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Psychological Boundaries, Coping, and Noctcaelador: Examining a Psychic Structure Model

William E. Kelly [1], Don Daughtry [2]

[1] Department of Psychology, University of the Incarnate Word, San Antonio, Texas, USA

[2] Department of Psychology, Texas A&M University–Kingsville, Kingsville, Texas, USA

Correspondence: William E. Kelly (wkelly@uiwtx.edu)

ABSTRACT – Previous research characterizes individuals higher in noctcaelador, a trait-like psychological attachment to the night sky, as more connected with nature, more prone to absorption, and more open to experience. However, the theoretical foundations underlying its development have received limited empirical attention. The present study tested a psychic structure model of noctcaelador proposing that individuals with a permeable self-structure are more likely to engage in night sky watching as way of coping and feeling "whole," which in turn fosters attachment to the night sky. Participants (N = 162) completed measures of noctcaelador, watching the night sky to cope, and indices of psychic structure, including psychological boundaries, splitting, and ego strength. Results supported the model, indicating that thin psychological boundaries were indirectly associated with noctcaelador through night sky coping. High levels of watching the night sky to cope moderated the relationships of splitting and ego strength with noctcaelador. Implications for theory and future research are discussed.

Keywords: Noctcaelador; Psychological boundaries; Psychic structure; Coping; Absorption; Splitting; Ego Strength

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Introduction

A relatively understudied area of psychology concerns individuals' relationships with the natural environment (Peng et al., 2020), particularly night environments. Most existing research on human–environment relationships emphasizes attachment to places, personal identity related

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to place, and environmental protectionism (Lewicka, 2011). Far less is known about responses to night environments. Given suggestions that being awake at night may have psychological detriments (Tubbs et al., 2022), examining motivations for and responses to night environments may be useful for understanding human relationships with nocturnal settings.

One avenue for understanding the human relationship with night environments is connection to the night sky (Barnes & Passmore, 2024). Humans have a long history of interest in the night sky for insight and inspiration, aesthetic appreciation, and meditative or spiritual reasons (Brady, 2018; Sheehan, 2010). Between 54% and 64.2% of contemporary adults report intentionally viewing the night sky at least monthly (Heim, 2019; Kelly, Kelly, et al., 2006; Mace & McDaniel, 2013). While opportunity to view the night sky likely influences interest, finding meaning and enjoyment in the night sky appears to be amplified by personality factors (Barragan & Meltzoff, 2024).

To investigate the psychology of night sky watching, previous factor-analytic studies examined responses to items assessing night-sky-related attitudes and behaviors (Kelly, 2003, 2006; Kelly & Kelly, 2003). A consistent finding was the identification of a single latent factor. Kelly (2003) termed this factor noctcaelador and described it as psychological attachment to the night sky. The existence of noctcaelador has also been supported through qualitative findings (Blair, 2018; Heim, 2019; McNiven, 2025).

Researchers have identified relationships between noctcaelador and astrotourism, traveling away from home to experience the night sky (Tapada et al., 2023; Zhang & Li, 2022), as well as feelings of connection with and protectiveness of nature (Barnes & Passmore, 2024), affective responses to urban nightscapes (Gao & Zhu, 2025), and its potential use as a positive psychology intervention (Conway & Hefferon, 2019). One of the strongest correlates of noctcaelador identified thus far is psychological absorption—a tendency to become deeply engaged in stimuli (Kelly, Daughtry, et al., 2006), particularly complex aesthetic stimuli (Kelly, 2008). Additional findings indicate that noctcaelador is associated with curiosity (Kelly & Daughtry, 2016), creativity (Kelly & Kelly, 2014), a rational cognitive style (Kelly, 2005a), problem-focused and alternative-strategy-seeking coping (Idris, 2018; Kelly & Kelly, 2008), artistic and intellectual leisure and vocational interests (Kelly, 2005b, 2021), and weakly with educational attainment (Ndlovu, 2016).

Noctcaelador bears conceptual similarity to biophilia, described partly as a general human tendency to affiliate with natural environments and derive psychological benefit from them (Wilson, 1984; Kellert & Wilson, 1993). However, whereas biophilia typically emphasizes attraction to living systems and terrestrial landscapes, noctcaelador reflects a more specific attachment to the night sky, a largely nonliving and perceptually abstract natural stimulus. This distinction suggests that noctcaelador represents a specialized, personality-conditioned form of nature-related engagement characterized by aesthetic absorption and symbolic meaning rather than generalized nature affiliation (Kaplan & Kaplan, 1989; Kelly, Daughtry, et al., 2006; Keltner & Haidt, 2003). Building on this framework, the present study examines whether individual differences in psychic permeability are associated with noctcaelador indirectly through engagement in night-sky watching as a form of coping behavior.

From a broader personality perspective, noctcaelador has been related to openness to experience within the five-factor model of personality (Kelly, 2004a, 2025). McCrae (1994) described openness as reflecting receptivity to ideas and experiences, appreciation of aesthetics, and attunement to one's inner world. Extending this work, noctcaelador (and openness) occupies a similar factor space to the Jungian "feeling" dimension, which emphasizes placing emotional value and meaning on objects or events (Kelly, 2025). Consistent with this, Silvia et al. (2015) found that among individuals high in openness to experience, viewing images of the night sky was associated with positive emotional responses of awe and wonder.

One theoretical model posits that the development of noctcaelador rests partly on psychic structure (Kelly, 2019), hereafter referred to as the psychic structure model. Psychic structure may be described as the degree of consistency and integration of expectations and beliefs that regulate perception and behavior (Bandura, 1978). Cohesive and integrated structures allow manageable amounts of information about the self and external world to be perceived, assimilated, and accommodated. Less organized structures are more permeable, allowing the intake of information that diverges from the self and is less readily integrated into the core self (Showers & Zeigler-Hill, 2007). Permeability of self-structure is continuous, and both higher and lower degrees of permeability confer advantages and disadvantages. For example, greater permeability allows openness and flexibility but may also result in reduced stability and identity diffusion. Kelly's (2019) psychic structure model suggests that some individuals with a permeable and less integrated self-structure may use the night sky as a predictable and soothing object to maintain emotional equilibrium and a syntonic self-image. In other words, some individuals may use the night sky to cope and to experience a sense of restoration of self-coherence, i.e., psychologically "whole."

This psychic structure model is consistent with findings that noctcaelador is related to openness to experience (Kelly, 2004a, 2025), which itself implies psychic permeability (McCrae, 1994). Additionally, McNiven (2025) found that night sky engagement facilitated coping—a process relevant to structural coherence (Kohut, 1977). Similarly, Dao (2016) experimentally demonstrated that night sky watching can induce positive affect and mood regulation, while correlational findings indicated that watching the night sky to cope was strongly related to noctcaelador (Kelly & Daughtry, 2007).

Psychic structure may be conceptualized in several ways. In the present study, psychic structure was operationalized using psychological boundaries, splitting, and ego strength because these constructs represent distinct but complementary aspects of experiential permeability, integrative capacity, and self-regulation. These variables are reflective of personality correlates of noctcaelador identified in prior work (Kelly, 2019).

Hartmann (1991) described psychological boundaries as the degree of separation and permeability between mental experiences. Thin boundaries allow greater crossover of perceptual experiences, whereas thick boundaries maintain clearer distinctions among mental events. Research suggests that thinner boundaries are associated with more negative self-perceptions (Mathe & Kelly, 2023), greater sensory sensitivity, and anomalous experiences (Roxburgh et al., 2024).

Splitting refers to fragmentation of psychic structure in which contradictory representations of self and others are compartmentalized and experienced as either "good" or "bad" (Berney et al., 2014). This process typically occurs when the self-system is unable to integrate opposing perceptions, resulting in extreme and alternating self-experiences (Freud, 1938; Kernberg, 2022). Empirical findings suggest that splitting functions as a cognitive inhibitory process that limits integration of unwanted self-perceptions into the psychic structure (Gagnon et al., 2022).

The ego is a hypothetical mental structure that provides individuals with a synthesized experience of the self. It represents the center of rational thought, shaped by external consequences and the capacity to regulate impulses (Bornstein, 2006). Greater ego strength reflects better functioning through the ability to adapt resiliently to environmental demands and integrate threatening perspectives of the self (Kelly & Daughtry, 2018). Ego functioning has been associated with well-being, psychological adjustment, and ego boundaries (Daughtry et al., 2022; Kelly & Mathe, 2024; Ziadni et al., 2017).

The current study aimed to partially test the psychic structure model of noctcaelador. Based on the model, it was hypothesized that noctcaelador would be associated with indices of a permeable, less integrated psychic structure: thinner boundaries, more splitting, and lower ego strength (Hypothesis 1). It was also expected that individuals with a more permeable psychic structure would be more likely to watch the night sky to cope (Hypothesis 2). Finally, it was hypothesized that psychic structure variables would predict noctcaelador indirectly through watching the night sky to cope (Hypothesis 3).

Method

Participants and Procedure

After providing informed consent, 162 students (102 women, 55 men, 5 unidentified) enrolled in psychology courses at a university in the southwestern United States completed the measures described below. The mean age of the sample was 20.79 years (*SD* = 3.24). Most participants identified as Latinx (n = 115, 71.0%), followed by White/Caucasian (*n* = 23, 14.2%), Black or African American (*n* = 10, 6.2%), Asian (*n* = 5, 3.1%), Native American (*n* = 1, 0.6%), and "other" (*n* = 8, 4.9%). Participants completed questionnaires in group settings prior to regular classes. No time limits were imposed, and no exclusionary criteria were applied. The study was approved by the local Institutional Review Board.

Measures

Noctcaelador-Related Variables

Noctcaelador. The 4-item version of Kelly's (2004b) Noctcaelador Inventory (Kelly, 2019) was used to assess noctcaelador. Participants responded using a 5-point Likert scale ranging from 1 (*Strongly disagree*) to 5 (*Strongly agree*). Higher scores reflect greater noctcaelador (e.g., "I feel an emotional attachment to the night sky"). The scale demonstrated factorial and convergent validity and 1-month test–retest reliability (.81; Kelly, 2019).

Night Sky Coping. A 3-item version of the Night Sky Coping Scale (Kelly & Daughtry, 2007) was used to measure watching the night sky as a coping strategy. Participants responded using a

5-point scale from 1 (*Strongly disagree*) to 5 (*Strongly agree*). The original scale consisted of five items; however, two items were omitted in the present study because they did not directly involve looking at the night sky. The retained items were: "I usually feel better after looking at the night sky," "Looking at the night sky helps me forget my problems," and "Looking at the night sky helps me to cope." Higher scores indicate more use of night sky watching for coping. A principal components analysis using the current dataset yielded a single factor (eigenvalue = 2.53) accounting for 84.2% of the variance, with item loadings ranging from .90 to .93. The original 5-item version demonstrated adequate convergent validity and internal consistency reliability (.86; Kelly & Daughtry, 2007).

Psychic Structure Variables

Psychological Boundaries. A 13-item version (Mathe & Kelly, 2022) of the Boundaries Questionnaire (Kunzendorf et al., 1997) was used to assess thin psychological boundaries. Participants responded on a scale ranging from 0 (*Strongly disagree*) to 4 (*Strongly agree*). Higher scores indicate thinner boundaries (e.g., "My feelings blend into one another"). The measure demonstrated factorial and convergent validity and acceptable internal consistency reliability (.77–.82; Kelly & Mathe, 2024; Mathe & Kelly, 2022, 2023).

Ego Strength. The 18-item Ego Strength Scale (Kelly & Daughtry, 2018) was used to measure ego strength. Participants responded using a dichotomous format (0 = *True*, 1 = *False*). Higher scores indicate more ego strength (e.g., "My plans have frequently seemed so full of difficulties that I have had to give them up"). The measure demonstrated convergent validity and acceptable internal consistency reliability (.78–.82; Daughtry et al., 2020; Kelly & Daughtry, 2018).

Splitting. The 8-item Self-Splitting Subscale of the Splitting Scale (Gould et al., 1996) was used to assess splitting. Participants responded using a 5-point scale from 1 (*Strongly disagree*) to 5 (*Strongly agree*). Higher scores indicate more splitting, i.e., less integration of the psychic structure (e.g., "The different parts of my personality are difficult to put together"). The measure demonstrated factorial and convergent validity and 4-week test–retest reliability (.83; Gould et al., 1996).

Statistical Analyses

Analyses were conducted using SPSS Version 30 for Windows. Statistical significance was set at $p < .050$ (two-tailed). Coefficient alpha was used to assess internal consistency reliability, with values above .70 considered acceptable (Tavakol & Dennick, 2011). To test Hypotheses 1 and 2, Pearson correlation coefficients were computed. Correlations were interpreted as small (.10), medium (.30), or large (.50) in magnitude (Cohen, 1988).

As follow-up analyses for Hypotheses 1 and 2, separate multiple linear regressions were conducted using either noctcaelador or watching the night sky to cope as the criterion variable. Splitting, psychological boundaries, and ego strength were entered simultaneously as predictors to examine the unique variance accounted for by each.

To test Hypothesis 3, Model 4 of the PROCESS macro for SPSS for Windows (Version 4.0; Hayes, 2021) was employed. Separate models were estimated using splitting, boundaries, or ego strength as predictors, while adjusting for the remaining psychic structure variables as covariates.

Noctcaelador served as the outcome variable, and night sky coping was specified as the mediator. Bootstrapping with 10,000 resamples was used to generate bias-corrected confidence intervals (Hesterberg, 2015). Indirect effects were considered significant if the 95% confidence interval did not include zero (Preacher & Hayes, 2008).

Results

Table 1 presents descriptive statistics and internal consistency estimates for each variable. All measures demonstrated acceptable reliability. Preliminary analyses found that age only significantly correlated with splitting, $r = -.22$, $p = .004$. Gender was not significantly related to any variables, ts < 1.30, ps > .197. Race/ethnicity also was not significantly related to any variables (regrouped as Latinx and non-Latinx), ts < 1.20, ps > .230.

As shown in Table 1, all variables were significantly correlated, supporting Hypotheses 1 and 2. The strongest association indicated that greater night sky coping was strongly related to higher levels of noctcaelador. The weakest, though still significant, association indicated that greater ego strength was moderately related to less night sky coping.

Follow-up regression analyses (Table 2) indicated that thin psychological boundaries uniquely predicted both night sky coping and noctcaelador. Splitting approached, but did not reach, statistical significance as a predictor of noctcaelador.

As shown in Table 3, PROCESS analyses revealed no significant direct effects of psychic structure variables on noctcaelador. However, thin boundaries were indirectly associated with noctcaelador through night sky coping. No significant indirect effects were observed for splitting or ego strength.

Table 1: Descriptive statistics and correlations between variables

Variable	2	3	4	5	*M (SD)*	*α*
1. Noctcaelador	.73	.45	.42	−.40	10.77 (4.86)	.89
2. NS Coping		.43	.35	−.30	8.52 (3.89)	.91
3. Boundaries			.59	−.59	26.57 (9.43)	.79
4. Splitting				−.65	22.17 (8.04)	.86
5. Ego Strength					11.41 (4.10)	.82

Note: $N = 162$. All correlations significant at $p < .01$. NS = night sky.

Table 2: Linear regressions with psychic structure variables predicting night sky coping and noctcaelador

	Night Sky Coping			Noctcaelador		
	β	*t*	*p*	*β*	*t*	*p*
Boundaries	.34	3.63	<.001	.27	2.93	.004
Splitting	.16	1.60	.112	.18	1.88	.062
Ego Strength	.00	0.03	.980	−.12	1.25	.215
	R^2 (adj) = .188, $F = 13.25$, $p < .001$			R^2 (adj) = .229, $F = 16.78$, $p < .001$		

Exploratory moderation analyses were conducted using PROCESS Model 1. Night sky coping (low [−1 SD], mean, and high [+1 SD]) was specified as a moderator, noctcaelador as the outcome, and each psychic structure variable as a predictor (with adjustment for the remaining psychic structure variables). Night sky coping did not significantly moderate the relationship between thin boundaries and noctcaelador. However, high levels of night sky coping significantly moderated the relationship between splitting and noctcaelador (B = .12, p = .037), as well as the relationship between ego strength and noctcaelador (B = −.28, p = .015).

Table 3: Standardized direct and indirect (mediated by night sky coping) relationships of psychic structure variables predicting noctcaelador

Predictor	Indirect Relationships		Direct Relationships	
	β	LLCI, ULCI	β	LLCI, ULCI
Boundaries	.22	0.102, 0.342	.05	– 0.048, 0.097
Splitting	.10	– 0.037, 0.241	.08	– 0.040, 0.136
Ego Strength	.00	– 0.121, 0.124	−.12	– 0.319, 0.026

Note: Each analysis adjusted for other psychic structure predictors.

Discussion

The results supported Hypotheses 1 and 2 and partially supported Hypothesis 3. Although noctcaelador and night sky coping were significantly correlated with thin boundaries, splitting, and lower ego strength, regression and mediation analyses indicated that thin psychological boundaries emerged as the primary unique predictor. Similarly, only thin boundaries indirectly predicted noctcaelador through night sky coping. Psychological boundaries may have emerged as the primary predictor because they reflect continuous permeability of experience, whereas splitting and ego strength may index more global or conditional forms of self-organization that influence noctcaelador primarily in specific regulatory contexts.

These findings align with prior research linking noctcaelador to openness to experience (Kelly, 2025) and to cognitive styles reflecting permeability and aesthetic sensitivity (Kelly, 2008). Importantly, mean levels of splitting, ego strength, and boundaries were consistent with prior university-based samples and do not suggest psychopathology associated with night sky watching (Gould et al., 1996; Kelly & Mathe, 2024).

Exploratory moderation analyses provided additional nuance, suggesting that night sky coping may contribute more strongly to noctcaelador among individuals with lower ego strength and higher tendencies toward splitting. Taken together, the present findings suggest that noctcaelador is best understood *not* as a direct expression of global ego organization or defensive structure, but as an experiential attachment that emerges from ongoing permeability of psychological boundaries coupled with the regulatory use of the night sky. Within this framework, thin boundaries appear to facilitate openness to complex, absorbing stimuli, increasing the likelihood that the night sky is experienced as meaningful and organizing.

In contrast, splitting and ego strength subsequently may shape the conditions under which night sky engagement becomes regulatory rather than merely aesthetic, influencing when noctcaelador develops rather than whether it does. Thus, psychic structure appears to contribute to noctcaelador primarily through experiential permeability and context-dependent self-regulation, rather than through stable levels of integration or strength of the self-structure alone. Individuals who experience greater difficulty integrating self-representations or adapting to environmental changes may be more likely to develop noctcaelador through the regulatory function of night sky watching. These findings are consistent with prior work suggesting that noctcaelador reflects openness combined with a preference for predictability and structure (Kelly, 2025).

With respect to the psychic structure model of noctcaelador (Kelly, 2019), the findings clarify that thin psychological boundaries represent the most robust structural pathway through which night sky coping contributes to noctcaelador. However, the results do not address why individuals initially begin watching the night sky.

Prior qualitative research suggests that night sky watching may develop through social exposure, media influences, or exploratory learning beginning in childhood (Blair, 2018; Heim, 2019; McNiven, 2025). The present findings suggest that individuals with less integrated psychic structures who seek emotional regulation and/or psychical wholeness may be particularly likely to experience positive effects of night sky exposure, especially those prone to absorption in complex stimuli (Kelly, Daughtry, et al., 2006).

Several limitations should be considered. The reliance on self-report measures may limit precision relative to behavioral or longitudinal assessments. The sample consisted primarily of young Latinx female university students, limiting generalizability. Additionally, the cross-sectional design does not allow causal inference. As such, we cannot definitively state that thinner boundaries lead to watching the night sky to cope, which leads to noctcaelador.

Future research should employ longitudinal designs to examine developmental pathways of noctcaelador and to clarify the origins of night sky engagement. Although noctcaelador has not been linked to objective levels of light pollution (Barnes & Passmore, 2024), exposure may occur through digital media or travel (McNiven, 2025; Tapada et al., 2023). Experimental paradigms, such as simulated night sky exposure (Tanaka et al., 2025), combined with measures of psychic structure and noctcaelador, may further clarify these mechanisms. Future research might also replicate the current findings by using different measures of psychic structure or wholeness, such as the one used by Ehrenthal et al. (2023) or self-fragmentation paired with self-structure (e.g., Daughtry et al., 2025).

In conclusion, the present study provides partial support for a psychic structure model of noctcaelador. Individuals with thinner psychological boundaries who use night sky watching to cope report the highest levels of noctcaelador. These findings suggest that psychic structure may represent an important foundation for psychological attachment to the night sky, particularly among individuals who experience the night sky as promoting stress reduction and a sense of psychological wholeness.

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