to belief in supernatural religious agents and events (Study 3). Thus, belief in ETI does not simply reflect a general tendency to believe in phenomena unsubstantiated by scientific evidence. In all, these results have a number of implications for future research.

As previously noted, perceptions of meaning contribute to quality of life (King and Napa 1998; Low and Molzahn 2007) and aid in coping with stress and illness (Park 2010). The present research suggests that when people are striving to perceive life as meaningful, they may be attracted to the kind of beliefs that we normally associate with science fiction. Future research should thus explore the potential for these types of beliefs to confer psychological benefits associated with meaning. Might believing in ETI help people cope with life stressors that jeopardize perceptions of meaning?

Future research should also explore further the relationships between religiosity, meaning in life, and belief in ETI. Many people who do not identify with religion may also reject the notion of ETI. There are many ways to attain perceptions of meaning that do not involve these types of beliefs or any form of magical thinking (e.g., close relationships; Lambert et al. 2013). In fact, research indicates that non-religious individuals increase their belief in science following existential threat (Farias et al. 2013). The present work does, however, suggest that at least some of the people who are not inclined to accept traditional religious beliefs are attracted to alternative religious-like magical beliefs (e.g., intelligent aliens have visited Earth). Thus, the present work paves the way for future research to further explore religious-like thought processes that depart from traditional religious narratives. Considering that cognitive psychologists have advanced the notion that magical thinking is innate to humans and requires conscious effort and perhaps significant training to override (Kelemen et al. 2013), even people who purposefully reject magical beliefs in one domain (e.g., religion) might be vulnerable to magical beliefs in other domains. We focused on paranormal ETI beliefs, but there may be other types of magical beliefs that non-religious individuals are attracted to because they appear sufficiently distinct from traditional supernatural religious beliefs. Exploring domain-specific magical beliefs may prove to be important for continued theoretical developments in the psychology of religion and the study of existential motivation.

Further, the present research found that men generally tend to believe in ETI more than women. As previously noted, past research has often (e.g., Goode 2000; Patry and Pelletier 2001; Rice 2003) but not always (Swami et al. 2009, 2010) observed gender differences in these types of beliefs. The present studies were not designed to systematically examine gender differences but since a gender effect was observed, future research should seek to further elucidate the relationship between gender and belief in ETI. Public polling indicates that women report being more religious than men (Trzebiatowska and Bruce 2012; Winseman 2002) and this was also the case in our research. Therefore, one possibility is that women are less in need of alternative meaning-providing religious-like beliefs because they are more inclined to identify with traditional religious beliefs. Future research should further examine the relation between these variables and consider other variables that may influence the extent to which males and females may be attracted to beliefs regarding ETI.

Once again we would note that we specifically focused on the type of ETI beliefs that reflect magical thinking in that they are outside of our scientific understanding of the world. People may have interests and curiosities about the possibility of living organisms on other worlds and a

general openness to such a possibility would not constitute magical thinking. It is possible that these less magical interests in alien life may also confer psychological benefits such as meaning. That is, the general idea that some kind of life may exist on other worlds may make humans feel less alone in the universe and the search for such life may also generate a sense of purpose. Thus, future research should explore a broader range of interest in extraterrestrial life beyond paranormal beliefs. Importantly, in the present work we found evidence in support of the assertion that people who tend to reject one brand of magical thinking (religion) are susceptible to other forms of magical thinking when seeking meaning. As many scientists have speculated, it may be quite reasonable to suspect that life exists elsewhere in the universe. However, it requires more religious-like thinking to believe that such alien life includes highly intelligent and technologically sophisticated beings that have travelled to Earth, influenced or interacted with humans, and been hidden from the public by elaborate government conspiracies.

Finally, the present research has a number of limitations that warrant discussion. For one, our research was conducted using undergraduate student samples. Thus, we are hesitant to generalize our findings beyond young adults living in the United States. However, as noted in the Introduction, ETI beliefs are commonplace among adults in the United States. Also, surveys in the United Kingdom suggest ETI beliefs are relatively high there as well and also associated with low levels of religiosity, though this research did not examine the potential role of meaning-related variables (e.g., Swami et al. 2010).

It is also worth noting that we did not observe a significant zero-order correlation between presence of meaning and ETI beliefs in Study 4, though we did observe such a relationship in Study 3 and observed a significant positive relationship between search for meaning and ETI beliefs in Studies 3 and 4. We also observed a significant effect of threatened meaning on ETI beliefs in Study 1 and significant indirect effects linking meaning to ETI beliefs through search for meaning in Studies 3 and 4. Collectively, with the exception of that one nonsignificant correlation, our research provides evidence linking the meaning motive to ETI beliefs. That being said, we would point out that the effect sizes across studies were relatively small. As noted before, there are many paths to meaning (e.g., close relationships, personal goals) and ETI beliefs are likely not a major source of meaning for most nonreligious individuals. However, we believe even a small effect size makes an important theoretical point that humans appear to be drawn to a range of magical beliefs in their search to find meaning.

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## Compliance with ethical standards

**Conflict of interest** Authors have no conflict of interest.

**Informed consent** In addition, informed consent was obtained from all participants in the reported studies and all participants were fully debriefed after they participated in the study.

**Research involving human and animal participants** All procedures performed in the reported studies involving human participants were in accordance with the ethical standards of the institutional research committee and with the American Psychological Association Ethics Code.

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