# Exploring the Momentary Dynamics of Discrete Narcissistic States

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## Author Note

This thesis was submitted as the requirements for the degree of Bachelor of Science with Honors in Psychology at the University of Michigan–Ann Arbor, 2026. The data used in this project was drawn from the Community–Personality in Daily Life (CPDL) study conducted in the Personality Processes and Outcomes Lab.

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Artificial intelligence tools were used only to support programming tasks, including learning how to implement statistical packages in R (e.g., NbClust and markovchain) and troubleshooting coding errors. AI tools were not used for writing, editing, or generating the text of this thesis.

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**Abstract**

Narcissism is commonly conceptualized as comprising two core dimensions: grandiosity and vulnerability. Research using ecological momentary assessment (EMA) has shown that narcissistic states vary within individuals across daily life, yet less is known about how these states transition between each other over time. The present study investigated the dynamic organization of narcissistic expressions in daily life by identifying discrete momentary states, examining trait predictors of state occupancy, and modeling probabilistic transitions between states. Data were drawn from a community sample participating in a 10-day EMA study assessing momentary narcissistic grandiosity, vulnerability, and affect. Momentary variables were person-centered and scaled before analysis. K-means clustering was used to identify recurring momentary state configurations, beta regression models examined whether trait narcissism predicted the proportion of time spent in each state, and Markov modeling was used to estimate transition probabilities between states. Clustering analyses identified three recurring momentary states characterized as grandiose, vulnerable, and neutral. Trait grandiosity predicted greater time spent in the grandiose state and less time spent in the neutral state, whereas trait vulnerability predicted greater time spent in the vulnerable state. Transition analyses showed that the neutral state was the most stable state, whereas the vulnerable state showed the lowest stability. These findings suggest that narcissistic functioning in daily life organizes into recurring affective states that fluctuate over time in structured ways, highlighting the value of combining EMA with person-centered and temporal modeling approaches to study personality dynamics.

*Keywords:* narcissism, grandiosity, vulnerability, ecological momentary assessment, Markov modeling, state transitions

## Exploring the Momentary Dynamics of Discrete Narcissistic States

Narcissism is a multifaceted construct comprising two core dimensions: grandiosity and vulnerability. Grandiosity reflects self-enhancement, dominance, entitlement, and elevated self-regard, whereas vulnerability reflects insecurity, shame, contingent self-esteem, and defensive withdrawal (Edershile et al., 2019; Zajenkowski & Szymaniak, 2019). These dimensions exhibit distinct patterns of association with other psychological variables, with grandiosity linked to extraversion and positive affect and vulnerability linked to neuroticism and negative affect, yet they are theorized to share a common antagonistic core (Edershile et al., 2019; Krizan & Herlache, 2018; Miller et al., 2017). Trait-based research has extensively documented these dimensions at the dispositional level, establishing grandiosity and vulnerability as central features of narcissistic personality (Anello et al., 2019; Day et al., 2024; Pincus & Lukowitsky, 2010).

Although trait research has clarified the structure of narcissism, it provides limited insight into how these dimensions unfold in daily life. Trait measures capture individuals' typical levels of grandiosity and vulnerability, but they do not directly model the moment-to-moment fluctuations that may characterize narcissistic experience. Clinical and theoretical perspectives have long suggested that narcissistic functioning involves shifts between self-enhancing and self-protective modes, particularly in response to interpersonal feedback or threats to self-esteem (Edershile et al., 2024; Pincus & Lukowitsky, 2010). Similarly, clinical research has also documented distinct emotional and interpersonal patterns associated with grandiose and vulnerable expressions of narcissism, including differences in affective intensity, defensiveness, and relational style (Hilsenroth et al., 2010). Thus, understanding narcissism may require examining not only stable dispositions but also dynamic patterns of state-level variation.

Empirical work using ecological momentary assessment (EMA) has begun to examine narcissistic grandiosity and vulnerability at the state level. Edershile et al. (2019) demonstrated that state grandiosity and vulnerability exhibit a consistent two-factor structure across within- and between-person levels and show theoretically expected associations with momentary affect. This distinction between grandiose and vulnerable narcissism is also supported by broader structural work integrating multiple forms of narcissism within unified personality frameworks (Rogoza et al., 2019). Subsequent research has documented substantial within-person variability in narcissistic states across daily life and highlighted their associations with fluctuations in affect and interpersonal behavior (Edershile et al., 2024; Edershile & Wright, 2020). Experimental and daily process research further suggests that shifts between grandiosity and vulnerability may occur in response to interpersonal events, such as social validation or rejection (Amad et al., 2020). Together, these findings suggest that narcissistic experience is not static but varies meaningfully across contexts.

Although prior research has documented meaningful within-person variability in narcissistic states, less attention has been given to modeling their temporal organization. Much of the existing state-level research on narcissism has focused on concurrent associations between momentary psychological variables or on average levels of fluctuation across time rather than explicitly modeling transitions between distinct states (Edershile et al., 2024). For example, Edershile and Wright (2020) used autoregressive cross-lagged models to examine within-person dynamics of grandiosity and vulnerability across time but found relatively limited evidence for strong or consistent temporal dependencies between these dimensions. While such approaches are useful for assessing lagged associations, they may be less well suited for capturing more complex patterns of movement across qualitatively distinct states. No study has explicitly

quantified the probabilities of individuals transitioning between discrete narcissistic states over time. As a result, the sequential structure underlying narcissistic experience in daily life remains relatively underexamined. Understanding whether certain states are more stable than others, or whether transitions follow identifiable probabilistic patterns, may provide deeper insight into the dynamic organization of narcissism.

One approach to examining the temporal structure of psychological states is through probabilistic transition modeling. Markov models provide a framework for estimating the likelihood of transitioning from one state to another based on observed sequential data. These models allow researchers to quantify both the stability of particular states and the probability of transitions between states over time.

Within this framework, a distinction is often made between standard Markov models and hidden (latent) Markov models. Standard Markov models estimate transitions between observed states, whereas hidden Markov models assume that observed variables reflect underlying latent states that must be inferred statistically. In the present study, states were not directly observed but were derived from momentary data using clustering methods, resulting in data-driven state classifications that can be treated as observed inputs to the Markov model.

Markov models have previously been applied to psychological state data. For instance, Catarino et al. (2020) applied latent Markov modeling to identify distinct depressive states based on symptom profiles and to estimate the probabilities of transitioning between these states over time. This approach allowed the authors to characterize both the stability of depressive states and patterns of change across treatment.

In addition to modeling state configurations and their transitions, it is important to consider how stable dispositional traits relate to momentary dynamics. Although trait grandiosity

and vulnerability capture individuals' typical levels of narcissistic functioning, it remains unclear how these traits map onto the proportion of time individuals spend in different state configurations in daily life. Examining whether trait narcissism predicts state occupancy may clarify how dispositional tendencies are expressed through dynamic patterns of momentary experience.

**Present Study**

Drawing on prior research demonstrating that narcissistic grandiosity and vulnerability fluctuate across situations and time (Edershile et al., 2024), the present study examined the moment-to-moment dynamics of narcissistic states using EMA data.

To identify these state configurations, we used k-means clustering to group momentary observations into recurring patterns defined by combinations of grandiosity, vulnerability, and affect. In the present study, clustering was used to identify discrete configurations of momentary experience (also referred to as "states" in this paper).

After identifying these state configurations, we examined whether trait grandiosity and vulnerability predicted the proportion of time individuals spent in each state. Finally, we modeled transitions between states using Markov modeling to estimate transition probabilities and state stability, providing a probabilistic representation of how individuals move between narcissistic states over time.

**Hypotheses and Expectations**

Aim 1 focused on identifying recurring momentary state configurations characterized by distinct patterns of grandiosity, vulnerability, and affect. Consistent with prior conceptualizations of narcissistic grandiosity and vulnerability, we expected to observe at least one state cluster characterized by elevated grandiosity and one cluster characterized by elevated vulnerability.

Because the identification of clusters was exploratory, the total number of clusters was determined using clustering validity indices and interpretability.

Aim 2 examined whether trait grandiosity and vulnerability predicted the proportion of time individuals spent in each state. We hypothesized that individuals higher in trait grandiosity would spend a greater proportion of time in grandiose state clusters. Similarly, individuals higher in trait vulnerability were expected to spend more time in vulnerable state clusters.

Aim 3 focused on modeling transitions between narcissistic state clusters. We hypothesized that transitions between states would be non-random, with some transitions occurring more frequently than others, reflecting meaningful dynamic organizations in daily life.

## Methods

### Participants & Data Source

Data for the present study were drawn from an EMA project conducted by the Personality Processes and Outcome Lab. It was taken from the community sample in the Community-Personality in Daily Life (CPDL) dataset. The broader project included both a community and an undergraduate sample, allowing for the examination of personality processes across different populations. For a more detailed description of the dataset, see Edershile and Wright (2020). The present study focused exclusively on the community sample, which was designed to capture personality and affect in adults.

Participants were recruited between 2018 and 2019 through online advertisements and posted flyers for a study of personality and daily life. To obtain a distinct community sample, individuals currently enrolled as full-time undergraduate students were not eligible to participate. Preliminary screening procedures were used to recruit a gender-balanced sample and to ensure adequate representation of personality traits of interest. Specifically, participants were pre-

screened using items from the NEO Personality Inventory-Revised (NEO-PI-R) assessing modesty, and recruitment was structured to obtain a distribution of low, moderate, and high levels of trait modesty within each gender (Costa & McCrae, 2008).

The original community sample consisted of 615 participants. Following exclusions due to incomplete baseline data, invalid responding, failure to complete training procedures, and lack of EMA participation, the final community sample included 342 participants. Of these, 320 participants completed at least 10 EMA surveys, and 311 completed at least 20 EMA surveys. The present analyses were restricted to participants who completed 20 or more valid EMA observations and corresponding baseline data.

Participants ranged in age from 18 to 40 years ($M = 27.99$, $SD = 5.01$). The sample was 51.8% female ($n = 177$), 47.4% male ($n = 162$), with a small number of participants identifying as non-binary or another gender identity. Most participants identified as White (84.8%), with smaller proportions identifying as Asian (7.6%), Black (3.2%), multiracial (3.2%), and other racial or ethnic groups. Additionally, 42.7% of participants reported a lifetime history of mental health treatment, of which 58.2% had received mental health treatment in the last year.

All participants completed baseline self-report questionnaires prior to EMA participation and provided informed consent in accordance with the study's procedures. Participants who completed baseline questionnaires received entry into prize drawings, and additional compensation was provided based on EMA completion, with higher compensation for greater compliance. Following baseline assessment and a brief training procedure, participants completed an intensive EMA protocol using a smartphone-based survey platform, allowing repeated assessment of experiences in naturalistic settings.

The EMA protocol spanned a 10-day monitoring period. During this time, participants received randomly prompted momentary surveys between 9:00 AM and 9:00 PM, with a minimum interval of 90 minutes between prompts, as well as a scheduled daily diary survey each evening. The present analyses focused exclusively on randomly prompted EMA observations.

Participants were excluded from the analytic dataset if they demonstrated invalid responding on baseline measures, did not complete required study training procedures, did not enroll in the EMA platform, or failed to complete any EMA surveys.

## Measures

### *Baseline Measures*

Trait narcissism was assessed at baseline using a self-report questionnaire administered prior to EMA participation. Narcissistic grandiosity and vulnerability were operationalized using scores from an extended brief version of the Pathological Narcissism Inventory (BPNI-X). The BPNI-X measure captures clinically relevant expressions of narcissism across two higher-order domains: grandiosity and vulnerability, each composed of multiple facets (Schoenleber et al., 2015).

The grandiosity domain includes facets reflecting exploitativeness, self-enhancement through helping others, grandiose fantasy, and exhibitionistic tendencies. The vulnerability domain includes facets reflecting contingent self-esteem, concealment of perceived weaknesses, devaluation of others, and anger in response to unmet expectations. Participants rated items on a Likert-type scale ranging from 0 (Very untrue of me) to 4 (Very true of me).

Composite scores for trait grandiosity and trait vulnerability were computed by averaging relevant items within each domain. These baseline trait measures were used as person-level predictors in subsequent analyses examining state-level dynamics.

### *EMA Measures*

Momentary positive affect, negative affect, narcissistic grandiosity, and narcissistic vulnerability were assessed at each randomly prompted EMA survey using state-level self-report items. Positive affect was operationalized as the mean of momentary ratings of happiness, pride, confidence, excitement, and relaxation, whereas negative affect was operationalized as the mean of ratings of sadness, anger, shame, nervousness, and hostility. Momentary narcissistic grandiosity and vulnerability were assessed using adjective-based items capturing momentary self-perceptions. Grandiosity was indexed by ratings of feeling brilliant, glorious, powerful, and prestigious, whereas vulnerability was indexed by ratings of feeling ignored, resentful, misunderstood, and underappreciated. Participants rated these items on a continuous scale ranging from 0 (not at all) to 100 (extremely). Composite scores for each construct were computed by averaging the relevant items. All EMA variables were treated as continuous in subsequent analyses.

## Data Preparation

EMA observations were treated as the unit of analysis for state-level clustering and transition analyses. Observations with missing values on any clustering variable were excluded prior to analysis. In total, 245 observations were excluded due to missingness on clustering variables.

To isolate within-person variability and reduce the influence of stable between-person differences in scale use and response tendencies, momentary variables were person-centered and scaled. For each participant, the mean and standard deviation of each variable were computed across all available EMA observations. Participant-specific z-scores were calculated by

subtracting the participant-specific mean from each momentary score and dividing by the participant-specific standard deviation.

**Aim 1 – Identification of Momentary Narcissistic State Clusters**

Momentary narcissistic states were identified using k-means clustering applied to EMA observations. Clustering analyses were conducted on both unscaled and person-centered scaled data to evaluate the structure of the state-level variables. The number of clusters was evaluated across solutions ranging from k = 2 to k = 10 using multiple cluster validity indices, including the elbow method, gap statistics, and silhouette width.

All clustering analyses were conducted in R using the cluster package. Cluster number evaluation was supported by the NbClust package, which compares multiple validity indices across candidate solutions. Visualization of cluster structure and separation was performed using the factoextra package, and additional visualizations were created using ggplot2.

**Aim 2 – Trait Predictors of the Time Spent in Each State**

This aim examined whether trait-level narcissism predicted the proportion of time participants spent in each momentary state identified in Aim 1 (i.e., trait occupancy). Cluster assignments derived from the scaled EMA dataset were used to compute the proportion of time individuals spent in each cluster. Separate beta regression models were estimated for each state proportion outcome, predicting time spent in each state from trait grandiosity and trait vulnerability.

Because beta regression requires outcome values to lie strictly between 0 and 1, proportions equal to 0 were recoded to 0.001, and proportions equal to 1 were recoded to 0.999 before analysis. All regression analyses were conducted in R using the betareg package, which is

designed for modeling continuous proportion outcomes bounded between 0 and 1. Predicted values and visualizations were generated using ggplot2.

**Aim 3 – Dynamics of Transition Between States**

To examine temporal dynamics, transitions between states were modeled using sequential EMA observations ordered within participants. Observations with missing participant IDs, state labels, or timestamps were excluded.

State-to-state transitions were defined as movement from one momentary state to the subsequent state within individuals. Transition counts were aggregated across participants to produce a pooled transition count matrix. Counts were converted into probabilities by dividing each transition count by the total number of transitions originating from that state. This produced a transition probability matrix representing the likelihood of moving from one state to another at the next observation. A Markov chain was estimated from the pooled transition matrix using maximum likelihood estimation.

Markov models were estimated in R using the markovchain package. Uncertainty in transition probabilities was quantified using bootstrap resampling (500 iterations) to obtain 95% confidence intervals. Visualizations were generated using ggplot2, and the state transition diagram was constructed using the diagram package.

## Results

**Aim 1 – Identification of Momentary Narcissistic State Clusters**

Clustering analyses were conducted on 17,294 EMA observations from 307 participants ($M = 56.33$ observations per participant, $SD = 14.35$).

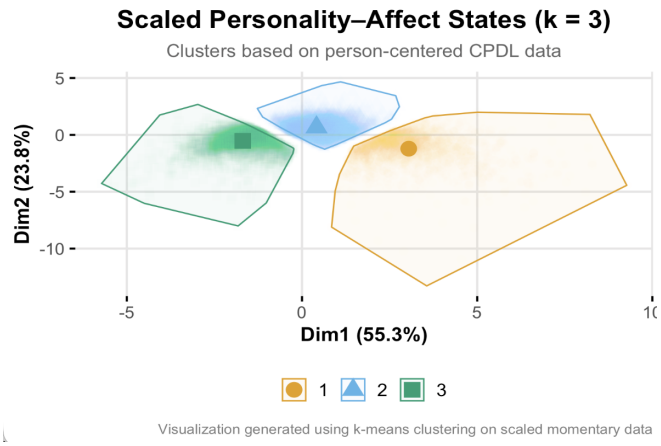
Cluster validity indices supported a three-cluster solution. Evidence from the elbow method, gap statistics, and silhouette width converged on this solution (see Appendix A, Figures

A1-A3). Mean values of grandiosity, vulnerability, positive affect, and negative affect were used to characterize each cluster. In the scaled solution, one cluster was characterized by elevated vulnerability (M = 1.77) and negative affect (M = 1.76) and lower grandiosity (M = −0.44) and positive affect (M = −0.91). A second cluster showed lower-than-average levels across all variables, reflecting a neutral state (grandiosity: M = –0.49; vulnerability: M = −0.24; positive affect: M = −0.41; negative affect: M = −0.19). A third cluster was characterized by elevated grandiosity (M = 0.86) and positive affect (M = 0.92) with lower vulnerability (M = −0.29) and negative affect (M = −0.36).

A visualization of cluster assignments for the scaled solution is presented in Figure 1. Cluster visualizations for the scaled solution are presented in Appendix A. Visualizations of the unscaled solution are provided in Appendix C. Correspondence between unscaled and scaled cluster assignments is shown in Appendix C, Figure C5.

**Figure 1**

*Scaled Personality-Affect States (k = 3)*




*Note.* Points represent EMA observations on two principal dimensions. Colors indicate k-means clusters (k = 3): grandiose (1, yellow), neutral (2, blue), and vulnerable (3, green). Ellipses show cluster distributions.

**Aim 2 – Trait Predictors of the Time Spent in Each State**

Across participants, the mean proportion of time spent in each state was 0.13 (SD = 0.05) for the vulnerable state, 0.51 (SD = 0.10) for the neutral state, and 0.36 (SD = 0.08) for the grandiose state. Results of beta regression analyses are presented in Table 1.

Trait vulnerability was associated with greater time spent in the vulnerable state. Trait grandiosity was significantly positively associated with time spent in the grandiose state and negatively associated with time spent in the neutral state. No other associations were statistically significant. Predicted proportions derived from the fitted models are displayed in Figures 2 and 3.

**Table 1**

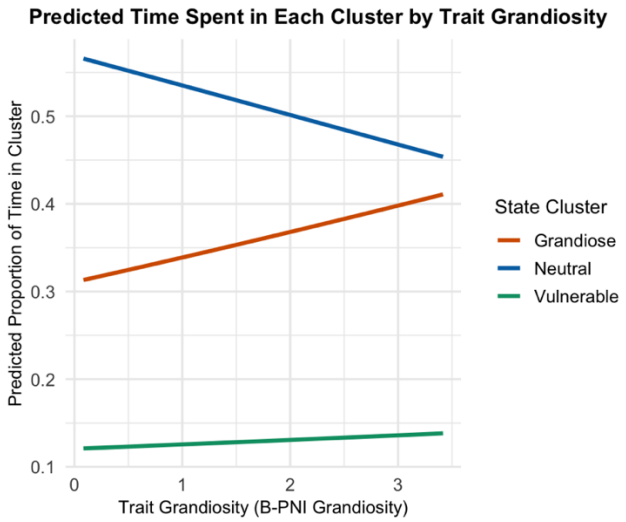
*Beta regression models predicting the proportion of time spent in each narcissistic state from trait grandiosity and trait vulnerability*

| Cluster | Term | Estimate | SE | OR | CI_low | CI_high | p |
|---|---|---|---|---|---|---|---|
| Vulnerable | (Intercept) | -2.09 | 0.06 | | | | < .001 |
| Vulnerable | bpnixGrandiosity | 0.05 | 0.04 | 1.05 | 0.96 | 1.14 | 0.27 |
| Vulnerable | bpnixVulnerability | 0.08 | 0.04 | 1.08 | 1.00 | 1.16 | 0.05 |
| Vulnerable | (phi) | 55.29 | 4.46 | | | | < .001 |
| Neutral | (Intercept) | 0.25 | 0.06 | | | | < .001 |
| Neutral | bpnixGrandiosity | -0.14 | 0.04 | 0.87 | 0.81 | 0.94 | < .001 |
| Neutral | bpnixVulnerability | 0.02 | 0.04 | 1.02 | 0.95 | 1.10 | 0.61 |
| Neutral | (phi) | 28.26 | 2.24 | | | | < .001 |
| Grandiose | (Intercept) | -0.71 | 0.05 | | | | < .001 |
| Grandiose | bpnixGrandiosity | 0.13 | 0.04 | 1.14 | 1.06 | 1.22 | < .001 |
| Grandiose | bpnixVulnerability | -0.06 | 0.03 | 0.94 | 0.88 | 1.01 | 0.09 |
| Grandiose | (phi) | 37.21 | 2.97 | | | | < .001 |

*Note.* Proportion outcomes were adjusted to fall within the open interval (0, 1) by recoding values of 0 to 0.001 and values of 1 to 0.999 prior to analysis. OR = odds ratio; CI = confidence interval.

**Figure 2**

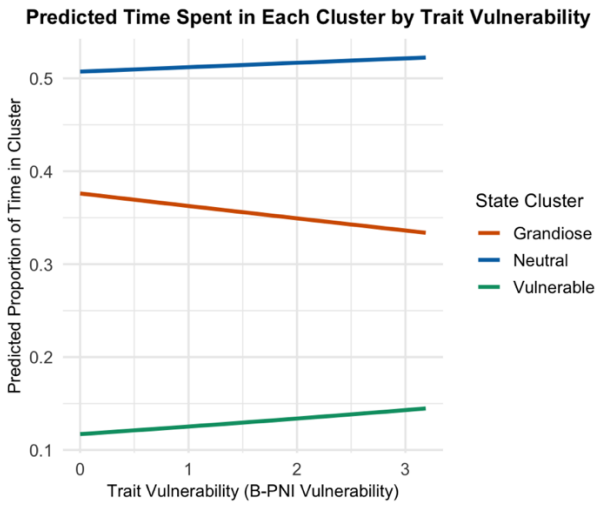
*Predicted Time Spent in Each Cluster by Trait Grandiosity*




*Note.* Lines represent predicted proportions of time spent in each state cluster as a function of trait grandiosity (B-PNI grandiosity), based on beta regression models.

**Figure 3**

*Predicted Time Spent in Each Cluster by Trait Vulnerability*




*Note.* Lines represent predicted proportions of time spent in each state cluster as a function of trait vulnerability (B-PNI vulnerability), based on beta regression models.

**Aim 3 – Dynamics of Transition Between States**

The pooled transition probability matrix is presented in Table 2. Transition probabilities varied by originating state.

When in the grandiose state, participants most frequently remained in that state (probability (p) = 0.54), followed by transition to the neutral state (p = 0.37), and less frequently to the vulnerable state (p = 0.09). When in the neutral state, the probability of remaining neutral was highest (p = 0.65), followed by transition to the grandiose state (p = 0.25) and the vulnerable state (p = 0.10). When in the vulnerable state, participants were most likely to transition to the neutral state (p = 0.44), followed by remaining in the vulnerable state (p = 0.30) or transitioning to the grandiose state (p = 0.26).

A visualization of the transition structure is presented in Figure 4. Additional visualizations, including the transition probability heatmap and state stability estimates, are provided in Appendix B, Figures B1-B2. Bootstrap confidence intervals for all transition probabilities are presented in Appendix B, Table B1, and were narrow and did not include zero, indicating that all estimated transitions were reliably greater than zero.

**Table 2**

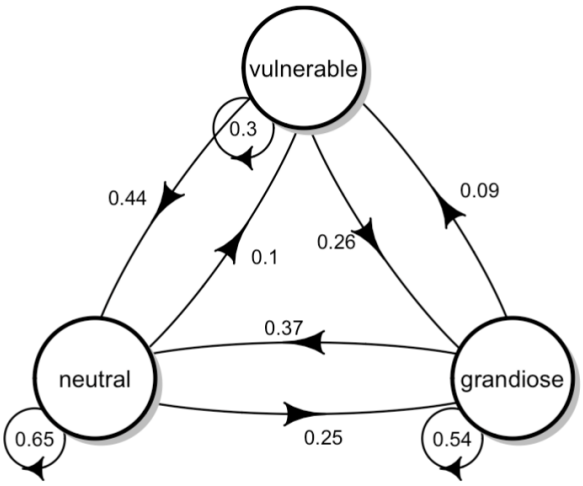
*Pooled Markov transition probability matrix for narcissistic state transitions*

| | Grandiose | Neutral | Vulnerable |
|---|---|---|---|
| Grandiose | 0.54 | 0.37 | 0.09 |
| Neutral | 0.25 | 0.65 | 0.10 |
| Vulnerable | 0.26 | 0.44 | 0.30 |

*Note.* Rows represent the originating (current) state, and columns represent the subsequent (next) state.

**Figure 4**

*State Transition Matrix Diagram*




*Note.* Arrows represent transitions between states, and values indicate transition probabilities. Curved arrows indicate remaining in the same state.

## Discussion

The present study examined how narcissistic experiences unfold in daily life using EMA and person-centered analytic approaches. Across three aims, results identified distinct grandiose, vulnerable, and neutral states, demonstrated that trait narcissism predicts time spent in these states, and showed that transitions between states follow structured patterns over time. Together, these findings suggest that narcissistic functioning is best understood as a dynamic system of fluctuating psychological states.

### Substantive Findings

The first aim of the present study was to identify recurring momentary state clusters of narcissistic experience in daily life defined by grandiosity, vulnerability, and affect. Clustering analyses were conducted on both unscaled momentary data and person-centered, standardized

data to evaluate the robustness of the identified structure. Across both analytic approaches, a three-cluster solution was supported.

The person-centered (scaled) solution served as the primary analytic model because it isolates within-person deviations from individual baselines. Within this solution, three psychological clusters emerged that were consistent with expectations. Specifically, we observed a cluster characterized by elevated vulnerability and negative affect alongside lower grandiosity and positive affect, consistent with the vulnerable state, and a second cluster characterized by elevated grandiosity and positive affect with lower vulnerability and negative affect, consistent with a grandiose state. These findings align with prior conceptualizations of narcissism as comprising distinct grandiose and vulnerable modes of functioning. In addition, a third cluster reflecting comparatively moderate labels across all variables emerged and was interpreted as a neutral state.

Importantly, the presence of a distinct neutral state suggests that daily narcissistic functioning is not characterized solely by oscillation between grandiose and vulnerable extremes. Instead, most momentary experiences appear to occur within a relatively neutral baseline state, with grandiose and vulnerable states representing meaningful but less frequent deviations from this baseline. This finding adds nuance to prior work demonstrating within-person variability in narcissistic grandiosity and vulnerability in daily life (Edershile & Wright, 2020; Edershile et al., 2024), by suggesting that such fluctuations may occur intermittently rather than continuously dominating momentary experience.

Furthermore, the presence of distinct grandiose and vulnerable states suggests that these modes do not typically co-occur at the same moment but instead emerge as qualitatively distinct psychological configurations. This pattern is consistent with theoretical perspectives that

conceptualize grandiosity and vulnerability as alternating self-regulatory strategies in response to situational demands or threats to self-esteem, rather than simultaneously activated processes (Edershile et al., 2024). Together, these findings support a dynamic systems view of narcissism in which individuals move between discrete states organized around distinct affective and self-evaluative patterns in everyday life.

The second aim of the study examined whether individual differences in trait narcissism predicted the proportion of time participants spent in each momentary state. Trait grandiosity and trait vulnerability were modeled as predictors of the proportion of EMAs spent in the grandiose, vulnerable, and neutral clusters.

Consistent with expectations, higher levels of trait grandiosity were associated with spending a greater proportion of time in the grandiose state. Trait grandiosity was also significantly associated with spending less time in the neutral state but was not significantly associated with time spent in the vulnerable state. Together, this pattern suggests that individuals higher in trait grandiosity are more likely to experience momentary states characterized by elevated grandiosity and positive affect, without a corresponding reduction in vulnerability. This pattern is consistent with priority work, suggesting that grandiosity and vulnerability represent a relatively independent dimension of narcissism rather than opposite ends of a single continuum (Anello et al., 2019; Edershile et al., 2019).

A complementary pattern emerged for trait vulnerability. Higher levels of trait vulnerability were associated with spending more time in the vulnerable state. Trait vulnerability was not significantly associated with time spent in either the grandiose or neutral states. This pattern further supports the interpretation that grandiosity and vulnerability reflect distinct

dimensions of narcissism rather than opposing ends of a single continuum (Edershile et al., 2019).

Taken together, these findings suggest that dimensions of trait narcissism shape the probability of occupying particular momentary psychological states. Individuals higher in trait grandiosity were more likely to experience states characterized by elevated grandiosity and positive affect, whereas individuals higher in trait vulnerability were more likely to experience states characterized by elevated vulnerability and negative affect. Crucially, because these analyses were conducted using person-centered data, these findings reflect differences in the likelihood of occupying particular states relative to individuals' own baselines rather than differences in overall levels of grandiosity or vulnerability. Thus, higher trait grandiosity is associated not only with elevated average levels of grandiosity but also with a greater likelihood of experiencing moments that are especially high in grandiosity relative to one's typical level of functioning.

These findings are consistent with dynamic models of narcissism, which suggest that narcissistic traits influence how individuals experience everyday situations (Edershile, 2019). Traits do not imply that people are constantly in a particular psychological state. Instead, they reflect tendencies that make certain states more likely to occur. Consistent with this perspective, individuals higher in trait grandiosity spent more time in grandiose states, whereas individuals higher in trait vulnerability spent more time in vulnerable states during daily life.

The third aim of the study examined how individuals transitioned between momentary narcissistic states over time. The Markov model showed that these transitions were not random. Instead, the three states differed meaningfully in their stability and in the likelihood of transitioning to other states.

The neutral state was the most stable state, with the highest self-transition probability ($p = 0.65$). This suggests that once individuals were in a moderate state characterized by relatively average levels of grandiosity, vulnerability, and affect, they were most likely to remain there at the next assessment. The grandiose state was also relatively stable ($p = 0.54$), although less stable than the neutral state. One notable finding is the substantially lower stability of the vulnerable state ($p = 0.30$). This may suggest that vulnerable experiences in daily life are relatively transient and more likely to shift into another cluster, particularly a neutral one. Although the present study cannot identify the causes of these shifts, the transition structure indicates that vulnerability may be a more fluctuating and less enduring state than neutrality or grandiosity in this community sample.

The transition pattern also suggests that the neutral state may function as a common intermediate state in daily life. Individuals in the grandiose state most often remained grandiose or transitioned to the neutral state, and individuals in the vulnerable state were most likely to transition to the neutral state. This pattern is especially clear for the vulnerable state, where transition to the neutral state ($p = 0.44$) was more likely than either remaining vulnerable or transitioning to the grandiose state. Altogether, these findings suggest that more extreme narcissistic states may often resolve into a more moderate state over time. At the same time, transitions between all three states were observed, and all estimated probabilities were greater than zero. This indicates that movement across the full state space was possible.

Notably, no state functioned as a terminal or absorbing condition. The Markov chain was therefore fully connected, with individuals able to move among grandiose, neutral, and vulnerable states across consecutive assessments. This indicates that narcissistic functioning in

daily life reflects an ongoing dynamic process, with individuals moving between grandiose, neutral, and vulnerable states over time.

Overall, the findings across the three aims provide a more comprehensive view of narcissistic functioning in daily life. Clustering analyses identified three recurring psychological states defined by grandiosity, vulnerability, and affect. Trait-level narcissism predicted how frequently individuals occupied these states, with trait grandiosity associated with greater time spent in grandiose states and trait vulnerability associated with greater time spent in vulnerable states. Finally, transition analyses showed that these states follow structured patterns of stability and change over time, with the neutral state functioning as the most stable cluster and vulnerable states showing lower stability. Together, these results suggest that narcissistic functioning in daily life can be understood as a dynamic process in which stable personality traits influence the likelihood of entering particular states while those states fluctuate and transition over time.

**Methodological Contribution**

In addition to the substantive findings, the present study contributes methodologically to the study of narcissism and personality dynamics. Much of the existing literature on narcissism has relied on cross-sectional self-report measures that capture stable trait differences between individuals (Anello et al., 2019; Day et al., 2024). While these approaches have been useful for establishing the structure of narcissistic personality, they provide limited insight into how narcissistic experiences unfold in daily life (Edershile et al., 2019; Edershile & Wright, 2020). By combining EMAs with person-centered analytic techniques, the present study illustrates a framework for examining the dynamic organization of narcissistic states.

First, the use of clustering methods to identify momentary state configurations provides a person-centered approach to modeling narcissistic experiences. Clustering methods have been

used in psychological research to identify recurring patterns of emotional or psychological states (Fisher & Bosley, 2020), however these methods have not been widely applied to the study of narcissistic state dynamics. Rather than examining grandiosity and vulnerability as independent continuous variables (Edershile et al., 2019; Zajenkowski & Szymaniak, 2019), clustering allows the identification of recurring configurations defined by combinations of narcissistic states and affect.

Second, the study demonstrates how trait-level variables can be integrated with momentary state data to examine how stable personality characteristics shape patterns of everyday experience (Edershile et al., 2024). By modeling the proportion of time individuals spent in each state as a function of trait narcissism, the analyses provide a direct link between dispositional traits and momentary psychological dynamics. This approach illustrates how traditional trait frameworks can be extended to understand how personality operates in real-world contexts.

Finally, the application of Markov modeling provides a quantitative framework for examining how psychological states evolve (Catarino et al., 2020). While prior work has documented variability in narcissistic states, fewer studies have explicitly modeled the probabilities of transitioning between different states. Markov models allow researchers to estimate both the stability of psychological states and the likelihood of movement between them. By applying this framework to narcissistic states, this paper demonstrates how dynamic processes underlying personality functioning can be formally modeled and visualized.

Collectively, these analytic approaches highlight the value of combining EMA, person-centered, and temporal modeling techniques. Such methods provide a more detailed view of

personality processes as they unfold in everyday life and may be useful for studying the dynamics of other personality constructs beyond narcissism.

**Limitations and Future Directions**

Despite these contributions, several limitations should be considered when interpreting the findings.

First, the study relied on self-report EMA measures of narcissistic states and affect. Although EMA reduces retrospective bias by capturing experiences close to the time they occur, responses still depend on participants' self-perceptions and willingness to report their experiences accurately. As a result, some aspects of narcissistic functioning may not be fully captured through self-report measures alone. Future studies could extend this work by incorporating behavioral indicators, reports from interaction partners, or passive sensing measures (e.g., smartphone or observational data) to complement self-reported momentary states.

Second, the study used a community sample rather than a clinical sample specifically selected for narcissistic pathology. As a result, the findings primarily reflect narcissistic dynamics within the normal range of personality variation. Although individuals in community samples may still vary in levels of narcissistic traits, the results may not fully generalize to clinical populations in which narcissistic pathology is more severe or pervasive. Future research could examine whether similar state structures and transition dynamics emerge in clinical or high-trait narcissism samples, which may reveal stronger or more persistent grandiose or vulnerable states.

Third, the clustering approach used involves analytic decisions that can influence the resulting state structure. For example, clustering methods require selecting the number of clusters based on statistical indices and interpretability. Although most cluster validity indices and the

NbClust algorithm supported a three-cluster solution, the silhouette method suggested a two-cluster solution. However, the three-cluster solution was retained because it was supported by the majority of indices and provided a more interpretable structure that distinguished grandiose, vulnerable, and neutral states. As with all clustering approaches, the resulting structure should be interpreted as a statistical representation of patterns in the data rather than a definitive taxonomy of narcissistic states. Future work could examine whether similar state structures emerge across different datasets, clustering methods, or measurement approaches, which would help establish the robustness of the identified configurations.

Fourth, the Markov modeling approach assumed that transitions between states depended only on the immediately preceding state. This first-order assumption is common in Markov models and provides a tractable way to estimate temporal dynamics. However, psychological experiences may also be influenced by earlier states or situational factors that extend beyond a single time step. Future research could explore more complex models that incorporate longer temporal dependencies or contextual predictors of state transitions. Future research could extend this work using multilevel Markov models, which allow transition probabilities to vary across individuals and may provide a more detailed understanding of how narcissistic state dynamics differ from person to person.

Finally, although the present study modeled transitions between narcissistic states, it did not directly examine the situational or interpersonal factors that may trigger these changes. Narcissistic states are often theorized to fluctuate in response to social feedback, goal pursuit, or perceived threats to self-esteem (Edershile et al., 2019; Edershile & Wright, 2020; Day et al., 2024). Incorporating measures of interpersonal context, social evaluations, or situational

stressors into EMA designs may therefore help clarify the mechanisms that drive transitions between grandiose, vulnerable, and neutral states in daily life.

## Conclusion

The present study examined how narcissistic experiences unfold in daily life using EMAs and person-centered analytic methods. The findings suggest that narcissistic functioning is characterized by recurring grandiose, vulnerable, and neutral states that fluctuate over time rather than remaining fixed at a single level. Trait narcissistic grandiosity and vulnerability shaped the likelihood of occupying these states, while transition analyses showed that movement between states followed a structured pattern in everyday life, with neutral states often intervening between extremes. Overall, these findings highlight the value of studying narcissism as a dynamic system and show how momentary assessment methods can provide insight into how personality processes unfold over time.

## References

Amad, S., Gray, N. S., & Snowden, R. J. (2020). Self-esteem, narcissism, and aggression: Different types of self-esteem predict different types of aggression. *Journal of Interpersonal Violence,* 36, 13296--13313. https://doi.org/10.1177/0886260520905540

Anello, K. L., Lannin, D. J., & Hermann, A. D. (2019). The values of narcissistic grandiosity and vulnerability. *Personality and Individual Differences*, 1-6. https://doi.org/10.1016/j.paid.2019.06.021

Catarino, A., Fawcett, J. M., Ewbank, M. P., Bateup, S., Cummins, R., Tablan, V., & Blackwell, A. D. (2020). Refining our understanding of depressive states and state transitions in response to cognitive behavioural therapy using latent Markov modelling. *Psychological Medicine*, 52, 332–341. https://doi.org/10.1017/S0033291720002032

Costa, P. T., Jr., & McCrae, R. R. (2008). The Revised NEO Personality Inventory (NEO-PI-R). In G. J. Boyle, G. Matthews, & D. H. Saklofske (Eds.), *The SAGE handbook of personality theory and assessment*, 2, 179-198. https://doi.org/10.4135/9781849200479.n9

Day, N. J. S., Green, A., Denmeade, G., Bach, Bo., & Grenyer, B. F. S. (2024). Narcissistic personality disorder in the ICD-11: Severity and trait profiles of grandiosity and vulnerability. *Journal of Clinical Psychology*, 80, 1917–1936. https://doi.org/10.1002/jclp.23701

Edershile, E. A., Woods, W. C., Sharpe, B. M., Crowe, M. L., Miller, J. D., & Wright, A. G. C. (2019). A Day in the life of Narcissus: Measuring narcissistic grandiosity and

vulnerability in daily life. *Psychological Assessment*, 1-12. https://doi.org/10.1037/pas0000717

Edershile, E. A., & Wright, A. G. C. (2020). Fluctuations in grandiose and vulnerable narcissistic states: A momentary perspective. *Journal of Personality and Social* Psychology, 1-29. https://doi.org/10.1037/pspp0000370

Edershile, E. A., & Wright, A. G. C. (2021). Grandiose and vulnerable narcissistic states in interpersonal situations. *Self and Identity, 20*(2), 165–181. https://doi.org/10.1080/15298868.2019.1627241

Edershile, E. A., Szücs, A., Dombrovski, A. Y., & Wright, A. G. C. (2024). Dynamics of narcissistic grandiosity and vulnerability in naturalistic and experimental settings. *Journal of Personality and Social Psychology,* 1-18. https://doi.org/10.1037/pspp0000510

Fisher, A. J., & Bosley, H. G. (2020). Identifying the presence and timing of discrete mood states prior to therapy. *Behaviour Research and Therapy*, 128, 1-11. https://doi.org/10.1016/j.brat.2020.103596

Hilsenroth, M. J., Hibbard, S. R., Nash, M. R., & Handler, L. (2010). A Rorschach study of narcissism defense, and aggression in borderline, narcissistic, and Cluster C personality disorders. *Journal of Personality Assessment*, 60(2), 346-361. https://doi.org/10.1207/s15327752jpa6002_11

Krizan, Z., & Herlache, A. D. (2018). The narcissism spectrum model: A synthetic view of narcissistic personality. *Personality and Social Psychology Review, 22*(1), 3–31. https://doi.org/10.1177/1088868316685018

Miller, J. D., Lynam, D. R., Hyatt, C. S., & Campbell, W. K. (2017). Controversies in

narcissism. *Annual Review of Clinical Psychology, 13*, 291–315. https://doi.org/10.1146/annurev-clinpsy-032816-045244

Pincus, A. L., & Lukowitsky, M. R. (2010). Pathological narcissism and narcissistic personality disorder. *Annual Review of Clinical Psychology, 6*, 421–446. https://doi.org/10.1146/annurev.clinpsy.121208.131215

Rogoza, R., Cieciuch, J., Strus, W., & Baran, T. (2019). Seeking a common framework for research on narcissism: An attempt to integrate the different faces of narcissism within the circumplex of personality metatraits. *European Journal of Personality, 33*(4), 437-455. https://doi.org/10.1002/per.2206

Schoenleber, M., Roche, M. J., Wetzel, E., Pincus, A. L., & Roberts, B. W. (2015). Development of a brief version of the Pathological Narcissism Inventory. *Psychological Assessment,* 27(4), 1520–1526. https://doi.org/10.1037/pas0000158

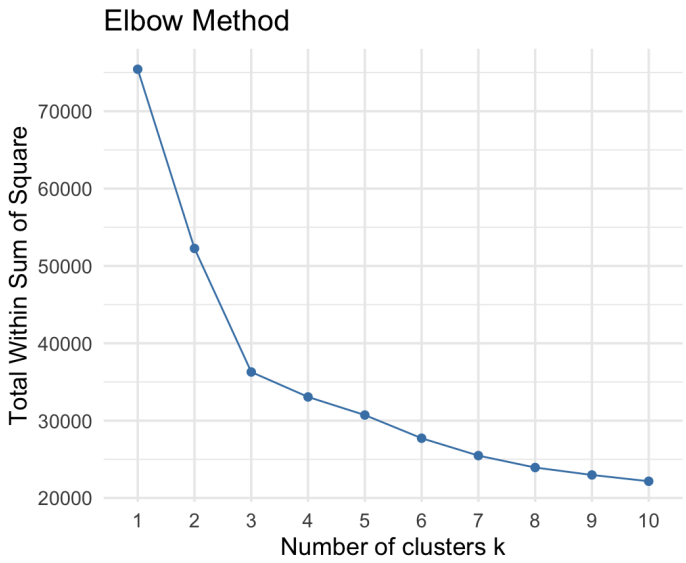
Zajenkowski, M., & Szymaniak, K. (2019). Narcissism between facets and domains. The relationships between two types of narcissism and aspects of the Big Five. *Current Psychology,* 40, 2112–2121. https://doi.org/10.1007/s12144-019-0147-1

# Appendix A

## Cluster Validity Indices for the Scaled Data

### Figure A1

*Elbow plot for determining the number of clusters in the scaled solution*




### Figure A2

*Gap statistics method plot for determining the number of clusters in the scaled solution*

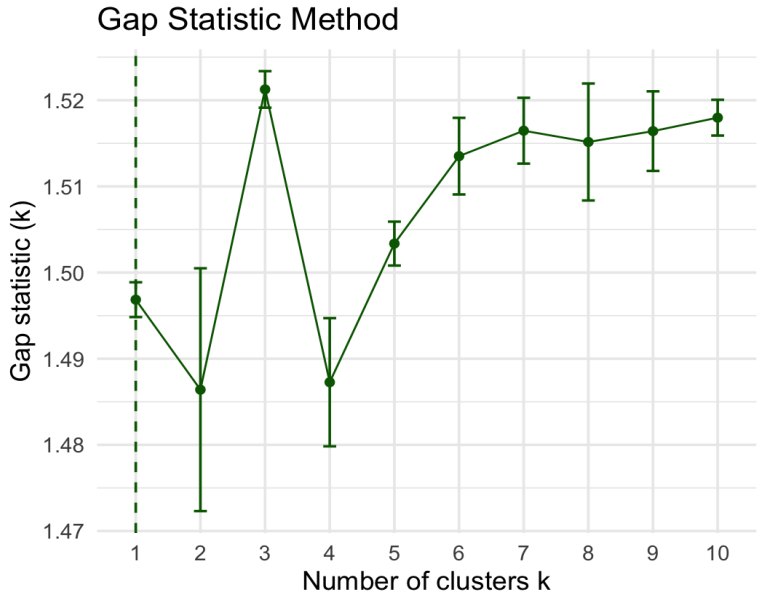
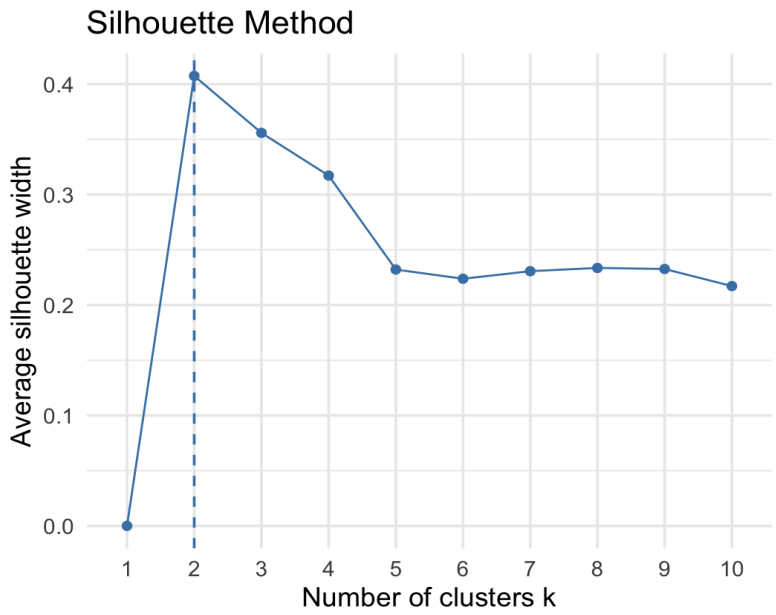


**Figure A3**

*Silhouette method plot for determining the number of clusters in the scaled solution*

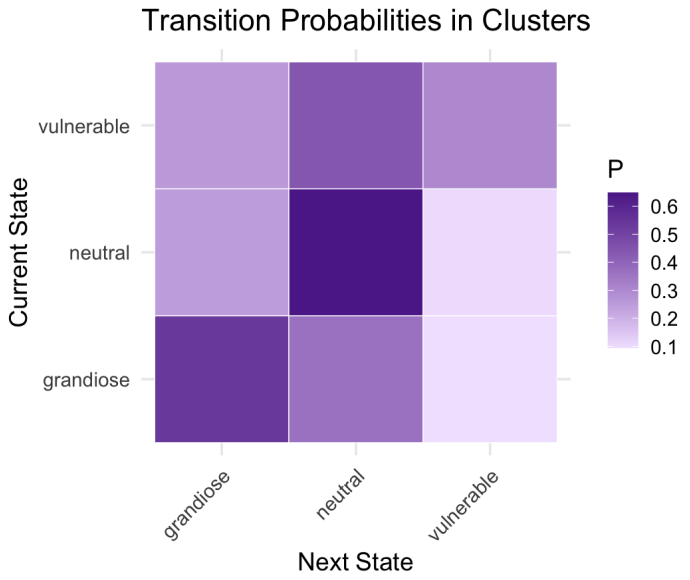


## Appendix B

## State Transition Probabilities and Bootstrap Confidence Intervals

### Figure B1

*Heatmap of Markov transition probabilities between narcissistic state clusters. Rows represent the current state, and columns represent the subsequent state*




### Figure B2

*Self-transition probabilities (state stability) for each narcissistic state cluster*

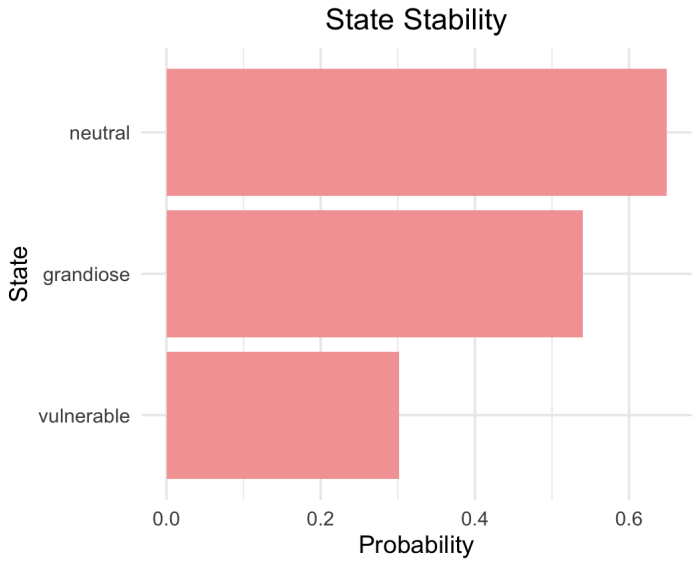


**Table B1**

*Bootstrap 95% confidence intervals for Markov state transition probabilities*

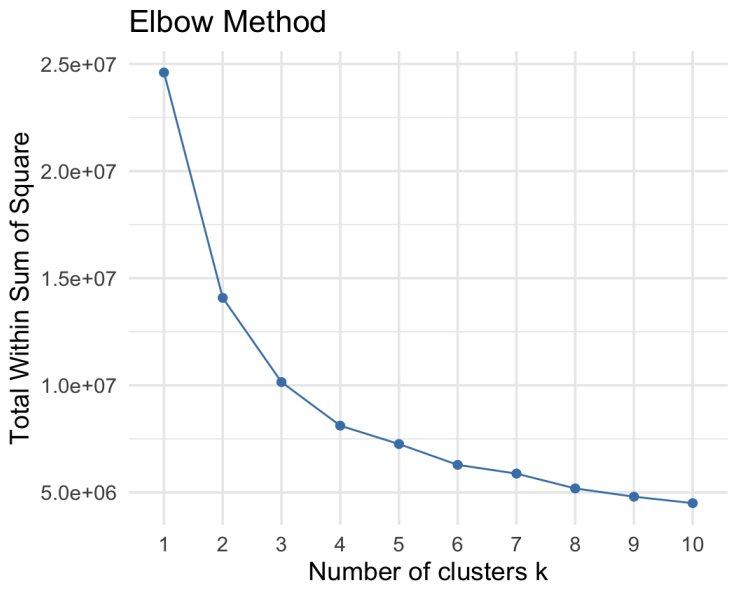
| From | To | p_hat | SE | CI_low | CI_high | Reliable_gt0 |
|---|---|---|---|---|---|---|
| grandiose | grandiose | 0.54 | 0.00 | 0.54 | 0.54 | TRUE |
| grandiose | neutral | 0.36 | 0.00 | 0.36 | 0.36 | TRUE |
| grandiose | vulnerable | 0.10 | 0.00 | 0.10 | 0.10 | TRUE |
| neutral | neutral | 0.64 | 0.00 | 0.64 | 0.64 | TRUE |
| neutral | grandiose | 0.25 | 0.00 | 0.25 | 0.25 | TRUE |
| neutral | vulnerable | 0.11 | 0.00 | 0.11 | 0.11 | TRUE |
| vulnerable | neutral | 0.44 | 0.00 | 0.44 | 0.44 | TRUE |
| vulnerable | vulnerable | 0.30 | 0.00 | 0.30 | 0.30 | TRUE |
| vulnerable | grandiose | 0.26 | 0.00 | 0.26 | 0.26 | TRUE |

# Appendix C

## Cluster Validity Indices and Cluster Assignments for Unscaled Data

### Figure C1

*Elbow method plot for determining the number of clusters in the unscaled solution*




### Figure C2

*Gap statistics method plot for determining the number of clusters in the unscaled solution*

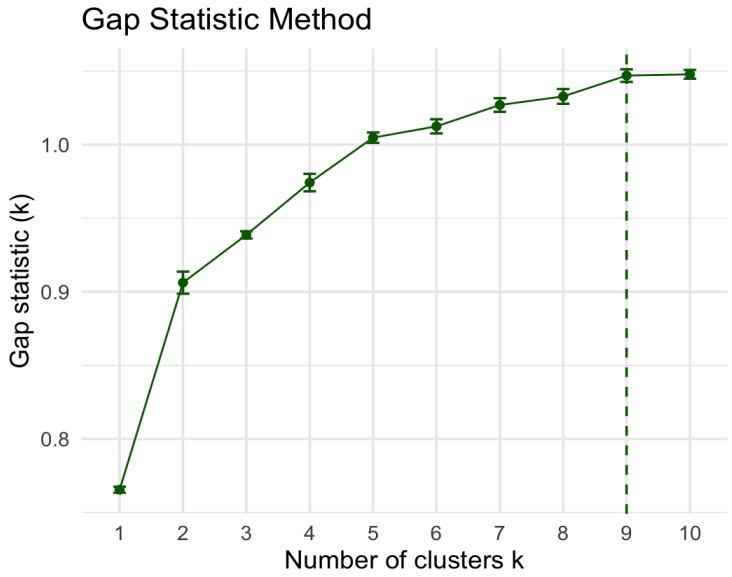


**Figure C3**

*Silhouette method plot for determining the number of clusters in the unscaled solution*

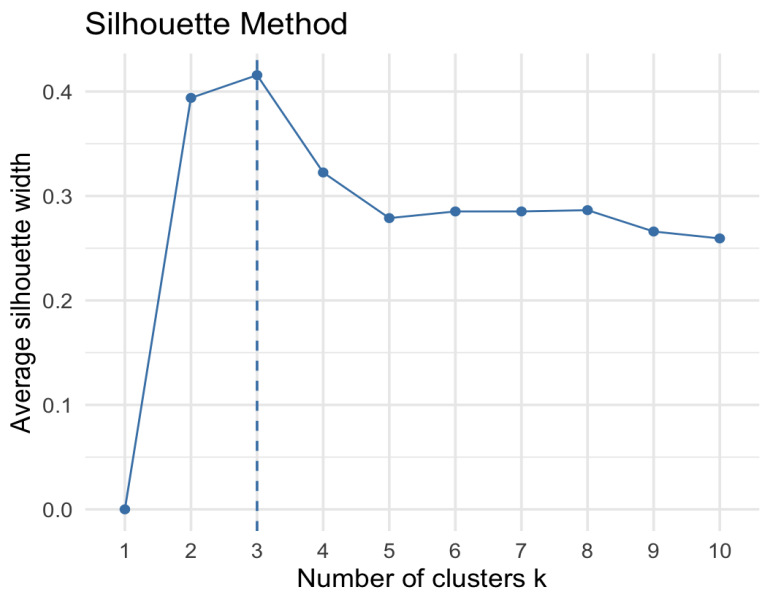



**Figure C4**

*Cluster assignment plot for the unscaled solution*

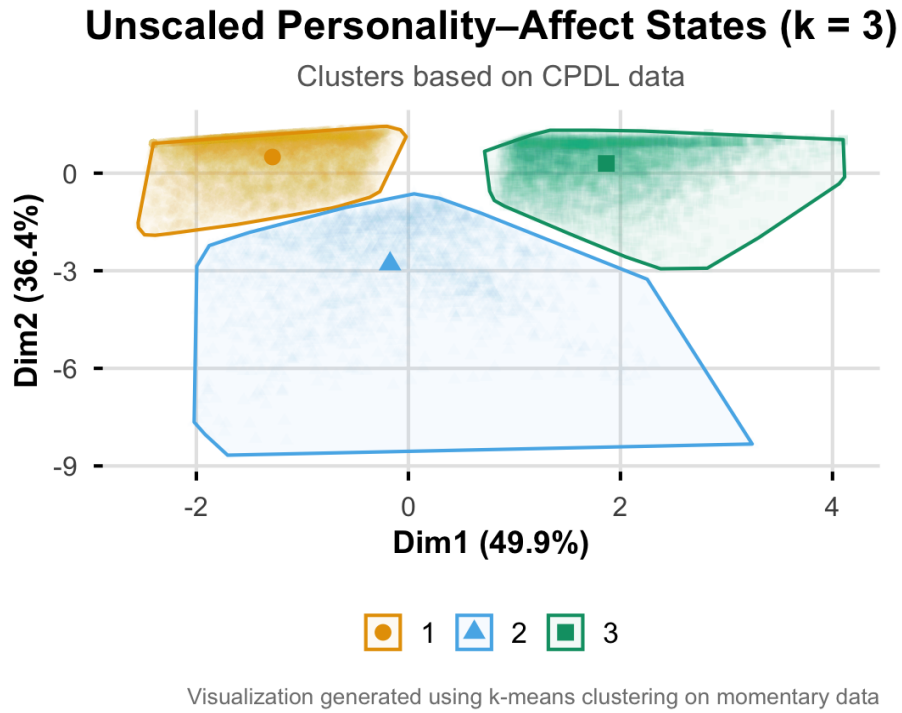


**Figure C5**

*Cluster assignments corresponding from scaled to unscaled data*

