Int. j. adv. multidisc. res. stud. 2025; 5(4):390-396

Received: 26-05-2025
Accepted: 06-07-2025

International Journal of Advanced Multidisciplinary Research and Studies

ISSN: 2583-049X

Relationships of Noctcaelador with Measures of Psychological Dysfunction: The MMPI-2 and Cognitive Ability

William E Kelly
Department of Psychology, University of the Incarnate Word, San Antonio, Texas, United States

DOI: https://doi.org/10.62225/2583049X.2025.5.4.4606
Corresponding Author: **William E Kelly**

Abstract
Research has not examined noctcaelador, psychological attachment to the night sky, in relation to psychological dysfunction. Previous studies have produced ambiguous results in this regard suggesting noctcaelador was related both to healthy psychological processes and possible indicators of dysfunction such as hallucinatory activity. The current research examines the relationship between noctcaelador and psychological dysfunction directly in a cross-sectional study. A sample of 44 undergraduate students (28 females, 16 males) completed self-report measures of noctcaelador, psychological dysfunction, and cognitive ability. Generally, noctcaelador was unrelated or negatively related to most indices of psychological dysfunction. However, there was a strong positive relationship between noctcaelador and hypomania. A substantial 28.9% of individuals high in noctcaelador also scored above the clinical cut-off for hypomania. It was surmised that some processes involved in hypomania may underly noctcaelador such as divergent thinking, unusual perceptual processes, and seeking out novelty. Less defensiveness among individuals higher on noctcaelador was also noted and discussed in the context of a psychic structural model of noctcaelador. Additional research is suggested to examine possible hypomanic processes in noctcaelador and the potential mediating effects of openness to experience.

Keywords: Noctcaelador, Night Sky, Psychological Dysfunction, Psychopathology, Cognitive Ability, MMPI-2

1. Introduction

Noctcaelador is a latent psychological construct defined as emotional attachment to the night sky [1]. The construct was identified by factor analyzing university students' survey responses about their night sky watching attitudes and behaviors [1, 2]. Additional research supported existence of the construct using both quantitative [3, 4, 5] and qualitative [6, 7, 8] methodology. The night sky has been of interest across human societies for thousands of years [9, 10]. Contemporary surveys indicate that between 54.0–64.2% of adult samples view the night sky at least monthly [6, 11, 12].

Previous summaries of noctcaelador research suggest the construct is related to two clusters of traits: 1) a rational, approach-oriented cognitive style and 2) a tendency to have divergent perceptual experiences and beliefs [13]. These findings and others [14, 15, 16] situate noctcaelador in the factor space of openness to experience, one of the Big Five factors of "normal" personality. Like noctcaelador, openness to experience includes two aspects: openness (appreciation for aesthetics, creativity) and intellect (enjoyment of reasoning, new ideas) [17].

It has been asserted that individuals higher in noctcaelador are generally psychologically healthy [18], implying the construct is unrelated to psychological dysfunction. However, research has not directly examined this. Indeed, there is a dearth of research examining night sky watchers' psychological functioning in general. Even astronomers, a group identified centuries ago, have received little attention from social and behavioral science researchers except for a few case studies and surveys [19, 20, 21].

Psychological dysfunction can be conceptualized as atypical disturbances in functioning across cognition, emotion, behavior, and perceptual experiences [22]. Reorganizing previous findings in terms of possible psychological dysfunction suggests that noctcaelador is related to 1) mundane, even healthy aspects of daily life and individual differences which have no obvious relation to psychological dysfunction; 2) variables more ambiguous for psychological dysfunction (that is, they could indicate typical variations in experiences or psychopathology in extremes [23]); and 3) traits that could indicate psychological dysfunction, or at least higher risk of dysfunction. Examples of traits related to noctcaelador using this characterization are presented in Table 1. Added to this, Barnes and Passmore [24] found no significant relationships of noctcaelador with

resilience, well-being, or emotional dysregulation, which are associated with psychological dysfunction.

Given the mix of findings and the lack of inclusion of psychopathology measures, previous research does not foreclose the possibility that noctcaelador might be related to psychological dysfunction. The purpose of the current study was to clarify the relationship of noctcaelador with psychological dysfunction. Psychological dysfunction is often evaluated using assessments of personality dysfunction and cognitive ability.

Scales of personality dysfunction provide normative information about respondents across various clinically known syndromes [25]. Despite their focus on dysfunction, scores on these measures can have implications for both clinical and nonclinical samples [26]. Typically, measures of personality dysfunction include validity scales and clinical scales. Validity scales assess response styles that might create distortion when interpreting clinical scales with the understanding that individuals sometimes over or under respond when being assessed [27, 28].

Measures of cognitive ability are thought to provide impressions of individuals' abilities to reason and manage complex situations [29, 30]. This is attempted by assessing capacity for information processing and abstract thinking [31]. Though criticized for possible biases, popularly used cognitive ability measures have some of the highest reported retest reliability estimates in psychology [30]. Moreover, research generally indicates that cognitive ability is associated with environmental adaptation and managing complex tasks separate from personality factors [32]. Cognitive ability may signify a form of cognitive psychological dysfunction on its own or add context to other measures [29].

Previous studies found that noctcaelador was related to hallucinatory activity [33], unusual thinking [34], and schizotypy [35]. Given descriptions of the MMPI-2's schizophrenia scale (Table 2), individuals higher in noctcaelador may also score higher on the MMPI-2 schizophrenia scale. Higher scores on the MMPI-2 masculinity-femininity scale indicate not conforming to expected gender roles. This scale is usually not interpreted as dysfunction but rather healthy psychosocial adjustment and perhaps a protective factor [36, 37]. Previous research found that individuals scoring higher on noctcaelador were less conforming to traditional gender roles [38]. As such, they might also score somewhat higher on masculinity-femininity.

Other possible relationships with psychological dysfunction measures can be gleaned through noctcaelador's most consistent correlate – openness to experience. The few psychopathologies related to openness to experience are mania (positively related) [39] and depression (negatively related) [40]. As such, noctcaelador might be related to the MMPI-2 hypomania and depression scales. Finally, weak relationships have been observed between openness to experience and cognitive ability [41]. Further, noctcaelador has very weak relationships with educational attainment [42]. As such, noctcaelador would be expected to have weak, likely nonsignificant relationships with cognitive ability.

Based on the review and reasoning above, higher scores on noctcaelador are expected to significantly relate to higher scores on hypomania (hypothesis 1: H1). Higher noctcaelador scores will significantly relate to lower scores on depression (hypothesis 2: H2). Higher noctcaelador scores will significantly relate to higher scores on masculinity-femininity (hypothesis 3: H3). Higher noctcaelador scores would be significantly related with higher scores on schizophrenia (hypothesis 4: H4).

Table 1: Examples of variables related to noctcaelador indicating no obvious psychological dysfunction to possible psychological dysfunction

Source	Variables
Healthy or no obvious psychological dysfunction	
Kelly (2025) [16]	Openness to experience
	Jungian "feeling" type
Kelly & Daughtry [43]	Reading for pleasure
Gao & Zhu [44]	Enjoyment of city nightscapes
Kelly & Daughtry [45]	Curiosity
Kelly & Kelly (2008) [46]	Reflective coping
Kelly (2005) [47]	Need for cognition
	Rational problem solving
Kelly *et al*. (2006) [11]	Owning night sky watching equipment
	Visiting planetariums/observatories
Tapada *et al*. (2023) [48]	Astro-tourism
Kelly (2005) [49]	Artistic/investigative career interests
Barnes & Passmore (2024) [24]	Night sky connectedness
	Nature connectedness
Kelly & Kelly (2005) [50]	Preference for time outdoors
Kelly (2008) [51]	Tolerance of ambiguity
Kelly & Kelly (2014) [52]	Creativity
Ndlovu (2016) [42]	Educational attainment
Ambiguous for psychological dysfunction	
Kelly *et al*. (2006) [53]	Psychological absorption
Kelly & Batey (2005) [54]	Fantasy proneness
	Lower self-esteem
Kelly (2007) [55]	Sensation seeking
Kelly & Daughtry (2007) [56]	Mistrust of instructors
Kelly & Rose (2005) [57]	Less habitual sleep length
Possible psychological dysfunction	
Kelly & Daughtry (2005) [34]	Magical ideation
Kelly (2006) [33]	Hallucinations
Kelly (2007) [35]	Schizotypy
Kelly & Batey (2005) [54]	Worry
Kelly & Paul (2010) [58]	Compulsive behaviors

2. Methods and Measures

2.1 Participants and Procedure

The sample consisted of 44 individuals including 16 (36.4%) males and 28 (63.6%) females. Totals do not always equal 44 because some data were missing. The average age of the sample was 22.14 ± 3.63 years ranging from 20-43. Most participants identified their race/ethnicity as white/Caucasian (36; 88.6%), followed by African American/Black (4; 9.1%), and "other" (1; 2.3%).

Participants were recruited from upper-level psychology courses at a university in the United States. All participants provided informed consent. The study was carried out in accordance with the Helsinki Declaration of 2000 and ethical principles of the American Psychological Association. Measures were completed as "paper and pencil" hardcopies, deidentified, and hand scored using scoring templates by students in a psychological assessment class. Materials were rescored by a Ph.D. level psychologist to minimize scoring inaccuracies [59]. The only exclusionary criteria were that participants be at least 18 years of age. No time limits for completion were imposed. Nominal course credit was provided in exchange for participation.

2.2 Measures

2.2.1 Noctcaelador: The 10-item Noctcaelador Inventory [4] measures psychological attachment to the night sky. The response scale is 1 (strongly disagree) to 5 (strongly agree) for each item. Higher total scores indicate more noctcaelador. Validity of the measure has been supported [18, 60] A 1-month retest reliability coefficient was reported as. 88 [4].

2.2.2 MMPI-2-370: The abbreviated 370-item version of the Minnesota Multiphasic Personality Inventory-2 (MMPI-2-370) [61] was used to measure personality syndromes. The measure includes the first 370 items of the 567-item MMPI-2 and allows for scoring all the basic clinical and validity scales. The MMPI-2-370 has good equivalency with the full MMPI-2 [62, 63]. Participants respond to items as "true" or "false." The MMPI-2-370 includes 3 validity scales and 10 clinical scales (see Table 2 for descriptions). Higher scale scores indicate higher levels of each domain. Validity has been supported across several contexts [61, 63]. One week retest reliability coefficients for different scales range from. 62–.91 [64].

2.2.3 Cognitive ability: The 64-item Baddeley Reasoning Test [65] is a 3-minute timed measure of fluid (i.e., abstract reasoning) cognitive ability. Participants are asked to solve grammatical reasoning puzzles (e.g., A precedes B = AB) to which they respond "true" or "false." Higher scores indicate better cognitive ability. The measure has adequate validity [66]. A retest reliability coefficient (one day) was estimated as. 80 [65].

Table 2: Standard scales of the Minesota Multiphasic Personality Inventory-2

Scale name	Scale description for higher scores
Validity scales	
L	Socially desirable responding
F	Over-reporting or distress
K	Subtle defensiveness
Clinical scales	
1 – Hypochondriasis	Focus on bodily experiences and discomfort
2 – Depression	Dissatisfaction and hopelessness
3 – Hysteria	Expressing stress and conflict through physical symptoms
4 – Psychopathic deviate	Disregard for rules, social conflict, and need for stimulation
5 – Masculinity-femininity	Preferences and sensibilities atypical of expected gender roles
6 – Paranoia	Sensitive to criticism, suspiciousness, and mistrust
7 – Psychasthenia	Worry, struggle with concentration, and self-doubt
8 – Schizophrenia	Unusual thinking and perceptions, disconnected from others
9 – Hypomania	High levels of energy, activity, and enthusiasm
0 – Social introversion	Social preference for solitude or small groups

Descriptions based on Pomerantz [29], Butcher *et al*. [61], Greene [63].

2.3 Data Analysis

Statistical analyses were carried out using the Statistical Package for the Social Sciences (SPSS) version 30 for Windows (IBM Corp., Armonk, N.Y., USA). Prior to the study a power analysis found that an adequate sample size for correlations based on previous correlation coefficients for noctcaelador, a power of. 80, and significance level of. 05 was 36.

Independent samples *t*-tests were used to examine gender differences with Cohen's *d* for effects size. Pearson correlation coefficients were calculated to examine relationships between noctcaelador and other variables. Findings were considered significant if p<.05 (two-tailed). Correlation coefficient effect sizes were considered small, medium, or large if they reached. 10, 30, and 50, respectively [67].

3. Results

Females (31.85 ± 5.34) scored significantly higher than males (27.00 ± 5.68) on masculinity-femininity, t (41) = 2.81, p = .008, d = .887. No other significant gender differences were observed. Age was not significantly correlated with any variables.

Average scores and standard deviations are presented in Table 3. Average scores in the current sample for MMPI-2-370 scales, the Noctcaelador Inventory, and the Baddeley Reasoning Test were on par with previous reports [63, 18, 66]. Also presented in Table 3 are correlation coefficients for noctcaelador with other study variables. There were medium size, significant negative correlations for noctcaelador with K (Defensiveness) and Scale 2 (Depression) (Table 3). There was a large, significant positive relationship between noctcaelador and Scale 9 (Hypomania) (Table 3). Cognitive ability was not significantly related with noctcaelador scores (Table 3).

For exploratory purposes, a median split (Mdn = 26.5) was used to create high (n = 21) and low (n = 20) noctcaelador groups to examine the relationship between noctcaelador and hypomania. Using criteria in the MMPI-2 test manual [61], 6 participants (14% of the sample) scored at or above the clinical cut-score (26; T=65) for hypomania. All these participants were classified as scoring high on noctcaelador making up 28.9% of the high noctcaelador group. The high noctcaelador group's average hypomania score was not beyond the clinical cut off (M = 22.19 ± 4.97) but, as would be expected, was significantly higher than the low noctcaelador group (M = 18.05 ± 3.24), t (39) = 3.15, p = .003, d = .983.

Table 3: Descriptive statistics and correlation coefficients for noctcaelador with MMPI-2-370 scales and cognitive ability

Variable	*r*	*M* ± *SD*
Noctcaelador		27.67 ± 8.20
L – Lie	-.28	3.12 ± 2.14
F – Infrequency	-.20	7.07 ± 8.32
K– Defensiveness	-.40*	14.37 ± 4.46
1 – Hypochondriasis	-.25	14.40 ± 4.07
2 – Depression	-.40*	20.49 ± 6.19
3 – Hysteria	-.29	20.98 ± 5.30
4 – Psychopathic deviate	.06	24.47 ± 5.26
5 – Masculinity-femininity	-.15	30.05 ± 5.90
6 – Paranoia	.02	11.26 ± 4.34
7 – Psychasthenia	.05	24.53 ± 8.61
8 – Schizophrenia	.22	22.63 ± 8.87
9 – Hypomania	.53**	20.28 ± 4.61
0 – Social introversion	-.13	24.40 ± 8.71
Cognitive ability	-.03	27.14 ± 10.54

Note: N = 41. *p<.01 **p<.001. No correlations were significant at p < .05.

4. Discussion

The results were partly consistent with the hypotheses. Noctcaelador was positively, significantly related with hypomania (H1: supported). Higher noctcaelador was negatively, significantly related to depression (H2: supported). Higher noctcaelador was not significantly related with MMPI-2-370 masculinity-femininity scores (H3: not supported) or schizophrenia scores (H4: not supported).

Previous research found that openness to experience was related to more mania [39] and less depression [40]. Considering that noctcaelador appears to exist in the factor space of openness to experience [16], the current finding of a strong correlation coefficient between noctcaelador and hypomania can be considered consistent with previous research. Similarly, the finding that noctcaelador was related to lower scores on depression can also be considered consistent with previous research.

Inconsistent with previous research [38] and the hypothesis, noctcaelador did not significantly relate to masculinity-femininity. In fact, the relationship was in the opposite direction. This may partly have been the result of different measurements used. The MMPI-2-370 masculinity-femininity scale was designed differently and may assess different aspects of gender role expectations than theoretically driven measures [68]. Further, sample differences may have influenced the results. Kelly and McGee [38] found noctcaelador was related to an androgenous gender role using a sample of students from across majors. The current sample included upper-level psychology students. These qualitatively different samples may have influenced the results [69].

Given that noctcaelador has been related to more usual beliefs and perceptual experiences [33, 34], it was expected that noctcaelador would be related to schizophrenia. This was not observed though the relationship was in the expected direction. In retrospect, the MMPI-2-370 schizophrenia scale includes several processes not consistent with characteristics associated with noctcaelador. For instance, the schizophrenia scale includes processes of disorganization, social withdrawal, and lack of contact with reality [64]. Conversely, noctcaelador is related to rationality and reflection [47]. These discrepancies, along with the small sample size, may have limited the relationship of noctcaelador and schizophrenia in the current study. Given that nonnormal perceptual experiences are sometimes associated with hypomania, it is also possible that previous noctcaelador findings in this regard were tapping hypomanic processes rather than schizophrenia (see below).

Unexpectedly, noctcaelador was significantly associated with less defensiveness (K scale). Though not hypothesized, this finding is consistent with theoretical speculations. A model of noctcaelador suggests that individuals become more easily attached to the night sky if they have a permeable psychic structure [18]. Such structures have been described as less defended [70]. The lowered defenses hypothetically make these individuals more sensitive to stressors which they partly cope with and self-sooth by watching the night sky through a sort of meditative absorption [71].

Though not a hypothesis, as expected noctcaelador was not related to cognitive ability suggesting a capacity for processing complex stimuli is not involved in interest in the night sky. It may be as previous research suggested more a function of aesthetic and hypnotic value that attracts individuals to the night sky [51, 53]. On the other hand, the current study utilized a measure of fluid rather than crystallized cognitive ability which could have influenced this finding [66].

Overall, the present study found noctcaelador was generally unrelated, or negatively related, to psychological dysfunction. The exception to this was hypomania. While most hypomania scores in the current sample were subclinical, similar processes to those reflected by the MMPI-2-370 hypomania scale may underly noctcaelador. For instance, the MMPI-2-370 hypomania scale indicates high energy, optimism, wide interests, creativity, being easily bored, intellectualization, and possibly having unusual sensory experiences [61, 63]. This description resembles several correlates of noctcaelador (see Table 1). It is important to emphasize that in the present study noctcaelador was generally related to these processes at a subclinical level. As such, it is important not to pathologize interest in night sky watching. Nevertheless, nearly 1/3 of individuals scoring high on noctcaelador were above the clinical cut-off for hypomania. This may indicate some individuals with noctcaelador are more at risk of hypomania, or oppositely, individuals with clinical hypomania are interested in the night sky.

The current study has several limitations which should be acknowledged. First, though the average scores on scales were on par with previous findings, the small sample may limit generalizability. Similarly, the inclusion of mostly young, Caucasian undergraduate students does not represent the larger population. Also, the measures in this study were self-report. Though the MMPI-2-370 has good psychometrics [61], it is limited and may not always represent the constructs it purports to [72]. Finally, the cross-sectional nature of the study does not allow cause-effect conclusions. Therefore, the causal relationship between noctcaelador and hypomania cannot be determined.

Future research should extend the findings of the current study by utilizing larger, more diverse community samples. The use of interviews in addition to self-report measures might also provide additional insight. To better understand noctcaelador and psychological dysfunction, future studies might utilize clinical samples. Extensions of the current study might more thoroughly investigate underlying hypomanic processes in addition to the descriptive overlaps with noctcaelador presented herein. Such studies might include measures of psychophysiology. Future use of a longitudinal design might clarify the directionality of the current findings. Finally, it could be interesting to include a measure of openness to experience as well to better understand if noctcaelador independently relates to hypomania or if openness is a mediator [73].

5. Conclusion

The findings of the current study *partly* support the statement that noctcaelador is unrelated to psychological dysfunction [18]. Most correlations in the present study indicate that noctcaelador was either unrelated or negatively related psychological dysfunction. The findings even suggest a lack of defensiveness among individuals higher in noctcaelador. However, noctcaelador was found to relate to hypomania, even at clinical levels. At subclinical levels, the relation with hypomania may simply manifest as individuals higher in noctcaelador being outgoing, energetic, but easily

frustrated with obstacles; at higher levels manifestations may include impulsiveness, an accelerated stream of thought, and unusual perceptual experiences [61]. Regardless of clinical or subclinical level, it may be that processes associated with hypomania are involved in noctcaelador as well. Consistent with previous theory [18], this might include a loosened organization of the psychic structure. Psychic structure could partly explain some associates of noctcaelador such as divergent thinking, unusual perceptual processes, and seeking out novelty [70]. Interestingly, similar processes are noted in openness to experience. To the extent that these outcomes do not create distress or psychosocial impairment, these characteristics likely indicate more of a personality disposition than a dysfunction [74]. However, some individuals higher in noctcaelador may be at an increased risk of mood dysfunction or even a form of bipolar disorder [75]. This possibility should be evaluated further. Additional research is needed to examine the underlying mechanisms of the relationship between noctcaelador and hypomania as well as the possible influences of openness to experience.

6. References

1. Kelly WE. Night sky watching attitudes among college students: A preliminary investigation. Coll Stud J. 2003; 37(2):194-196.
2. Kelly WE, Kelly KE. Further identification of noctcaelador: An underlying factor influencing night sky watching behaviors. Psychol Educ. 2003; 40(3/4):26-27.
3. Kelly WE. Evidence of the existence of noctcaelador across three measures: A factor analytic study. J Instr Psychol. 2006; 33(4):261-262.
4. Kelly WE. Development of an instrument to measure noctcaelador: Psychological attachment to the night sky. Coll Stud J. 2004; 38(1):100-102.
5. Kelly WE. Factorial validity, reliability, and measurement equivalence of the Noctcaelador Inventory across three ethnic groups. J Instr Psychol. 2008; 35(3):271-274.
6. Heim J. The night sky in the lives of amateur and professional astronomers. TJ. Cosmol Culture. 2019; 5(2):41-64.
7. Blair A. An exploration of the role that the night sky plays in the lives of the dark sky island community of Sark. J Skyscape Archaeol. 2018; 3(2):236-252. Doi: 10.1558/jsa.34689
8. McNiven HB. An exploration into 'noctcaelador' in young people of Generation Z [dissertation]. Lampeter, Wales UK: University of Wales Trinity Saint David, 2025.
9. Brady B. Stars and cultural astronomy. J Skyscape Archaeol. 2018; 4(1):129-133. Doi: 10.1558/jsa.36095
10. Sheehan W. A passion for the planets: Envisioning other worlds from the Pleistocene to the age of the telescope. Springer, 2010.
11. Kelly WE, Kelly, KE, Batey. Frequency of college students night sky watching behaviors. Coll Stud J. 2006; 40(1):166-168.
12. Mace BL, McDaniel J. Visitor evaluation of night sky interpretation in Bryce Canyon National Park and Cedar Breaks National Monument. J Interpret Res. 2013; 18(1):39-57. Doi: 10.1177/10925872130180010
13. Kelly WE. Pick a hand, any hand: Mixed-handedness and night sky watching in a college student sample. Coll Stud J. 2009; 43(1):228-233.
14. Kelly WE. The OCEAN and the night-sky: Relations between the five-factor model of personality and noctcaelador. Coll Stud J. 2004; 38(3):406-409.
15. Kelly WE, Kelly KE. Bring on the night: Openness to experience and interest in night sky watching. Individ Differ Res. 2010; 8(4):214-219.
16. Kelly WE. The personality of night sky watchers: Relationships of noctcaelador with the big five, Eysenck's PEN model, and Jung's typologies. North Am J Psychol. 2025; 27(2):289-300.
17. DeYoung CG, Quilty LC, Peterson JB. Between facets and domains: 10 aspects of the Big Five. J Pers Soc Psychol. 2007; 93(5):880-896. Doi: 10.1037/0022-3514.93.5.880
18. Kelly WE. Hypnotic attachment to the night sky: Theoretical considerations and an abbreviated measure of noctcaelador. Sleep Hypn. 2019; 21(2):147-157. Doi: 10.5350/Sleep.Hypn.2019.21.0183
19. Johansson CB. Strong Vocational Interest Blank introversion-extraversion and occupational membership. J Couns Psychol. 1970; 17(5):451-455. Doi: 10.1037/h0029902
20. Morton BE. Line bisection-based hemisphericity estimates of university students and professionals: Evidence of sorting during higher education and career selection. Brain Cogn. 2003; 52(3):319-325. Doi: 10.1016/s0278-2626(03)00169-6
21. Sharov AS, Novikov ID, Kiskin V. Edwin Hubble, the discoverer of the big bang universe. Cambridge University Press, 2005.
22. Comer R.J, Comer JS. Fundamentals of abnormal psychology, 10th ed. Worth Publishers. 2022.
23. Mann FD, Atherton OE, DeYoung CG, Krueger RF, Robins RW. Big five personality traits and common mental disorders within a hierarchical taxonomy of psychopathology: A longitudinal study of Mexican-origin youth. J Abnorm Psychol. 2020; 129(8):769-787.
24. Barnes C, Passmore H-A. Development and testing of the Night Sky Connectedness Index (NSCI). J Envir Psychol. 2024; 93:102198. Doi: 10.1016/j.jenvp.2023.102198
25. Kelly WE. The Ausburg Multidimensional Personality Instrument (AMPI) "Clinical" Scales: Brief MMPI relevant scales for undergraduate lab assignments and research. Psychol J. 2012; 9(3):86-96.
26. Hoffman GA, Pietrzak DR. MMPI-2 restructured clinical scales: Correlates for a nonclinical adult sample using the Adjective Checklist. Int J Educ Psychol Community. 2024; 14(1-2):59-86.
27. Kelly WE. Preliminary validity scales for the Ausburg Multidimensional Personality Instrument (AMPI). Individ Differ Res. 2012; 10(4):182-192.
28. Kelly WE. Different responses to the AMPI in anonymous and evaluative conditions. Psych J. 2013; 10(2):56-62.
29. Pomerantz AM. Clinical psychology, 6th ed. Sage, 2023.
30. Sheperis C, Drummond RJ, Jones KD. Assessment procedures for counselors and helping professionals, 9th ed. Pearson, 2019.

31. Drummond RJ, Sheperis C, Jones KD. Assessment procedures for counselors and helping professionals, 9th ed. Pearson, 2019.
32. Ones DS, Dilchert S, Viswesvaran C. Cognitive abilities. In: Schmitt N, ed. The Oxford handbook of personnel assessment and selection. Oxford University Press; 2012, 179-224. Doi: 10.1093/oxfordhb/9780199732579.013.0010
33. Kelly WE. Watching the night sky and seeing things that aren't there: Relationships among noctcaelador, dissociative experiences, and hallucination-proneness in a non-clinical sample. Couns Clin Psychol J. 2006; 3(3):148-159.
34. Kelly WE, Daughtry D. Relationship between magical ideation and noctcaelador. Percept Mot Skills. 2005; 101(2):373-374.
35. Kelly WE. Interest in astronomy and interest in night-sky watching: Evidence for separate but related constructs. Psychol J. 2007; 4(2):58-71.
36. Todd AL, Gynther MD. Have MMPI MF scale correlates changed in the past 30 years? J Clin Psychol. 1988; 44(4):505-510. Doi: 10.1002/1097-4679(198807)44:4<505::aid-jclp2270440405>3.0.co;2-l
37. King GD, Kelley CK. MMPI behavioral correlates of spike-5 and two-point code types with scale 5 as one elevation. J Clin Psychol. 1977; 33(1):180-185.
38. Kelly WE, McGee CL. Gender roles and night-sky watching among college students. Coll Stud J. 2012; 46(1):82-87.
39. Tackett JL, Quilty LC, Sellbom M, Rector NA, Bagby RM. Additional evidence for a quantitative hierarchical model of mood and anxiety disorders for DSM-V: The context of personality structure. J Abnorm Psychol. 2008; 117(4):812-825. Doi: 10.1037/a0013795
40. Quirk SW, Christiansen ND, Wagner SH, McNulty JL. On the usefulness of measures of normal personality for clinical assessment: Evidence of the incremental validity of the Revised NEO Personality Inventory. Psychol Assess. 2003; 15(3):311-325.
41. Schretlen DJ, van der Hulst EJ, Pearlson GD, Gordon B. A neuropsychological study of personality: Trait openness in relation to intelligence, fluency, and executive functioning. J Clin Exp Neuropsychol. 2010; 32(10):1068-1073. Doi:10.1080/13803391003689770
42. Ndlovu R. Analysing education as a variable in “The Sky in Our Lives Survey”. Mediterr Archaeol Archaeom. 2016; 16(4):519-524. Doi: 10.5281/zenodo.220978
43. Kelly WE, Daughtry D. Pursuit of leisure reading and interest in watching the night-sky: Relationship between reading for pleasure and noctcaelador. Read Improv. 2006; 43(2):59-63.
44. Gao M, Zhu X. Development and testing of the nightscape affect index. Appl Psych Health Well Being. 2025; 17(3):e70036. Doi: 10.1111/aphw.70036
45. Kelly WE, Daughtry D. The case of curiosity and the night sky: Relationship between noctcaelador and three forms of curiosity. Educ. 2016; 137(2):204-208.
46. Kelly WE, Kelly KE. Let the stars be your guide through troubled times? The relationship between noctcaelador and coping. Psychol Educ. 2008; 45(3/4):10-15.
47. Kelly WE. Some cognitive characteristics of night sky watchers: Correlations between social problem-solving, need for cognition, and noctcaelador. Educ. 2005; 126(2):328-333.
48. Tapada A, da Encarnação Marques CS, Peixeira Marques C, Costa C. Astrotourism: Image and visit intention in low-density territories. The case of the inland north of Portugal. Portug J Reg Stud. 2023; 66:117-132. Doi: 0.59072/rper.vi66.33
49. Kelly WE. An investigation of vocational interests and noctcaelador. J Instr Psychol. 2005; 32(2):164-166.
50. Kelly WE, Kelly KE. Noctcaelador and preference for spending time outdoors. Psychol Educ. 2005; 42(1):40-42.
51. Kelly WE. Relationship between noctcaelador and aesthetic sensitivity: Art-related personality factors associated with college students' night sky watching. Coll Stud J. 2008; 42(2):265-269.
52. Kelly WE, Kelly KE. An examination of noctcaelador and creativity. Psychol Educ. 2014; 51(1/2):26-32.
53. Kelly WE, Daughtry D, Kelly KE. Entranced by the night sky: Psychological absorption and noctcaelador. Psychol Educ. 2006; 43(2):22-27.
54. Kelly WE, Batey J. Some correlates of noctcaelador: An exploratory study. Psychol Educ. 2005; 42(3/4):20-22.
55. Kelly WE. Getting a thrill from the night sky: The relationship between sensation seeking and noctcaelador. Psychol J. 2007; 4(1):40-46.
56. Kelly WE, Daughtry D. Academic orientation, academic achievement, and noctcaelador: Does interest in night sky watching correlate with students approach to the academic environment? Educ. 2007; 128(2):274-281.
57. Kelly WE, Rose C. Losing sleep to watch the night-sky: The relationship between sleep-length and noctcaelador. Coll Stud J. 2005; 39(1):45-47.
58. Kelly WE, Paul ST. Nonpathological compulsiveness and interest in night sky watching. Psychol Educ. 2010; 47(1-2):35-42.
59. Miller MJ, Kelly WE, Clanton RC, Bickham PJ. Error rates on the SDS Career Explorer among junior high students. Louis Educ Res J. 1999; 24(2):13-19.
60. Batey J, Kelly WE. Criterion group validity of the Noctcaelador Inventory: Differences between astronomical society members and controls. Indiv Differ Res. 2005; 3(3):200-203.
61. Butcher JN, Dahlstrom WG, Graham JR, Tellegen A, Kaemmer B. The Minnesota Multiphasic Personality Inventory-2 (MMPI-2): Manual for administration and scoring. University of Minnesota Press, 1989.
62. Fox DD. Equations for prorating the symptom validity scale (FBS) for the 370-item MMPI-2. Clin Neuropsychol. 2010; (7):1238-42. Doi: 10.1080/13854046.2010.515246
63. Greene RL. The MMPI-2: An interpretive manual, 2nd ed. Allyn & Bacon, 2000.
64. Butcher JN, Graham JR, Dahlstrom WG, Bowman E. The MMPI-2 with college students. J Pers Assess. 1990; 54(1-2):1-15. Doi: 10.1207/s15327752jpa5401&2_1
65. Baddeley AD. A 3 min reasoning test based on grammatical transformation. Psychon Sci. 1968; 10(10):341-342. Doi: 10.3758/BF03331551
66. Furnham A. Measuring intelligence in 3 min: Concurrent, convergent, and discriminant validity of the

Baddeley Reasoning Test. Appl Cogn Psychol. 2024; 38(6):e4244. Doi: 10.1002/acp.4244
67. Cohen J. Statistical power analysis for the behavioral sciences, 2nd ed. Erlbaum, 1988.
68. Evans RG, Dinning WD. MMPI correlates of the BEM Sex Role Inventory and Extended Personal Attributes Questionnaire in a male psychiatric sample. J Clin Psychol. 1982; 38(4):811-815.
69. Naydenova I, Lounsbury JW, Levy JJ, Kim JY. Distinctive big five and narrow personality traits of psychology majors. Indiv Differ Res. 2012; 10(3):129-140.
70. Hartmann E. Boundaries in the mind: A new psychology of personality. Basic Books, 1991.
71. Kelly WE, Daughtry D. Sleep-length, noctcaelador, and watching the night-sky to cope. Ind Differ Res. 2007; 5(2):150-157.
72. Helmes E, Reddon JR. A perspective on developments in assessing psychopathology: A critical review of the MMPI and MMPI-2. Psychol Bull. 1993; 113(3):453-471. Doi:10.1037/0033-2909.113.3.453
73. Kelly WE. Openness to experience and night sky watching interest as predictors of reading for pleasure: Path analysis of a mediation model. Read Improv. 2010; 47(4):219-226.
74. Eckblad M, Chapman LJ. Development and validation of a scale for hypomanic personality. J Abnorm Psychol. 1986; 95(3):214-222. Doi: 10.1037//0021-843x.95.3.214
75. American Psychiatric Association. Diagnostic and statistical manual of mental disorders. 5th ed, text rev. American Psychiatric Association, 2022.