Integrating Naturalistic and Experimental Paradigms to Understand Mechanisms of Narcissism

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Theoretical accounts of narcissism emphasize dynamic shifting of self-states in response to the social context. Situations in which an individual experiences threats to their status are thought to set narcissism's dynamics in motion. Naturalistic studies (e.g., ecological momentary assessment) have been used to examine the general patterning of fluctuations in grandiose and vulnerable states, as well as to examine how grandiosity and vulnerability change in response to perceptions of the interpersonal environment. Experimental studies have emphasized behavioral expressions of narcissistic individuals in response to putative "ego threats" from others. In many respects, naturalistic and experimental studies suffer from opposing limitations (e.g., lack of experimental control versus ambiguous real-life generalizability). Integrating naturalistic and experimental studies has the potential to provide a comprehensive model of how dynamics within narcissism unfold in response to status threat. The current study (N = 437) examined shifts in grandiosity and vulnerability in both naturalistic (ecological momentary assessment) and experimentally controlled (rigged tournament game) social interactions. Grandiosity decreased and vulnerability increased in response to both naturalistic and experimental status threats. Further, grandiose responses were generally amplified for the same people across methods. The current study reinforces the importance of status threatening environments to expressions within narcissism and elucidates important differences with respect to expressions of grandiosity and vulnerability across naturalistic and experimental methods.

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1.0 Introduction

Narcissism can have significant personal and social costs, including depression, suicidality, and violence (e.g., Ansell et al., 2015; Ellison et al., 2013; Pincus et al., 2009). Clinical theorists argue that narcissism involves deficits in an individual's self and interpersonal functioning that manifest in unstable self-esteem, and cycles of grandiosity and vulnerability (Kernberg, 1975; Ronningstam, 2009, 2011; Pincus et al., 2014; Wright, 2014). The mechanisms underlying these cycles remains unclear. Whereas most of narcissism research has relied on cross-sectional assessments using trait-based measures (e.g., Dashineau et al., 2019; Edershile et al., 2019a; Miller et al., 2014, 2016, 2017), a mechanistic understanding necessitates longitudinal assessments that directly measure processes. Both naturalistic studies and experimental paradigms have been used to capture narcissism dynamics, though they have largely remained disparate literatures. As a result, whether naturalistic and experimental study designs evoke the same processes remains an open question. Each study design may offer unique strengths that the other method typically does not possess. Whereas experimental study designs allow for experimental control over variables of interest, naturalistic tools offer high ecological validity. Integrating naturalistic study designs with experimental studies has the potential to extend our understanding of the processes that underlie narcissistic expression.

1.1 Shifting the Focus from Traits Dynamics

Most research on narcissism is trait-based, demonstrating how individuals with narcissistic tendencies present in general, or on average (Back et al., 2013; Campbell et al., 2004; Edershile et al., 2019a; Gebauer et al., 2012; Glover et al., 2012; Hendin & Cheek, 1997; Hyler, 1994; Raskin & Terry, 1988; Pincus et al., 2009). A structural understanding of narcissism and its trait-level manifestations are crucial for several reasons. Such phenotypic descriptions and characterizations of pathology undergird the current diagnostic framework (American Psychiatry Associations, 2013). Further, average descriptions of symptoms and behavior are thought to represent "density distributions" of states, such that traits, or dispositions, provide a likelihood estimation of the types of problems and symptoms an individual is likely to experience (Fleeson, 2001). Despite the importance of cross-sectional associations, within-person dynamics, or state-level manifestations of behavior and personality expression, are thought to underlie phenotypic expressions of narcissism. Given that traits represent aggregates of states, by leveraging only trait-based assessments for the study of narcissism, only between-person associations can be explored. Between-person associations do not necessarily reflect within-person processes (Molenaar, 2004). How an individual's presentation varies from moment to moment and how they respond to their interpersonal environment are the fundamental processes defining the construct in clinical characterizations of narcissistic pathology (Morf & Rhodewalt, 2001).

1.2 Clinical Models of Narcissism

Early descriptions of narcissism emerged from psychoanalytic theories (Freud 1914; Kernberg, 1967; Kohut, 1968). Such models converge on the types of situations theorized to trigger underlying processes within narcissistic individuals. Narcissistic individuals possess exaggerated expectations for what they deserve (Campbell et al., 2004). In pursuit of praise and admiration, they are likely to present as outwardly grandiose (Morf & Rhodewalt, 2001). Having unrealistic expectations increases one's chance for disappointment, as others are unlikely to deliver on inflated needs for recognition (Grubbs & Exline, 2016). Accordingly, many interpersonal interactions are likely to serve as perceived threats to the narcissistic individual's status. When they realize the mismatch between what they believe they deserve and what they are likely to receive, they work to inflate their sense of self to fend off deep-seated feelings of weakness and inferiority (Grubbs & Exline, 2016; Morf & Rhodewalt, 2001).

Clinical descriptions of narcissism emphasize a process of self, affective, and interpersonal dysregulation in response to status threats. Clinical observations suggest a desire to be in a constant state of superiority for narcissistic individuals (Morf & Rhodewalt, 2001). Periods of feeling superior and periods of feeling inferior have been identified as key features of narcissism that accompany the chronic desire for superiority (Freud, 1914/1957; Kernberg, 1986; Kohut, 1966, 1977). That the narcissistic individual experiences bouts of feeling superior and feeling inferior is taken as evidence that regulatory processes are occurring (Grubbs & Exline, 2016). In other words, it is argued that dysregulation is evident through frantic efforts to return to a state of superiority. Despite the agreement on the general process that occurs within narcissism (i.e., chronic pursuit of status), clinical descriptions lack consensus on how we can identify that such regulatory processes are occurring. How to characterize states of feeling superior and states of feeling inferior,

and how to understand the movement from one state to another, has not been well-established and remains poorly understood (for a more detailed discussion of this point, please see Edershile & Wright, 2022).

Some theorists suggest that states of superiority can be understood as high self-esteem whereas states of inferiority are captured by low self-esteem. This would suggest that fluctuations in self-esteem reflect regulatory patterns playing out within the narcissistic individual (Rhodewalt et al., 1998; Rhodewalt & Morf, 1998; Rhodewalt & Morf, 1995). Other theories of narcissism suggest that dysregulation can be identified through changes with respect to grandiosity and vulnerability (Ronningstam, 2005; Horowitz, 2009; Morf & Rhodewalt, 2001). Narcissistic grandiosity is understood as immodesty, self-promoting, and lacking empathy (Cain et al., 2008; Miller et al., 2017). Vulnerability is characterized by self-doubt and avoidance of shame and embarrassment when the individual feels they do not get the recognition they deserve (Morf, 2006; Cain et al., 2008). Other clinical accounts highlight the possibility that narcissism is best understood as an *interplay* between self-esteem, grandiosity, and vulnerability, as well as other related processes (Ronningstam, 2009). When the narcissistic individual experiences a status-threatening situation, this triggers a cascade of unfolding processes, including fluctuations in self-esteem, and fluctuations in grandiosity and vulnerability.

1.3 The Importance of Dominance and Power in Narcissism

Interpersonal theory (Leary, 1957; Wright et al., 2021) uses the two orthogonal domains of agency and communion to organize interpersonal functioning across levels of functioning. These levels include assessments of the individual's own behavior and their perception and construal of

the situation (e.g., how they interpret their interacting partner's behavior). Agency encompasses dominance, power, and status, whereas communion includes warmth, nurturance, and connectedness. Most theories of narcissism center on the connection between power or status and narcissism (Grapsas et al., 2020; Morf, 2006; Morf & Rhodewalt, 2001). These theories postulate that people with narcissistic features have chronically activated agentic motives, such that agentic motives often far outpace communal motives (Grapsas et al.,2020; 2022; Ziegler-Hill et al., 2018). When the situation is going well for the narcissistic individual, they are theorized to pursue agency through self-promotion and self-assertion (Grapsas et al., 2020; 2022; Morf & Rhodewalt, 2001). When the narcissistic individual experiences threats to their status, strategies to pursue agentic motives may switch to more antagonistic strategies whereby the narcissistic individual actively puts down others around them (Grapsas et al., 2020; See also Szücs et al., 2022)

Connecting these contextual features to narcissism dynamics, it can be inferred that in a desirable situation, the narcissistic individual experiences grandiosity, high self-esteem, and positive affect and engages in behavior consistent with these features, such as being outgoing and praise-seeking. When the individual experiences threats to their status, this may create shifts to less favorable experiences, such as narcissistic vulnerability, low self-esteem, negative affect, and depression and corresponding behaviors of being socially withdrawn and punitive. Thus, it is the threat to one's status strivings that is likely to precede observable shifts in narcissistic expression.

1.4 Integrating Naturalistic Studies with Clinical Accounts

Though the literature on narcissism is predominantly trait-based, some researchers have worked to identify clinically theorized dynamics within narcissism in naturalistic settings (see

Edershile & Wright, 2022 for a review and discussion). Different strategies for studying such dynamics have been employed in the literature. Some researchers have asked people to rate whether individuals they know and who are prototypically grandiose or vulnerable fluctuate between grandiosity and vulnerability (e.g., Gore & Widiger, 2016). Others have leveraged intensive longitudinal designs, predominantly in the form of either ecological momentary assessment (EMA) or daily diaries. Whereas daily diaries ask people to complete daily assessments regarding their psychological states over a period of time, EMA is used to sample psychological states intensively and repeatedly in naturalistic settings to explore dynamic processes (Hamaker & Wichers, 2017). Using these various approaches, researchers have examined variability patterns in self-esteem, grandiosity, vulnerability, as well as other potential manifestations of fluctuations for individuals exhibiting high trait levels of narcissism.

Results between self-esteem fluctuations and narcissism are unclear. Some work suggests that narcissism and self-esteem patterns are connected (Edershile & Wright, 2021a; Geukes et al., 2017). On other hand, Bosson and colleagues (2008) meta-analytically examined associations between self-esteem fluctuations and dispositional narcissism ratings. Their findings revealed a lack of consensus in the literature, with some studies suggesting that narcissism is associated with outwardly high self-esteem and covertly low self-esteem and others failing to replicate this association.

In contrast to the literature on self-esteem fluctuations in narcissism, findings with respect to grandiosity and vulnerability have largely replicated across studies. Individuals who are rated as dispositionally high in grandiosity display periods of state-level grandiosity as well as periods of state-level vulnerability, whereas individuals who are dispositionally high in vulnerability only are rated as experiencing states of vulnerability (Edershile et al., 2021a; Edershile & Wright,

2021b; Gore & Widiger, 2016; Hyatt et al., 2017; Oltmanns & Widiger, 2018). These findings are consistent regardless of the method used (e.g., Edershile & Wright, 2021a; Gore & Widiger, 2016). The harmonious nature of these findings provides strong evidence that state-level ratings of grandiosity and vulnerability are critical to regulatory patterns within narcissism.

Patterns of variability in affect (Giacomin & Jordan, 2016a), mood (Czarna et al., 2018), and depressive symptoms (Dawood & Pincus, 2018) have also been tied to narcissism. Though variability in affect, mood, and depression (Czarna et al., 2018; Dawood & Pincus, 2018; Giacomin & Jordan, 2016a) do not directly correspond to clinical models of dynamics within narcissism, variability patterns captured in these studies demonstrate the complexity of dynamics within narcissism.

As clinical models would suggest, it is likely the case that fluctuations within narcissism can be understood as a cascade of unfolding processes (Ronningstam, 2009). Thus, variability in mood, for example, is likely part of the cascade that also includes fluctuations in self-esteem, grandiosity, and vulnerability. Alternatively, it may be that despite clinical theories' emphasis on self-esteem, grandiosity, and vulnerability, processes thought to be unique to narcissism may be adequately captured by dynamics not specific to narcissism. Some researchers have argued this is the case, such that fluctuations in grandiosity and vulnerability may be better captured by shifts in positive and negative affect (Miller et al., 2016, 2018).

As the context, or situation, is thought to drive fluctuations in narcissism (i.e., experiencing a threat to status), some work has examined how trait-level manifestations of narcissism associate with various momentary interpersonal contexts in naturalistic settings. Using EMA, Roche and colleagues (2013) found that trait-level grandiosity and vulnerability yielded modest associations with different interpersonal styles, depending on the perception of the interacting partner's

behavior. Wright and colleagues (2017) demonstrated that narcissistic personality disorder features tend to associate with increased negative affect and colder behavior when others are perceived as dominant. These findings suggest that trait-level manifestations of narcissism associate with a significant amount of interpersonal dysfunction.

Whereas Roche and colleagues (2013) and Wright and colleagues (2017) examined how trait-level narcissism associates with momentary contextual features, two studies have considered how momentary, or state-level, manifestations of narcissism associate with contemporaneous contextual features. Momentary manifestations of grandiosity associate with warmer social exchanges, in which the individual rates their behavior as warm and dominant and their interacting partner as warm and slightly submissive (Edershile & Wright, 2021b; Giacomin & Jordan, 2016b). Momentary manifestations of vulnerability are associated with colder interpersonal exchanges, in which the individual rates their own behavior as cold and views their interacting partner as behaving dominant and cold (Edershile & Wright, 2021b).

Studies exploring how narcissism associates with various momentary interpersonal interactions (Edershile & Wright, 2021b; Giacomin & Jordan, 2016b) provide information on variables and contexts likely key for state-level changes for people high in narcissism (e.g., interacting partner's behavior). Momentary associations for features of narcissism and perceptions of the interacting partner's behavior are clear. For example, in the moment vulnerability is linked to perceiving their interacting partner as cold and dominant. However, findings remain ambiguous with respect to interpreting underlying processes and mechanisms. It is possible that when someone is feeling vulnerable, their construal is biased such that they are more likely to perceive their interacting partner as behaving cold than people experiencing less vulnerability in the moment. Alternatively, is possible that when one is feeling vulnerable, they experience a greater

tendency to select into certain situations. In other words, when someone is feeling vulnerable, they may seek out interpersonal interactions in which the interacting partner will behave cold. Third, it could be the case that when someone is feeling vulnerable, they behave in a way that evokes a cold interpersonal situation (e.g., the person behaves cold which makes it likely for the interacting partner to behave cold). Finally, a third variable could influence the relation between momentary expressions of vulnerability and perceptions of others as cold. Given that naturalistic studies do not benefit from a controlled experimental environment, teasing apart these possibilities is difficult.

1.5 Integrating Experimental Studies with Clinical Accounts

In contrast to naturalistic studies, experimental designs afford full control over manipulation of the environment or context. Indeed, experimental studies have explicitly evaluated the eliciting role of context as it pertains to narcissistic expression. Most research leveraging experimental designs to study narcissism examines behavior change in response to putative "ego threats" (Bushman & Baumeister, 1998; Bushman et al., 2009; Thomaes et al., 2008). Overwhelmingly, these studies demonstrate that highly narcissistic individuals behave aggressively following social rejection or other operationalizations of "ego threat" (i.e., losing a video game; see Kjaervik & Bushman, 2021 for a review). For example, Chester and DeWall (2015) measured participants reported distress after engaging in a rigged Cyberball task. Participants were provided the opportunity to administer loud noise blasts to their rejecters. Results revealed that, at high levels of distress, narcissism was associated with increased retaliatory behavior (i.e., increased likelihood of administering noise blasts). The propensity to administer

loud noise blasts for "revenge" following video games (Thomaes et al., 2008) and other forms of social rejection (Bushman & Baumeister, 1998; Bushman et al., 2009) for individuals high in narcissism has been consistently observed in the literature.

When variables of interest are experimentally controlled, ambiguity with respect to biased construal, selection, and evocation affecting the naturalistic literature is reduced. For example, as noted above, the experimental literature suggests that people high in narcissism are more likely to respond with aggression following social rejection. In these studies, social rejection was experimentally manipulated such that there may not be a mismatch between construal and the designed situational context, thus limiting bias. Further, as the social situation is experimentally manipulated, the individual is not able to evoke or select into a specific social environment. Thus, any links found between narcissism and the social situation in an experimental setting are likely due to the social context itself, rather than directly a result of bias construal, selection, or evocation.

Despite clear benefits of experimental studies, experimental paradigms leveraged for the study of narcissism have several notable limitations. In many ways, the limitations of experimental studies are at the opposing end of limitations of naturalistic studies. First, most experimental studies on narcissism have focused on changes in *behavioral* expression (e.g., aggressiveness). Experimental work on narcissism has yet to incorporate explicit shifts in self-states (i.e., self-esteem, grandiosity, and vulnerability) that are essential to theorized processes within narcissism.

Second, to date the interpersonal meaning of "ego threat" as used in the experimental literature has been ambiguous. Recall that interpersonal theory describes interactions across the self and other's behavior as well as across the dimensions of warmth and dominance. Much of the naturalistic work on narcissism has explicitly included each level (e.g., perceptions of the interacting partner, one's own behavior) and dimension (warmth and dominance) of interpersonal

behavior (Edershile & Wright, 2021a; Wright et al., 2017). Agentic threats are those theorized to be most salient for individuals high in narcissism, as clinical theories of narcissism suggest that "ego threatening" situations are those that threaten one's status (e.g., Grubbs & Exline, 2016; Ronningstam, 2009). In other words, situations in which the individual perceives their interacting partner as more dominant, powerful, or higher in status are theoretically most likely to spark changes in narcissistic expression. In some experimental situations, the interpersonal situation would seem to be explicitly communal (e.g., Cyberball), failing to capture agentic interpersonal aspects that are likely key to narcissistic expression.

Finally, whereas naturalistic studies offer no experimenter control, experimental paradigms often have ambiguous real-life generalizability. For example, consider studies above that examine the tendency for narcissistic individuals to administer loud noise blasts (e.g., Bushman & Baumeister, 1998; Bushman et al., 2009). In the real world, it is unlikely the case that someone will use an air horn following social rejection, regardless of how antagonistic they are. The inability to translate experimental paradigms to real-world contexts is an important limitation when considering clinically relevant phenomena, such as narcissism.

Naturalistic and experimental studies have complementary strengths and weaknesses. There are clear parallels among studies examining narcissism dynamics in naturalistic and experimental settings. For instance, all studies, on some level, recognize the important of status-threatening situations. However, few connections have been made across these two literatures. The effect of the limitations of each body of work can be lessened by better understanding how and when parallels between behavior measured in experiments and behavior in naturalistic settings can be drawn. As such, integration across experimental and naturalistic literatures has the potential to provide the most comprehensive understanding of processes within narcissism to date.

1.6 Integrating Experimental and Naturalistic Studies with Clinical Accounts of Narcissism

Although each body of work can be improved upon individually, integrating across naturalistic and experimental research designs is likely to provide the most information about processes underlying narcissistic expression. To better integrate these two literatures of interest is whether comparable status threatening environments are occurring in both settings. Currently, these literatures have remained so separate that it is unclear whether the same contexts are being captured and whether each study design is eliciting the same response to status threat. Methods for identifying (in the case of naturalistic studies) and creating (in the case of experimental studies) such situations are quite different.

There is reason to believe that similar contexts may be captured across both study designs, such that similar narcissistic behaviors are likely to be displayed. The pursuit of status is theorized to be fundamental to expressions of narcissism (Neel et al., 2016; Ziegler-Hill et al., 2018). Given this, the desire for status may manifest as trait-like within narcissism, making the individual likely to functionally equate a wide variety of social contexts and engage in status-related pursuit (recall that traits are thought to represent density distributions of states; Fleeson, 2001). If an individual views ambiguous interpersonal interactions as status-threatening, whether the interaction occurred naturalistically or was experimentally manipulated is unlikely to matter much when exploring processes related to narcissism. If narcissism manifests similarly across naturalistic and experimental methods, then links between narcissism and the social situation are unlikely to be *only* a function of bias in perception, selecting into certain situations, or evoking certain behaviors from interacting partners, as experimental manipulation mitigates the effect of these potential mechanisms.

Alternatively, it is possible that contexts in experimental versus naturalistic settings elicit different state-level responses. Links between narcissism and the social context may be due to bias construal, selection, or evocation. If one (or multiple) of these mechanisms is responsible for narcissistic expression, differences would be expected between naturalistic and experimental methods, as naturalistic studies are most likely to provide the opportunity for bias in construal, situational selection, or evocation to impact results.

1.7 Current Study

The current study leverages both naturalistic and experimental designs to explore fluctuations within narcissism. Currently, EMA tools that ask individuals to report on experiences following a social interaction have provided the most fruitful results in this line of research (e.g., Edershile & Wright, 2021b; Giacomin & Jordan, 2016b; Wright et al., 2017). The current study uses a similar approach, asking participants to rate their interacting partners' behavior across agency and communion as well as rate their momentary experience of grandiosity and vulnerability in the interaction. This allows for a direct assessment of whether more communal versus agentic situational aspects spark narcissistic self-states in naturalistic settings.

For the experimental portion, a new behavioral task (Szücs et al., 2020) specifically designed to invoke feelings of loss of status is used in the experimental component of the study. In this task, individuals engage in an arcade game in which who wins and loses is rigged. Participants receive frequent opportunities to view the leader board and verify their status against their opponents. In the current version of the task, ratings of grandiosity and vulnerability are assessed throughout the game. Further, the game is designed to measure rivalry and admiration-

seeking behavior in response to social defeat and victory. Initial validation of this task (Szücs et al., 2020) suggests it successfully elicits competitive behavior from individuals, particularly the more they start to lose. Further, individuals with more narcissistic features (measured at the trait-level) demonstrated increased rivalry and admiration-seeking behavior during engagement with the task (Szücs et al., 2020; Szücs et al., 2022).

State-level ratings of grandiosity and vulnerability are selected for the current study as fluctuations in grandiosity and vulnerability have been identified as most central to clinical accounts of dynamics within narcissism (Morf & Rhodewalt, 2001). Empirical accounts for how grandiosity and vulnerability contribute to shifts in narcissism have continuously been replicated in the naturalistic literature (Edershile & Wright, 2021a; Gore & Widiger, 2016; Hyatt et al., 2017). In contrast, empirical evidence for fluctuations in other theorized processes within narcissism, such as self-esteem, is inconsistent (Bosson et al., 2008). As such, exploring fluctuations in grandiosity and vulnerability across both naturalistic and experimental settings will likely be the most fruitful. Finally, given that affective processes have been proposed as alternative proximal causes for variability in narcissism (Miller et al., 2016, 2018), whether fluctuations in grandiosity and vulnerability maintain after accounting for affect is an important consideration. As a result, state-level ratings of positive and negative affect are also administered to examine whether unfolding processes appear to be unique to narcissism (i.e., fluctuations in grandiosity and vulnerability), or can be captured by a more general process (fluctuations in positive and negative affect).

Table 1 provides an overview of both the EMA and experimental component of the current study. As demonstrated in Table 1, the two study designs are not interchangeable with respect to included variables. Of interest is whether changes with respect to grandiosity and vulnerability occur in similar ways in response to perceptions of the interacting partner's behavior (EMA

component) and in response to increased losing (arcade game). Further, although dominance-orientated situations are thought to be key to narcissistic fluctuations, as has been the case in prior work leveraging a similar EMA protocol (Edershile & Wright; 2021b), an assessment of warmth situations is also included in the EMA portion. More communal contexts versus more dominance-oriented ones are not explicitly separated out in the experimental portion and are rather collapsed into one context—status-threat.

The dispositional literature on narcissism suggests that narcissism's structure can be divided into a two-factor structure of narcissism (grandiosity and vulnerability) and further into a three-factor structure of narcissism (agentic extraversion, entitlement, and vulnerability; Krizan & Herlache, 2017; Miller et al., 2017; Wright & Edershile, 2018). As previously noted, three-factor structural models of narcissism suggest that the core feature is entitlement (evidenced by antagonistic behavior; see Edershile & Wright, 2022), such that what grandiosity and vulnerability share is entitlement. As most research on narcissism has been dispositional in nature, a two-factor and three-factor trait measure of narcissism is included as a cross-level predictor of behavior in analyses of the current study.

1.7.1 Study Aims and Hypotheses

By leveraging both EMA tools and an experimental task that creates a status threatening environment, this study targets gaps in the literature by addressing several aims. First, of interest is how much status threatening situations influence one's narcissistic state in each study design individually (i.e., EMA portion and experimental task separately). Across each of these study designs, it is hypothesized that increased status threat (increased perceptions of one's interaction partner dominance in the EMA portion [H1]; increased rate of losing in the experimental portion

[H2]) will be positively associated with state-level ratings of vulnerability and will be negatively associated with state-level ratings of grandiosity (as found previously; Edershile & Wright, 2021b).

Next, whether people who are more variable in one setting (EMA portion) are also more variable in the other (experimental portion) is explored. It is hypothesized that being more variable in one context will be positively correlated with being more variable in the other (H3). Once general variability patterns across the two designs are explored, of interest is whether and how the situational contexts influence this variability. In other words, of interest is whether people who react strongly in one context (e.g., stronger reaction to perceived dominance) also react strongly in the other (e.g., stronger response to losing in the experimental task). It is predicted that people who respond with increased vulnerability (and decreased grandiosity) in one setting, will response with similar momentary reactions in the other setting (H4).

Further, of interest is whether processes observed in the prior two aims can be accounted for by fluctuations in affect. Though it is hypothesized that positive and negative affect will perform similarly to shifts in grandiosity and vulnerability ([H5] i.e., positive affect and grandiosity will yield similar associations, and negative affect and vulnerability will yield similar associations), it is predicted that associations with shifts in grandiosity and vulnerability will maintain even after controlling for affective processes in the EMA portion (H6), in the arcade game (H7), and in the combined result (H8).

As dispositional scales of narcissism remain an important component of current research, the extent to which dispositional scales moderate momentary processes within narcissism is examined. All results with dispositional scales will be treated as exploratory and, as such, no hypotheses are offered.

2.0 Methods

All study procedures were approved by the University of Pittsburgh's Institutional Review Board under protocol number STUDY19080070.

2.1 Subjects

University of Pittsburgh during the Fall 2019 semester. Participants had to be 18 years of age or older at the time of participation and users of a smartphone running iOS or Android software. Participants ranged in age from 18 to 44 (M = 18.86, SD = 1.82). The majority of participants identified as male (51% male; 47% female; 1% non-binary/third gender; .2% prefer to self-describe; .7% chose not to answer). Additionally, most participants identified as White (77.9%; 19% Asian; 5.2% Black or African American; 4.6% multiracial; .3% Hawaiian or Other Pacific Islander).

2.2 Procedure

Participants came to an on-campus computer lab in groups of about 10 people for training and to complete the experimental snake arcade game (detailed below) and baseline questionnaires (detailed below). After completing the arcade game and in-person assessments, participants were instructed to download the MetricWire smartphone application (MetricWire Inc., 2019), and

trained on how to use this software to complete the 10-day EMA portion of the study (detailed below).

At the conclusion of data collection, participants were provided with full debriefing information about the deception that occurred during the experimental task (see below) and a $5 Amazon gift card. Participants were also given a portion of course credit for completion of the baseline questionnaires and arcade game, and full credit if they completed 70% of the smartphone assessments in addition to the baseline questionnaires and game. Additionally, for each event-contingent survey completed, participants received a chance to win one of three $100 Amazon gift cards.

2.3 Experimental Task

Before the task, participants were instructed on game mechanics as well as a series of decisions they would have to make throughout the task. For a full discussion on decision making available throughout the game, see Szücs and colleagues (2020). Only components of the experimental task relevant for the current study will be discussed here. The task is designed to measure the influence of personality on responses to social defeat. The snake arcade game was adapted from the classic video game to Python 2.7 (see Szücs et al., 2020). The goal of the game is for the snake to 'eat' as many apples as possible. Each apple was equivalent to one point. Participants played a series of head-to-head matches (roughly 30 seconds each) in the snake arcade game. In total there were three blocks of matches and each block consisted of 36 trials (or head-to-head matches). Each block was "rigged" such that the ratio of wins to losses across the 36 trials was fixed to a certain number. Block order was randomized but all participants participated in

three different blocks with the following ratios: 1 defeat: 1 victory (neutral block); 2 defeat: 1 victory (losing blocks); 3 defeat:1 victory (extreme losing block).

Prior to beginning the snake arcade game and at the conclusion of each block (i.e., after each set of 36 trials), participants completed several assessments, some of which were relevant to state-level narcissism and affect. The entire arcade game task (including playing the game, selecting choices for various decision-making components, and completing the assessments) took approximately 45 minutes.

2.4 Ecological Momentary Assessment

Surveys were administered through the MetricWire smartphone application. Participants were instructed to complete surveys every time they experienced an interpersonal interaction. Interpersonal interactions were defined as real-time, direct conversations between the participant and one or more other individuals that lasted for at least five minutes. In-person, voice, video, and text-based conversations were all included, provided they met the other conditions for a social interaction. Participants completed an average of 29.13 interaction reports (SD = 10.9) over the course of the study.

2.5 Measures

Baseline Measures

The Five Factor Narcissism Inventory—Short Form (FFNI-SF; Sherman et al., 2015)

FFNI-SF is a 60-item version of the original Five-Factor Narcissism Inventory (FFNI; Glover et al., 2012) that assesses narcissism across 15 different traits. These traits have been shown to tap the broad dimensions of grandiosity and vulnerability, as well as a three-factor structure of Extraversion, Antagonism, and Neuroticism. Participants rate the degree to which each statement captures them on a 5-point Likert scale (0 – Very Untrue of Me, 1 – Moderately Untrue of Me, 2 – Neither True nor Untrue of Me, 3 – Moderately True of Me, 4 – Very True of Me). Internal consistency for the FFNI was good (Grandiosity ω= .90, Vulnerability ω=.83; Antagonism ω= .89, Extraversion ω=.84, Neuroticism ω=.90).

Momentary Measures

Positive and Negative Affect Schedule (PANAS; Watson et al., 1988)

A subset of 12-items from the PANAS were completed prior to beginning the arcade game and at the conclusion of each block during the game. Positive affect was represented by excited, happy, relaxed, proud, determined, and alert. Negative affect was represented by sad, irritable, hostile, fragile, angry, and nervous. Participants were asked questions in the following forms: "Indicate to what extent you feel in the following way right now: [adjective]". Ratings were made on a scale from 1 [Slightly/Not at all] – 5 [Extremely]. Reliability for the PANAS items in the game were adequate (Positive Affect: ω_{within}= .75, $\omega_{between}$=.89; Negative Affect: ω_{within}= .67, $\omega_{between}$=.91).

A subset of eight items from the PANAS was selected to be completed at each interaction report during the EMA portion. Positive affect was represented by Happy, Excited, Relaxed, and Alert. Negative affect was represented by Nervous, Sad, Angry, and Ashamed. Participants were asked questions in the form "How ADJECTIVE did you feel during the interaction?". Ratings were made on a slider scale from 0 (Not at All) to 100 (Extremely). Reliability for the PANAS

items in the EMA were adequate (Positive Affect: ω_{within}= .69, $\omega_{between}$=.70; Negative Affect: ω_{within}= .75, $\omega_{between}$=.97).

Narcissistic Grandiosity Scale (NGS; Crowe et al., 2016)

State level narcissistic grandiosity was assessed using a subset of adjectives from the NGS and was completed prior to beginning the arcade game and at the conclusion of each block during the game. The same adjectives were also completed at each interaction report during the EMA portion. Grandiosity adjectives included powerful, brilliant, prestigious, and glorious. Ratings were made on a scale from 1 [Slightly/Not at all] – 5 [Extremely] in the arcade game and in the form "How ADJECTIVE did you feel during the interaction?" during the EMA portion, with ratings on a slider scale from 0 (Not at All) to 100 (Extremely). Reliability for the NGS was adequate (*Game:* Grandiosity: ω_{within}= .70, $\omega_{between}$=.95. *EMA:* Grandiosity: ω_{within}= .82, $\omega_{between}$=.98)

Narcissistic Vulnerability Scale (NVS; Crowe et al., 2018)

State level narcissistic vulnerability was assessed using a subset of adjectives from the NVS and was completed prior to beginning the arcade game and at the conclusion of each block during the game. The same adjectives were also completed at each interaction report during the EMA portion. Vulnerability adjectives were resentful, underappreciated, ignored, and misunderstood. Ratings were made on a scale from 1 [Slightly/Not at all] – 5 [Extremely] during the arcade game and in the form "How ADJECTIVE did you feel during the interaction?" during the EMA portion, with ratings on a slider scale from 0 (Not at All) to 100 (Extremely). In prior work leveraging this scale for momentary use, the items demonstrated adequate reliability (*Game:* Vulnerability: ω_{within}= .47, $\omega_{between}$=.91. *EMA:* Vulnerability: ω_{within}= .86, $\omega_{between}$=.99).

Visual Interpersonal Analogue Scale (VIAS; Woods et al., in press)

The VIAS (https://osf.io/cz968/) was developed to efficiently assess the perception of the interacting partners' dominant and affiliative behavior during social interactions using two items and was completed at each interaction report of the EMA portion. The interacting partner's dominant behavior was assessed using a visual analogue slider bar ranging from -50 ("Accommodating/Submissive/Timid") to 50 ("Assertive/Dominant/Controlling"). The partner's affiliative behavior was rated on a similar visual slider bar ranging from -50 ("Cold/Distant/Hostile") to 50 ("Warm/Friendly/Caring").

2.6 Analytic Plan

To explore momentary associations in the EMA portion between perceptions of dominance and state-level ratings of grandiosity and vulnerability (H1) multilevel structural equation modeling in Mplus (Muthén & Muthén, 2017) was used to estimate within-person associations among these two variables. These models were estimated using Bayes estimation, which allows for the inclusion of random effects as well as latent person-mean centering in the multi-level model. All models were estimated controlling for time. State narcissism ratings (momentary grandiosity and momentary vulnerability) were regressed on perceptions of others' behavior (dominance and warmth) at Level 1. At Level 2, dispositional narcissism was used as a predictor of the between-person averages of grandiosity, vulnerability, dominance, and warmth, as well as a predictor of the random slope estimates described at Level 1. Separate models were estimated for the three-factor structure of narcissism (FFNI Antagonism, FFNI Extraversion, and FFNI Neuroticism) and the two-factor structure of narcissism (FFNI Grandiosity and FFNI Vulnerability). Sex and age were included as between-person covariates at Level 2. Standardized

estimates are reported, including point estimates and 95% credibility intervals (CIs). Parameters for which the 95% CIs do not include 0 are interpreted as statistically significant.

To explore momentary associations in the experimental task between status in the game and state-level ratings of grandiosity and vulnerability (H2), as above, multilevel structural equation modeling in Mplus 8.4 was used (Muthén & Muthén, 2017). Also as above, these models were estimated using Bayes estimation which allows for the inclusion of random effects as well as latent person-mean centering in the multi-level model. All models were estimated controlling for time (i.e., total engagement in the game). State narcissism was assessed at baseline (prior to the task), after the neutral block, after the losing block, and after the extreme losing block. A single variable, "block condition," was coded 0 (prior to the task), 1 (neutral block), 2 (losing block), and 3 (extreme losing block) to represent each of the block conditions, and consequently reflect experimental defeat.[1] At Level 1, grandiosity and vulnerability were regressed on the block condition variable such that changes in grandiosity and vulnerability as a function of each block condition could be explored. As before, separate models were estimated, first using the two-factor structure of the FFNI as a predictor of the random slope estimates, and then the same procedure using the three-factor structure of the FFNI. Also as before, sex and age were included as between-person covariates at Level 2. Separate models estimated effects for grandiosity and vulnerability individually. Standardized estimates are reported, including point estimates and 95% CIs. Parameters for which the 95% CIs do not include 0 are interpreted as statistically significant.

[1] Please note, three separate variables were initially dummy coded (0 or 1) representing each of the block conditions with "prior to task" serving as the reference group. However, after examining the results, effect sizes across each block condition increased (or decreased) in roughly equivalent increments. As such, the variable was collapsed for ease of interpretability and presentation.

To examine individual patterns of variability (H3), individual standard-deviation (*i*SD) were calculated for each of the four momentary variables of interest (grandiosity, vulnerability, positive affect, and negative affect) across blocks in the lab protocol and across situations in the EMA. Such an approach is similar to prior work examining variability in narcissism, specifically (Edershile & Wright, 2021a), and psychopathology, more broadly (Wright & Simms, 2016). *i*SD estimates for the EMA portion and experimental portion of the study were calculated separately. These estimates were correlated with one another in *R* (R Core Team, 2022) to determine whether general patterns of variability are similar across the two tasks.

To compare whether similar contexts spark change in grandiosity and vulnerability similarly across the two tasks (H4), random slope estimates were first obtained in the EMA portion in *R* (R Core Team, 2022). Specifically, random slope estimates were calculated from the model in which perceptions of dominance predicted grandiosity and a model in which perceptions of dominance predicted vulnerability (the same models were also estimated for perception of warmth). Random slope estimates from these models served as between-person predictors in the models predicting expressions of grandiosity and vulnerability in the arcade game.

To explore the extent to which affect accounted for observed fluctuations in grandiosity and vulnerability, every model discussed above was re-estimated for positive and negative affect alone. This allowed for examination of whether patterns for grandiosity and vulnerability were similar to those for positive and negative affect across both the EMA and arcade portions (H5). Next, sensitivity models were estimated such that all models for grandiosity and vulnerability were re-estimated but controlling for positive and negative affect, respectively, at Level 1. Specifically, positive affect was partialed from grandiosity and negative affect from vulnerability, to examine

whether the effects for grandiosity and vulnerability obtained in the models described above, hold when controlling for affect (H6/H7/H8).

3.0 Results

A summary of the results is provided in text. Please refer to the tables, figures, footnotes, and Supplementary Materials for complete results. Please note, all results for which affect served as the primary outcomes (i.e., all analyses related to H5) can be found in supplementary materials.

3.1 Correlations and Bivariate Associations

Within-method standardized bivariate associations of all main study variables are presented in Table 2 (EMA) and Table 3 (arcade game).

Between-person correlations across method (e.g., correlation between grandiosity in the arcade game and grandiosity in the EMA portion) are presented in Table 4. Grandiosity in the EMA portion was strongly positively correlated with grandiosity in the arcade game and was moderately positively associated with vulnerability, positive affect, and negative affect in the game. Vulnerability in the EMA portion was modestly positively associated with grandiosity in the game and moderately positively associated with vulnerability and negative affect in the game. Positive affect in the EMA portion was modestly positively associated with grandiosity in the game and moderately positively associated with positive affect in the game. Negative affect in the EMA portion was modestly positively associated with grandiosity in the game and moderately positively associated with vulnerability and negative affect in the game.

3.2 Path Models for the EMA Portion

3.2.1 EMA: Within-Person Effects

Results from the within-person path model in the EMA portion where grandiosity and vulnerability served as outcomes are presented in Figure 1.[2] In the moment, perceptions of the interacting partner's dominance were modestly negatively associated with momentary grandiosity and modestly positively associated with momentary vulnerability (black coefficients; in line with H1). Perceiving the interacting partner as warm was modestly positively associated with grandiosity and moderately negatively associated with momentary vulnerability (in line with H1). All effects were attenuated but remained significant and in the same direction after controlling for positive and negative affect (blue coefficients; in line with H6).

3.2.2 EMA: Between-Person Moderation

As shown in Figure 1, FFNI Extraversion amplified the effect between perceptions of other's dominance and momentary grandiosity both with (blue arrows and coefficients) and without (black arrows and coefficients) controlling for affect. FFNI Neuroticism amplified the same effect only after controlling for positive affect (blue arrows and coefficients). After controlling for negative affect, FFNI Neuroticism strengthened the link between perceptions of other's dominance and momentary vulnerability (blue arrow and coefficient). FFNI Extraversion

[2] Neither gender nor age significantly amplified or dampened any of the linkages between perceptions of others dominance, perceptions of others warmth, and narcissism. This was true with and without controlling for positive and negative affect.

strengthened the link between perceptions of other's warmth and vulnerable narcissism both with (blue arrows and coefficients) and without (black arrows and coefficients) controlling for negative affect.

3.2.3 EMA: Between-Person Predictors of Momentary Averages

Regression coefficients in which the two-factor and three-factor FFNI, gender, and age predicted between-person averages of momentary variables for the EMA model are presented in Table 5. On average, males were less likely to perceive their interacting partner as dominant, at a modest effect, and this effect maintained after controlling for affect. On average, FFNI Antagonism and FFNI Grandiosity were negatively associated with perceiving the interacting partner as warm, at a modest effect, and the effect with FFNI Antagonism maintained after controlling for affect. FFNI Extraversion was modestly positively associated with perceiving the interacting partner as warm and maintained after controlling for affect. FFNI Grandiosity, FFNI Extraversion, and FFNI Antagonism were modestly positively associated with average levels of momentary grandiosity, and these effects maintained after controlling for affect. FFNI Grandiosity, FFNI Vulnerability, and FFNI Antagonism were positively associated with average levels of momentary vulnerability, and these effects maintained after controlling for affect.

3.3 Path Models for the Arcade Game

3.3.1 Arcade Game: Within-Person Effects

As shown in Figure 2, block condition, henceforth "experimental defeat," was moderately negatively associated with grandiosity such that more extreme rates of losing were associated with greater decreases in grandiosity (black coefficients; in line with H2). After controlling for affect, this effect was attenuated but remained significant at a modest effect (blue coefficients; in line with H7).

As displayed in Figure 3, experimental defeat was modestly positively associated with momentary vulnerability such that more extreme rates of losing were associated with greater increases in vulnerability (in line with H2). This effect was attenuated to near-zero after controlling for affect (counter to H7).

3.3.2 Arcade Game: Between-Person Moderation

As shown in Figure 2, FFNI Grandiosity and FFNI Extraversion amplified the link between experimental defeat and grandiosity (black coefficients). After controlling for positive affect, FFNI Extraversion strengthened the link between experimental defeat and grandiosity (blue coefficients).

As depicted in Figure 3, no FFNI dispositional subscales were associated with the link between experimental defeat and momentary vulnerability with or without controlling for negative affect.

3.3.3 Arcade Game: Between-Person Predictors of Momentary Averages

Regression coefficients in which the two-factor and three-factor FFNI, gender, and age predicted between-person averages of momentary variables for the arcade game are presented in Table 6. Males exhibited higher levels of grandiosity, on average, and this effect maintained after controlling for affect. FFNI Grandiosity, FFNI Extraversion, and FFNI Antagonism were positively associated with grandiosity, on average, at a modest to moderate effect, and these effects maintained after controlling for affect. FFNI Vulnerability and FFNI Neuroticism were negatively associated with grandiosity, on average, at a modest effect, and these effects maintained after controlling for positive affect. FFNI Antagonism and FFNI Vulnerability were modestly positively associated with vulnerability, on average, and these effects maintained after controlling for negative affect.

3.3.4 *i*SD Correlations within and across the EMA and Arcade Game

Figure 4 presents the *i*SD correlations for all momentary variables in the EMA portion and the arcade game. Within-task correlations were generally markedly stronger than across tasks (e.g., correlations between variables within EMA portion compared with correlations between EMA and arcade game variables). All within-task *i*SD values were positively correlated with one another (e.g., all *i*SD values within the EMA portion were positively correlated). Within-task correlations were strongest between the *i*SD for vulnerability and the *i*SD for negative affect within both the EMA portion and the arcade game, but correlations were generally moderate to strong for all within-task *i*SDs. Across tasks (i.e., between the EMA portion and the arcade game), the strongest correlations were between *i*SD of negative affect in the game and *i*SD of grandiosity in the EMA

portion, and between *i*SD of grandiosity in the EMA and *i*SD of grandiosity in the arcade game (partial support for H3). *i*SD of vulnerability across the two tasks were modestly positively correlated (in line with H3).

3.4 Associations Among Random Slopes of Narcissism in EMA and Arcade Game

Table 7[3] presents the results of the random slopes of dominance perceptions → narcissism in the EMA as predictors for experimental defeat → narcissism in the arcade game. Responding with decreased grandiosity in response to perceived dominance in the EMA portion amplified the association for responding with decreased grandiosity in response to experimental defeat (partial support for H4). However, this effect became non-significant when controlling for affect in the arcade game (counter to H8).

Table 8[4] presents the results of the random slopes of warmth perceptions → narcissism in the EMA as predictors for experimental defeat → narcissism in the arcade game. People who responded with increased grandiosity in response to perceiving their interacting partner as warm (or decreased grandiosity in response to perceiving their interacting partner as cold) in the EMA portion amplified the link for responding with decreased grandiosity in response to experimental defeat (partial support for H4). Additionally, people who responded with increased grandiosity in response to perceiving their interacting partner as warm, had a stronger link between losing the

[3] Gender was significantly associated with the link between grandiosity and block condition. In particular, males had stronger links between grandiosity and losing, on average (-.18 [-.32, -.06]). Age was not a significant predictor of any of these linkages.

[4] Gender was significantly associated with the link between grandiosity and losing. In particular, males had stronger links between grandiosity and losing, on average (-.17 [-.30, -.06]). Age was not a significant predictor of any of these linkages.

game and increased vulnerability (partial support for H4). These effects became non-significant after controlling for affect in the arcade game (counter to H8).

4.0 Discussion

Theorists have long posited that status-threatening situations provide the context within which narcissistic regulatory processes are likely to unfold (Grapsas et al., 2020; Rhodewalt et a., 1998; Ronningstam, 2009). Narcissistic grandiosity and narcissistic vulnerability are thought to be important components of narcissism's dynamics (Ronningstam, 2005; Horowitz, 2009; Morf & Rhodewalt, 2001). Using naturalistic designs, such as EMA, researchers have explored a variety of narcissism's dynamics (Edershile et al., 2021a; Edershile & Wright, 2021b; Gore & Widiger, 2016; Hyatt et al., 2017; Oltmanns & Widiger, 2018). A large but separate experimental literature has explored how narcissism associates with behavior change in response to putative "ego threats" in the laboratory (Bushman & Baumeister, 1998; Bushman et al., 2009; Thomaes et al., 2008). Both empirical approaches have supported the importance of status-threatening situations to dynamics within narcissism. Each approach offers unique strengths that motivate an integration to better understand the processes underlying narcissism's expression.

To integrate naturalistic and experimental literatures, of interest is whether comparable status threatening environments are evoked in both settings. The present study examined how narcissistic grandiosity and vulnerability associated with perceived status threat (in the naturalistic setting) and with increased losing (in the experimental setting). Further, of interest was whether people who responded more strongly in the naturalistic setting, also responded more strongly in the experimental setting. Exploring expressions of grandiosity and vulnerability in both study designs will serve to better integrate the vast and disparate naturalistic and experimental literatures.

Associations within the EMA portion almost exactly mirrored findings from Edershile and Wright (2021b) at the within-person level. In full support of H1, the results of the current study

suggest that experiences of grandiosity coincide with perceiving one's interacting partner as submissive and warm, whereas experiences of vulnerability coincide with perceiving one's interacting partner as dominant and cold. Theories of narcissism suggest that when things are going well for the narcissistic individual, such that their status is not being infringed upon, they are more likely to experience bouts of grandiosity (Grapsas et al., 2020). When the individual feels that someone is encroaching on their superior status, they are more likely to experience vulnerability. From the current study, we gain a deeper understanding of the interpersonal meaning of status infringement with respect to agency and communion. Status infringement is represented by a hostile social environment in which the narcissistic individual feels they are interacting with someone who is dominant and/or cold.

Grandiosity and vulnerability also seem to be linked to manipulated threats to status. In full support of H2, people experienced decreases in grandiosity and/or increases in vulnerability the more they started to lose. That the findings for grandiosity and vulnerability in the arcade game largely parallel those from the naturalistic portion suggests that non-favorable environments lead to increases in vulnerability and decreases in grandiosity. Similar changes with respect to grandiosity and vulnerability in response to perceptions of a hostile social environment and non-favorable game play, continue to reinforce the centrality of status threat to expressions of grandiosity and vulnerability (Neel et al., 2016; Ziegler-Hill et al., 2018).

Grandiosity and vulnerability display a seemingly similar dynamic in both methods, and further support for this similarity comes from the cross-method between-person correlations. People who tended to exhibit high levels of grandiosity in the naturalistic portion also exhibited high levels of grandiosity in the experimental portion. The same was true for vulnerability in the naturalistic portion and vulnerability in the experimental portion. These findings suggest that

people who have high mean levels of grandiosity (or vulnerability) in one setting also tend to have high mean levels of grandiosity (or vulnerability) in another. In addition to similar mean levels exhibited in both tasks, correlations for individual standard deviations also suggest that variability manifests similarly across the two tasks. In support of H3, people who varied more about their levels of grandiosity in the naturalistic portion also varied more in their grandiosity in the experimental portion. A similar pattern emerged for vulnerability in the two tasks. Cross-method between-person effects for variability and for mean comparisons were modest to moderate. That such cross-method effects emerged is promising, as cross-method effects tend to be significantly attenuated (Edershile et al., 2019; Fleeson & Gallagher, 2009). Together, these findings suggest that people display similar levels and variability in their grandiosity and vulnerability in both naturalistic and experimental contexts.

As has been noted here and elsewhere (e.g., Edershile & Wright, 2022), variability is not decontextualized. In other words, people likely change in their narcissistic expression in response to certain environmental triggers or cues. This is evident in the individual results presented above for the naturalistic portion and experimental portion, such that grandiosity decreases in response to status threat whereas vulnerability increases. To ultimately integrate naturalistic and experimental work, of interest is whether the same person responds similarly with respect to narcissism for both naturalistic and experimental hostile environments. In partial support of H4, people who responded with decreased grandiosity when their interacting partner was dominant, depreciated quicker in their levels of grandiosity the more they lost in the arcade game. People who responded with increased grandiosity in response to warmth from their interacting partner also responded with greater *decreases* in grandiosity, and greater *increases* in vulnerability, in response to losing in the arcade game. These findings highlight the central role of grandiosity in

response to status threat. That an individual was likely to have a similar grandiose response in both the naturalistic and experimental portion, suggests that people who are high in grandiosity may be particularly reactive to status threatening situations broadly defined. Bias in construal, situational selection, and evocation are likely not the primary mechanisms for shifts in grandiosity as a wide range of status threatening situations trigger rapid decreases in grandiosity for the same individual.

Though grandiosity may be central to status threatening interactions, the role of vulnerability is less clear. Though increases in vulnerability were apparent in both the naturalistic and experimental portion in response to status threat, it does not appear that such increases in vulnerability occurred for the same people in both tasks. These findings expand on those presented for each component of the study individually. Declines in grandiosity are central to processes that unfold in response to status infringement and lowered grandiosity occurs within the same people regardless of how status infringement is operationalized. In contrast, though patterns of vulnerability are similar in both tasks, increases in vulnerability in response to status infringement may not occur in the same people across a broad range of status threatening situations. Contrary to findings with grandiosity, this may suggest that bias in construal, situational selection, and/or evocation is/are more central mechanisms to expressions of vulnerability than they are for grandiosity.

As discussed thus far, findings in both tasks yielded important dynamic associations between grandiosity and vulnerability. Of interest was whether the effects found for grandiosity and vulnerability maintained after controlling for positive and negative affect, as affective and narcissistic processes are thought to be highly related (Miller et a., 2016, 2018). In full support of H6, all effects within the naturalistic portion held when controlling for affect. People experienced greater grandiosity, above and beyond their level of positive affect, when they perceived their

interacting partner as warm and submissive. People also experienced greater vulnerability, above and beyond negative affect, when they perceived their interacting partner as dominant and cold. These findings are not dissimilar to those leveraging naturalistic methods that suggest that variability patterns within grandiosity and vulnerability maintain after controlling for other related process, such as self-esteem (Edershile & Wright, 2021a).

Considering manipulated status threat, in partial support of H7, people experienced decreases in grandiosity, above and beyond decreases in positive affect, in response to losing the game. On the other hand, counter to H7, the effect for vulnerability did not hold such that increases in vulnerability in response to losing the game were no longer significant after controlling for negative affect. This may suggest that whereas grandiose responses within the arcade game are unique to narcissism, experiences of vulnerability in the arcade game reflect those captured by many forms of negative emotionality (e.g., negative affectivity, neuroticism, general psychopathology). The relatively diffuse association between narcissistic vulnerability and many forms of psychopathology has been acknowledged elsewhere (Dashineau et al., 2019; Miller et al., 2017, 2018).

Further, counter to H8, after controlling for positive and negative affect, all links between grandiose increases (and decreases) in the naturalistic portion and corresponding changes in the arcade game were no longer significant. Within the current study and elsewhere, narcissism and positive and negative affect tend to be highly correlated (Edershile et al., 2019; Miler et al., 2018). Further, as random slope estimates served as cross-method predictors of behavior, which also tend to yield attenuated effects (e.g., Edershile et al., 2019; Fleeson & Gallagher, 2009), it may not be surprising that such cross-method effects did not maintain after controlling for affect.

Exploratory results within the current study examined how a trait-based measure of narcissism (The Five Factor Narcissism Inventory; Glover et al., 2012; Sherman et al., 2015), associated with interpersonal processes. Agentic extraversion emerged as an important predictor of narcissistic processes. People with higher levels of agentic extraversion had a stronger association between perceiving the interacting partner as submissive and their level of grandiosity. People higher in agentic extraversion had a stronger link between perceiving their interacting partner as cold and their level of vulnerability. Agentic extraversion also amplified the depreciation in grandiosity in response to losing in the arcade game. All effects with agentic extraversion maintained after controlling for affect. From these results, it seems that agentic extraversion served as particularly strong predictor of changes with respect to grandiosity and vulnerability in social situations and can be thought of as a "vulnerability" to reactivity within narcissism.

Interestingly none of the dispositional subscales moderated the link between losing the game and expressions of vulnerability. That dispositional scales related to vulnerability did not amplify associations between losing a game and vulnerability, in conjunction with the relatively weak link between losing the game and experienced vulnerability, may suggest that the way vulnerability manifests in the game does not perfectly align with theoretical models of vulnerability (Ronningstam, 2005; Horowitz, 2009; Morf & Rhodewalt, 2001). There may be features of an interpersonal context that are crucial to expressions of vulnerability. For example, expressions of vulnerability may be particularly salient when the person is having a real-time interpersonal exchange (e.g., thoughts, emotions, opinions are being expressed/exchanged). If such an exchange is crucial to expressions of narcissistic vulnerability, playing a game and getting a subsequent ranking on a leader board may not activate vulnerability in the same way that interacting with a romantic partner, for example, does.

In addition to trait-based measures of narcissism serving as important predictors of momentary processes, gender was consistently associated with unfolding processes in narcissism as well. Males, on average, had stronger associations between status-infringement and their narcissistic response. This is not altogether surprising as a wealth of research suggests that men tend to have higher levels of narcissism than women which, in turn, translates to an increased desire for status and prestige (see Grijalva et al., 2015 for a review).

A few important takeaways emerge from the current study. Prior to the current study, it was unclear what role bias in construal, situational selection, and evocation played in expressions of narcissistic grandiosity and narcissistic vulnerability. Decreased grandiosity in response to status infringement seems a somewhat universal narcissistic response. In other words, it is the experience of status infringement that sparks changes in grandiosity, such that bias in construal, situational selection, and evocation may not be the primary causes for such shifts in grandiosity. On the other hand, experiences of narcissistic vulnerability may be activated by status infringement that occur under *specific* circumstances. Interpersonal *investment* or having a relationship with the interacting partner may be important. As results within the EMA portion were generally more pronounced for vulnerability than they were within the arcade game, the effect of bias in construal, selection into certain social situations, or the tendency to evoke certain situations cannot be ruled out for expression of vulnerability. In other words, bias in construal, selection into a social situation, or evocation may play a more prominent role in expressions of narcissistic vulnerability than narcissistic grandiosity.

Another takeaway from the current study is the importance of warmth (or coldness) in status-threatening situations. Prior experimental literature has overwhelmingly emphasized the role of dominance in status-threatening environments (Kjaervik & Bushman, 2021). Despite this

emphasis, warmth (or rather coldness) has consistently played an important role in narcissistic expression (Edershile & Wright, 2021b; Grapsas et al., 2022; Giacomin & Jordan, 2016b; Wright et al., 2017). In the current study, as well, the link was strong between perceptions of warmth and expressions of grandiosity and vulnerability, suggesting that status threatening environments may be those in which in which one experiences a lack of warmth and threats to his/her dominance.

Results of the current study align well with prior theoretical (e.g., Grapsas et al., 2021; Morf & Rhodewalt, 2001) and empirical work (Grapsas et al., 2022; Kjaervik & Bushman, 2021) that suggest status-threatening situations are most central to expressions of narcissism. Perceiving the interacting partner as dominant and cold gives rise to vulnerability whereas perceiving the interacting partner as submissive and warm sparks grandiosity. Losing a game is associated with lower levels of grandiosity and higher levels of vulnerability. Cross-method narcissistic expression in response to status-threat occurs in a similar fashion, particularly for grandiosity.

4.1 Limitations and Future Directions

The current study had many strengths including a large sample size in which the same participants completed an EMA protocol and experimental protocol. Nonetheless, there were several limitations that would be important to address in future research. First, the majority of participants in the current study identified as White (nearly 78%). A question is whether results generalize to individuals of other racial and ethnic identifications. It would be important to recruit more diverse samples in the future.

Second, the within-person reliability of the vulnerability items in the experimental game were quite low. One possibility is that some of the item content of the NVS is strictly interpersonal

(e.g., “Rate the extent to which you felt *misunderstood*”). Endorsement of such items might require a real interpersonal interaction in which the person feels there was a mismatch in what they were trying to convey and what their interacting partner took away from the social interaction. In the context of the game, such feelings may have been difficult to achieve whereas others are conceivably possible in response to losing a game (e.g., “Rate the extent to which you felt *resentful*”). To some extent, differences in frequency of endorsement of these two items reflect this possibility. Future research should select vulnerable narcissism items that more appropriately lend themselves to playing a computer game.

Perhaps related to lower reliability in the NVS, there were also many fewer assessment periods in the experimental task than the EMA portion. The average number of interaction reports completed in the EMA portion was 29. This translates to an average number of 29 narcissism ratings in the EMA portion. On the other hand, participants completed a maximum of four assessments of narcissism in the experimental task. Nonetheless, strong cross-task correlations suggest that ratings of narcissism and affect were comparable in the EMA and experimental portion.

An additional consideration for future work is the role affect plays in expressions of grandiosity and vulnerability. Researchers have noted that grandiosity, vulnerability, positive affect, and negative affect yield similar associations with other psychological constructs (Miller et al., 2016, 2018). The current study took a conservative approach by adjusting for positive and negative affect in links between status threat and grandiosity and vulnerability. However, such an approach is psychometric in nature, exploring the unique effect between status threat and narcissism once affect is partialed. A key conceptual issue is the specific patterning of psychological states following threats to status for narcissistic individuals. Of interest is whether

threats to one's status cause changes in grandiosity and vulnerability which *precede* positive and negative affect shifts, or vice versa. The need to explore the specific patterning of psychological states in narcissism has been noted elsewhere (e.g., Edershile & Wright, 2022) and would be important to address in future work.

A final limitation is the extent to which perceptions of status threat versus manipulated status threat were assumed to be non-overlapping contexts. In other words, though the naturalistic portion of the study relied on perceived status threat and the experimental portion relied on manipulated status threat, it is possible that effects emerged in both contexts due to *perceived* status threat. In the context of the game, even though participants were playing a video game that was rigged, it is also possible that their *perception* of the environment played an important role in their narcissistic expression and behavior. Thus, whereas the game was able to rule out the role of situational selection and evocation to some extent, it was impossible to rule out that *bias in construal* played at least some role in cross-method findings for grandiosity and vulnerability. Future experimental work may wish to include measures related to participants' perception so that such hypotheses can be tested.

4.2 Conclusions

Narcissistic grandiosity and narcissistic vulnerability are central to what drive narcissistic expression (Ronningstam, 2005; Horowitz, 2009; Morf & Rhodewalt, 2001). However, to fully understand dynamics underlying narcissism, an integration of the naturalistic and experimental literature is key. The current study revealed important similarities and differences between narcissistic expression in naturalist versus experimental settings. As researchers continue to

explore dynamics within narcissism, considering the individuals *perception* across interpersonal dimensions of dominance and warmth in the context of naturalistic and manipulated status-threat will be crucial.

5.0 Figures and Tables

5.1 Figures

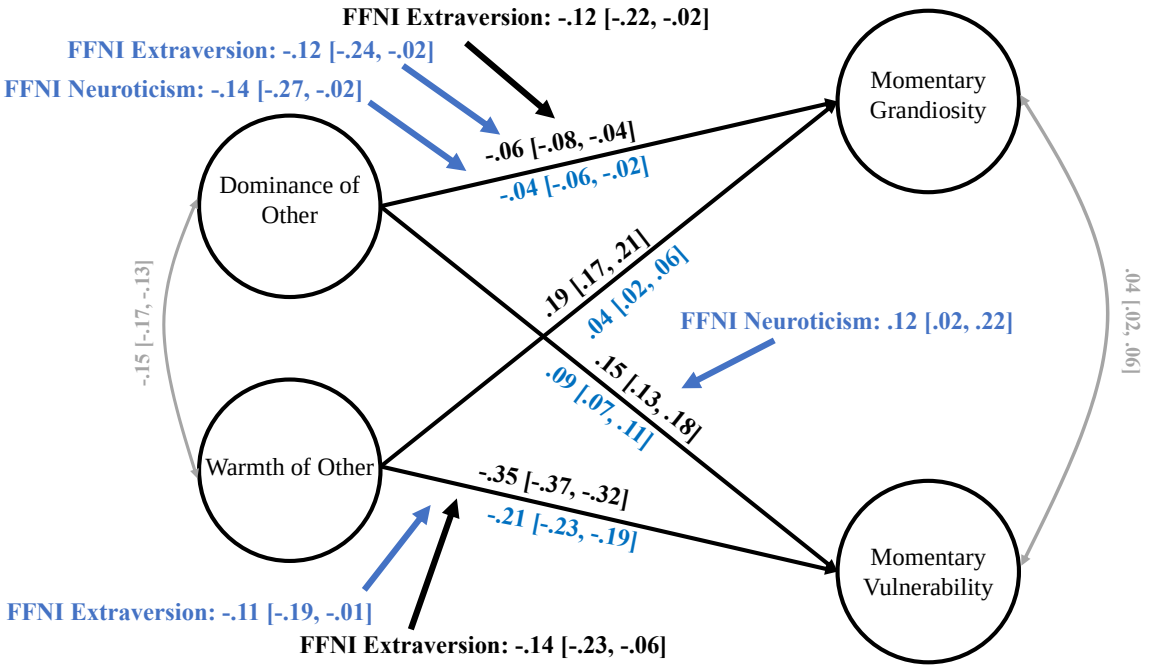

Figure 1 EMA Momentary Path Model with and without Controlling for Positive and Negative Affect

Note. N = 420, $N_{observations}$ = 10,423. Values in black are those from the models without controlling for positive and negative affect. Values in blue are the effect after controlling for positive and negative affect. Arrows from dispositional scales (e.g., FFNI Extraversion) to the designated path represent significant amplification/dampening of the effect. EMA = Ecological Momentary Assessment; FFNI =Five Factor Narcissism Inventory.

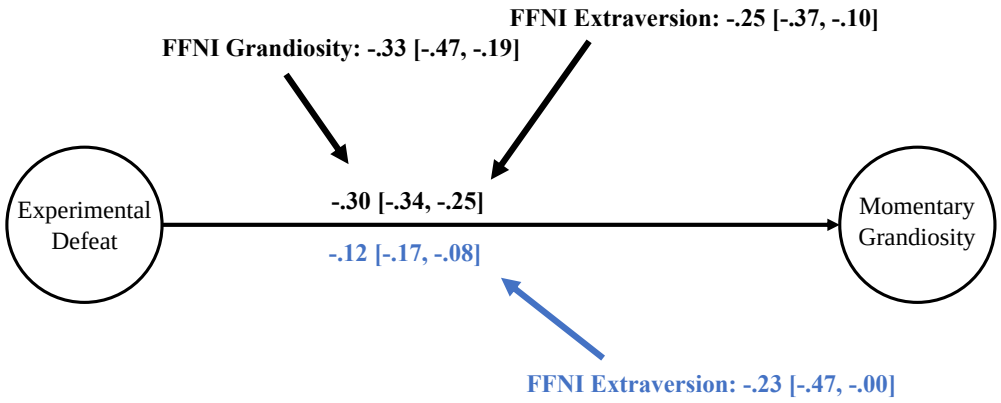

Figure 2 Arcade Game Momentary Path Model for Grandiosity With and Without Controlling for Positive Affect

Note. N = 428, $N_{observations}$ = 1,691. Values in black are those from the models without controlling for positive and negative affect. Values in blue are the effect after controlling for positive and negative affect. Arrows from dispositional scales (e.g., FFNI Extraversion) to the designated path represent significant amplification/dampening of the effect. FFNI =Five Factor Narcissism Inventory

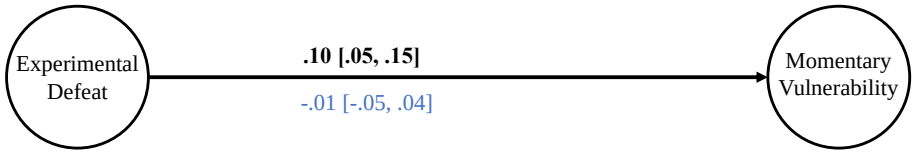

Figure 3 Arcade game momentary path model for vulnerability with and without controlling for negative affect.

Note. N = 428, $N_{observations}$ = 1,691. Values in black are those from the models without controlling for positive and negative affect. Values in blue are the effect after controlling for positive and negative affect. Arrows from dispositional scales (e.g., FFNI Extraversion) to the designated path represent significant amplification/dampening of the effect. FFNI =Five Factor Narcissism Inventory.

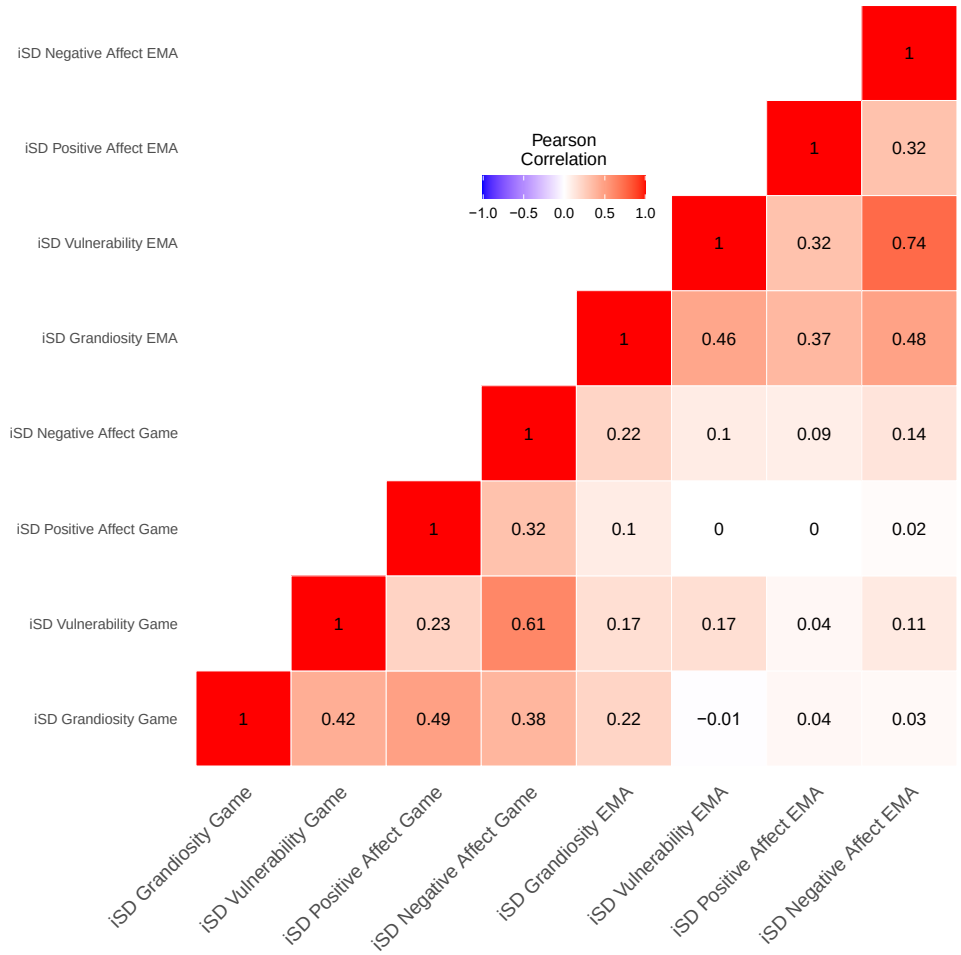

Figure 4 Correlations between individual standard deviations of all momentary variables across EMA and the arcade game.

Note. N = 423. EMA = Ecological Momentary Assessment; *i*SD = individual standard deviation.

5.2 Tables

Table 1 Places of Convergence and Divergence Across the EMA and Experimtenal Protocol

Table 1. Places of convergence and divergence across the EMA and experimental protocol

	Dominance Situations	Warmth Situations	Grandiosity	Vulnerability	Positive Affect	Negative Affect	Dispositional Narcissism Scales
EMA Design	Rated interacting partners' behavior	Rated interacting partners' behavior	Adjectives completed in response to social interaction	Adjectives completed in response to social interaction	Adjectives completed in response to social interaction	Adjectives completed in response to social interaction	Completed following the experimental task and prior to the EMA portion
Experimental Task	Three randomized blocks: 1 victory:1 defeat; 1 victory: 2 defeat; 1 victory: 3 defeat	NA	Adjectives completed at the conclusion of each block	Adjectives completed at the conclusion of each block	Adjectives completed at the conclusion of each block	Adjectives completed at the conclusion of each block	

Note. EMA = Ecological Momentary Assessment

Table 2 Standardized Bivariate Associations Among All Variables in the Ecological Momentary Assessment Portion

Table 2. Standardized bivariate associations among all variables in the Ecological Momentary Assessment portion.

Within-Person	1	2	3	4	5
1. Grandiosity	-				
2. Vulnerability	**-.07 [-.09, -.05]**	-			
3. Positive Affect	**.43 [.41, .44]**	**-.30 [-.32, -.28]**	-		
4. Negative Affect	**-.05 [-.07, -.03]**	**.68 [.67, .69]**	**-.31 [-.33, -.29]**	-	
5. Dominance of Other	**-.09 [-.11, -.07]**	**.21 [.20, .23]**	**-.11 [-.13, -.09]**	**.19 [.16, .19]**	
6. Warmth of Other	**.21 [.19, .23]**	**-.41 [-.43, -.39]**	**.41 [.39, .43]**	**-.31 [-.33, -.30]**	**-.15 [-.17, -.13]**

Between-Person	1	2	3	4	5	6	7	8	9	10
1. Grandiosity	-									
2. Vulnerability	**.53 [.45, .61]**	-								
3. Positive Affect	**.36 [.27, .45]**	-.01 [-.12, .11]	-							
4. Negative Affect	**.52 [.44, .60]**	**.96 [.95, .97]**	.01 [-.10, .13]	-						
5. Dominance of Other	**.10 [.01, .19]**	**.14 [.05, .24]**	**.14 [.02, .24]**	**.12 [.02, .22]**	-					
6. Warmth of Other	**-.17 [-.28, -.07]**	**-.57 [-.63, -.47]**	**.44 [.35, .51]**	**-.53, -.69, -.44]**	.09 [-.05, .20]	-				
7. FFNI Grandiosity	**.25 [.15, .35]**	**.17 [.07, .25]**	.01 [-.12, .11]	**.14 [.04, .23]**	-.04 [-.15, .08]	**-.14 [-.23, -.05]**	-			
8. FFNI Vulnerability	.03 [-.08, .11]	**.18 [.07, .28]**	**-.14 [-.24, -.04]**	**.20 [.09, .29]**	-.02 [-.13, .09]	-.09 [-.29, .03]	-.01 [-.11, .09]	-		
9. FFNI Extraversion	**.20 [.11, .29]**	.05 [-.04, .13]	**.11 [.02, .20]**	.05 [-.05, .13]	.04 [-.06, .16]	.02 [-.08, .10]	**.68 [.62, .74]**	.02 [-.08, .11]	-	
10. FFNI Antagonism	**.24 [.15, .33]**	**.26 [.15, .35]**	**-.13 [-.23, -.05]**	**.22 [.11, .31]**	-.11 [-.21, .00]	**-.23 [-.34, -.15]**	**.83 [.80, .86]**	**.33 [.24, .41]**	**.34 [.25, .42]**	-
11. FFNI Neuroticism	-.07 [-.18, .01]	.04 [-.05, .16]	-.10 [-.20, .01]	.08 [-.01, .19]	.03 [-.09, .13]	.01 [-.09, .14]	**-.40 [-.46, -.28]**	**.80 [.76, .83]**	**-.11 [-.20, -.02]**	-.10 [-.19, .00]

Note. N = 423 across 10,472 observations. FFNI = Five Factor Narcissism Inventory

Table 3 Standardized Bivariate Associations Among all Variables in the Arcade Game

Table 3. Standardized bivariate associations among all variables in the Arcade Game.

Within-Person	1	2	3	4	5
1. Grandiosity	-				
2. Vulnerability	.04 [-.01, .10]	-			
3. Positive Affect	**.56 [.52, .59]**	-.01 [-.06, .03]	-		
4. Negative Affect	**-.12[-.17, -.05]**	**.50 [.46, .54]**	**-.26 [-.31, -.21]**	-	
5. Experimental Defeat	**-.36 [-.40, -.32]**	.01 [-.03, .05]	**-.52 [.57, -.49]**	**.23 [.19, 28]**	-

Between-Person	1	2	3	4	5	6	7	8	9
1. Grandiosity	-								
2. Vulnerability	**.53 [.44, .61]**	-							
3. Positive Affect	**.66 [.60, .72]**	**.26 [.16, .38]**	-						
4. Negative Affect	**.39 [.29, .49]**	**.72 [.66, .77]**	.09 [-.02, .24]	-					
5. FFNI Grandiosity	**.42 [.34, .49]**	**.18 [.08, .29]**	**.22 [.13, .32]**	**.16 [.06, .28]**	-				
6. FFNI Vulnerability	-.09 [-.18, -.03]	**.18 [.07, .30]**	**-.15 [-.23, -.06]**	**.31 [.21, .42]**	-.02 [-.11, .07]	-			
7. FFNI Extraversion	**.30 [.21, .39]**	.05 [-.08, .17]	**.26 [.17, .38]**	.08 [-.02, .18]	**.70 [.66, .75]**	.03 [-.07, .13]	-		
8. FFNI Antagonism	**.33 [.23, .41]**	**.27 [.18, .38]**	.07 [-.04, .19]	**.28 [.17, .38]**	**.83 [.79, .86]**	**.34 [.25, .42]**	**.32 [.24, .40]**	-	
9. FFNI Neuroticism	**-.23 [-.32, -.15]**	.08 [-.04, .18]	**-.21 [-.30, -.13]**	**.18 [.06, .28]**	**-.37 [-.44, -.26]**	**.80 [.77, .84]**	**-.11 [-.20, -.02]**	-.08 [-.17, .01]	-

Note. $N = 431$ across four different time points (prior to the task, and then each of the three blocks; $N_{observations} = 1,703$). FFNI = Five Factor Narcissism Inventory

Table 4 Between-Person Correlations of Momentary Variables Across the EMA Component and Arcade Game

Table 4. Between-person correlations of momentary variables across the EMA component and arcade game.

	Grandiosity EMA	Vulnerability EMA	Positive Affect EMA	Negative Affect EMA
Grandiosity Game	**.47**	**.15**	**.19**	**.14**
Vulnerability Game	**.30**	**.38**	-.01	**.36**
Positive Affect Game	**.21**	-.07	**.33**	-.07
Negative Affect Game	**.28**	**.38**	.05	**.37**

Note. $N = 423$. Correlations shaded in blue are matching variables across methods. Bolded correlation values are significant at $p < .05$. EMA = ecological momentary assessment.

Table 5 Regression Coefficients for Between-Person Averages of Momentary Variables and Between-Person Predictors in EMA

Table 5. Regression coefficients for between-person averages of momentary variables and between-person predictors in EMA.

	Perceptions of Dominance	Perceptions of Warmth	Momentary Grandiosity	Momentary Vulnerability
	β	β	β	β
FFNI Grandiosity	.02 [-.06, .09]	**-.08 [-.17, -.01]**	***.17 [.10, .24]***	***.13 [.07, .20]***
FFNI Vulnerability	-.03 [-.09, .05]	-.06 [-.14, .02]	.03 [-.04, .09]	***.12 [.06, .19]***
FFNI Extraversion	.07 [-.02, .14]	***.08 [.02, .15]***	***.09 [.03, .16]***	-.04 [-.12, .04]
FFNI Antagonism	*-.07 [-.15, .01]*	***-.19 [-.26, -.12]***	***.14 [.06, .21]***	***.20 [.13, .27]***
FFNI Neuroticism	-.01 [-.08, .06]	-.02 [-.09, .07]	-.02 [-.09, .07]	.04 [-.03, .10]
Gender	***-.15 [-.23, -.07]***	-.07 [-.13, .01]	*.06 [-.01, .12]*	-.03 [-.09, .04]
Age	.02 [-.05, .08]	-.01 [-.06, .06]	.01 [-.06, .08]	.02 [-.04, .08]

Note. $N = 420$; $N_{observations} = 10{,}423$. FFNI = Five Factor Narcissism Inventory. Values in bold are those for which the credibility interval does not contain zero. Italicized values are those that are significant in models controlling for positive and negative affect.

Table 6 Regression Coefficients for Between-Person Averages of Momentary Variables and Between-Person Predictors in Arcade Game

Table 6. Regression coefficients for between-person averages of momentary variables and between-person predictors in Arcade Game.

	Momentary Grandiosity	Momentary Vulnerability
	β	β
FFNI Grandiosity	***.29 [.22, .36]***	*.08 [-.00, .15]*
FFNI Vulnerability	***-.08 [-.15, -.01]***	***.10 [.03, .18]***
FFNI Extraversion	***.17 [.08, .25]***	-.04 [-.11, .05]
FFNI Antagonism	***.16 [.08, .23]***	***.16 [.08, .24]***
FFNI Neuroticism	***-.15 [-.23, -.08]***	*.07 [-.00, .15]*
Gender	***.15 [.07, .23]***	.02 [-.06, .10]
Age	-.03 [-.09, .03]	.06 [-.02, .13]

Note. $N = 428$, $N_{observations} = 1{,}691$. FFNI = Five Factor Narcissism Inventory. Values in bold are those for which the credibility interval does not contain zero. Italicized values are those that emerged as significant in models controlling for positive and negative affect.

Table 7 Associations Among Random Slopes in EMA and the Arcade Game

Table 7. Associations among random slopes in EMA and the Arcade Game

Variable	Coefficient	Controlling Affect
Random Slope (dominance perceptions → narcissism) from EMA → Arcade Game Behavior		
Random Slope Grandiosity X Experimental Defeat → Grandiosity	**.17 [.02, .29]**	.19 [-.04, .47]
Random Slope Grandiosity X Experimental Defeat → Vulnerability	.02 [-.19, .17]	.12 [-.13, .46]
Random Slope Grandiosity → B/P Grandiosity	**-.12 [-.19, -.04]**	**-.12 [-.19, -.04]**
Random Slope Grandiosity → B/P Vulnerability	.01 [-.07, .09]	.01 [-.17, .09]
Random Slope Vulnerability X Experimental Defeat → Grandiosity	.06 [-.08, .18]	.15 [-.10, .40]
Random Slope Vulnerability X Experimental Defeat → Vulnerability	-.03 [-.24, .16]	-.16 [-.42, .10]
Random Slope Vulnerability → B/P Grandiosity	**-.08 [-.15, -.00]**	**-.11 [-.19, -.03]**
Random Slope Vulnerability → B/P Vulnerability	.03 [-.05, .10]	.03 [-.04, .11]

Note. N = 426. Values in bold are those for which the credibility interval does not contain zero. EMA = Ecological Momentary Assessment; B/P = between-person.

Table 8 Associations Among Random Slopes in EMA and the Arcade Game

Table 8. Associations among random slopes in EMA and the Arcade Game

Variable	Coefficient	Control Affect
Random Slope (warmth perceptions →narcissism) from EMA → Arcade Game Behavior		
Random Slope Grandiosity X Experimental Defeat → Grandiosity	**-.26 [-.38, -.15]**	-.17 [-.45, .07]
Random Slope Grandiosity X Experimental Defeat → Vulnerability	**.16 [.02, .33]**	-.03 [-.27, .23]
Random Slope Grandiosity → B/P Grandiosity	**.24 [.17, .30]**	**.25 [.18, .32]**
Random Slope Grandiosity → B/P Vulnerability	.05 [-.03, .13]	**.10 [.03, .17]**
Random Slope Vulnerability X Experimental Defeat → Grandiosity	-.03 [-.17, .10]	.03 [-.25, .30]
Random Slope Vulnerability X Experimental Defeat → Vulnerability	-.03 [-.18, .14]	.08 [-.16, .31]
Random Slope Vulnerability → B/P Grandiosity	.05 [-.04, .11]	.05 [-.03, .12]
Random Slope Vulnerability → B/P Vulnerability	-.02 [-.10, .06]	-.05 [-.13, .03]

Note. N = 426. Values in bold are those for which the credibility interval does not contain zero. EMA = Ecological Momentary Assessment.

The results presented below are those for which positive and negative affect served as primary outcomes.

5.3 Path Models for the EMA Portion

5.3.1 EMA: Within-Person Effects

Results from the path model in the EMA portion where positive and negative affect served as outcomes are presented in Supplementary Figure 1.[5] In the moment, perceiving the interacting partner as dominant was modestly negatively associated with positive affect and modestly positively associated with negative affect (in line with H5). In the moment, perceiving the interacting partner as warm was strongly positively associated with positive affect and moderately negatively associated with negative affect (in line with H5).

[5] Gender significantly dampened the link between perceptions of warmth and positive affect such that males had weaker effects between these two variables, on average (-.14 [-.23, -.04]). Age was not a significant predictor of any of these linkages.

5.3.2 EMA: Between-Person Predictors of Momentary Averages

Regression coefficients in which gender and age predicted between-person averages of momentary variables for the EMA model are presented in Supplementary Table 1. Males were less likely to perceive their interacting partner as dominant, on average.

5.4 Path Models for the Arcade Game

5.4.1 Arcade Game: Within-Person Effects

Results for the path model for the arcade game are presented in Supplementary Figure 2[6] for positive affect as the outcome and Supplementary Figure 3[7]for negative affect. Positive affect was strongly negatively associated with losing in the arcade game whereas momentary negative affect was moderately positively associated with losing (in line with H5).

[6] Gender amplified the link between the block condition and positive affect, such that males had stronger links than females, on average (-. 37[-.57, -.17]). Age was not a significant predictor of this link.

[7] Age nor gender were significant predictors of the link between block condition and negative affect.

5.4.2 Arcade Game: Between-Person Predictors of Momentary Averages

Regression coefficients between between-person averages of momentary variables, gender, and age for the arcade game model are presented in Supplementary Table 2. Males had higher momentary averages of positive affect at a moderate effect.

5.5 Associations Among Random Slopes of Narcissism in EMA and Arcade Game

Supplementary Table 3[8] presents the results of the random slopes from the EMA (i.e., dominance perceptions → affect) as predictors for experimental defeat → affect expression in the arcade game. Neither responding with increased positive affect nor increased negative affect to perceptions of dominance in the EMA portion were significant predictors of affect expression in response to losing in the arcade game.

Supplementary Table 4[9] presents the results of the random slopes from the EMA (i.e., warmth perceptions → affect) as predictors for experimental defeat → affect expression in the arcade game. Neither responding with increased positive affect nor increased negative affect to perceptions of warmth in the EMA portion were significant predictors of affect expression in response to losing in the arcade game.

[8] Gender was significantly associated with the link between positive affect and block condition. Males had stronger links between positive affect and losing, on average (-.36 [-.57, -.11]).

[9] Gender was significantly associated with the link between positive affect and block condition. Males had stronger links between positive affect losing (-.36 [-.51, -.17]).

Appendix A.1 Tables and Figures

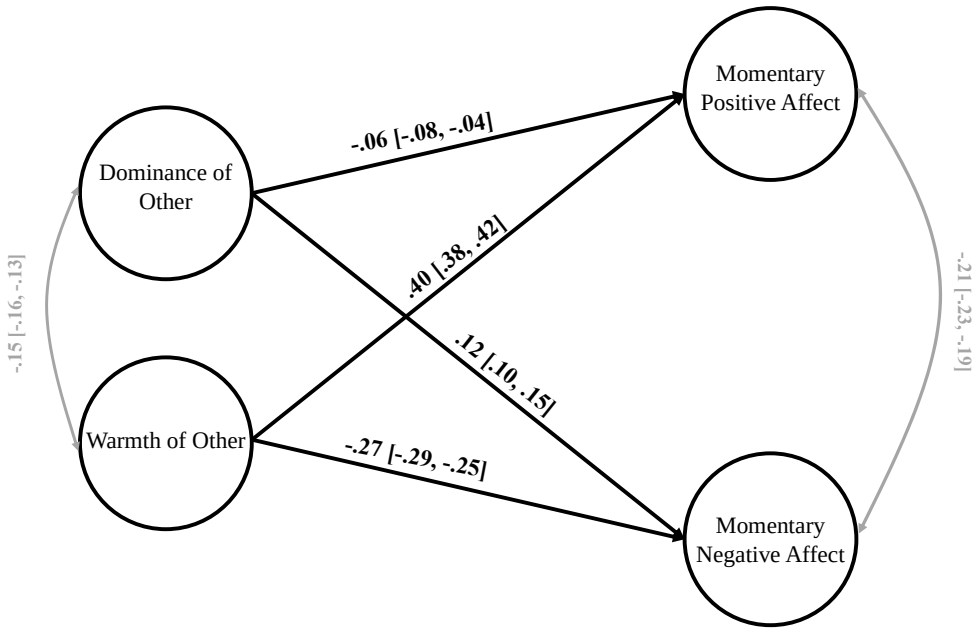

Figure 5 EMA Momentary Path Model for Affect

Note. N = 420, $N_{observations}$ = 10,423. Values in black are those from the models without controlling for grandiosity and vulnerability. Values in blue are the effect after controlling for grandiosity and vulnerability. Arrows from dispositional scales (e.g., FFNI Extraversion) to the designated path represent significant amplification/dampening of the effect. FFNI =Five Factor Narcissism Inventory.

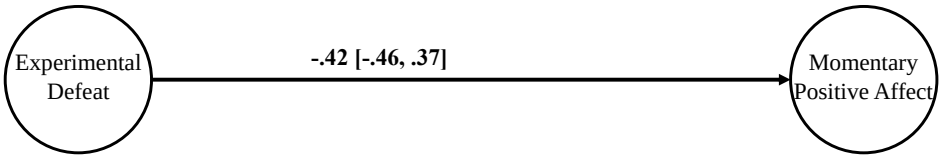

Figure 6 Arcade Game Momentary Path model for Positive Affect

Note. N = 428, $N_{observations}$ = 1,691. Values in black are those from the models without controlling for grandiosity and vulnerability. Values in blue are the effect after controlling for grandiosity and vulnerability. Arrows from dispositional scales (e.g., FFNI Extraversion) to the designated path represent significant amplification/dampening of the effect. FFNI =Five Factor Narcissism Inventory.

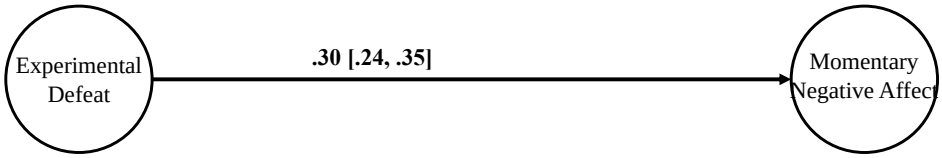

Figure 7 Arcade Game Momentary Path Model for Negative Affect.

Note. N = 428, $N_{observations}$ = 1,691. Values in black are those from the models without controlling for grandiosity and vulnerability. Values in blue are the effect after controlling for grandiosity and vulnerability. Arrows from dispositional scales (e.g., FFNI Extraversion) to the designated path represent significant amplification/dampening of the effect. FFNI =Five Factor Narcissism Inventory

Table 9 Regression Coefficients for Between-Person Averages of Momentary Variables and Between-Person Predictors in EMA

Supplementary Table 1. Regression coefficients for between-person averages of momentary variables and between-person predictors in EMA.

	Perceptions of Dominance	Perceptions of Warmth	Momentary Positive Affect	Momentary Negative Affect
	β	**β**	**β**	**β**
Gender	**-.13 [-.20, -.06]**	-.09 [-.15, -.02]	.03 [-.04, .11]	-.00 [-.07, .06]
Age	.02 [-.05, .10]	-.00 [-.06, .06]	-.04 [-.11, .02]	-.03 [-.09, .03]

Note. $N = 420$; $N_{observations} = 10{,}423$. EMA = Ecological Momentary Assessment; FFNI = Five Factor Narcissism Inventory. Gender was coded Females = 0; Males =1; Values in bold are those for which the credibility interval does not contain zero.

Table 10 Regression Coefficients for Between-Person Averages of Momentary Variables and Between-Person Predictors in the Arcade Game

Supplementary Table 2. Regression coefficients for between-person averages of momentary variables and between-person predictors in the arcade game.

	Momentary Positive Affect	Momentary Negative Affect
	β	β
Gender	**.27 [.19, .34]**	-.09 [-.17, .00]
Age	-.10 [-.17, .03]	.02 [-.07, .10]

Note. $N = 428$; $N_{observations} = 1, 691$. FFNI = Five Factor Narcissism Inventory. Gender was coded Females = 0; Males =1. Values in bold are those for which the credibility interval does not contain zero.

Table 11 Random Slopes of Dominance from the EMA Portion Predicting Behavior in the Arcade Game

Supplementary Table 3. Random slopes of dominance from the EMA portion predicting behavior in the arcade game.

Variable	Coefficient
Random Slope (dominance perceptions→Affect) from EMA → Arcade Game Behavior	
Random Slope Positive Affect X Experimental Defeat → Positive Affect	.04 [-.18, .25]
Random Slope Positive Affect X Experimental Defeat → Negative Affect	.02 [-.12, .15]
Random Slope Positive Affect → B/P Positive Affect	-.05 [-.12, .04]
Random Slope Positive Affect → B/P Negative Affect	.11 [.01, .19]
Random Slope Negative Affect X Experimental Defeat → Positive Affect	.16 [-.06, .42]
Random Slope Negative Affect X Experimental Defeat → Negative Affect	.06 [-.06, .18]
Random Slope Negative Affect → B/P Positive Affect	-.05 [-.13, .03]
Random Slope Negative Affect → B/P Negative Affect	.13 [.03, .22]

Note. N = 423. Values on bold are those for which the credibility interval does not contain zero.

Table 12 Random Slopes of Warmth from the EMA Portion Predicting Behavior in the Arcade Game

Supplementary Table 4. Random slopes of warmth from the EMA portion predicting behavior in the arcade game.

Variable	Coefficient
Random Slope (warmth perceptions → Affect) from EMA --> Arcade Game Behavior	
Random Slope Positive Affect X Experimental Defeat → Positive Affect	-.03 [-.20, .18]
Random Slope Positive Affect X Experimental Defeat → Negative Affect	-.13 [-.24, .01]
Random Slope Positive Affect → B/P Positive Affect	.03 [-.05, .11]
Random Slope Positive Affect → B/P Negative Affect	-.09 [-.19, .00]
Random Slope Negative Affect X Experimental Defeat → Positive Affect	.06 [-.18, .30]
Random Slope Negative Affect X Experimental Defeat → Negative Affect	-.09 [-.21, .06]
Random Slope Negative Affect → B/P Positive Affect	-.04 [-.12, .04]
Random Slope Negative Affect → B/P Negative Affect	.00 [-.09, .09]

Note. N = 423. Values on bold are those for which the credibility interval does not contain zero.

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