

THE PALE BLUE DOT EFFECT: EXPLORING THE PSYCHOLOGICAL IMPACT OF CONTEMPLATING OUR PLACE IN THE VAST UNIVERSE

Maarab Zaheer¹, Mazen Zaheer^{*2}, Muhammad Taha Rasool³, Muhammad Ibraheem Tarar⁴, Syed Muhammad Hussain⁵, Kainaat Yousaf⁶

¹Department of Applied Psychology, University of Management and Technology, Lahore

^{*2}Bahria Town School and College – Sector F, Lahore

³International School Lahore

⁴Crescent Model Higher Secondary School, Lahore

⁵Lahore Grammar School, Muslim Town

⁶Lecturer at department of applied psychology school of professional psychology university of management and technology Lahore

¹maarab.zaheer@gmail.com; ^{*2}mazenzaheer06@gmail.com; ³taha.rasool129@icloud.com; ⁴ibraheem.tarar0604@gmail.com; ⁵muhammadhussainscholar@gmail.com; ⁶kainaat.yousaf@umt.edu.pk

Corresponding Author: *

Received	Revised	Accepted	Published
15 August, 2024	15 September, 2024	30 September, 2024	14 October, 2024

ABSTRACT

An investigation into the psychological impact of the contemplation of place in the universe among human beings was carried out through this qualitative phenomenological study. Data was collected from adults and analysed through thematic analysis. Nine key themes were identified from interviews conducted with high school physics students. These included themes of Feelings of Insignificance, Shifts in Meaning and Purpose, Awe and Wonder, Existential Reflection, Connection to Humanity, Emotional Discomfort and Anxiety, Search for Meaning, and Spirituality and Transcendence. The study further points out the opportunity for the use of imagery concerning cosmic within the learning environment that can facilitate emotional wellness and a sense of interdependence among the students. Future directions of research will include cross-cultural studies as well as longitudinal studies of the long-term impact of perspectives that were also cosmic in nature.

Keywords: Pale Blue Dot Effect, Cosmic Perspective, Existentialism, Metaphysical Contemplation

INTRODUCTION

When Voyager I was about to leave the solar system in 1990, astronomer Carl Sagan urged NASA to turn the camera back towards Earth. The famous photograph, called the "Pale Blue Dot," is a small blue dot suspended in the sunbeam, as though suspended in the vast expanse of outer space. This image eventually symbolized humanity's minute position in the cosmos and prompted us to reassess our value in the cosmic dimension. Sagan's poetic thoughts about this image threw light on the paradox of grand self-perception that contrasted with the

humbling reality of our physical scale in the universe (Sagan, 1994).

The Pale Blue Dot Effect is the psychological reaction obtained when one contemplates humanity's relative smallness in cosmic scale. It is an awe response which provokes reflection about humankind's place in the universe, sometimes with feelings of insignificance and sometimes with a feeling of interconnectedness. This type of awe experience has been shown to lower self-importance and build feelings of humility and existential introspection (Yaden et al., 2016). Such an effect is

strikingly alike to the "overview effect," which astronauts during spaceflight undergo: when they see Earth from space, it provokes similar cognitive and affective responses, making them relate to other humans and the planet in a much deeper way (Gallagher et al., 2015).

The purpose of the present study was to explore the impact of contemplating the Pale Blue Dot and the enormity of the cosmos on psychological well-being, the sense of meaning, and belief in existence. Specifically, this research aimed to find out whether being exposed to such a cosmic view has the potential to foster personal value change, increased life purpose, and a reconsideration of existential concerns. This study would look at the emotional and cognitive impacts of this cosmic consideration based on sampling existential psychology and the latest research works about awe.

The concept of seeing the Earth from the cosmic angle elicits a deep psychological reaction, including awe, humility, and rewriting of one's self-concept (Shiota et al., 2007). Especially, it has been interpreted as a moral, spiritual and aesthetic emotion which devolves the hierarchies of the mind by reducing self-importance and increasing greater desire to connect with others (Keltner & Haidt, 2003). Experiences of awe such as viewing the Pale Blue Dot have been shown to create a "small self" effect whereby individuals state that they feel less great personally but more a part of something larger (Preston & Shin, 2017). Prosocial behaviors, greater magnanimity, and more benevolence are generated by the inspirational cosmic sense as their focus shifts from self-centered interests to a wider appreciative compass of the collective existence of mankind (Prade & Saroglou, 2016).

In addition, the cosmological view is a form of existential thought that appears to be, at the same time, both unique and unparalleled. When the individual considers Earth's infinitesimally small position in space, they feel an extremely uncomfortable sense of smallness, but occasionally they also find themselves filled with a feeling of purpose and connection to the universe. Such psychic dissonance fits well into the definition of awe: humbling yet expansive, expanding the self while inducing existential thought (Yaden et al., 2016).

Existential psychology looks at how people cope with the meaning of their existence, struggle with existential anxiety, and learn to handle the inherent ambiguity and uncertainty of human existence (Koole, 2008). A reminder of death or the universe can bring on existential anxiety and push people to look for more meaningful meaning in existence (Kuiken & Madison, 1988). The Pale Blue Dot Effect can be placed within an existential framework, drawing the perceived indifference of the cosmos and making humanity's presence transitory within it.

Terror management theory, or TMT, generally describes how people manage their anxiety over death by developing symbolic immortality through cultural achievements, relationships, or beliefs that transcend the possibilities of death (Koole, 2008). Yet the Pale Blue Dot Effect can neutralize all of those defenses and strip human endeavor of its sense of significance when viewed against cosmic scale. The result can be existential meltdown for some, but perhaps it is the precursor to a change of values and a newer sense of purpose for others. The reflection of death, when viewed from a cosmological standpoint, can evoke in an individual feelings of personal growth and authenticity (Hill et al., 2018).

The Overview Effect, for the astronauts who have had the privilege of viewing Earth from space, is another valid comparative study tool in understanding the Pale Blue Dot Effect. Astronauts frequently narrate profound psychological changes upon seeing Earth in space, the sense of deep connectivity to all other humans on the planet and the responsibility for preservation of the planet (Yaden et al., 2016). Consciousness shift is similar to the kind which was reported in psychological effect elicited in people who contemplate the Pale Blue Dot, that too are characterized by awe, humility, and reframing of existential concern itself (Gallagher et al., 2015).

The overview effect also tends to draw attention to the vulnerability of Earth and human existence, and so make astronauts more eco-centric in their worldviews, giving greater care on Earth and future generations. In the same way, the Pale Blue Dot Effect could make individuals change their focus from being self-centered to becoming collectivist in their orientations because of realization that humans are by essence united in space (Yaden et al., 2016).

Research Questions

This research considers several key questions about psychological and emotional effects of contemplating the Pale Blue Dot and the place of humanity in cosmic vastness. The first question that would be asked addresses how such contemplation affects one's sense of who they are and their purpose. This could lead to reduced egocentric thinking, plus an expanded view with a focus on shared humanity and the planet (Yaden et al., 2016; Gallagher et al., 2015). Research shows that this cosmic view can shift the priorities of individuals, and many state that they have a greater sense of purpose due to interconnection and a sense of responsibility to others (Jiang & Sedikides, 2021).

On that basis the following questions help construct the framework of this study: How does cosmic reflection on humanity's small place in the universe affect individuals' sense of self, purpose, emotional landscape, and personal values? Hence, this research paper will examine how that in itself will make one's values or beliefs change, determining if reflecting at a cosmic level stimulates that reconsideration process of what matters in life from both environmental and ethical standpoints.

Methodology

Research Design

This study adopted the qualitative phenomenological research method in order to examine how individuals perceive the Pale Blue Dot Effect and what they reflect on it. A phenomenological research design was used in this study because the study had to preserve the gist of the subjective experiences which are associated with cosmic contemplation, particularly those evoked by the image of the photograph called the Pale Blue Dot. This study, using this method, was looking to determine how the respondents interpreted the emotions and thoughts that resulted from their engagement with the image and how these responded to form an understanding related to identity, purpose, and existential beliefs.

Sample

The study participants comprised high school physics students, who had been exposed to cosmic imagery and discussion about the vastness of the universe due to their physics coursework. These

students were selected to explore how early experiences with the cosmic perspective impacted their developing worldviews. To ensure heterogeneity among those selected for the sample, a wide range of socioeconomic backgrounds were represented.

Twelve participants were selected for the purpose of conducting in-depth interviews and deep examination of individual experiences. This small sample size was very well suited to the phenomenological study, which put a value on depth rather than breadth in an attempt to capture a subject's unique experiences (Smith et al., 2009). This, in turn, enabled the research to find detailed, nuanced insights into how these students interpreted and internalized the Pale Blue Dot Effect.

Data Collection

Semi-structured interviews with participants were conducted to collect data. The interviews were unstructured or open-ended and therefore allowed each respondent to express thoughts, feelings, and reflections in his or her words at the same time ensuring that the conversation stayed within the scope of the study objectives. Questions revolved around how the participants felt and thought about the image of Pale Blue Dot and whether they changed their views of themselves, the purpose of life, or the universe based on the contemplation of human smallness within the cosmic scale.

The interviews lasted between 45 and 60 minutes, giving participants adequate time to think more profoundly and clearly on what they were thinking without getting too fatigued. Participants were asked to reflect on how they initially felt when they first saw the Pale Blue Dot or similar cosmic imagery, how this would make them feel about their place in the universe, and whether it called for changes in the values or priorities.

Interview Protocol

The interview protocol was developed after a pilot interview aimed at general perceptions of cosmic imagery and reflection on the place of humanity in the universe. Pilot data was thematically analyzed, and some of the emerging themes there included the major psychological domains of awe, insignificance, shifts in meaning, and existential reflection. From

these emerging themes, the research team further refined their questions to probe deeper into each one. For example, the initial general topics of affective reactions resulted in more specific questions about feelings of wonder and a lack of meaning, and discussions of meaning and personal values were

expanded to include shifts in goals and attitudes toward the world. This iterative process ensured that the final protocol was both holistic and participant-centered, thereby enabling further exploration into the psychological effects of cosmic reflection. These questions are detailed in Table 1 below.

Table 1

S. No.	Question
1	How did you feel the first time you saw the Pale Blue Dot image or learned about it?
2	What thoughts went through your mind when you considered Earth's smallness in the vast universe?
3	Did viewing the image evoke any strong emotions such as awe, insignificance, or wonder? Can you describe those emotions in more detail?
4	How, if at all, did contemplating the Pale Blue Dot change the way you see yourself and your role in the world?
5	Have your personal goals or values shifted since reflecting on humanity's place in the universe? If so, in what ways?
6	Did the experience make you reconsider your sense of purpose or what gives your life meaning?
7	Did the image cause you to think differently about life, death, or existence?
8	How did reflecting on the Pale Blue Dot affect your views on humanity's future or significance in the universe?
9	Do you think that contemplating humanity's smallness in the universe made you feel more connected to or disconnected from others?
10	Can you compare your experience with the Pale Blue Dot to any other similar moments where you felt a sense of awe or wonder, such as looking at the night sky or other cosmic imagery?

Data Analysis

The interviews in this study were analyzed by thematic analysis, which was appropriate for the qualitative data for the purpose of uncovering and explaining recurrent patterns or themes (Braun & Clarke, 2006). Thematic analysis of the data resulted in key themes for this study-categorized in relation to existential reflection, meaning-making, and emotional responses to the cosmic perspective. The study aimed most typical emotional and cognitive responses through rigorous coding: specifically, awe, humility, or shifts in worldviews or values. The analysis was to follow a six-phase procedure, namely: familiarizing with the data, generating initial codes, searching for themes, reviewing themes, defining and naming themes, and producing the final report. This would ensure that research captured the full range of participant experiences and drew meaningful conclusions from their reflections (Braun & Clarke, 2006).

Ethical Considerations

Ethical considerations were taken into consideration while conducting this research. All participants were well-informed regarding the purpose of the study, procedures to be followed, and the risks associated with it. The rights given to participants included the rights to withdraw from the study at will, without any such penalty. Informed consent was obtained so that every participant understood it was based on purely voluntary grounds, and the responses were utilized only for the purpose of research. In this regard, all interviews had been conducted with the participants, and their information and responses were kept confidential. For data analysis and transcription, pseudonyms were applied to ensure anonymity, and audio recordings coupled with their respective transcripts were kept in password-protected devices. The access of the data was limited to the key researcher and other authorized collaborators, and identifiable data were destroyed once the research was over to maintain

confidentiality for participants. Following these ethical principles, this ensured participants were assured of comfort in giving real experiences without direct exposure.

Findings

Nine main themes arose based on an analysis of the interview transcripts, each representing a number of codes that emerged and described participants' reflections of the Pale Blue Dot Effect. The codes that make up these themes are discussed in Table 2.

Table 2

Superordinate Themes	Subordinate Themes	Codes	Narrative (Verbatim Phrases from Interviews)
Awe and Wonder	Emotional Overwhelm, Fascination	Vastness of space, small self	"I just couldn't grasp how huge the universe is... I felt so tiny, like a speck of dust."
	Wonder, Curiosity	Fascination with cosmic phenomena	"It makes me wonder about the things we don't even know exist out there."
Insignificance and Humility	Feeling Small, Cosmic Perspective	Existential insignificance, humility	"It hit me how insignificant we are in the grand scheme of things."
	Humility and Perspective Shift	Realizing the smallness of human existence	"Seeing that image made me realize how little our problems matter when you look at the universe."
Existential Reflection	Contemplation of Life and Death	Meaning of existence, existential questions	"It made me think about my purpose in life—what's the point of all of this?"
	Reflecting on Purpose and Mortality	Search for deeper meaning	"You start to question what you're doing with your life when you think about how short and fragile it is."
Connection to Humanity	Shared Humanity, Collective Future	Sense of global connectedness, collective future	"We're all on this tiny dot together; it makes me feel more connected to everyone else."
	Collective Responsibility	Importance of collective human effort	"Thinking about the future of humanity makes me want to do more for the planet."
Emotional Discomfort and Anxiety	Existential Anxiety, Mortality	Fear of meaninglessness, discomfort with mortality	"It's unsettling to think about how little we

	Fear and Discomfort	Mortality and vulnerability	actually matter in the universe." "There's this fear that everything we do is pointless in the long run."
Search for Meaning	Desire for Meaning, Reassessment	Quest for purpose, alignment with new beliefs	"It made me rethink my beliefs and question whether I'm living according to what really matters."
	Reassessing Life Priorities	Shifting goals and values	"I've started focusing more on the bigger picture rather than stressing about trivial stuff."
Comparison to Other Awe Experiences	Cosmic Awe vs. Natural Awe	Similar feelings from nature and space	"It reminded me of how I felt when I stared up at the night sky, just full of awe."
	Night Sky, Nature	Awe-inspiring moments from nature	"The only other time I felt this way was while camping, looking at the stars."
Spirituality and Transcendence	Spiritual Reflection, Transcendence	Connection to higher power, spiritual awe	"It made me feel closer to something greater, like there's a higher power out there."
	Spiritual Connection	Feeling of transcendence	"There's a sense that you're part of something much bigger than yourself."
Cosmic Perspective on Problems	Reassessment of Personal Problems	Triviality of daily concerns, reduced stress	"It puts things into perspective—my problems feel so small now."
	Reduced Stress, Perspective Shift	Reduced stress and focus on bigger picture	"After reflecting on the vastness of space, I've been stressing less about everyday things."

The participants felt at their existential worse while imagining the universe. The Pale Blue Dot picture made them acutely see that the Earth was fragile and so were all humans to their existence in the universe. Most could feel the fragility as they considered the space and ended up showing how vulnerable they were, as shown in other studies on existential

psychology (Yaden et al., 2016; Braaten, 2023). "Seeing the Pale Blue Dot made me understand exactly just how fragile everything is. It's like we're all specks floating in this endless void." (P1) This sense of insignificance was rich in introspection that had the dimensions of psychical incongruence—this sentiment could very well instill a sense of fear

in one due to their irrelevance; yet at the same time, it had an empowering dimension to it, and participants were ready to revise what was important in life (Keltner & Haidt, 2003). Most of the daily problems were stated to be nearly minor in the world and space by participants, which best illustrated what could be after the contemplation of insignificance for a deep sense of being and meaning (Koole, 2008). "It really hit me that our problems seem so trivial when you think of how inconsequential we are in the universe." (P7)

After pondering about the Pale Blue Dot, it was stated by participants that it made them re-evaluate their values and purposes almost immediately at first. Many reflected a renewed emphasis on relationships, acts of kindness, and a care for the planet; this has been congruent with some existential psychological findings that indicate people often seek meaning in life by finding significance in social bonds and sense of responsibility toward the planet (Hill et al., 2016). "After seeing that image, I started to prioritize more in the aspect of my relationships. It made me realize how all of us are connected." (P4)

The small place of human beings in the universe led to a collective consciousness such that the participants acted more benevolently towards others and the environment (Shiota et al., 2007). A feeling of being connected with all other living beings led the participants to greater unison and challenged them to give more importance to relationships and to be more active in community oriented activities (Yaden et al., 2016). This theme, in general, highlighted the possible transformation of perspectives that participants related to the purpose of their life by the Pale Blue Dot Effect. "Thinking about our small position in the universe made me want to be more kind and responsible towards others and the planet." (P8)

Awe and wonder occurred as a significant commonality in responses from participants, who felt deeply inspired by the broader cosmic perspective brought by the Pale Blue Dot image. Most persons reported an increased interest in the universe; indeed they cherished the beauty and complexity of existence. This sense of awe created a strong emotional response beyond everyday experiences, hence most participants reflected on their very existence and their place in the world (Keltner &

Haidt, 2003). "That picture filled me with wonder. It's so hard to put into words, but it inspired me to love life's beauty and complexity." (P5)

The authors remarked that such stunning experiences may influence character development, strengthen them with nature, and foster a broadened view of the world (Gallagher et al., 2015). The powerful beauty of space along with feelings of modesty seemed to further provoke them into the pursuit of meaningful lives and a connection to the world at a deeper level (Jiang & Sedikides, 2021). This theme discussed the emotional and psychological benefits of contemplating the sheer vastness of space. "I just wanted to study more about the universe; it was as if I saw everything in a different light." (P2)

Individuals thought about reflecting on existence and what human purposes are in respect of existential reflection. Several took tentative answers towards questions in life, death, and humankind that often shook them into an enhanced clarity of belief and value systems. The process of the existential inquiry resonates with theories in existential psychology, which emphatically point to the salience of addressing one's mortality as well as a search for meaning (Koole, 2008; Kuiken & Madison, 1988). "Thinking about my mortality in relation to the universe gave me a kind of inner peace. It's like I understood that life, however short, is incredibly beautiful." (P6)

When participants reflected on their mortality in the context of how big the universe was, they reported receiving insight that enlarged their comprehension of the fragility and meaning of life. These often led to finding a deep acceptance and sense of calm. They appreciated that, even though the human experience as such was but for a moment, it contained something inside so beautiful (Dahl & Davidson, 2019). The redemption a confrontation with existential questions through the Pale Blue Dot Effect represented was the kind of changing experiences it would cause one to have for life. "While reflecting on our existence, I realized that how much there actually is in life than I had once thought about." (P1)

Discussion

The themes found here correspond with the general psychological findings related to awe, existentialism, and cosmic perspective. In this study, the feelings of

being small and powerless identified by participants mirror the idea of existential anxiety—the sense that subjects are overwhelmed by their scope of existence and themselves within it (Yaden et al., 2016; Keltner & Haidt, 2003). Such anxiety may eventually lead to transformation, like meaning-making and bonding with others, in the sense that thinking about the grandeur of the universe forms a basis for attaining great insights regarding life and humanity (Braaten, 2023). Furthermore, the discovery of awe due to cosmic imagery also highlights psychological reasons for experiencing beauty and wonder, leading to emotional well-being and further one's development (Gallagher et al., 2015). This interplay between insignificance and the quest for meaning encapsulates the peculiar relationship between man and cosmos.

The Pale Blue Dot Effect adds more depth to research on meaning-making and human need for purpose by underlining the cosmic perspective as essential to the determination of individual worldviews. The study would thus, recommend that meditation of our presence in the cosmos will inspire potential changes in what is good and significant for humans; that is, from wealth and power to communication and generosity (Hill et al., 2016). The findings of this study can be applied to the classroom setting, such as the illustration of cosmos to students may positively affect the emotional and mental well-being of the students, especially within the high school stage where issues relating to identity formation are at play and where cosmic thinking sets in. Instead, instructors can teach the concept of belonging to something bigger than one's self that would inspire the student to be able to participate with such wider concerns as stewardship of the earth and social responsibility for a more empathetic and connected society.

While the implications of the Pale Blue Dot Effect lie in personal introspection, the phenomenon itself seems to presage more inclusive transformations involving society as a whole. Respondents who reflected on their place in the universe noted their new sense of belonging and interdependence of all living things. This consciousness of life interconnectivity promotes a collective sense of responsibility even inspiring people to become more proactively engaged with environmental stewardship

and community service. The respondents stated that now they have recognised the fact that their small insignificant actions do contribute to the larger tapestry of existence. This conclusion is consistent with other research studies, suggesting that awe triggers prosocial behavior toward others and for the future of this planet (Shiota et al., 2007). This, apart from making students emotionally resilient, makes students appreciate cosmic perspectives, hence producing a generation that better relates to global challenges and elicits wholesome change. Through these messages from contemplating the Pale Blue Dot, the young minds pondering their place within the universe will be motivated to direct the affairs of their life with meaningful intention and empathetic concern for the wellbeing of all other people living under that picture of the pale blue dot.

Limitations

The relatively small size of the participants may not generalize to the larger population. The study lacks the ability to project the findings into a much larger group, considering that there is a lot of complexity and subjectivity in the psychological impact that cosmic reflection has on people. The cultural homogeneity of the sample population further narrows down the scope of the study. For example, people from various cultures can view and understand the Pale Blue Dot Effect in rather different ways, depending upon how they believe, perceive their world, and understand their society. Thus, cultural bias may be a factor to some extent when individuals perceive awe, insignificance, or existence reflection, thereby limiting the depth of insights aggregated. Furthermore, people will likely react to socially desirable ways, especially when discussing the abstract concepts, for example spirituality or purpose; thus they elicit responses that may not necessarily reflect their deeper or more private thoughts.

Conclusion

The Pale Blue Dot Effect was asserted to have a highly important impact in this study in which the subjects admitted that the process of thinking about insignificance, shift in values, wonder, and existential contemplation. Most importantly, there is much appreciation for life and relationships, and a

desire for pro-social behaviors and environmental stewardship. Themes pointed to the fact that thinking about the vastness of the universe can bring about very deep emotional and psychological responses in an enrichment of understanding of existence.

Future research could be cross-cultural, comparing how people from different backgrounds interpret and respond to the Pale Blue Dot Effect. Longitudinal studies may study the long-term implications of cosmic perspective experiences on personal growth and value change. Investigating further whether or not the concept of embedding cosmic images has inherent value is enlightening in regard to emotional wellness and purpose among students and, in doing so, towards a more compassionate and connected world.

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