

**EFFECTS OF EXTRATERRESTRIAL LIFE ON MEANING,
MATTERING, AND SPIRITUALITY**

An Undergraduate Research Scholars Thesis

by

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ABSTRACT

Effects of Extraterrestrial Life on Meaning, Mattering, and Spirituality

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Research concerning the effects of extraterrestrial beliefs has been largely concerned with its correlation to other paranoid beliefs and mental health issues. This study, however, attempts to understand the more intrapersonal consequences of beliefs in extraterrestrial life. In this study we randomly assigned participants from Texas A&M University to read a prompt stating that scientists have come to the conclusion that life is either scarce to non-existent outside of Earth, or highly likely and abundant while looking at photos taken from the Hubble Space Telescope. The differences between the two groups average responses to items measuring meaning, mattering, and spirituality, as well as other items, was examined. It was hypothesized that those within the group being told extraterrestrial life was scarce will have a decreased general meaning in life and mattering, with an increase in spirituality and religiosity when compared to those within the group told extraterrestrial life is abundant. Data suggests that although there was no direct correlation with the conditions and meaning in life, mattering, or spirituality, religiosity was a moderating variable between the conditions and both general meaning in life and the variable comprehension.

DEDICATION

To everyone who has supported me on my journey.

*I appreciate everything you all have done for me, and I hope to make you proud with my work
and career.*

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I would like to thank my faculty advisor, Dr. Hicks for his guidance and support throughout the course of this research. The fact that he was willing to take me under his wing and allow me to do this project with him is something I will always be appreciative of. I feel as though he has really allowed me to come into my own academically and has allowed me to have a taste of what high-level psychology research is like.

I would like to thank Chase Gause, the graduate student assigned to assisting me and aiding in the general oversight of the process. I have immense appreciation for the fact that he was willing to teach me, an undergraduate, the things he has been learning throughout his graduate career. His insight into the project was vital, and I am grateful for his help.

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Thank you to the URS program for this wonderful opportunity and providing essential aid in the development of this paper. The resources that this program has provided have been essential for me in writing this paper and have not gone unappreciated.

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1. INTRODUCTION

The concept of extraterrestrial life has been deeply explored in traditional media including movies such as “E.T the Extra-Terrestrial” directed by Steven Spielberg, and books such as “The Hitchhiker’s Guide to the Galaxy” written by Douglas Adams, Eoin Colfer, and Thomas Tidholm. Aliens and life beyond Earth have been a subject that is widespread within American culture. With the coverage and exposure that the concept extraterrestrial life has, it is no surprise that the number of individuals who believe in the existence of extraterrestrial life has steadily increased over time (Gallup, 1991).

Kwon (2018) conducted a study attempting to measure the reactions that people would have if extraterrestrial life forms came to Earth. Most reported that they would have a positive reaction if the situation were to occur. However, most participants also reported that they believe that the general population would have a negative reaction. The belief in the extraterrestrial and considerations of how the populus would react to extraterrestrial life seems to be something the common person has considered and developed an opinion on. Chequers (1997) stated that belief in the existence, and abundance, of extraterrestrial life is commonplace amongst the general population and especially prominent with youth. It is extremely important to research the topic of extraterrestrial beliefs because if there are any negative consequences of holding such a belief, it could have widespread effects.

Chequers also stated in the same study that beliefs in extraterrestrial life have often been hypothesized to be a paranormal belief, which in turn is correlated with schizotypal mental disorders. Windholz and Diamant (1974) found an association between student scores of extraordinary phenomena beliefs and scores on the schizophrenia scale of the MMPI (Minnesota

Multiphasic Personality Inventory). Chequers, however, found that the belief in extraterrestrial life is not a paranormal belief, unlike its similar counterpart belief in UFOs, which is positively correlated with magical ideation, cognitive disorganization, and paranoid ideation. There was in fact no correlation between belief in extraterrestrial life and these variables. Although the two concepts are closely related, it is extremely important to understand the difference between the two as there are major differences in the mental health consequences of having beliefs in both concepts.

Swami (2010) furthered the discussion surrounding the concept of extraterrestrial beliefs and its potential mental health consequences. Swami states that it is important to distinguish paranormal and nonparanormal beliefs in extraterrestrial life. because of the negative associations with retaining paranormal beliefs. Specifically, Swami suggests that the belief in extraterrestrial life could be associated with scientific thinking, rather than a belief in the paranormal. In their study Swami sought to understand the individual differences that facilitate the difference in the population's extraterrestrial beliefs. They found that 37% of the reason for the variance in beliefs of extraterrestrial life is from individual differences in personality, and education level. Swami's findings suggest that different populations and personality types are more likely to hold beliefs in the extraterrestrial, as well as paranormal beliefs.

In a previous study Swami (2009) had found that the likelihood of an individual believing in extraterrestrial life is tied to their religiosity and political orientation. They found that extraterrestrial beliefs were higher within participants low in religiosity and more left leaning politically. They stated that this finding is consistent with the suggestion that there is an inverse relationship between extraterrestrial beliefs and religious beliefs. Due to this finding that beliefs in extraterrestrial life are correlated with religiosity it is important to understand the association

between general meaning in life and religiosity, as we will be exploring the relationship further within our study.

Meaning in life as a concept is vital to both this study and individuals. Meaning in life reflects the feeling that one's existence has significance, purpose, and coherence. Li et al., (2021) also states that meaning in life involves internal value, that individuals derive meaning from life itself. Overall meaning in life has a variety of positive effects. A high meaning in life is associated with an increased lifespan, overall health, and general happiness in life (Routledge 2021). It also promotes social and community engagement. Individuals with simply a desire to live a meaningful life are more likely to engage in prosocial behavior such as volunteering and charitable giving. Meaning in life has positive economic effects as well since it is associated with an increased amount of self-control and goal directed behavior, which likely aids in economic decision-making and work-related goals leading to an increased financial security. Overall meaning in life is associated with a variety of benefits for individuals, and as such it is important to understand what positively and negatively affects it.

Routledge (2021) sought to find the differences in general meaning in life between theists and atheists. He examined how each group prioritizes and gathers meaning from different sources. He and his team found that atheists were more likely to report having no meaning, and to find it in unconventional sources, whereas theists were more likely to reference social sources and sources more conventionally coded. Theists were in general more likely to score higher on need for meaning than atheists. This research is important to understand for our study as we will be examining the differences between high, low, and average religiosity participants.

Routledge (2018) also found 13 different predominant sources of meaning from past research and an examination of random sample narratives. These 13 themes were social

relationships, parenting, personal goals/self-improvement, spirituality, helping others, legacy, pursuit of knowledge, hobbies, travel, career, nature, and no meaning/uncertainty. After following studies Routledge deemed that spirituality, legacy, hobbies, and travel were absent from most respondents' narratives, and as such were no longer considered in following studies. Routledge made the conclusion that meaning is found through social connections for all, however there are a number of differences between theists and atheists, as well as between men and women. Specifically concerning religion theists generally focus more on relationships and parenting, and not religion whereas atheists were more likely to state that life had no meaning or to feeling uncertain about life's meaning. Concerning the sex differences in sources of meaning it was found that women focus more on relationships, parenting, religion, helping others, and nature than males whereas men focused more on personal goals/self-improvement. There was an interesting interaction within this study between female theists as they were the only group who viewed parenting as a source of meaning. This study is vital to better understanding our study as it is primarily concerned with how individuals generate meaning in life, and from what sources.

Overall, the belief in the existence of extraterrestrial life has been associated with having a variety of psychological effects including an increased number of paranormal beliefs, which in turn have physical health ramifications. Past research concerning the topic has also centered around distinguishing the belief in the existence of extraterrestrial life with paranormal beliefs in topics such as UFOs. However, there has been little research done to understand the intrapersonal psychological effects of the belief. With recent pictures from NASA's Hubble Space Telescope being released, it has become increasingly important to understand the effects that thoughts about the universe and life outside of Earth have on the individual.

Our study's focus was concerned with finding the direct effects of beliefs in extraterrestrial life are on internal aspects of the self. We sought to manipulate participants' beliefs in the extraterrestrial in order to examine what its effects were on general meaning in life, belief in oneness, spirituality and religiosity, and comprehension, as well as other similar concepts. We hypothesized that participants with beliefs that extraterrestrial life was scarce would have a decreased general meaning in life and mattering, as well as an increase in spirituality and religiosity. In turn participants with the belief that extraterrestrial life was abundant would have an increased general meaning in life and mattering, as well as a decrease in spirituality and religiosity.

2. METHODS

2.1 Participants

We recruited 117 participants, 68 females, with ages ranging from 18 to 24 ($M = 18.9$, $SD = 1.12$) from Texas A&Ms psychology subject pool. We asked participants to state their identified religion, or lack thereof. 78 participants (66.7%) indicated Christian affiliation, 4 (3.4%) Hindu, 5 (4.3%) Buddhist, 2 (1.7%) Muslim, 3 (2.6%) Spiritual, 8 (6.8%) Agnostic, 9 (7.7%) Atheist, and 8 (6.8%) other. Participants were also asked to report their identified race, with 1 (0.9%) reporting American Indian/Alaskan Native, 16 (13.7%) Asian, 1 (0.9%) Indian, 92 (78.6%) White, 2 (1.7%) Black or African American, 4 (3.4%) More than one race, and 1 (0.9%) Other. 38 (32.8%) reported being Hispanic, and 78 (67.2%) reported to not be.

2.2 Procedure

Participants were instructed to complete an online survey while in our physical lab space. During the survey participants looked at an image from the James Webb Space Telescope (JWST) and read statements describing the mathematical vastness of the universe. Statements such as ‘Each speck of light, from the very large specks to the specks that can only be seen when we zoom in, is a single galaxy.’ and various others stating the abundancy of stars, and planets within each galaxy. Participants were then randomly assigned to either a ‘scarce’ condition, or an ‘abundant’ condition. Within the scarce condition, participants read a false statement that modern scientists have come to the conclusion that extraterrestrial life, including intelligent life, is nonexistent. Within the abundant condition, participants read a false statement concluding the opposite as the scarce condition. These participants read that modern scientists have concluded that amount extraterrestrial life, including intelligent life, is immense. Following reading these

statements participants completed measures of meaning in life, belief in oneness, spirituality, religiosity, comprehension, and others. Students then responded to questions attaining demographic information, as well as a serious check item asking the participants if for any reason their responses may be invalid. Upon completion participants received class credit through TAMU's SONA system.

2.3 Materials

2.3.1 Extraterrestrial Abundancy Manipulation

Extraterrestrial abundancy was manipulated by asking participants to read various statements concerning the likely abundancy, or scarcity, of extraterrestrial life. Participants were first instructed to look at an image taken by NASA's James Webb Space Telescope and read a brief introductory paragraph discussing the mathematics about how many planets. Statements were made about the number of galaxies, stars, and planets in the universe such as "According to NASA there are approximately 100 billion stars in the Milky Way, and at least 1 planet per star in the universe" and "this suggests that there are over 1 septillion... planets in the universe.". Following this paragraph participants were randomly assigned to either the 'abundant' condition, or the 'scarce' condition.

Each group read a false statement concerning the hypothesized number of planets in the universe. In the abundant category, participants read a paragraph stating that scientists believe that intelligent life is "nearly guaranteed", while in the scarce category participants read a paragraph stating that scientists believe that intelligent life is "nearly impossible". After reading the two paragraphs both groups of participants were instructed to write about how the texts made them feel.

2.3.2 ETI Belief Measure

We assessed belief in the abundance of extraterrestrial life by having participants respond to two questions. Participants were asked “How abundant is intelligent life in the universe according to scientists?” and “How abundant do you think intelligent life is in the universe?” which could be responded to on a 7-point Likert scale (1 = *very scarce*, 7 = *very abundant*).

2.3.3 Meaning in Life

To measure Meaning participants were instructed to respond to questions from the Costin and Vignoles Meaning + EA5 Scale. (CVM+EA5; Costin and Vignoles, 2019). This scale consists of 21 items that assess participants’ general meaning in life, comprehension, purpose, mattering, and existential appreciation.

The general meaning in life subscale consists of 4 items which attempts to measure the existence of meaning in an individual. Participants responded to items such as “My life as a whole has meaning” on a 7-point Likert scale (1 = *strongly disagree*, 7 = *strongly agree*).

The comprehension subscale consists of 4 items that attempt to measure the participants’ ability to understand the events in their life. Participants responded to items such as “I can make sense of the things that happen in my life” on a 7-point Likert scale (1 = *strongly disagree*, 7 = *strongly agree*).

The purpose subscale consists of 4 items measuring the amount of motivation one has in their life. Participants responded to items such as “I have certain life goals that compel me to keep going” on a 7-point Likert scale (1 = *strongly disagree*, 7 = *strongly agree*).

The mattering subscale consists of 4 items measuring whether or not the events in an individual’s life are perceived to be important. Participants responded to items such as “Whether

my life ever existed matters – even in the grand scheme of the universe” on a 7-point Likert scale (1 = *strongly disagree*, 7 = *strongly agree*).

The existential appreciation subscale (Kim et al., 2022) has 5 items measuring the participant’s appreciation for the life surrounding them. Participants responded to items such as “I appreciate a wide variety of experiences” on a 7-point Likert scale (1 = *strongly disagree*, 7 = *strongly agree*).

2.3.4 Awe

To measure Awe participants were asked to respond to questions from the Awe Experience Scale (AWE-S; Yaden et al., 2018). This scale consists of 30 items that assess participants’ altered time perception, self-diminishment, connectedness, vastness, physical sensations, and need for accommodation.

The altered time perception subscale consists of 5 items measuring the level participants felt a slowed or increase in the passage of time. Participants responded to items such as “I sensed things momentarily slow down” on a 7-point Likert scale (1 = *strongly disagree*, 7 = *strongly agree*).

The self-diminishment subscale consists of 5 items measuring the participants’ feeling of their perception of self-become smaller. Participants responded to items such as “I felt my sense of self shrink” on a 7-point Likert scale (1 = *strongly disagree*, 7 = *strongly agree*).

The connectedness subscale consists of 5 items measuring the participants’ feeling an increased level of connection with life around them. Participants responded to items such as “I had the sense of being connected to everything” on a 7-point Likert scale (1 = *strongly disagree*, 7 = *strongly agree*).

The vastness subscale consists of 5 items measuring the participants' feeling of the world around them being more grand or larger. Participants responded to items such as "I perceived vastness" on a 7-point Likert scale (1 = *strongly disagree*, 7 = *strongly agree*).

The physical sensations subscale consists of 5 items measuring the participants' feeling various physical sensations. Participants responded to items such as "I had goosebumps" on a 7-point Likert scale (1 = *strongly disagree*, 7 = *strongly agree*).

The need for accommodation subscale consists of 5 items measuring the participants' feelings of being challenged intellectually and perceptually. Participants responded to items such as "I found it hard to comprehend the experience in full" on a 7-point Likert scale (1 = *strongly disagree*, 7 = *strongly agree*).

2.3.5 *Belief in Oneness*

To measure belief in oneness, or the belief that everything in the world or universe is fundamentally connected, participants were asked to respond to items from the Belief in Oneness (BIO; Diebels et al., 2018). This scale consists of 6 items that assess participants' belief in oneness. Participants responded to items such as "Beyond the surface appearances, everything is fundamentally one" on a 7-point Likert scale (1 = *strongly disagree*, 7 = *strongly agree*).

2.3.6 *Spiritual Transcendence*

To measure spiritual transcendence, participants responded to items from the Spiritual Transcendence Scale (STS; Piedmont, 2001). This scale consists of 24 items that assess participants' connectedness, prayer fulfillment, and universality.

The connectedness subscale consists of 6 items measuring the participants' feelings of connectedness with their family, community, and greater, whether alive or not. Participants

responded to items such as “I am a link in the chain of my family’s heritage, a bridge between past and future.” on a 6-point Likert scale (1 = *strongly disagree*, 6 = *strongly agree*).

The prayer fulfillment subscale consists of 9 items measuring the participants’ feelings of fulfillment from various prayer methods. Participants responded to items such as “I find inner strength and/or peace from my prayers or meditations.” on a 6-point Likert-scale (1 = *strongly disagree*, 6 = *strongly agree*).

The universality subscale consists of 9 items measuring the participants’ beliefs on existential meaning in respect to themselves and the universe. Participants responded to items such as “There is an order to the universe that transcends human thinking” on a 6-point Likert-scale (1 = *strongly disagree*, 6 = *strongly agree*).

2.3.7 *Fear of Personal Death*

To fear of personal death, participants responded to items from the Fear of Personal Death Scale (Florian & Kravetz, 1983). This scale consists of 31 items that assess participants’ fear of loss of self-fulfillment, fear of loss of social identity, fear of consequences to family and friends, fear of transcendental consequences, fear of self-annihilation, and fear of punishment in the hereafter.

The loss of self-fulfillment subscale consists of 10 items measuring the participants’ fears of death that are primarily associated with not fulfilling or losing parts of the self that allowed the participant to engage in enjoyable activities or work. Participants responded to items such as “Death frightens me because of the loss of all plans and activities” on a 7-point Likert-scale (1 = *strongly disagree*, 7 = *strongly agree*).

The loss of social identity subscale consists of 8 items measuring the participants’ fears that their death will not be felt by those around them, or that they may be forgotten. Participants

responded to items such as “Death frightens me because my loss will not hurt close others” on a 7-point Likert-scale (1 = *strongly disagree*, 7 = *strongly agree*).

3. RESULTS

We first examined if there were any direct correlations between our measures and our conditions. We then examined the effects of the conditions on general meaning in life by running a linear regression. The results showed that there were no direct effects of the conditions on our measures.

3.1 Manipulation Comprehension and Believability Check

Next, we examined the responses from the comprehension and believability checks concerning the manipulation. Upon examining the scarce condition, we see a difference between how much participants reported scientists beliefs on extraterrestrial abundancy, and their personal beliefs on extraterrestrial abundancy. In figure 1 the Abundant Comp Check references participants' responses to the two items in the ETI Belief Measure. The difference between the scarce condition comprehension check ($M = 1.60$, $SD = 1.27$) and believability check ($M = 3.1$, $SD = 1.82$) responses is greater than preferred, especially when we compare it to the mean difference in the abundant condition. The participants in the abundant condition had a much closer difference between the mean responses on the respective comprehension check ($M = 5.71$, $SD = 1.53$) and the believability check ($M = 5.29$, $SD = 1.78$).

Descriptives				
	Abundant Comp Check	Abundant Belivability	Scarce Comp Check	Scarce Believability
N	59	59	58	58
Mean	5.71	5.29	1.60	3.10
Median	6	6	1.00	3.00
Standard deviation	1.53	1.78	1.27	1.82
Minimum	1	1	1	1
Maximum	7	7	7	7

Figure 1: Descriptives of Abundant and Scarce condition believability check and comprehension check. Note: Item responses were between 1 and 7 (with 1 representing scarce and 7 representing abundant).

3.2 Religiosity as a Moderator between Conditions and General Meaning in Life

Although there was no direct correlation between conditions and general meaning in life, upon further examination we found that religiosity acted as a moderating variable. Participants high in religiosity had reported lower general meaning in life within the abundant condition as compared to the scarce condition. This can be seen in figure 2 as those high in religiosity had a positive slope ($r = 0.2479$) when going from the abundant (left) to scarce conditions (right). However, the inverse effect was seen when examining participants who reported being low in religiosity. Low religiosity participants reported having a greater general meaning in life when in the abundant condition as compared to the scarce condition as in figure 2 again, we see that participant low in religiosity had a negative slope when going from the abundant (left) to scarce (right) conditions ($r = -0.3229$). Average religiosity participants had a near zero correlation between the conditions and general meaning in life ($r = -0.0375$). Overall, religiosity moderated the relationship between the conditions and meaning in life. It is important to note that these findings are not statistically significant.

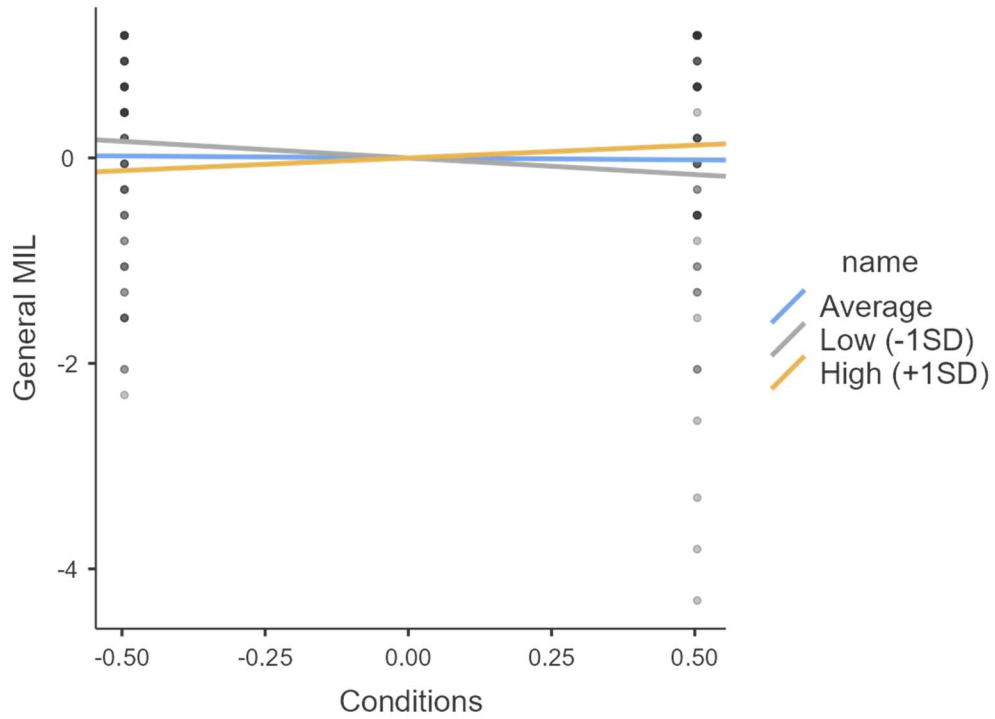


Figure 2: Religiosity acting as a moderator between conditions and general meaning in life. Note: The left side of graph represents responses from abundant condition. The right side of graph represents responses from scarce condition.

Moderation Estimates				
	Estimate	SE	Z	p
Conditions	-0.0375	0.1823	-0.206	0.837
Religiosity	0.1616	0.0271	5.962	< .001
Conditions * Religiosity	0.0848	0.0541	1.567	0.117

Figure 3: Moderation of religiosity on conditions and general meaning in life.

Simple Slope Estimates				
	Estimate	SE	Z	p
Average	-0.0375	0.184	-0.204	0.839
Low (-1SD)	-0.3229	0.260	-1.243	0.214
High (+1SD)	0.2479	0.260	0.954	0.340

Figure 4: Simple Slope Analysis of religiosity on conditions and general meaning in life.

3.3 Religiosity as a Moderator between Conditions and Comprehension

Similar to religiosity being a moderating variable between the conditions and general meaning in life, we found that religiosity was also moderating the relationship between the conditions and comprehension. Participants high in religiosity reported having less comprehension when in the abundant condition, compared to high religiosity participants in the scarce condition. When examining figure 5 we find that those high in religiosity have the most drastic difference in comprehension between the two conditions. Average religiosity participants reported having a similar effect as high religiosity participants in that they both had reported a comparatively increased sense of comprehension within the scarce life condition as compared to the abundant condition. Participants who reported low religiosity had a near zero correlation between the conditions and general meaning in life, unlike average and high religiosity respondents. Religiosity is overall acting as a moderating variable between the conditions and comprehension. It is important to note that most of the findings are not statistically significant.

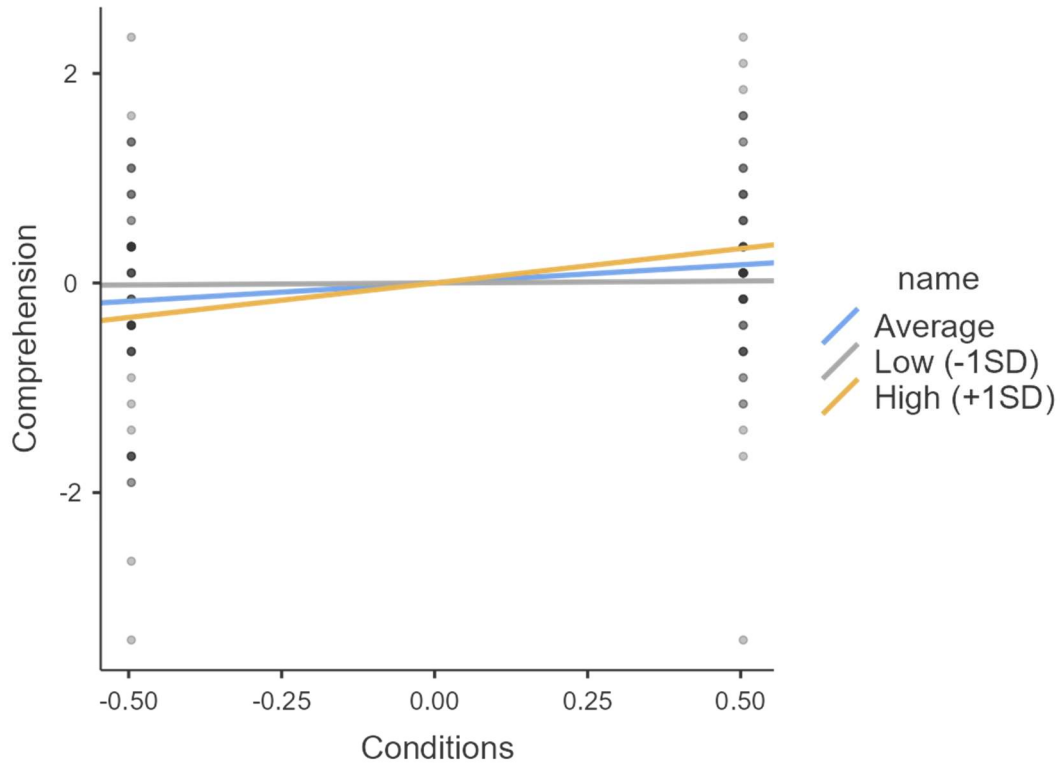


Figure 5: Religiosity acting as a moderator between conditions and comprehension. Note: The left side of graph represents responses from abundant condition. The right side of graph represents responses from scarce condition.

Moderation Estimates				
	Estimate	SE	Z	p
Conditions	0.3475	0.1802	1.93	0.054
Religiosity	0.0721	0.0268	2.69	0.007
Conditions * Religiosity	0.0921	0.0535	1.72	0.085

Figure 6: Moderation of religiosity on conditions and comprehension.

Simple Slope Estimates				
	Estimate	SE	Z	p
Average	0.3475	0.182	1.905	0.057
Low (-1SD)	0.0376	0.257	0.146	0.884
High (+1SD)	0.6574	0.257	2.557	0.011

Figure 7: Simple slope analysis of religiosity on conditions and comprehension.

4. CONCLUSION

The findings from the study do not support the hypothesis that participants within the scarce extraterrestrial life condition would have a decreased general meaning in life and mattering, as well as an increase in spirituality and religiosity. Overall, the findings suggest that there is no direct correlation between the conditions and the variables measured. However, with further examination a variety of interesting interactions can be seen between our conditions and the measured concepts.

4.1 Conditions As Direct Correlations

Overall, we saw that the conditions were not directly correlated with any of our measures. Generally, this can be understood to mean that the manipulation was not as strong as we had liked it to be. There are a variety of reasons that this could have happened. Not everyone is going to have a strong reaction to seeing the image of deep space taken from the James Web Space Telescope. This could heavily affect the results as when this happens people are going to lean heavily on their preconceived beliefs. It is likely that the statements made in the manipulation section of the survey were not strong enough to sway participants out of their preconceived beliefs about the abundance or scarcity of extraterrestrial life, a concept that research has shown young adults think about consistently. The abundant manipulation had more similar responses between what participants believed field scientists concluded, and their own beliefs. This is likely because this manipulation aligns with the preconceived beliefs of the participants in the abundance of extraterrestrial life. The sample population likely had perceived extraterrestrial life to be more abundant than not, which makes sense as the sample is comprised of educated

personal who are more likely to be up to date on the current status of the likelihood of the existence of extraterrestrial life.

4.2 Religious Moderation of Conditions and General Meaning in Life

Religiosity heavily moderated the effects of the conditions on general meaning in life. Conditions and general meaning in life had not had a statistically significant correlation prior to being examined with a religious moderator. This makes sense as the correlation between average religiosity participants and general meaning in life is near zero, meaning that for average religiosity participants there was nearly no change in general meaning in life between the two conditions. This statement cannot be made for both low and high religiosity participants, however. High religiosity participants had the greatest change between conditions. Participants in the scarce condition had a greater general meaning in life.

Speculation on why this phenomenon had resulted concerns the beliefs of our predominantly Christian participants as the likely group reporting highest in religiosity. It is likely that these participants had a specifically sacred view of the Earth and the life contained on it. They likely see the Earth as special because it was the site of God's works and the creation of man, and to state or imply that these special acts had occurred outside of our planet in abundance is something that understandably does not sit well. This is likely why we saw a decrease in general meaning in life within the abundant condition and an increase in general meaning in life within the scarce condition. It simply came down to whether or not the information that had been provided coincided with their already held and understood beliefs.

Routledge (2022) conducted an applicable study in which he explained that an individual's need for meaning significantly predicted their likelihood of having paranormal beliefs. It was also understood that the same existential motive for meaning that helps to explain

people's religious beliefs can be applied to individual's paranormal beliefs. With this in mind it is understandable how religiosity was a moderator between the conditions and general meaning in life. Participants who were low in religiosity likely underwent a similar process as high religiosity participants, except instead of applying meaning to religion low religiosity participants applied meaning to more extraterrestrial concepts such as extraterrestrial life.

Examining the results from participants average in religiosity and comparing them to those high in religiosity is also important. As previously stated, average religiosity participants had a near zero correlation between general meaning in life and conditions. This suggests that participants with average religiosity likely have the least amount of their general meaning associated with extraterrestrial beliefs, unlike those average and low in religiosity. It is likely that extraterrestrial abundance is a source of thought for both high and low religiosity groups, but not for average religiosity groups.

4.3 Religious Moderation of Conditions and Comprehension

Comprehension as a measure concerns itself with understanding how much an individual feels that they understand the events of the world. Does the participant feel confused with the occurrence of their life events, not understanding why, or how, or for what overarching reason they happen? With this in mind it is interesting to examine the implications of the findings of religious moderation on the conditions and comprehension. Overall, it can be seen that participants reporting high in religiosity had a lower comprehension within the abundant condition, implying that with the knowledge that life outside of earth is widespread, the world and it's events overall make less sense. The relationship between comprehension and the conditions for the high religiosity group can likely be explained similarly to the relationship between general meaning in life and the conditions. For high religiosity participants, most

Christian, providing information that is contradictory to their previously held beliefs is going to cause questions and doubt, which will reduce the amount of overall comprehension they have.

An interesting phenomenon with this moderation analysis was that participants low in religiosity had a near zero correlation between comprehension and the conditions. This suggests that the underlying understanding of the world that low religiosity participants have is not tied to the existence, or lack thereof, of extraterrestrial life. In the general meaning in life correlation, we saw that those average in religiosity had a near zero correlation with the conditions, whereas in this analysis with comprehension it is instead the low religiosity participants with the near zero correlation. This suggests that low religiosity participants gathered meaning in life from knowledge of extraterrestrial abundance, but did not rely on the knowledge for any comprehension of the world. Participants average in religiosity however are the opposite in that they rely on knowledge of extraterrestrial abundance to provide comprehensive value to their lives, but not meaning.

4.4 Believability of Conditions

There was an interesting difference between the believability between the abundant and scarce conditions. Participants within the scarce condition appeared to have understood the conclusions scientists had made just as much as participants within the abundant condition, however they did not believe the scientists outcome similarly. This phenomenon can likely be explained by the fact that the general population has pre-conceived beliefs about extraterrestrial life that favor on the side of abundance. Dagnall (2010) reported that extraterrestrial beliefs are more common than not. This is in direct contrast to the scarce condition, in which it was stated that extraterrestrial life was non-existent. It is less likely that participants are going to believe in evidence that counters their previously held beliefs than evidence that coincides with them. This

likely is the reason that participants in the scarce condition rated that they agree with the finding that extraterrestrial life is scarce less than those within the abundant condition who rated how much they agree with extraterrestrial life being abundant.

4.5 Study Limitations

The study was limited in a variety of ways. First and foremost, the sample size was not as large as preferred. Ideally 200 participants would have been recruited with 100 participants being in each condition. With the current number of participants being 117, we are well below the desired number. This effect can be seen in our data as most of the findings are not statistically significant, and with a greater number of participants this fact has the potential to change. Overall, an increase in the number of participants likely would have resulted in statistical significance.

Another limitation of this study was that the sample population was not as representative of the general population as preferred. As participants were recruited from students attending Texas A&M University, our sample mainly consisted of white Christian females. Ideally our sample would be more representative of the United States as a whole with a greater number of Asian and African American participants. There were also a slightly larger number of female participants to male participants, which can be important to consider as research has suggested that there are differences between how men and women approach religiosity and meaning in life (Rayburn, 2004). Another demographic issue is that the sample population was all 18-24 year olds caused by the fact that participants were recruited at a University. Generally, our survey was limited by the population and the sample was drawn from not being representative of the general population.

The study was also potentially limited because of the lack of a believable manipulation. As mentioned in the results section, the manipulation was shown to be more believable in the abundant life condition when compared to the scarce life condition. The believability of the manipulation is important as we are attempting to show that there is a correlation between perceived abundancy/scarcity of extra-terrestrial life. If the participants do not believe that extraterrestrial life is truly abundant/scarce, then the conditions and items involving such are not valid. This study could be improved by creating a more believable manipulation, specifically within the scarce condition.

4.6 Future Directions

Overall, this study adds to the growing conversation concerning meaning in life, connectedness, religiosity, and other existential psychology concepts. It also adds to the fields understanding of the interactions between the previously mentioned concepts and the belief in paranormal concepts such as extraterrestrial life. Although the understanding the field has is still limited, this study is a step towards better understanding.

This study is currently being replicated as of the Spring 2023 semester. This study will be attempting to further understand the relationship between perceived beliefs on extra-terrestrial life and existential psychology aspects such as meaning in life, religiosity, spirituality, and other similar concepts. The future study will also be further exploring the relationship seen in this study concerning religiosity's moderating effects on comprehension and general meaning in life. It will primarily be hoping to establish a direct correlational relationship between the conditions and general meaning in life.

Additionally, the study will be examining a possible main effect between the conditions on connectedness to humanity. Preliminary data has shown that there is a direct correlation

between the manipulation of belief in extraterrestrial life and participants' feelings of connectedness to humanity. Participants within the abundant life condition reported having higher feelings of connectedness to humanity when compared to participants within the scarce condition who reported relatively lower scores. Although this interaction is not statistically significant at the time, with more participants there is the possibility that it could be.

The future study and replication, as well as any other follow-up studies, would benefit by making an effort to recruit a more diverse population. Recruiting from outside of Texas A&M University would be beneficial as it would allow us to have a more diverse sample in ethnicity, race, sex, religion, and age. Recruiting more participants is also something that the future study would benefit from, as it would allow for the correlations seen in this study to potentially become statistically significant. The study may also benefit from rewriting, or altering the manipulation in the original study. As previously reported, the manipulation in the present study is not as believable as preferred and rewriting it would likely cause correlations between the two groups to be stronger than in the present study.

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