



## ‘Wired up about self’ - narcissistic traits predict elevated physiological arousal during self-disclosure in conversation

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### ARTICLE INFO

#### Keywords:

Self-disclosure  
Social interaction  
Narcissism  
Psychophysiology  
Storytelling

### ABSTRACT

Individuals vary in their self-disclosure motivations and physiological responses. It is unclear, however, whether the content of a person's self-view accounts for this variation. In this paper we explore the impact of self-disclosure on autonomic nervous system activity in participants with high and low levels of grandiose narcissistic traits. Three conversational experiments were conducted to simulate different contexts of self-disclosure: getting acquainted (Experiment 1), talking about emotional life experiences (Experiment 2), and telling emotional stories with varying self-relevance (Experiment 3). The experiments were conducted on the same sample of 22 dyads ( $n = 44$ ) measured in a single session. While Experiment 1 did not confirm the anticipated heightened sympathetic arousal in participants with high grandiose narcissism (N+), Experiment 2, focusing on telling about positive and negative life experiences, supported the hypothesis of increased skin conductance among the N+ individuals. Experiment 3, with more specific topics that varied in self-relevance, further supported the notion that narcissism is associated with elevated physiological arousal during self-disclosure. Notably, the skin conductance of the N+ individuals was particularly heightened when telling about being admired by others. Exploratory analyses showed that tellers' (whether N+ or N-) skin conductance was even more pronounced when they were discussing with an N+ co-participant.

### 1. Introduction

Self-disclosure can be described as ‘the process of making the self known to others’ (Jourard and Lasakow, 1958, p. 91). It is part of the mundane conversational activities, such as getting acquainted with someone or sharing personal stories, where participants reveal information about their past experiences and relations to others (e.g., Svennevig, 2014; Antaki et al., 2005). It is estimated that approximately 30–40 % of the speech contents in daily interactions relate to self-disclosure (Dunbar et al., 1997; Tamir and Mitchell, 2012). Yet, individuals differ in their motivation to make their self known to others and show inter-individual differences in physiological reactivity when revealing self-relevant information (Christensen and Smith, 1993). In previous research, these differences have been attributed to personality

traits, such as hostility and mistrust, but an individual's self-image may also affect their emotional reactions to self-disclosure. For example, narcissistic individuals have a heightened preoccupation with overly positive self-image (Kernberg, 1984). They may see self-disclosure as a means to control the self-image portrayed to others (Schlenker, 2012), for which reason they are likely to show pronounced emotional reactivity when revealing information about themselves. In the current study, we investigate the effects of self-disclosure on the autonomic nervous system (ANS) activity of participants with high or low levels of grandiose narcissistic traits in dyadic first encounters. Studying participants with narcissistic traits could deepen our understanding of how individual differences in self-image are associated with self-disclosure. The participants went through three naturalistic experiments representing different interactional contexts of self-disclosure: getting

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<https://doi.org/10.1016/j.ijpsycho.2025.112527>

Received 8 June 2024; Received in revised form 7 February 2025; Accepted 10 February 2025

Available online 11 February 2025

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acquainted, talking about one's positive and negative life experiences, and telling stories about emotional events with high and low self-relevance.

### 1.1. Getting acquainted, self-disclosure, and storytelling in conversation

The need for careful impression management and strategic self-presentation (Goffman, 1959) in first encounters has received much attention in psychology (see e.g., Ambady and Skowronski, 2008). Self-disclosure is an integral part of the activity of getting acquainted in initial interactions (e.g., Antaki et al., 2005; Holtgraves, 1990; Svennevig, 2014; Derlega et al., 2008). Conversation analytic research has shown how participants in first encounters present themselves and share personal information through particular types of conversational sequences (Maynard and Zimmerman, 1984; Svennevig, 2014). Psychological and neuroscientific research on the topic has shown that self-disclosure is generally perceived as an intrinsically rewarding activity (Tamir and Mitchell, 2012). In their seminal study, Tamir and Mitchell (2012) reported that engaging in self-disclosure increased activation in the mesolimbic dopaminergic system involved in, for example, reward processing, and that people were even willing to pay for the possibility of disclosing information about themselves. It has been suggested that, in forming relationships, self-disclosure has a large number of benefits: it is positively associated with trust, liking, attraction, and even mental health (Rosenfeld, 1979, p. 63). However, self-disclosure can also be seen as a 'risky' endeavor where the possibility of non-validation from the co-participant(s) may be experienced as a social threat (e.g., Burger, 1990; Logren et al., 2019; Vinogradov and Yalom, 1990). Here, personality differences can also influence how self-disclosure affects autonomic nervous system activity. For example, Christensen and Smith (1993) found that participants high in trait hostility displayed significantly greater blood pressure reactivity in a self-disclosure discussion task compared with non-hostile participants.

One fundamental conversational practice that can be used to self-disclose is storytelling. Telling personal stories about one's own life is a vehicle for humans to share experiences and create empathic moments in interaction (Heritage, 2011). Storytelling, however, can be seen as 'imposing' on the recipient and limiting their actions by taking the conversational floor for several turns (cf. Brown and Levinson, 1987). It can be thus seen as a high-stakes activity<sup>1</sup> where participants' selves are under threat. Affiliative responses from story-recipients can legitimize the taking of the time to tell the story, thus saving the teller's face (Goffman, 1955; Brown and Levinson, 1987). The significance of this can also be seen on a psychophysiological level, as lack of recipient affiliation has been found to increase storytellers' skin conductance responses (Peräkylä et al., 2015, p. 306). Furthermore, individuals can differ in their sensitivity to the self-threat involved with storytelling: participants with high levels of narcissistic traits have been found to be more emotionally sensitive to lack of recipient-engagement when telling stories about their personal experiences (Koskinen et al., 2024).

### 1.2. Narcissism in social interaction and psychophysiology

Narcissism has been associated with a strong dependence on social approval and a need to be loved and admired (Kohut, 1971; Kernberg, 1975). Narcissism can thus provide a window into the interplay of emotions and self-image in self-disclosure. The Narcissistic Personality Inventory (NPI; Raskin and Hall, 1979) is the most common self-report instrument that examines the degree to which individuals exhibit grandiose narcissistic traits on a continuum (Pincus and Lukowitsky, 2010). In grandiose narcissism, individuals have higher self-esteem,

extraversion, and less emotion regulation difficulties (Czarna et al., 2015; Campbell et al., 2002; Sedikides et al., 2004; Watson et al., 1996; Gramzow and Tangney, 1992) than in the other dimension of narcissism, vulnerable narcissism. In the current study, we focus particularly on grandiose narcissism, since it has been more robustly associated with deviant patterns of psychophysiological reactivity (Coleman et al., 2019; see below).

A closely related concept to self-disclosure is self-presentation, also called impression management, which refers to the use of various conscious and unconscious behaviors as means to control the self-image portrayed to others (Schlenker, 2012; Goffman, 1959). Impression management is an integral part of human interaction where people try to convey a certain image of themselves to others (Goffman, 1959). It is therefore a regulatory part of the self-disclosure process that dictates which aspects of the self should or should not be disclosed. Self-presentation can be used to either assert desired self-image or defend against self-related threats. Research suggests that people with grandiose narcissistic traits use self-assertive and intimidation tactics in their self-presentation (Hart et al., 2017). The motivation behind more agentic and active self-promotion is the strongly held belief that such self-promotion will make a good impression (ibid.). Casale et al. (2016) found that grandiose narcissists promoted "a perfect image of the self", the need to project such perfection arising without apparent effort, and they were also able to maintain such an image of the self in interpersonal situations. These studies suggest that people with high levels of grandiose narcissistic traits might engage in self-disclosure more strategically than people with low narcissism. However, whether this strategic approach to self-disclosure is reflected in a grandiose individual's physiological activity remains unstudied.

What has been studied is how individuals with grandiose traits show psychophysiological and neuroendocrine sensitivity to interpersonal stressors (see Coleman et al., 2019 for a review), such as performing a task in front of an audience (Edelstein et al., 2010). Furthermore, some research suggests a link between grandiose traits and elevated basal cortisol levels (Reinhard et al., 2012). However, grandiosity may differentially influence stress-reactivity depending on the type of stressor or indicator of stress-reactivity and, under certain conditions (e.g., anticipatory stress), grandiosity may confer some level of resilience (Coleman et al., 2019, p.62). Evidence for the assertion that individuals with grandiose traits simply have elevated stress levels is also mixed (Wardecker et al., 2018). Taken together, the reported findings still support the notion that grandiose narcissism is related to elevated stress reactivity in conditions of self-threat. Furthermore, it is important to note that narcissistic individuals exhibit a reliable pattern of discordance between their self-reported and physiological indicators of emotional reactions in response to social-evaluative stressors across experimental studies (Cascio et al., 2015). In recent research it was shown that participants with grandiose narcissistic traits react with higher physiological arousal to self-threats in storytelling (Koskinen et al., 2024) and amplified facial electromyography activity to negative social evaluations (Harjunen et al., 2023). In both of these experiments, the physiological effects were present, despite a lack of self-reported emotional distress.

Self-disclosure in first encounters represents an opportunity for the participants to self-enhance and gain validation via interpersonal interactions, as well as poses a potential threat due to the possibility of social rejection. In either case, we expect that people with high grandiose narcissism traits react with stronger increase in sympathetic arousal to first encounters than people with low grandiose narcissism. We addressed these questions with three separate experimental settings (getting acquainted, talking about emotional life experiences, and telling emotional self-relevant stories with differing valences) included in a single session. Conducting a within-participants design with the same sample of 22 dyads ( $n = 44$ ) measured in three different experimental situations enabled us to examine how specific the physiological reactions associated with grandiose narcissism are from the socio-

<sup>1</sup> The description of storytelling as a high-stakes activity involving multiple face concerns is taken from a lecture course on conversational structures in 2017, taught by professors Steven Clayman and John Heritage at UCLA.

emotional context point of view. The experiments and hypotheses are described in more detail in section 3.

## 2. Participants and methods

### 2.1. Participants

Forty-four healthy university students participated in the experiment and were recruited from a pool of a previous survey study (Henttonen et al., 2022). Survey respondents who gave their permission to be contacted were sent a recruitment letter. The recruitment was based on the participants' NPI-13 narcissism scores. Narcissistic (N+) individuals were identified as those who reported scores above the 80th percentile ( $NPI-13 \geq 39$ ). Individuals in the low narcissism group (N-) were defined with scores below the 50th percentile ( $NPI-13 \leq 30$ ). In total, 44 participants (34 female) forming 22 same-sex dyads enlisted, and were assigned to N+/N- ( $N = 24$ , 18 female), N-/N- ( $N = 16$ , 12 female) and N+/N+ ( $N = 4$ , all female) dyads. The cutoff points were set to ensure maximal representation of high and low scoring individuals and balanced grouping into clearly defined dyads. The low cutoff point was adjusted from 20th percentile into 50th percentile due to low number of observations in this range during early stages of recruitment. The mean age of all participants was 29.00 years ( $SD = 8.71$ , range: 19–58 years), with no differences between groups ( $t(42) = -0.36$ ). There were no differences between the group distributions in terms of gender ( $\chi^2(1) = 0.23$ ,  $p = .634$ ) or education level ( $\chi^2(2) = 1.69$ ,  $p = .431$ ). Full demographics of the groups are available in Supplemental materials.

The current study and the questionnaire study used for recruitment had ethical approval from the [Anonymized] Research Ethics Committee in the Humanities and Social and Behavioral sciences.

### 2.2. Experimental procedure

Before the conversations, the participants were informed about the purpose and procedure of the experiment and they signed a consent form. The participants were told that the purpose of the conversational experiment is to gain understanding on how personality traits affect social interaction. The participants sat in comfortable armchairs angularly across each other, with a translucent screen, included as a COVID-19 hygienic measure, between them.

The conversations were recorded with three cameras, one facing each of the participants and one providing the overall view. Participants

received mutual instructions from a single 27" display screen and had individual computer mice to indicate readiness to proceed when applicable. The paradigm was implemented using Octave PsychToolBox 3 (Kleiner et al., 2007).

Participants were asked to talk naturally about the topics given to them, during three individual conversational setups designed to assess specific hypotheses corresponding to and reported as separate experiments. Between the experiments, participants were allowed to rest for a short time, answered short questionnaires after which they received instructions for the task in the next experiment. The experimental setting is illustrated in Fig. 1, whereas the temporal structure of the study is illustrated in Fig. 2.

In the first experiment, the session commenced with the measurement of a three-minute pre-interaction baseline activity, during which the participants were instructed to rest in silence while sitting in their chairs in the same room. After the pre-interaction measurement, the participants were asked to talk freely for five minutes without any topical prompts. The participants utilized these minutes to get acquainted with each other. The second experiment followed the paradigm of our previous studies (e.g., Koskinen et al., 2021; Peräkylä et al., 2015) where the participants were asked to talk about happy events and losses in their lives. The purpose was to examine physiological arousal when sharing positively versus negatively valenced life experiences. In the third experiment, the participants were instructed to tell stories each describing a more specific experience. The topics were chosen to prompt stories of both negative and positive valence and high and low self-relevance. A more detailed description of each task is provided in the context of each experiment.

In the debriefing, the participants were provided with the opportunity to ask questions and a visualization of their personality scores (extraversion, neuroticism, agreeableness, perspective taking, empathetic concern and narcissism) depicted in relation to the whole pool of background questionnaire respondents. In addition, participants received a gift valued ca. 20€ as compensation.

### 2.3. Measures

#### 2.3.1. Personality measures

Narcissism was assessed with the Narcissistic Personality Inventory (NPI-13; Gentile et al., 2013; Raskin and Hall, 1979). The NPI remains the most commonly utilized measure of narcissistic traits as well as a prominent measure of grandiose narcissism (Pincus and Lukowitsky,



Fig. 1. Experimental setting.

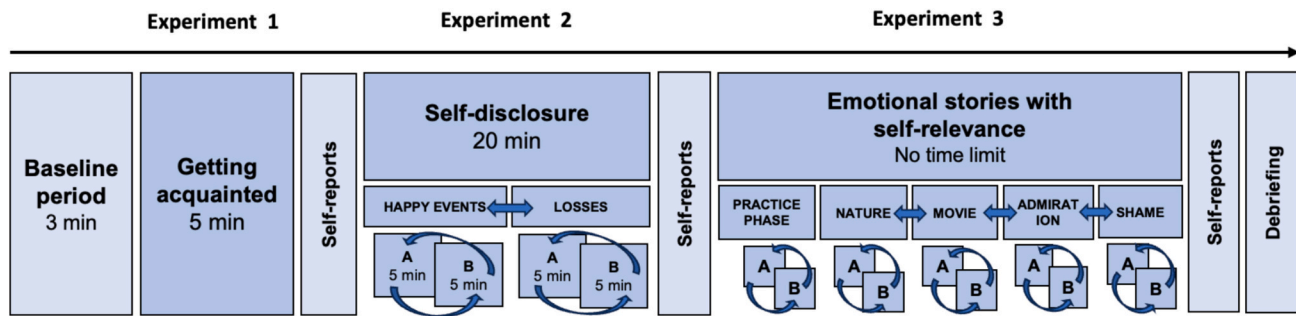


Fig. 2. Task diagram. Arrows indicate randomized order.

2010). We utilized the brief, 13-item NPI that includes three subscales pertaining to the three-factor solution: Leadership/Authority, Grandiose Exhibitionism, and Entitlement/Exploitativeness (NPI-13: Gentile et al., 2013; Ackerman et al., 2011). The entitlement/exploitativeness subscale is related to maladaptive interpersonal outcomes, whereas the leadership/authority and grandiose exhibitionism factors have been linked to more adaptive traits and behaviors (e.g., Giacomini and Jordan, 2016; Miller et al., 2007). The NPI can be reliably measured with Likert-type scales in lieu of the original binary questions (Miller et al., 2018). The Finnish NPI-13 version was demonstrated as a valid and reliable research instrument in the origin of the subsample reported by [Anonymized] (2022), where the scale exhibited small or nonexistent correlations with general personality pathologies but was a strong predictor of pathological narcissism.

Each item was rated on a 5-point Likert-type scale (1: “strongly disagree,” 5: “strongly agree”). At the conclusion of the experiment, NPI-13 was measured again, and demonstrated good internal ( $\alpha = 0.85$ ) and test-retest reliability ( $r = 0.82$ ).

### 2.3.2. Autonomic nervous system measures

Physiological data from both participants were recorded with individual Nexus-10 devices (Mindmedia BV, The Netherlands). Electrocardiogram data (ECG) were sampled at 512 Hz with two wet Ag/AgCl electrodes placed according to the modified Lead II configuration. Skin conductance (SC) was measured at 32 Hz with a constant voltage of 0.5 V between two dry Ag/AgCl electrodes affixed to the palmar middle phalanges of the index and middle fingers of the non-dominant hand. The recordings were synchronized with each other and the video recording using analog triggers originating from the stimulus computer.

SC data was preprocessed using the Ledalab toolbox for Matlab (Benedek and Kaernbach, 2010). Original time series data were down-sampled to 16 Hz and smoothed with an adaptive filter. Data were visually inspected, and short (< 10 s) movement artifacts were manually interpolated. The phasic component of the SC signal was extracted from the time series using continuous decomposition analysis. ECG data was analyzed by low pass, high pass and band pass (50 Hz mains noise) filtering and detection of R-peaks using the QRS detection algorithm by Pan and Tompkins (1985). Resultant inter-beat-interval series was manually screened for artifactual and ectopic beats. From the screened time series, average heart rate (HR, beats per minute) was calculated for the periods of interest. Average levels of derivative signals during individual phases of the experiment were used in the statistical analysis.

### 2.3.3. State measures

After each experiment, the participants reported their emotional state valence (negative vs. positive), arousal (high vs. low) and dominance (dominant vs. submissive) on a nine point scale according to the Self-Assessment Manikin (SAM) scales (Bradley and Lang, 1994). Positive and negative affects were assessed with two ten item five point PA/NA scales (“How do you feel like that right now?: 1: ‘very little or not at all’, 5: ‘very much’”; Watson et al., 1988). Because the self-report state

measures only captured the participants' overall emotional state across the series of experiments and they did not indicate responses to each story event, they are not applicable for the research questions of the current study and are thus reported in Supplementary materials.

## 3. Substudies

### 3.1. Experiment 1: Psychophysiological arousal in getting acquainted

Experiment 1 examined the association between the grandiose narcissism score (NPI-13) and psychophysiological arousal both before interaction (pre-interaction rest) and during the first interaction to get acquainted with each other. Based on earlier research linking narcissism to the excessive need to portray themselves in a favorable light in first encounters (Morf and Rhodewalt, 2001; Casale et al., 2016), and the potential for narcissistic individuals experiencing the situation as stressor (Coleman et al., 2019; Anonymized, 2024), we hypothesized that (H1) participants with high grandiose narcissism (N+) exhibit stronger increase in their phasic SC and HR from the pre-interaction level when getting acquainted with a new person than people with low grandiose narcissism (N-).

#### 3.1.1. Task

When the electrodes were applied and the experiment could begin, the participants were instructed to rest in silence for three minutes while sitting in their chairs with their eyes closed. After three minutes had elapsed, the experimenter arrived and asked the participants to talk freely for five minutes about whatever they wanted, and then left the room. The experimenter pressed a button and the screen between the participants showed the text “free discussion”. The participants utilized these minutes to getting acquainted with each other, asking and disclosing information about themselves. After 5 min the experimenter came back and asked the participants to fill in self-report questionnaires.

#### 3.1.2. Analyses

H1 was tested with separate multilevel linear models (MLMs) predicting SC and HR. The models were calculated with the restricted maximum likelihood (REML) estimation method using the lmer function for R. MLM was used allowing estimation of cross-level interaction between measurement point (pre-encounter rest vs. first encounter) that was a within-subject factor and Narcissism level (N+ vs. N-) that varied between the participants. Both models included fixed effects of Phase and Narcissism level as predictor along with age and gender as covariates. Dyad and Participant ID were defined as random intercept because the repeated measures were crossed with participants and the participants were nested in dyads. The fixed effects of Phase and Narcissism level and their two-way interaction were tested using analysis of variance with Satterthwaite's method and type-III sum of squares. In case the interaction effect between Phase and Narcissism was significant, the estimated margin means were examined to seek support for H1 that the N+ participants' physiological arousal would exhibit stronger

increase from the baseline (pre-encounter rest) than the N- participants' due to getting acquainted.

### 3.1.3. Results

Complete F-test statistics of the Omnibus tests of fixed effects can be found from supplementary materials (Supplementary Table 2). Here are reported the most important test results for the hypothesis testing. First, a significant main effect of Phase on SC was found [ $F(1, 41) = 64.28, p < .001$ ], indicating that the SC was higher during the first encounter ( $M = 0.19, SE = 0.02$ ) than during the pre-encounter rest ( $M = 0.06, SE = 0.02$ ). The main effect of Narcissism level was non-significant [ $F(1, 39) = 2.03, p = .162$ ] as was the interaction between Phase and Narcissism level [ $F(1, 41) = 0.71, p = .404$ ]. Thus, no support was observed for H1 when examining SC. The effects of Gender ( $p = .491$ ) and Age ( $p = .684$ ) were likewise non-significant.

Then, running the same MLM model for HR revealed a significant effect of Phase [ $F(1, 39) = 82.26, p < .001$ ] indicating again higher HR during getting acquainted ( $M = 87.2, SE = 2.34$ ) than before the first interaction ( $M = 81.8, SE = 2.34$ ). The main effect of Narcissism level [ $F(1, 37) = 0.80, p = .378$ ] as well as the interaction between Phase and Narcissism level [ $F(1, 39) = 0.06, p = .801$ ] were again non-significant. Therefore, no support was obtained for H1. Finally, the effect of Age was found to be significant ( $p = .043$ ) indicating higher HR for younger participants whereas the effect of gender was not significant ( $p = .253$ ).

### 3.1.4. Summary

Although getting acquainted significantly increased physiological arousal of the participants compared to the baseline, no support was observed for H1 according to which participants with high grandiose narcissism would react with a stronger increase in sympathetic arousal to getting acquainted as compared to people with low grandiose narcissism. It could be argued that in an experimental setting where the participants do not have a 'real-life purpose' (cf. [Svennevig, 2014](#)) for meeting, the importance of maintaining a good first impression can become less salient. However, in Experiment 1, neither the topics under discussion nor the self-other focus of talk were controlled for. These limitations were addressed in the next experiment.

## 3.2. Experiment 2: Psychophysiological arousal during self-disclosure

Experiment 2 examined whether people with pronounced narcissistic traits exhibit elevated physiological arousal when disclosing information about themselves and whether their arousal level is selectively elevated by sharing negatively (losses) versus positively valenced (happy events) information. The research question follows from the argument that self-disclosure is an intrinsically rewarding ([Tamir and Mitchell, 2012](#)) yet risky endeavor with the possibility of social rejection (e.g., [Burger, 1990](#)). Earlier empirical evidence suggests that individuals differ in their physiological reactivity to the self-threats associated with self-disclosure (e.g., [Christensen and Smith, 1993](#)). As people with grandiose narcissism exhibit pronounced physiological reactivity to self-threats in social encounters ([Anonymized, 2023](#)), we hypothesized that (H2.1) N+ participants exhibit more psychophysiological arousal than N- participants when they tell about their emotional life experiences (happy events and losses) to another person. Conversely, when the participants' task is to listen to another person's self-disclosure, no difference is observed between the N+ and N- participants.

As was pointed out above in the introduction section, those high in grandiose narcissism enter first encounters with a goal of presenting themselves in the best possible light ([Morf and Rhodewalt, 2001](#)). As telling about negatively valenced life-experiences such as losses can be experienced as more self-threatening and vulnerable than telling about happy events (e.g., [Coates and Winston, 1987](#)), our second hypothesis (H2.2) stated that the N+ participants exhibit more pronounced physiological arousal when telling about negatively valenced experiences

(losses) as compared to positively valenced experiences (happy events).

### 3.2.1. Task

In Experiment 2, the participants were instructed to tell about happy events and losses in their lives to the other participant. The order of topics (losses vs. happy events) and roles (teller vs. recipient) were pseudorandomized between participants so that both participants talked about the same topic as teller and recipient before moving on to the other valence. Instructions on the screen indicated the topic of discussion and also determined the participant who started; after 5 min the instructions on the screen told the participants to switch roles (teller → recipient); after 10 min they received instructions to move to the other topic (happy events → losses).

### 3.2.2. Analyses

H2.1 and H2.2 were tested with separate MLMs predicting SC and HR. The models were calculated again using the lmer function with the REML estimation method. MLM was used because it allowed estimation of cross-level interaction between situational factors (Role and Story topic) that were manipulated within participant and Narcissism level varying both between participants and between dyads (e.g., N+ with N-, N- with N-, and N+ with N+). Both models included role (teller/recipient) of the participant and story topic (losses vs. happy events) as repeated measures factors and narcissism level (N+/N-) as person level predictor along with age and gender as covariates. Dyad and participant ID were defined as random effects because the repeated measures were crossed with participants who, in turn, were nested in dyads. The models included fixed effects of role, story topic, age, and gender, as well as the two- and three-way interaction effects among narcissism level, role, and story topic. The outcome measures were phasic SC and HR, assessed as non-corrected interaction-related activity. Baseline subtraction was not performed because the analyses focused on individual differences in within-subject contrasts (teller vs. receiver; happy events vs. losses) and because the non-corrected value distributions showed no substantial interindividual variation or outliers. For hypothesis testing, the two-way interaction between role and narcissism level was examined to test H2.1 and the three-way interaction among role, story topic and narcissism level was estimated to test H2.2. These omnibus tests of fixed effects were tested using analysis of variance with Satterthwaite's method and type-III sum of squares. In case either of the interactions were statistically significant, planned pairwise comparisons between teller and receiver conditions were calculated on each narcissism level (H2.1) or on each narcissism level and story topic (H2.2).

### 3.2.3. Results

For SC, a MLM model was conducted to test the main and interaction effects of Story topic, Role, and Narcissism level. Here, the key findings have been reported. A complete report of the Omnibus test statistics can be found from Supplementary Table 3. Story topic had no significant main or interaction effects on SC ( $ps > 0.569$ ). However, the main effect of Role [ $F(1, 126) = 4.80, p = .030$ ] and the interaction between Role and Narcissism level [ $F(1, 126) = 4.76, p = .031$ ] were both significant. The interaction is illustrated in [Fig. 3](#). When N+ participants were in the role of teller, they exhibited elevated activation levels, compared to when they were in the role of a recipient,  $t(126) = 2.74, p = .007$ . In N- participants, there was no difference between the recipient and teller conditions,  $t(126) = 0.01, p = .994$ . This pattern was in alignment with H2.1. Contrary to H2.2, however, the three-way interaction among Role, Story topic and Narcissism level was non-significant [ $F(1.00, 126.00) = 0.21, p = .650$ ]. The effects of age [ $F(1.00, 38.49) = 0.01, p = .914$ ] and gender [ $F(1.00, 19.13) = 0.92, p = .351$ ] were likewise non-significant.

For HR, a similar MLM model was conducted. The main effects of Story topic and Narcissism level were non-significant as were their two-way and three-way interaction effects ( $ps > 0.164$ ). Therefore, the results gave no support for H2.1 or H2.2 when it came to HR. Only the main effects of Role [ $F(1,120) = 28.33, p < .001$ ] and Age [ $F(1, 38) =$

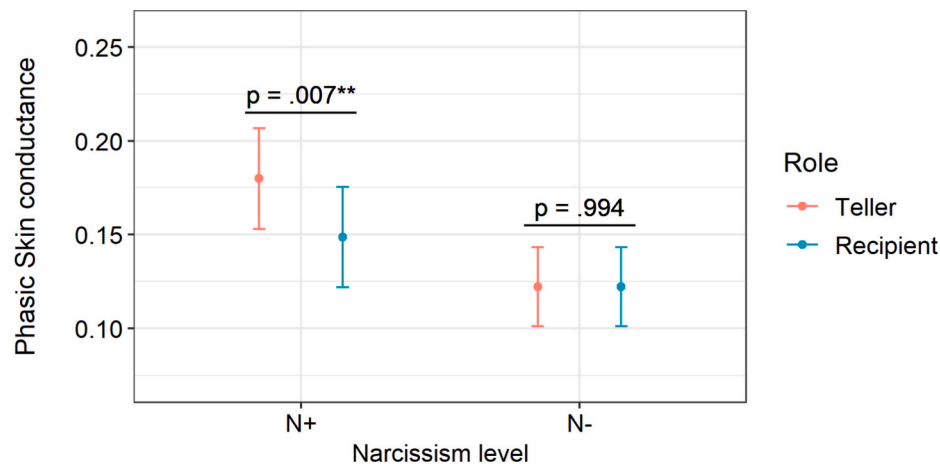


Fig. 3. Phasic SC between N+ and N- participants under different roles. Error bars indicate pooled standard errors of the estimated margin means.

5.98,  $p = .019$ ] were significantly associated with HR. When telling a story, participants' HR was higher ( $M = 84.7$  BPM,  $SE = 2.32$ ) than when receiving a story ( $M = 81.6$  BPM,  $SE = 2.32$ ). In regard to Age, younger participants had generally higher HR during the conversation ( $b = -0.52$ ,  $SE = 0.22$ ).

### 3.2.4. Summary

The results suggest that in accordance with H2.1 people with high grandiose narcissism respond with elevated SC when involved in self-disclosure. For HR, only the effect of self-disclosure (role of teller) was observed. Contrary to H2.2, emotional valence of the disclosed information (Story topic) had no significant influence on SC or HR. Thus, grandiose individuals seem to exhibit elevated SC but not HR when involved in self-disclosure regardless of the content's valence (positive/negative). The influence of self-disclosure on physiological arousal was therefore limited to electrodermal activity, which is more sensitive to the changes in sympathetic regulation of ANS. The experiment did not, however, reveal whether the N+ individuals were intentionally limiting the conversation topics' emotional intensity and relevance to self. The story topics given were rather general and gave participants a lot of room for self-protecting selection of the topics. Therefore, in a subsequent experiment, the participants were instructed to follow more specific topics, which varied in terms of both emotional valence and self-relevance.

### 3.3. Experiment 3: Emotional stories with self-relevance

Experiment 3 examined whether people with pronounced narcissistic traits exhibit elevated physiological arousal when disclosing self-relevant information with either negative or positive valence. Each participant was instructed to tell four emotional stories concerning different topics, varying from more self-relevant (being admired, feeling ashamed) to less self-relevant (the worst movie they have seen, the nicest nature experience). The topics had either a positive (the nicest nature experience, being admired) or negative emotional valence (worst movie, feeling ashamed). As narcissism is associated with a heightened preoccupation with admiration seeking (Campbell, 1999; Morf and Rhodewalt, 2001) and pronounced negative emotional reactions to self-threats (Casco et al., 2015; Anonymized, 2023), we hypothesized (H3) that N+ participants would exhibit higher psychophysiological arousal when telling about more self-relevant (vs. less self-relevant) experiences as compared to the N- participants. As it was deemed likely that the admiration topic may result in increased arousal in the N+ participants due to their self-promotion motives and the shame topic would increase arousal due to the self-threat associated with the disclosure, we did not assume the N+ participants to differ in their arousal levels between the

shame and admiration stories.

#### 3.3.1. Task and design

As a warm-up for the experiment with specific stories, the participants were first instructed to tell about their journey from their home to the laboratory that day. After this warm-up, the participants received an instruction on the screen to tell about 1) an event where they felt admired, 2) an event where they felt ashamed, 3) the nicest nature location they had been to, and 4) the worst movie they had seen. The order of the topics was randomized with the exception of the warm-up (journey to the lab), which was a training trial and thus was always presented first. For each trial, the participants were first presented with the topic for 30 s in order to come up with a story. After 30 s, the screen indicated which participant was to go first. The story duration was self-timed<sup>2</sup> and the tellers indicated when they were finished with telling by pressing a button. Then, it was the other participant's turn to tell a story about the same topic.

#### 3.3.2. Analyses

H3 was tested with separate MLMs predicting SC and HR. The models included fixed effects of Narcissism level (N+/N-), Role (teller/recipient) and Story topic (Admired / Ashamed / Movie / Nature) as predictors along with age and gender as covariates. Additionally, two- and three-way interactions among Narcissism level, Role, and Story topic were estimated. The same function, estimation method (REML) were used to calculate the models. The fixed effects were tested using ANOVA with Satterthwaite's method and type-III sum of squares. To test H3, the interaction among Role, Story topic, and Narcissism level was first inspected. If a significant interaction was observed, pairwise comparisons were calculated between the low (N-) and high (N+) narcissism on each level of Story topic and Role to see whether the N+ as tellers exhibited higher SC and HR especially when telling about the experiences of admiration or shame.

#### 3.3.3. Results

Complete F-test results for both SC and HR have been reported in Table 1. For SC, the effects of Role [ $F(1, 294) = 65.59$ ,  $p < .001$ ], Story topic [ $F(3, 294) = 2.88$ ,  $p = .036$ ] and interaction between Group and Role [ $F(1, 294) = 5.12$ ,  $p = .024$ ] were significant. Furthermore, a significant three-way interaction among Narcissism level, Role, and Story

<sup>2</sup> The topic of the story did have a significant effect on the length of the story, because stories about shameful events and admiration stories lasted longer than the other types of stories, but standardizing the duration of the story in the model did not explain the variation in SC or HR.

**Table 1**  
Effects of Narcissism Level, Role, Story Topic and Demographics on skin conductance (SC) and heart rate (HR) in Experiment 3.

| Effect            | Phasic skin conductance (SC) |        |       |        | Heart rate (HR) |        |        |        |
|-------------------|------------------------------|--------|-------|--------|-----------------|--------|--------|--------|
|                   | df Num                       | df Den | F     | p      | df Num          | df Den | F      | p      |
| Narcissism Level  | 1                            | 38.61  | 1.61  | 0.213  | 1               | 37     | 1.58   | 0.216  |
| Role              | 1                            | 294    | 65.59 | <0.001 | 1               | 273    | 114.41 | <0.001 |
| Story Topic       | 3                            | 294    | 2.88  | 0.036  | 3               | 273    | 8.24   | <0.001 |
| Age               | 1                            | 40     | 0.11  | 0.745  | 1               | 37     | 7.66   | 0.009  |
| Gender            | 1                            | 17.88  | 3.27  | 0.087  | 1               | 37     | 0.60   | 0.442  |
| Narcissism Level* | 1                            | 294    | 5.12  | 0.024  | 1               | 273    | 5.08   | 0.025  |
| Role              |                              |        |       |        |                 |        |        |        |
| Narcissism Level* | 3                            | 294    | 0.86  | 0.463  | 3               | 273    | 0.46   | 0.714  |
| Story Topic       |                              |        |       |        |                 |        |        |        |
| Role*             | 3                            | 294    | 0.64  | 0.591  | 3               | 273    | 0.03   | 0.993  |
| Story Topic       |                              |        |       |        |                 |        |        |        |
| Narcissism Level* | 3                            | 294    | 2.91  | 0.035  | 3               | 273    | 0.47   | 0.700  |
| Role*             |                              |        |       |        |                 |        |        |        |
| Story Topic       |                              |        |       |        |                 |        |        |        |

Note. F-test results of MLM fixed effects conducted with type-III sum of squares. Greenhouse Geisser correction method was used to adjust for lack of sphericity. Df Num = Degrees of freedom, numerator. Df Den = Degrees of freedom, denominator. \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$ .

topic was observed [ $F(1, 294) = 2.91, p = .035$ ]. The estimated means are depicted in Fig. 4. As can be seen in the figure, SC was generally higher in tellers than recipients. The N+ tellers exhibited more elevated SC than the N- participants specifically when telling about being admired. However, in the role of recipient there was no difference between the N+ and N- participants. Therefore, while there was evidence of Narcissism level moderating the effects of role and story topic, the pattern only partially aligned H3 as the difference between N+ and N- reached significance only in the admiration condition.

As for HR, the main effect of Story topic was significant [ $F(3, 273) = 8.24, p < .001$ ]. Examination of the estimated margin means revealed that stories about the worst movies ( $M = 78.80, SE = 2.16$ ), admiration experiences ( $M = 79.80, SE = 2.16$ ), or experiences of shame ( $M = 79.60, SE = 2.16$ ) resulted in higher HR than stories about the nicest nature experience ( $M = 77.10, SE = 2.16$ ) irrespectively of the effect of Role. Moreover, a significant main effect of Role [ $F(1, 273) = 114.41, p < .001$ ] as well as two-way interaction between Narcissism level and Role [ $F(1, 273) = 5.08, p = .025$ ] were obtained (See Fig. 5). Examination of the two-way interaction revealed that while both N+ and N- individuals reacted with elevated HR when telling vs. receiving a story, there was no significant difference between N+ and N- tellers or N+ and

N- recipients. The interaction was due to the difference in HR being largest when comparing the N+ tellers to N- recipients ( $p = .025$ ) and non-significant when comparing N+ recipients with the N- tellers ( $p = .970$ ). Contrary to SCR, however, there was no significant three-way interaction among Narcissism level, Role, and Story when predicting HR [ $F(3, 273) = 0.47, p = .700$ ], which is in contrast to H3 as indicating that the increased HR of N+ individuals was similar across the story topics. As for the covariates, Age had a significant main effect [ $F(1, 37) = 7.66, p = .009$ ] indicating again that younger participants had a generally higher HR during the task,  $b = -0.54, SE = 0.20$ .

### 3.3.4. Exploratory analyses of actor-partner interdependencies in physiological arousal

Last, as an exploratory analysis, we examined the SC and HR levels during Experiment 3 with dyadic analyses encompassing the so-called actor-partner interdependence model (APIM, Kenny et al., 2006). This allowed for estimating fixed effects of both the teller's Narcissism score and the recipient's Narcissism score on the teller's physiological arousal during self-disclosure. The APIM was estimated using the lmer function with REML estimation method. Similar to the previous models, both Dyad and Participant ID were set as random effects. Actor and partner

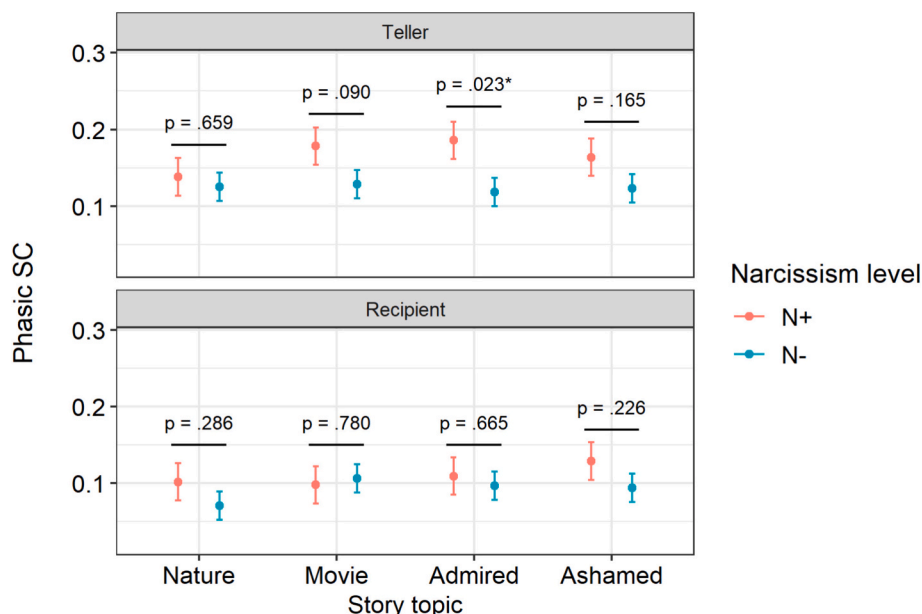


Fig. 4. Mean phasic SC for N+ and N- participants in each Role and each Story topic. Error bars indicate pooled standard errors of the estimated margin means.

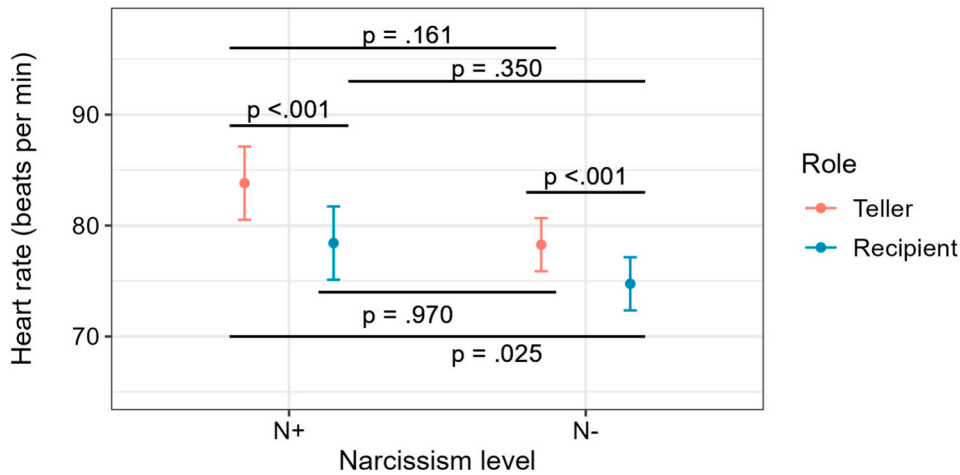


Fig. 5. Mean HR for N+ and N- participants in each Role. Error bars indicate pooled standard errors of the estimated margin means.

effects were estimated using continuous and mean-centered NPI 13 scores of both actor and partner as well as actor's Role, and Story topic as predictors. Two- and three level interactions were estimated separately for Story topic, Role, and Actor's Narcissism score and Story topic, Role, and Partner's Narcissism score to assess the actor and partner effects simultaneously. Continuous Narcissism scores were used instead of dichotomous Narcissism Levels due to the unbalanced N+/N- actor-partner groups and model requirements.

F-test results of the APIMs are reported in full in Supplementary Table 4. APIM calculated for SC revealed a main effects of Role [ $F(1, 287) = 59.47, p < .001$ ] and Story topic [ $F(3, 287) = 2.65, p = .049$ ]. Along with these effects, a significant interaction was found between Role and Partner's Narcissism score [ $F(1, 287) = 5.66, p = .018$ ]. Examination of the interaction with simple slopes (see Fig. 6) revealed that actors interacting with partners who had high Narcissism scores exhibited enhanced phasic SC, but only when they were in the role of the teller. If the actor was in the recipient's role, there was no positive association between the actor's SC activity and partner's Narcissism score. The previously found three-way interaction among actor's Role, Narcissism level, and Story topic did not quite reach the level of statistical significance in this model [ $F(3, 287) = 2.32, p = .076$ ].

APIM calculated for HR revealed significant effects of Role [ $F(1, 266) = 108.18, p < .001$ ] and Story topic [ $F(3, 266) = 8.55, p < .001$ ]. The main effect of Partner's Narcissism score [ $F(1, 38) = 1.31, p = .259$ ] was non-significant as was the interaction effect between Partner's Narcissism score and Role [ $F(1, 266) = 3.57, p = .060$ ]. Neither of the other two- or three-way interaction effects with Partner's Narcissism

score reached significance ( $ps > 0.124$ ).

3.3.5. Summary

Experiment 3 replicated the findings of Experiment 2 providing further support to H 2.1, according to which N+ individuals exhibit elevated physiological arousal when they engage in self-disclosure as compared to N-. In regard to H3, however, we observed that SC levels of N+ participants were pronounced when they told about an experience of being admired. The N- participants did not show similar selective responsiveness to stories of admiration. In contrast, they exhibited higher SC when telling about shameful experiences than when listening to others' shame stories. In N+ participants, telling and listening to shame stories led to comparable increases in phasic SC activity. Therefore, although the persons with high grandiose narcissism exhibited generally elevated sympathetic activity when disclosing information about themselves, only their SC activity captured a selective reactivity to moments of disclosing self-promoting information.

Exploratory analyses in Experiment 3 allowed for estimating the effects of both the participant's own level of narcissism and the level of their co-participant's narcissism on the participant's physiological arousal. The analyses revealed that the recipient's high score in narcissism increased the teller's SC activity during self-disclosure. This is an important addition to the results, since partner effects are indications of truly interpersonal processes. A similar significant partner effect was not observed in HR, although a trend was found. Furthermore, the original interaction effect of a person's own Narcissism score and Role on HR diminished when controlling for the effect of Partner's Narcissism score.

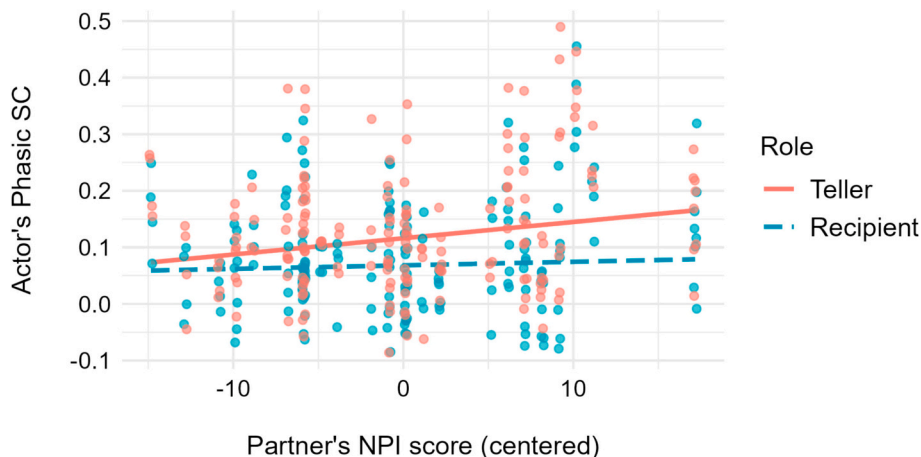


Fig. 6. Interaction effect of actor's role and partner's narcissism score on the actor's phasic SC. The partner's grand-mean centered NPI score is presented on the x-axis.

#### 4. General discussion

In this study, we investigated the effects of self-disclosure on the ANS activity of participants with high or low levels of grandiose narcissistic traits. The participants went through three naturalistic experiments representing different interactional contexts where self-disclosure is typically prominent: getting acquainted (Experiment 1), talking about one's emotional life experiences (Experiment 2), and telling stories about emotional events with high and low self-relevance (Experiment 3). Although getting acquainted significantly increased physiological arousal, no support was observed for our hypothesis (H1) that participants with high grandiose narcissism would react with a stronger increase in sympathetic arousal to interacting with an unknown co-participant for the first time. However, in Experiment 1, neither the topics under discussion nor the teller-recipient roles were controlled for. These limitations were addressed in Experiment 2, where we asked the participants to talk about happy events and losses in their lives. We manipulated the order of topics and roles (teller vs. recipient) so that both participants talked about the same topic as teller and recipient. The results supported our hypothesis (H2.1) that people with high grandiose narcissism respond with elevated SC when they engage in self-disclosure (i.e., are in the role of teller). Against our hypothesis (H2.2), the emotional valence (happy events or losses) of the disclosed information had no significant influence on SC or HR. Experiment 2, however, did not reveal whether the narcissistic individuals were intentionally limiting the topic's emotional intensity and relevance to self, so in Experiment 3 we gave the participants more specific topics. Experiment 3 provided support to our hypothesis (H3.1) according to which high grandiose narcissism individuals exhibit elevated physiological arousal when they engage in self-disclosure by telling personal stories (as compared to N- participants). Furthermore, we observed that SC levels of the more narcissistic participants were pronounced when they told a story about being admired. Our exploratory analyses additionally revealed that not only the teller's own high narcissism score increased the SC during self-disclosure but also the story-recipient's high score in narcissism increased the teller's SC activity during self-disclosure.

Our results are in line with earlier psychophysiological research that has shown a relationship between grandiose narcissistic traits and elevated stress and emotional reactivity in context of social evaluation (e.g., Edelman et al., 2010; Coleman et al., 2019; Anonymized, 2023). In telling about one's emotional experiences and sharing private emotions, individuals do more than just convey information: they put their *selves* on the line for others to judge (Goffman, 1955). It is therefore intuitively understandable that people with higher levels of grandiose narcissism exhibit heightened physiological reactivity when disclosing information about themselves. This can be attributed to self-disclosure being a potentially crucial mechanism for managing one's self-presentation, and the more narcissistic individuals are often especially motivated to portray themselves in favorable light (Morf and Rhodewalt, 2001; Casale et al., 2016).

SC mainly indicates sympathetic activity (Benedek and Kaernbach, 2010), while HR reflects a combination of sympathetic and parasympathetic activity. For example, HR deceleration can co-occur with increases in sympathetic activity as assessed by other measures (Vila et al., 2007). While the HR accelerations observed in this study may have resulted from decreased parasympathetic activity or increased sympathetic activity, the joint pattern of SC and HR results obtained suggest the latter as the predominant cause for the observed effects. While expected, the detection of the interaction effects between Role and Narcissism level in multiple dependent ANS dimensions further supports the reliability of the findings.

Apart from posing a potential self-threat, self-disclosure also offers a chance for self-enhancement and gaining validation from others (cf. Tamir and Mitchell, 2012). It is, therefore, possible that the elevated physiological arousal associated with self-disclosure in N+ individuals was not merely due to perceived self-threat but reflected a stronger

motivation to present themselves in the most favorable light. Initially, we hypothesized that the N+ participants would exhibit an equal increase of arousal levels when telling about shameful events as when telling about the moments of admiration, as in both topics the teller puts their self at stake. Our results, however, showed that SC levels of the more narcissistic participants were elevated when they told a story about being admired rather than when describing shameful events. This would suggest that the N+ participants reacted more to the possibility to gain validation and admiration from their co-participant than to the possible self-threat involved. Alternatively, it is possible that the stories of admiration that the N+ participants told were somehow qualitatively different from the ones told by N- participants (e.g., excessive self-enhancement), which might have reduced the affiliative behavior of the story-recipients thus leading to increased arousal in the N+ tellers (cf. Anonymized, 2015; Anonymized, 2023). In the future, a more detailed investigation of story contents would, therefore, be required.

Finally, the results of our exploratory analyses suggested that there might be something different and potentially stressful in the narcissistic story-recipients' conversational behavior. That is, not only the teller's own high narcissism score was associated with elevated physiological arousal, but also the story-recipient's high score in narcissism increased the teller's SC activity. While it remains unclear what caused this "partner effect", it could well be rooted in a particular story-reception style of the recipients. Future studies should, therefore, examine individual differences also in the recipient behaviors, such as verbal and non-verbal displays of affiliation, nodding, and eye-contact.

##### 4.1. Strengths and limitations

The study has at least five key limitations that should be considered when interpreting the results. First, our sample size was modest, thereby resulting in insufficient statistical power to reliably detect small-to-medium sized effects. In anticipation of sample size constraints, participants were recruited and assigned to dyads using extreme groups approach, which increases statistical power, but carries potential effects for reliability and interpretability of the results (see Preacher et al., 2005). Further studies with larger samples and continuous variables are, therefore, required to replicate the obtained findings. Second, all three studies were based on the same sample. While this enabled us to examine how specific or general the physiological reactions associated with grandiose narcissism were from the socio-emotional context point of view, it can nonetheless be considered a limitation that affects the generalizability of the results. Third, the sample was composed of young and mostly female university students that were divided to same-sex dyads, which also affects the generalizability of the results to the general population. Fourth, in this study we only considered the participants' levels of trait grandiose narcissism. It is possible that some other personality traits (e.g., neuroticism or vulnerable narcissism) might also explain our findings. Fifth, the explanatory power of the state measures was limited, partly due to time constraints of the study. Including more specific and frequent participants' self-reports, such as evaluations of interaction itself as rewarding or threatening and/or within the experiments instead of solely after them could provide additional evidence to support the interpretation of the physiological data.

These limitations notwithstanding, there were multiple strengths in the current study. Earlier research on narcissism has relied heavily on self-reports, whereas we used more objective indices of psychophysiological measures in our examination. Considering that the naturalistic dyadic experimental design was likely to increase the proportion of unexplained variance in the outcome measures, the obtained interaction effects between narcissism and self-disclosure on autonomic arousal is notable. The fact that similar interaction effects between self-disclosure and narcissism were observed in both SC and HR activity further demonstrates the robustness of the results. Finally, our naturalistic experiment on physiological arousal in interaction utilized rather subtle manipulations of interaction content and role of interactants as a teller

or recipient in contrast to conventional studies that employ more acute stressors for participants (e.g., Anonymized, 2023). It is therefore notable that a moderating effect of narcissism on physiological arousal during self-disclosure was observed in both Experiment 2 and 3. The lack of result in Experiment 1 is likely to be due to the lacking information of speaker switches.

## 5. Conclusions

Overall, we found a persistent pattern of grandiose narcissists' elevated physiological arousal during self-disclosure in naturalistic conversation. This heightened arousal can be attributed to the dual nature of self-disclosure, presenting both a potential self-threat and an opportunity for self-enhancement and validation. Unexpectedly, our results reveal that among the more narcissistic participants, elevated physiological arousal is associated with narratives of admiration rather than shameful events. This implies a reaction to the possibility of gaining validation rather than to potential self-threats. Further investigation indicated an impact of story-recipients' level of narcissism on tellers' arousal, emphasizing the need for future research to unravel the nuanced dynamics of narcissistic conversational and narrative practices.

## CRediT authorship contribution statement

**E. Koskinen:** Writing – original draft, Supervision, Project administration, Investigation, Conceptualization. **P. Henttonen:** Writing – original draft, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **V. Harjunen:** Writing – original draft, Visualization, Methodology, Formal analysis, Data curation, Conceptualization. **E. Krusemark:** Writing – original draft, Conceptualization. **J. Salmi:** Writing – original draft, Conceptualization. **J. Tuominen:** Writing – original draft, Conceptualization. **M. Wuolio:** Writing – original draft, Visualization, Project administration, Investigation. **A. Peräkylä:** Writing – original draft, Supervision, Project administration, Funding acquisition, Conceptualization.

## Declaration of Generative AI and AI-assisted technologies in the writing process

During the preparation of this work the author(s) used ChatGPT in order to improve the readability of the text. After using this tool, the authors reviewed and edited the content as needed and take full responsibility for the content of the publication.

## Declaration of competing interest

none.

## Acknowledgements

This work was supported by the Academy of Finland (grants #319113 and #320248 to AP and grant #325981 to JS) and the Society of Swedish Literature in Finland. The authors wish to thank Sanna Pesonen and Sanna Kie Kettunen for their great effort in the data collection, as well as other members of the 'Facing Narcissism' group for their invaluable comments and feedback throughout the project.

## Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.ijpsycho.2025.112527>.

## Data availability

Summary statistics from physiological data and self-reports are made available in Open Science Framework: <https://osf.io/v7f63/>

[view\\_only=e08509ad662f405b92183f74d084ad7a](https://doi.org/10.1016/j.ijpsycho.2025.112527). Audio and video data are not shared in order to protect the anonymity of the research participants.

## References

- Ackerman, R.A., Witt, E.A., Donnellan, M.B., Trzesniewski, K.H., Robins, R.W., Kashy, D.A., 2011. What does the narcissistic personality inventory really measure? *Assessment* 18 (1), 67–87. <https://doi.org/10.1177/1073191110382845>.
- Ambady, N., Skowronski, J.J. (Eds.), 2008. *First Impressions*. Guilford Press.
- Antaki, C., Barnes, R., Leudar, I., 2005. Self-disclosure as a situated interactional practice. *Br. J. Soc. Psychol.* 44, 181–199. <https://doi.org/10.1348/014466604X15733>.
- Benedek, M., Kaernbach, C., 2010. A continuous measure of phasic electrodermal activity. *J. Neurosci. Methods* 190 (1), 80–91.
- Bradley, M.M., Lang, P.J., 1994. Measuring emotion: the self-assessment manikin and the semantic differential. *J. Behav. Ther. Exp. Psychiatry* 25 (1), 49–59.
- Brown, P., Levinson, S., 1987. *Politeness: Some Universals in Language Usage*. Cambridge University Press.
- Burger, J.M., 1990. Desire for control and interpersonal interaction style. *J. Res. Pers.* 24 (1), 32–44.
- Campbell, W.K., 1999. Narcissism and romantic attraction. *J. Pers. Soc. Psychol.* 77 (6), 1254–1270. <https://doi.org/10.1037/0022-3514.77.6.1254>.
- Campbell, W.K., Foster, C.A., Finkel, E.J., 2002. Does self-love lead to love for others? A story of narcissistic game playing. *J. Pers. Soc. Psychol.* 83 (2), 340–354.
- Casale, S., Fioravanti, G., Rugai, L., Flett, G.L., Hewitt, P.L., 2016. The interpersonal expression of perfectionism among grandiose and vulnerable narcissists: perfectionistic self-presentation, effortless perfection, and the ability to seem perfect. *Personal. Individ. Differ.* 99, 320–324.
- Cascio, C.N., Konrath, S.H., Falk, E.B., 2015. Narcissists' social pain seen only in the brain. *Soc. Cogn. Affect. Neurosci.* 10 (3), 335–341.
- Christensen, A.J., Smith, T.W., 1993. Cynical hostility and cardiovascular reactivity during self-disclosure. *Psychosom. Med.* 55 (2), 193–202.
- Coates, D., Winston, T., 1987. The dilemma of distress disclosure. In: Derlega, V.J., Berg, J.H. (Eds.), *Self-Disclosure. Perspectives in Social Psychology*. Springer, Boston, MA. [https://doi.org/10.1007/978-1-4899-3523-6\\_11](https://doi.org/10.1007/978-1-4899-3523-6_11).
- Coleman, S.R.M., Pincus, A.L., Smyth, J.M., 2019. Narcissism and stress-reactivity: a biobehavioral health perspective. *Health Psychol. Rev.* 13 (1), 35–72. <https://doi.org/10.1080/17437199.2018.1547118>.
- Czarna, A.Z., Wróbel, M., Dufner, M., Zeigler-Hill, V., 2015. Narcissism and emotional contagion: do narcissists "catch" the emotions of others? *Soc. Psychol. Personal. Sci.* 6 (3), 318–324. <https://doi.org/10.1177/1948550614559652>.
- Derlega, V.J., Winstead, B.A., Greene, K., 2008. Self-disclosure and starting a close relationship. In: Sprecher, S., Wenzel, A., Harvey, J. (Eds.), *Handbook of Relationship Initiation*. Psychology Press, pp. 153–174.
- Dunbar, R.I.M., Marriott, A., Duncan, N.D.C., 1997. Human conversational behavior. *Hum. Nat.* 8 (3), 231–246. <https://doi.org/10.1007/BF02912493>.
- Edelstein, R.S., Yim, I.S., Quas, J.A., 2010. Narcissism predicts heightened cortisol reactivity to a psychosocial stressor in men. *J. Res. Pers.* 44 (5), 565–572.
- Gentile, B., Miller, J.D., Hoffman, B.J., Reidy, D.E., Zeichner, A., Campbell, W.K., 2013. A test of two brief measures of grandiose narcissism: the narcissistic personality inventory-13 and the narcissistic personality inventory-16. *Psychol. Assess.* 25 (4), 1120–1136.
- Giacomin, M., Jordan, C.H., 2016. Self-focused and feeling fine: assessing state narcissism and its relation to well-being. *J. Res. Pers.* 63, 12–21. <https://doi.org/10.1016/j.jrp.2016.04.009>.
- Goffman, E., 1955. On face-work. *Psychiatry* 18 (3), 213–231.
- Goffman, E., 1959. *Presentation of self in everyday life*. Anchor.
- Gramzow, R., Tangney, J.P., 1992. Proneness to shame and the narcissistic personality. *Personal. Soc. Psychol. Bull.* 18 (3), 369–376.
- Harjunen, V.J., Krusemark, E., Stigzelius, S., Halmesvaara, O.W., Annala, M., Henttonen, P., Määttänen, I., Silfver, M., Keltikangas-Järvinen, L., Ravaja, N., 2023. Under the thin skin of narcissus: Facial muscle activity reveals amplified emotional responses to negative social evaluation in individuals with grandiose narcissistic traits. *Psychophysiology* 60 (9), e14315. <https://doi.org/10.1111/psyp.14315>.
- Hart, W., Adams, J., Burton, K.A., Tortoriello, G.K., 2017. Narcissism and self-presentation: profiling grandiose and vulnerable Narcissists' self-presentation tactic use. *Personal. Individ. Differ.* 104, 48–57. <https://doi.org/10.1016/j.paid.2016.06.062>.
- Henttonen, P., Salmi, J., Peräkylä, A., Krusemark, E.A., 2022. Grandiosity, vulnerability, and narcissistic fluctuation: Examining reliability, measurement invariance, and construct validity of four brief narcissism measures. *Frontiers in Psychology* 13, 993663.
- Heritage, J., 2011. Territories of knowledge, territories of experience: Empathic moments in interaction. In: Stivers, T., Mondada, L., Steensig, J. (Eds.), *The Morality of Knowledge in Conversation*. Cambridge University Press, pp. 159–183.
- Holtgraves, T., 1990. The language of self-disclosure. In: Giles, H., Robinson, W.P. (Eds.), *Handbook of Language and Social Psychology*. John Wiley & Sons, pp. 191–207.
- Jourard, S.M., Lasakow, P., 1958. Some factors in self-disclosure. *J. Abnorm. Soc. Psychol.* 56 (1), 91–98.
- Kenny, D.A., Kashy, D.A., Cook, W.L., 2006. *Dyadic Data Analysis*. Guilford Press.
- Kernberg, O., 1975. *Borderline Conditions and Pathological Narcissism*. Rowman & Littlefield.

- Kernberg, O., 1984. *Severe Personality Disorders: Psychotherapeutic Strategies*. Yale University Press.
- Kleiner, M., Brainard, D., Pelli, D., Ingling, A., Murray, R., Broussard, C., 2007. What's new in psychtoolbox-3. *Perception* 36 (14), 1–16.
- Kohut, H., 1971. *The Analysis of the Self: A Systematic Approach to the Psychoanalytic Treatment of Narcissistic Personality Disorders*. University of Chicago Press.
- Koskinen, E., Henttonen, P.J., Harjunen, V.J., Krusemark, E.A., Piispanen, M.P., Voutilainen, L., Wuolio, M.P., Peräkylä, A., 2024. Putting self at stake by telling a story: Storyteller's narcissistic traits modulate physiological emotional reactions to recipient's disengagement. *PLoS One* 19 (8). <https://doi.org/10.1371/journal.pone.0302703>.
- Koskinen, E., Stevanovic, M., Peräkylä, A., 2021. The Recognition and Interactional Management of Face Threats: Comparing Neurotypical Participants and Participants with Asperger's Syndrome. *Soc. Psychol. Q.* 84 (2), 132–154. <https://doi.org/10.1177/01902725211003023>.
- Logren, A., Ruusuvoori, J., Laitinen, J., 2019. Peer responses to self-disclosures in group counseling. *Text & Talk* 39 (5), 613–647. <https://doi.org/10.1515/text-2019-2042>.
- Maynard, D., Zimmerman, D., 1984. Topical talk, ritual and the social organization of relationships. *Soc. Psychol. Q.* 47 (4), 301–316.
- Miller, J.D., Campbell, W.K., Pilkonis, P.A., 2007. Narcissistic personality disorder: relations with distress and functional impairment. *Compr. Psychiatry* 48, 170–177. <https://doi.org/10.1016/j.comppsy.2006.10.003>.
- Miller, J.D., Gentile, B., Carter, N.T., Crowe, M., Hoffman, B.J., Campbell, W.K., 2018. A comparison of the nomological networks associated with forced-choice and Likert formats of the narcissistic personality inventory. *J. Pers. Assess.* 100 (3), 259–267.
- Morf, C.C., Rhodewalt, F., 2001. Unraveling the paradoxes of narcissism: a dynamic self-regulatory processing model. *Psychol. Inq.* 12 (4), 177–196.
- Pan, J., Tompkins, W.J., 1985. A real-time QRS detection algorithm. *IEEE Trans. Biomed. Eng.* 32 (3), 230–236.
- Peräkylä, A., Henttonen, P., Voutilainen, L., Kahri, M., Stevanovic, M., Sams, M., Ravaja, N., 2015. Sharing the emotional load: Recipient affiliation calms down the storyteller. *Soc. Psychol. Q.* 78, 301–323.
- Pincus, A.L., Lukowitsky, M.R., 2010. Pathological narcissism and narcissistic personality disorder. *Annu. Rev. Clin. Psychol.* 6, 421–446.
- Preacher, K.J., Rucker, D.D., MacCallum, R.C., Nicewander, W.A., 2005. Use of the extreme groups approach: a critical reexamination and new recommendations. *Psychol. Methods* 10 (2), 178–192.
- Raskin, R.N., Hall, C.S., 1979. A narcissistic personality inventory. *Psychol. Rep.* 45 (2), 590.
- Reinhard, D.A., Konrath, S.H., Lopez, W.D., Cameron, H.G., 2012. Expensive egos: narcissistic males have higher cortisol. *PLoS One* 7 (1), e30858. <https://doi.org/10.1371/journal.pone.0030858>.
- Rosenfeld, L.B., 1979. Self-disclosure avoidance: why I am afraid to tell you who I am. *Commun. Monogr.* 46 (1), 63–74.
- Schlenker, B.R., 2012. Self-presentation. In: Leary, M.R., Tangney, J.P. (Eds.), *Handbook of Self and Identity*, 2nd ed. The Guilford Press, pp. 542–570.
- Sedikides, C., Rudich, E.A., Gregg, A.P., Kumashiro, M., Rusbul, C., 2004. Are normal narcissists psychologically healthy?: self-esteem matters. *J. Pers. Soc. Psychol.* 87 (3), 400–416.
- Svennevig, J., 2014. Direct and indirect self-presentation in first conversations. *J. Lang. Soc. Psychol.* 33 (3), 302–327.
- Tamir, D.I., Mitchell, J.P., 2012. Disclosing information about the self is intrinsically rewarding. *PNAS* 109 (21), 8038–8043. <https://doi.org/10.1073/pnas.1202129109>.
- Vila, J., Guerra, P., Muñoz, M.Á., Vico, C., Viedma-del Jesús, M.I., Delgado, L.C., Rodríguez, S., 2007. Cardiac defense: from attention to action. *Int. J. Psychophysiol.* 66 (3), 169–182.
- Vinogradov, S., Yalom, I.D., 1990. Self-disclosure in group psychotherapy. In: Stricker, G., Fisher, M. (Eds.), *Self-Disclosure in the Therapeutic Relationship*. Plenum Press, pp. 191–204. [https://doi.org/10.1007/978-1-4899-3582-3\\_13](https://doi.org/10.1007/978-1-4899-3582-3_13).
- Wardecker, B.M., Chopik, W.J., LaBelle, O.P., Edelman, R.S., 2018. Is narcissism associated with baseline cortisol in men and women? *J. Res. Pers.* 72, 44–49. <https://doi.org/10.1016/j.jrjp.2016.07.006>.
- Watson, D., Clark, L.A., Tellegen, A., 1988. Development and validation of brief measures of positive and negative affect: the PANAS scales. *J. Pers. Soc. Psychol.* 54 (6), 1063–1070.
- Watson, P.J., Hickman, S.E., Morris, R.J., 1996. Self-reported narcissism and shame: testing the defensive self-esteem and continuum hypotheses. *Personal. Individ. Differ.* 21 (2), 253–259.