

Running head: NARCISSISM AND SOCIAL NETWORKING SITES

Narcissism and Social Networking Behavior: A Meta-Analysis

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## Abstract

**Objective:** The increasing popularity of social networking sites (SNS) such as Facebook and Twitter has given rise to speculations that the intensity of using these platforms is associated with narcissistic tendencies. However, recent research on this issue has been all but conclusive. **Method:** We present a three-level, random-effects meta-analysis including 289 effect sizes from 57 studies (total  $N = 25,631$ ) on the association between trait narcissism and social networking behavior. **Results:** The meta-analysis identified a small to moderate effect of  $\rho = .17$  ( $\tau = .11$ ), 95% CI [.13, .21], for grandiose narcissism that replicated across different social networking platforms, respondent characteristics, and time. Moderator analyses revealed pronounced cultural differences with stronger associations in power distant cultures. Moreover, social networking behaviors geared toward self-presentation and the number of SNS friends exhibited stronger effects than usage durations. **Conclusions:** Overall, the study supported but also refined the notion of a relationship between engaging in social networking sites and narcissistic personality traits.

*Keywords:* narcissism, social networking, Internet, self-presentation, computer-mediated communication

### **Narcissism and Social Networking Behavior: A Meta-Analysis**

Social networking sites (SNSs) such as Facebook or Twitter have become an important part of the lives of hundreds of millions of users worldwide. Researchers and journalists have argued that the popularity of SNSs is connected to users' narcissism and that social networking behavior reflects narcissistic tendencies (e.g., Buffardi & Campbell, 2008; Fishwick, 2016; Davidow, 2013; Twenge, 2013). However, the existence and the boundary conditions of the link between SNSs use and narcissism is a matter of debate. Whereas some empirical studies found support for a positive relationship between narcissism and social networking behavior (e.g., Fox & Rooney, 2015) other studies found mixed results (e.g., Panek, Nardis, & Konratz, 2013) or even negative effects (e.g., Skues, Williams, & Wise, 2012). The present work is the first to provide a comprehensive meta-analytic overview on the relationship between narcissism and social networking behavior.

#### **The Narcissistic Personality**

Since the late 19<sup>th</sup> century scientists interested in human experience and behavior described excessive self-love with the term narcissism (Ellis, 1898), recurring to the mythological figure of *Narcissus* who—instead of accepting an approach by the nymph *Echo*—fell in love with his image that was reflected from a pond's surface. Narcissism is characterized by an inflated sense of the self and self-entitlement. Two distinct, albeit related forms of narcissism are documented (Miller et al., 2011): *Grandiose narcissism* involves a sense of self-importance, uniqueness, dominance, and grandiosity. *Vulnerable narcissism* is characterized by insecurity, interpersonal hypersensitivity, and social withdrawal (for a discussion on the narcissist personality disorder, NPD, which is not focused in the present study, see for example Pincus & Lukowitsky, 2010). Individuals

with a pronounced grandiose narcissism (the form that has received more attention in recent years) perceive themselves as gifted, remarkable, and successful, and individuals high in grandiose narcissism engage in active self-presentation (they tend to brag about their accomplishments, cf. Paulhus, 1998). These individuals need others in order to demonstrate their high and superior qualities and achievements (e.g., Wallace & Baumeister, 2002). Narcissists' high self-esteem is rather unstable (Rhodewalt, Madrian, & Cheney, 1998; Zeigler-Hill, Myers, & Clark, 2010) and narcissists are more likely to react aggressively when they are faced with threats to their embellished self-concepts (Bushman & Baumeister, 1998). Cultural influences are considered to play a substantial role in the development and maintenance of a narcissistic self. Initial studies that compared narcissism in different world regions suggest that narcissism is more prevalent in Western cultures (USA and to a lesser extent Europe) than in Eastern cultures (Asia; Foster, Campbell, & Twenge, 2003; Miller et al., 2015). Some researchers further identified an increase in narcissism across time ("generation me", e.g., Twenge, Konrath, Foster, Campbell, & Bushman, 2008), whereas others found few support for generational changes in narcissism (e.g., Grijalva et al., 2015; Roberts, Edmonds, & Grijalva, 2010; Trzesniewski & Donnellan, 2010).

### **Narcissism in the Digital Age**

Differences in narcissism across regions and time have been connected to the prevalent media culture, which is considered to reflect and shape individuals' narcissism (Twenge, 2013). In many cultures and world regions, the engagement in SNSs has become an immensely popular pastime activity. Recent data from national surveys suggest that nearly 79% of all Internet users in the United States are active in SNSs (Greenwood, Perrin,

& Duggan, 2016). Since the early days, concerns have been raised that Facebook is a playground that promotes narcissistic tendencies by encouraging users to present themselves frequently and in most positive ways (Buffardi & Campbell, 2008). Indeed, SNSs entail particular features of communication that differ from offline communication (e.g., Valkenburg & Peter, 2011), and that might suit narcissistic tendencies. First, SNSs provide easy access to a large number of other individuals. Users have the opportunity to send self-related information to a large audience and to receive feedback about oneself and information about others. Second, users can select the information they reveal about themselves. They can use pictures and words to communicate success and superiority (thereby ignoring incidents that do not fit their embellished self-concept). Third, the asynchronicity of communication on SNSs gives users the opportunity to craft their self-presentations meticulously.

The first study on the relationship between SNSs use and narcissism (Buffardi & Campbell, 2008) showed that users' self-reported grandiose narcissism was significantly related to the quantity of their social interactions (a composite measure of number of friends and number of wall posts) but not to the quantity of information listed in the "about self" section. Moreover, the researchers rated the extent of self-promoting content (mainly self-promotion in pictures and quotes) on the participants' Facebook pages and correlated these ratings with self-reported grandiose narcissism. Several Facebook content indicators such as self-promoting quotes yielded a positive relationship with self-reported narcissism, whereas others (e.g., self-promoting pictures) did not. These results suggest that narcissists seem to be particularly attracted to activities that reinforce their sense of self-importance and provide the means to present themselves favorably to others. They further strive for a

large audience by gathering a large number of Facebook friends and craft frequent status updates that reflect their grandiose self-image.

When this seminal study was submitted, Facebook had around 29 million active users—which are around 2% of its current active membership. Since then, a sizeable research on the link between SNSs and narcissism was conducted, paralleled by substantial media coverage on the topic. To date the available research is spread through different disciplines and remains somewhat inconclusive: Whereas many studies have supported the notion of a positive relationship between grandiose narcissism and the number of contacts on SNSs (e.g., Fox & Rooney, 2015; Panek et al., 2013), others found no (e.g., Lee, Ahn, & Kim, 2014; Utz, Tanis, & Vermeulen, 2012) or even reversed relationships (e.g., Skues et al., 2012; Wang, Jackson, Zhang, & Su, 2012). Similarly, whereas some narrative reviews in the field tend to emphasize the narcissism-SNSs link (e.g., Twenge, 2013), others assess the connection to be non-established (e.g., Ferguson, 2016).

### **The Current Meta-Analysis**

This meta-analysis is the first quantitative summary of prior findings on the relationship between narcissism and social networking behavior. Two general aims guided the research. On the one hand, we sought to provide meta-analytical evidence regarding the magnitude and variability of the relationship between SNSs behavior and narcissism. On the other hand, we examined the boundary conditions of the SNS-narcissism link. Three hypotheses guided this approach:

First, two forms of narcissism were distinguished, grandiose narcissism and vulnerable narcissism. Individuals high in grandiose narcissism are assertive, socially potent, and are driven by an inflated sense of self-admiration and overambition (Ackerman,

et al., 2011). Grandiose narcissists tend to exaggerate their positive qualities and praise their own virtues (Grijalva & Zhang, 2016; Paulhus, 1998). At the same time they are worried that others might not acknowledge their grandiosity. Therefore, they seek out social interactions to gain attention from others and corroborate their exaggerated self-views (Morf & Rhodewalt, 2001). SNSs provide such opportunities for self-presentation (Valkenburg & Peter, 2011), for example, by posting status updates and photos about one's life or publicly expressing strong opinions on others' achievements (i.e., commenting). Therefore, we expected that SNS activities would particularly suit individuals with pronounced grandiose narcissism. In contrast, vulnerable narcissism is associated with insecurity, a fragile self-esteem, and social withdrawal (Ackerman et al., 2011). Vulnerable narcissists do not openly seek approval from others because they do not have trust in their abilities (Pincus et al., 2009). Rather, they avoid situations that might not provide the desired approval. Consequently, SNS activities are likely to be less attractive for individuals with pronounced vulnerable narcissism. Thus, we expected a stronger relationship between SNS behaviors and grandiose narcissism than between SNS behaviors and vulnerable narcissism (*Hypothesis 1*).

Second, we assumed that SNS behaviors that reinforce their sense of self-importance would be particularly attractive for narcissists. A central characteristic of grandiose narcissists is their desire for attention; they love being among people, to talk, and to socialize (Holtzman, Vazire, & Mehl, 2010). Grandiose narcissists strive for public admiration and use interpersonal relationships as a means to regulate their positive self-views (Wallace & Baumeister, 2002). Although narcissists exhibit a strong motivation toward establishing new friendships (Foster, Misra, & Reidy, 2009), these friendships are

rarely enduring and primarily represent a means for gaining popularity (Leckelt, Küfner, Nestler, & Back, 2015). Accordingly, for grandiose narcissists SNSs might offer particularly easy access to a large number of superficial friendships and a platform to present themselves at their best. Therefore, we would expect grandiose narcissism to be associated with a larger number of contacts in SNSs because these online friends should provide the audience for narcissists' self-admiration. Similarly, SNS activities that are aimed at presenting oneself favorably, for example, in status updates or photos posted online, should be more strongly linked to narcissism than broad indicators of engagement in SNSs (e.g., time spent with SNSs). The latter also subsumes activities that might not be particularly attractive to narcissists (e.g., watching videos, playing games, lurking). Therefore, narcissism is expected to be more strongly associated with the number of SNS friends and SNS behaviors aimed at self-presentations as compared to broad usage indicators of SNSs (*Hypothesis 2*).

Finally, the cultural background of the study participants was addressed. Prior research indicates that members of Eastern countries (e.g., Asia, Middle East) spend on average less time with SNSs and attribute less importance to SNSs than members of Western cultures (e.g., United States or Western Europe, cf., Jackson & Wang, 2013; Wang & Sun, 2013). However, social media might also provide an escape from prevalent societal, religious, or legal norms. For example, in tightly controlled cultures that typically restrict cross-gender interactions (such as in many Arab countries) web-based interactions in discussion boards have been shown to reduce barriers between genders and facilitate open conversations between men and women (Al-Saggaf & Williamson, 2004; Madini & de Nooy, 2016). Similarly, SNSs could be particularly welcomed platforms to enact

narcissistic behaviors if cultural constraints restrict respective behaviors in everyday life. In collectivistic cultures individuals focus on interdependence and the integrity, norms, and goals of the in-group more strongly than in individualistic cultures (Triandis, 1995). Therefore, narcissistic behaviors are generally less valued in collectivistic societies (Foster et al., 2003) and thus SNS activities might be a sought after opportunity for narcissists to communicate outside the cohesive structure of community and family (De Angeli, 2009). Thus, grandiose narcissism might be particularly predictive of engaging in SNS in collectivistic societies. Likewise, in cultures that value pronounced social hierarchies and an unequal power distribution among their members (high power distance, Hofstede, Hofstede, & Minkov, 2010) people are reluctant to adopt narcissistic behavioral styles in their everyday lives (Koopman et al., 1999). Therefore, SNSs might provide a particularly rare and welcome opportunity for narcissistic individuals for standing out and presenting oneself, independent of their actual social standing in the society (Al Omoush, Yaseen, & Alma'Aitah, 2012). Thus, it was hypothesized that the link between SNS behaviors and grandiose narcissism would increase with the degree of collectivism (*Hypothesis 3a*) and power distance (*Hypothesis 3b*) in the participants' culture.

## Method

### Meta-Analytic Database

**Search process.** Relevant studies for the meta-analysis were identified on January 4<sup>th</sup> 2016 from searches in various scientific databases (*PsycINFO, Psyn dex, PsycArticles, Business Source Complete, EconLit, SocINDEX, ERIC, Medline*) using the keywords *narcissism* and *social networking, Facebook, Twitter, MySpace, Instagram, Friendster, Sixdegrees, Livejournal, Orkut, Linkedin, XING, StudiVZ, Renren, Bebo, Weibo, Habbo, or*

*Hyves*. Further studies were retrieved by conducting a similar search in the *ProQuest Dissertations & Theses Database* and *Google Scholar*. For the latter, we examined all 1,000 results that are returned by the search engine (cf. Boeker, Vach, & Motschall, 2013).

Studies were included in the meta-analytic database dependent upon the following conditions: (a) The study was published between 1997 (the founding year of the first major SNS, cf. Boyd & Ellison, 2007) and 2015, and (b) was written in English or German. (c) The study administered a validated instrument assessing trait narcissism. Ad-hoc constructed scales were excluded to avoid biases resulting from unreliable scales lacking construct validities. (d) Narcissism was measured as a self-report. Studies that collected observer reports<sup>1</sup> or inferred narcissism from thin slices of behavior were excluded. (e) The study examined social networking *behaviors* such as durations (e.g., usage time per day), frequencies (e.g., number of logins, friends or postings), text lengths (e.g., number of words in a profile), or intensity ratings (e.g., the Facebook Intensity Scale; Ellison, Steinfield, & Lampe, 2007). Studies that exclusively reported evaluative components of social networking such as attitudes, motives, or emotional experiences were excluded. (f) The study reported correlations between narcissism and SNS behaviors or appropriate statistics that could be transformed into correlations. (g) The study provided the sample size and (h) consisted of healthy individuals without psychopathological symptoms; thus, studies on clinical populations (e.g., with narcissistic personality disorders) were not considered. After

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<sup>1</sup> We only identified a single study reporting correlations between observer reports of narcissism and SNS behaviors. Because moderator analyses using a single study did not seem feasible, this study was excluded from the analyses.

applying these inclusion criteria the search resulted in 57 publications (see online supplement).

**Coding process.** The authors created a coding protocol for the extraction of relevant information from each study. The protocol included the definition of variables, guidelines regarding the range of values, and coding examples. The focal variable was the association between narcissism and SNS behaviors. In addition, the size of the examined sample and the coefficient alpha reliability of the narcissism scale were recorded. Moreover, we coded several moderators according to our hypotheses: We extracted (a) the name (and, if applicable, the subscale) of the administered narcissism instrument including (b) the number of administered items. These were subsequently classified as either operationalizing a grandiose or a vulnerable form of narcissism (see online supplement). Regarding the studied SNS we extracted (c) its name and (d) the specific indicator used to quantify SNS behaviors. (e) To examine potential sample effects we extracted the mean age of the respondents and the percentage of female respondents. (f) The publication year was used to examine changes over time. (g) To account for the participants' cultural origin, we first recorded the country where the participants originated from. Subsequently the respective culture scores for the four primary dimensions of culture (Hofstede et al., 2010), that is, power distance (the extent to which a society accepts inequalities and hierarchies among their people), individualism (the degree of autonomy and self-actualization as compared to interrelatedness), masculinity (the amount of prevalent emotional values from modest and caring to assertive and competitive), and uncertainty avoidance (the tendency towards tolerance towards ambiguity and lack of structure) were allotted for each country.

These culture scores range from 0 to 100 and reflect the relative standing of each country on the respective dimension.

Using the coding protocol three research assistants extracted the relevant information from each study. To evaluate the coding process, a random sample of 33 studies (including about 57% of all effect sizes) was independently coded a second time by a fourth research assistant trained in meta-analytic methods. For categorical variables (e.g., type of SNS) intercoder agreement was quantified using Cohen's (1960) Kappa  $\kappa$  and for continuous variables (e.g., correlation coefficients) we computed two-way intraclass coefficients (ICC; Shrout & Fleiss, 1979). Intercoder agreement is strong for values exceeding .70 and excellent for values greater than .90 (LeBreton & Senter, 2008). The intercoder reliability for the focal effect size and the sample size were ICC = .96, 95% CI [.95, .97] and ICC = 1.00, 95% CI [1.00, 1.00], respectively. The respective ICCs and Cohen's  $\kappa$  for the remaining variables had a median of .995 (*Min* = .982). The first author resolved disagreements by revisiting the respective study.

**Type of SNS behavior.** The different SNS behaviors were classified independently by the two authors into seven categories. First, the number of friends in SNSs was considered a relevant indicator. Second, we identified three behaviors related to self-presentations, namely (a) the generation of written SNS content (e.g., status updates, comments), (b) the provision of visual SNS content (e.g., uploading photos), and (c) the membership in common interest groups. Third, three indicators were used to represent general SNSs activities: (d) usage durations (i.e., the average time spent), (e) usage frequency (i.e., the number of check-ins), and (f) usage intensity as measured by the Facebook Intensity Scale (Ellison et al., 2007). The latter is a standardized measure

that combines quantitative aspects of SNSs usage with users' emotional connectedness to Facebook and integration into their daily lives. The respective inter-coder reliability was Cohen's  $\kappa = .91$ . Disagreements were resolved by discussion.

### **Meta-Analytic Procedure**

**Effect size.** The Pearson product-moment correlation was used as effect size measure. For one study that did not report correlation coefficients, two effect sizes were approximated by converting odds ratios into Pearson correlations (see Bonett, 2007). Moreover, about 5 percent of all effect sizes were approximated by transforming standardized weights from multiple linear regression analyses into correlation coefficients (see Peterson & Brown, 2005). Because the latter is discussed controversially (e.g., Aloe, 2015; Rothstein & Bushman, 2015), this decision was evaluated in sensitivity analyses that compared the meta-analytical results from pooled correlations to those from transformed effect sizes. Extreme correlations were identified using the studentized deleted residual ( $\alpha = .01$ ; Viechtbauer & Cheung, 2010). The impact of these outliers on the pooled effects was examined in sensitivity analyses that removed the identified outliers from the analyses.

**Meta-analytic model.** The effect sizes were pooled using a random-effects model with a maximum likelihood estimator (Cheung, 2015). Because some studies provided more than one effect size (e.g., obtained for different social networking behaviors) the meta-analysis was formulated as a three-level model (cf. Cheung, 2014). Three-level meta-analyses acknowledge dependencies between effect sizes stemming from the same sample by decomposing the total random variance  $\tau^2$  into two variance components: The random level-2 variance  $\tau^2_{(2)}$  reflects the heterogeneity of effects within samples, whereas the random level-3 variance  $\tau^2_{(3)}$  indicates the heterogeneity of effect sizes between samples.

Formally, the three-level random-effects model is given as  $r_{ij} = \rho + u_{(2)ij} + u_{(3)j} + e_{ij}$  or alternatively as  $r_{ij} = \lambda_{ij} + e_{ij}$  at level 1,  $\lambda_{ij} = f_j + u_{(2)ij}$ , at level 2, and  $f_j = \rho + u_{(3)j}$  at level 3, with  $r_{ij}$  as the observed effect size,  $\lambda_{ij}$  as the true effect size,  $e_{ij}$  as the known sampling error for the  $i$ th effect size in the  $j$ th sample,  $f_j$  as the true effect size in the  $j$ th sample,  $\rho$  as the average population effect size, and  $Var(u_{(2)ij}) = \tau^2_{(2)}$  and  $Var(u_{(3)j}) = \tau^2_{(3)}$  as the level-2 and level-3 random variances (cf. Cheung, 2014). Because sampling error is assumed to be known in meta-analyses  $e_{ij}$  is not estimated. Thus, three-level meta-analyses directly model dependencies between effect sizes. In contrast to other approaches that deal with dependent effect sizes in meta-analyses (e.g., averaging dependent effects; see van den Noortgate, López-López, Marín-Martínez, & Sánchez-Meca, 2013, for more details) three-level meta-analyses can easily address hypotheses on differences between individual effect sizes. The heterogeneity in observed effect sizes was quantified by a credibility interval (CRI) around the pooled effect. Moreover, we report  $I^2$  that indicates the percentage of the total variance in observed effects due to random variance (Higgins, Thompson, Deeks, & Altman, 2003). Prevalent rules of thumb regard  $I^2$  of .25, .50, and .75 as indicative of low, medium, and high heterogeneity. Moderating effects on the pooled effect size were examined using weighted, mixed-effects regression analyses (cf. López-López, Marín-Martínez, Sánchez-Meca, Noortgate, & Viechtbauer, 2014).

**Correction for artifacts.** To remove systematic influences that might distort reported study effects, we addressed two sources of error: First, sampling error was accounted for by weighting the individual correlations by the inverse of their variances. Second, the pooled effect was corrected for measurement error in the narcissism scales using a regression approach (see Hox & de Leeuw, 2003). Thus, the unreliability (i.e., 1

minus the coefficient alpha reliability) of the narcissism scale was used as a predictor of the individual effect sizes. The intercept in the respective regression model represents the pooled effect corrected for measurement error. Because rather few studies reported the reliability of the examined SNSs behaviors, comparable corrections were not applied for this variable.

**Missing values.** For about 25% of effect sizes the respective reliability of the narcissism scale was missing. Moreover, about 8% of studies failed to report the percentage of female respondents and about 19% did not indicate the mean age of their sample. Because single value imputations for missing values (e.g., the mean) can artificially deflate the effect size variance (e.g., Bushman & Wang, 1996), we handled missing values in our analyses by multiple imputation (see Pigott, 2009). Following Graham and colleagues we used 20 imputed values (Graham, Olchowski, & Gilreath, 2007).

### **Publication Bias**

Presence and consequences of publication bias were examined in three ways. First, the publication type was used as a moderator in a respective regression analysis. Significant differences in the pooled effects derived from published and unpublished sources would indicate that the published research literature is distorted due to the systematic suppression of (most likely small) effects. Second, PET-PEESE analyses (Stanley & Doucouliagos, 2014) tested the funnel plot of the effects sizes in our meta-analytic database (i.e., including published and unpublished effects) for asymmetry by regressing the effect sizes on their standard errors or variances. A significant effect would indicate systematically missing studies that might have distorted the pooled effect. Third, *p*-curve analyses (Simonsohn, Nelson, & Simmons, 2014) determined whether the published findings provide evidence

for a true phenomenon or more likely reflect an artifact of publication bias and questionable research practices such as *p*-hacking (e.g., excluding participants or selectively reporting variables to achieve significant results).

### **Statistical Software and Open Data**

All meta-analytic models were estimated with the *metaSEM* software version 0.9.6 (Cheung, 2015) using *OpenMx* version 2.6.9 (Neale et al., 2016). Multiple imputations were conducted with the *mice* package version 2.25 (van Buuren & Groothuis-Oudshoorn, 2011) in *R* version 3.2.4 (R Core Team, 2016). The raw data including the *R* syntax files are available at <https://osf.io/5qde9/>.

## **Results**

### **Descriptive Statistics**

The meta-analysis is based on 57 studies that were published between 2008 and 2015. Most studies were reported either in peer-reviewed journal articles (68%) or in books (2%); unpublished work appeared in theses (23%), conference proceedings, and research reports (8%). The meta-analytic database comprised 62 independent samples providing 289 effect sizes, with each sample contributing between 1 and 32 (*Mdn* = 3) effect sizes. The meta-analysis involved 25,631 participants (range of the individual samples' *N*s: 31 to 2,927) from 16 countries (see Figure 1). About 50% of all samples originated from the United States, 21% from Europe, and 15% from Asia. Approximately 60% of the participants were female and the mean age of the samples ranged from 14 to 35 years ( $M = 22.82$ ,  $SD = 4.72$ ). Most correlations (85%) involved variants of the Narcissistic Personality Inventory (Raskin & Terry, 1988). The measurement precision of the administered narcissism scales was generally good and showed an average coefficient alpha reliability of

.76 (for further details see online supplement). Among the diverse SNSs Facebook (58%) and Twitter (14%) dominated the observed correlations; the rest referred to generic SNSs (11%) or various regional or special-purpose platforms such as StudiVZ or Weibo.

### **Overall Pooled Correlation**

The results of the meta-analysis are summarized in Table 1. The uncorrected mean correlation between narcissism and SNS behavior was  $r = .14$  ( $SD = .13$ ). After addressing sampling and measurement error the respective true score correlation increased to  $\rho = .17$  ( $\tau = .11$ ), 95% CI [.13, .20]. This result was rather robust and also replicated for various subgroups of effects. For example, studies examining Facebook exhibited a pooled correlation of  $\rho = .16$  ( $\tau = .13$ ), 95% CI [.10, .21], and those focusing on Twitter a pooled correlation of  $\rho = .16$  ( $\tau = .05$ ), 95% CI [.11, .22]. However, grouping the effects by the type of SNS behavior showed markedly different correlations (see Table 1). For example, effect sizes focusing on usage durations resulted in slightly smaller pooled correlations,  $\rho = .14$  ( $\tau = .15$ ), 95% CI [.06, .22], than effect sizes related to visual self-presentations,  $\rho = .23$  ( $\tau = .12$ ), 95% CI [.14, .33]. This suggests that the type of the examined social networking behavior might represent a relevant moderator of narcissism's consequences (see below).

Overall, these results support the hypothesized effect between grandiose narcissism and social networking behaviors. However, the significant random variance resulted in a rather large credibility interval around the pooled effect ranging from .02 to .31 (see Table 1). Moreover, the  $I^2$  indices around .40 also pointed at moderate unaccounted heterogeneity (cf. Higgins et al., 2003) that might be explained by one or more moderators.

### **Moderator Analyses**

The three hypotheses regarding moderating effects were examined by regressing the individual effect sizes on the moderating variables (see method section). To correct for measurement errors all regressions also included the unreliability of the narcissism scale as an additional predictor.

**Type of narcissism.** The first hypothesis assumed that the association between narcissism and SNS behaviors would be larger for grandiose narcissism than for vulnerable narcissism. A respective mixed-effects regression analysis using the type of narcissism (coded 1 for grandiose and -1 for vulnerable) as a predictor of the individual correlations resulted in a significant effect,  $\gamma = 0.05$ ,  $SE = 0.02$ ,  $p = .01$ . In line with Hypothesis 1, the effect for grandiose narcissism  $\rho = .17$  ( $\tau = .11$ ), 95% CI [.13, .21], was larger than the effect for vulnerable narcissism  $\rho = .08$  ( $\tau = .14$ ), 95% CI [-.07, .24] (see Table 2). However, for vulnerable narcissism only four samples were available. Therefore, these results should be considered exploratory unless a larger body of effects can be examined. In light of the divergent associations of the two forms of narcissism, the following moderator analyses are limited to the 60 samples involving grandiose narcissism.

**Type of social networking behavior.** It was expected that narcissism would be more strongly correlated to behaviors gearing towards self-presentations such as posting status updates or photos as compared to overall usage indicators. To this end the effect sizes were regressed on seven dummy-coded variables indicating different SNS behaviors (see Table 2). Because previous research primarily focused on general usage indicators of SNSs (e.g., Fox & Rooney, 2015; Walters & Horton, 2015), we used the usage duration (i.e., the average time spent) as the reference category. The analyses revealed that visual self-

presentations (i.e., uploading photos),  $\rho = .23$  ( $\tau = .12$ ), 95% CI [.14, .33], showed a significantly,  $p = .04$ , stronger effect than usage duration,  $\rho = .14$  ( $\tau = .15$ ), 95% CI [.06, .22], whereas written self-presentations (i.e., posting status updates or comments),  $\rho = .15$  ( $\tau = .09$ ), 95% CI [.10, .20], had only a marginally stronger effect,  $p = .10$ . Moreover, the number of friends,  $\rho = .20$  ( $\tau = .14$ ), 95% CI [.09, .31], was also significantly,  $p = .01$ , stronger associated with narcissism than usage duration. With regard to the other usage indicators, usage frequency,  $\rho = .16$  ( $\tau = .14$ ), 95% CI [.02, .31], showed a similar effect,  $p = .92$ , as usage durations. Moreover, usage intensity (as assessed by the Facebook Intensity Scale, Ellison et al., 2007),  $\rho = .18$  ( $\tau = .11$ ), 95% CI [.04, .33], had a significantly,  $p < .001$ , stronger relationship with narcissism. Together, the behavioral indicators explained about 18 percent of the random variance. These results offer some support for different behavioral associations (Hypothesis 2).

**Culture.** Cross-cultural differences in narcissism's effects were examined by regressing the effect sizes on the scores for power distance, individualism, masculinity, and uncertainty avoidance. Five heterogeneous Internet samples including 16 effect sizes were excluded from these analyses because their participants came from diverse world regions. The association between narcissism and SNS behavior was significantly,  $p = .02$ , affected by the countries' power distance (Hypothesis 3b), whereas individualism (Hypothesis 3a),  $p = .52$ , did not moderate the effect (Table 2). Countries with larger power distance such as China or India exhibited larger associations between narcissism and SNS behavior (predicted effect at 1 *SD* above the mean  $\hat{\rho} = .25$ ) than low or medium power distance countries (predicted effect at 1 *SD* below the mean  $\hat{\rho} = .09$ ) such as Austria or the United

States (see Figure 1). The other cultural dimensions showed no moderating effects, all  $ps > .30$ . Together, culture explained about 17 percent of random between-sample variance.

### **Further explorations**

Although we had no a priori hypotheses regarding potential effects, we examined several further variables to study the pooled effect across a variety of conditions: the percentage of female respondents, the mean age (in years) of the sample, the publication year, the administered narcissism scale, the construct specificity (i.e., the global narcissism trait versus a specific facet such as entitlement or authority; cf. Raskin & Terry, 1988), the studied SNS (i.e., Facebook, Twitter, or another SNS), and the type of effect size (i.e., untransformed correlation coefficient versus another effect size transformed into a correlation). After controlling for these variables the intercept and, thus, the pooled correlation amounted to  $.12, p < .001$ , and was only slightly smaller than the pooled correlation that did not control for these covariates (see Table 3). Moreover, none of the examined variables showed a significant,  $p < .05$ , effect on the pooled correlation.

### **Sensitivity Analyses**

In order to determine the robustness of the previously presented results six extreme correlations (i.e., outliers) were removed from the meta-analytic database to compare the pooled effect to the pooled effect from the full database. After eliminating these effects from the database the pooled effect did not change and remained (with and without outliers) at  $\rho = .17$ . Although the random variance reduced slightly, that is, the 80% CRI reduced from  $[.02, .31]$  to  $[.05, .29]$ , the extreme correlations did not distort the pooled correlation. Similar patterns also emerged for most subgroup analyses (see online supplement). One notable exception was the association between grandiose narcissism and the number of

friends. After removing the three outliers associated with the number of friends, the pooled correlation increased from .20, 80% CRI [.02, .38], to .28, 80% CRI [.16, .40]. Thus, the outliers seemed to suppress the true effect slightly. Moreover, moderator analyses that excluded the six outliers generally replicated the previously reported pattern of results; albeit SNS behaviors related to written self-presentation showed a larger effect that was significant at  $p = .01$ . In addition, the random variances at level 2 and 3 explained by the moderators increased to about 24 percent and 20 percent, respectively. Overall, the outlier analyses corroborated the previously identified association between grandiose narcissism and social networking behavior.

### **Publication Bias**

To determine a potential publication bias, effect sizes extracted from published sources (i.e., journal articles and books) were compared to effects from unpublished sources (i.e., conference proceedings, research reports, and theses). The moderator analysis identified significantly,  $\gamma = .03$ ,  $SE = .01$ ,  $p = .03$ , smaller effects for unpublished,  $\rho = .09$  ( $\tau = .14$ ), 95% CI [-.03, .21], as compared to published effect sizes,  $\rho = .20$  ( $\tau = .11$ ), 95% CI [.16, .24]. Thus, published research findings seem to be systematically biased due to file-drawer studies with small effects. Whether this distortion also affected our meta-analytic database was tested within the PET-PEESE framework (Stanley & Doucouliagos, 2014). These analyses (see Table 4) identified a largely symmetric funnel plot (see online supplement) and no distortions due to a publication bias. Moreover, the PET-PEESE analyses estimated a pooled effect corrected for publication bias of .18 and thus replicated the previously reported results. Finally,  $p$ -curve analyses (see online supplement) provided evidence for the examined effect as a true phenomenon and not as a result of intense  $p$ -

hacking. Thus, publication bias did not seem to have distorted the previously presented analyses.

### Discussion

Today, around two thirds of all adults in the United States use social networking sites regularly (Greenwood et al., 2016). The fast growing popularity of SNSs has been accompanied by worries in popular science books and the mainstream media that these platforms reflect and fuel narcissistic tendencies (cf. Davidow, 2013; Fishwick, 2016). At the same time researchers worldwide have gathered a substantial amount of data. A little more than ten years after the founding of Facebook it is time to take stock: What do we know about the relationship between SNS behavior and narcissism? The present meta-analysis provided three central findings: First, we identified an overall relationship between SNS behaviors and grandiose narcissism of  $\rho = .17$  that replicated across a variety of conditions: Narcissism was equally predictive of activities on Facebook, Twitter or other SNSs, the relationship did not vary with the gender composition or the age of the participants, and no differences were found between early and more recent studies. This relationship is of small to moderate size according to prevalent interpretation guidelines (Cohen, 1988; Fritz, Morris, & Richler, 2012). Its size is similar to effect sizes often found in applied psychological research (cf. Bosco, Aguinis, Singh, Field, & Pierce, 2015; Richard, Bond, & Stokes-Zoota, 2003); as a point of comparison, a recent review involving nearly 8,000 effect sizes (Bosco et al., 2015) reported that empirical associations between attitudes and behaviors typically amounted to  $r = .16$ . Second, we provided a nuanced assessment of the SNS-narcissism link. As expected, the relationship was stronger for grandiose narcissism than for vulnerable narcissism (the latter association was non-

significant). Our data further indicates that narcissists have a larger circle of contacts on SNSs, they are particularly inclined to upload photos, and to feel a strong connectedness to Facebook (Facebook intensity, cf. Ellison et al., 2007). Thus, although narcissists tend to spend more time with SNSs in general, they display specific usage patterns. Together, these usage behaviors explained about 20 percent of the differences in the observed effects and, thus, were partly responsible for the heterogeneous findings reported in the published literature. Third, our meta-analytical approach allowed us to compare findings from different countries and to relate the findings to their cultural contexts:

### **Social Networking Behavior and Narcissism around the Globe**

Narcissistic tendencies are not equally distributed across different societies and even within countries between different ethnic groups (Foster et al., 2003). Therefore, this study sought to examine whether the relationship between narcissism and SNS behavior was equally susceptible to cross-country variations. Our meta-analysis involved data from 16 countries of four different continents (currently 83% of all Facebook users are located outside the US). We observed that the size of the SNS-grandiose narcissism link varies with the cultural background. Whereas the relationship was comparable in individualistic and collectivistic countries, the SNS behavior-narcissism link was particularly strong in societies in which social stratification is considered to be fixed and where citizens' place in a society appears to be a given—countries with a large power distance (Hofstede et al., 2010). In these countries SNSs provide rare opportunities to express self-entitlement and uniqueness and are therefore relatively more attractive for grandiose narcissists (cf., De Angeli, 2009). Thus, seemingly contradictory results in previous studies (e.g., Fox & Rooney, 2015; Ong et al., 2011; Skues et al., 2012; Utz et al., 2012), can in part be

explained by variations in the respondents' cultural background. The respective effect was quite strong; the average effects for high and low power distant countries were about  $\hat{\rho} = .09$  and  $.25$ . Thus, in some cultural regions considerably stronger associations between narcissism and SNS can be expected than the overall effects indicate.

A caveat needs to be noted: Most cultural indicators are not only correlated with each other to some degree but they are also correlated with various macro-economic and societal indicators<sup>2</sup>. Thus, for some time now cross-cultural researchers have advocated for polycontextual research paradigms (Tsui, Nifakdar, & Ou, 2007) that acknowledge multiple perspectives within a single analysis to identify unique effects for each variable. Following this approach, after accounting for the shared variance between individualism and power distance the latter was more informative for explaining cross-country differences in narcissism on SNSs.

### **Limitations of Results**

Several open questions remain. The first limitation is the scarcity of longitudinal designs. Do narcissists seek out SNSs or do SNSs reinforce narcissistic tendencies? Most of

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<sup>2</sup> For example, for the countries included in our meta-analytic database power distance and individualism correlated at  $r = -.77$  and  $r = .77$  with the Gross Domestic Product per capita (GDP) and at  $r = -.67$  and  $r = .63$  with the number of Internet users per 100 persons as retrieved from the World Bank (2016) database. However, a moderator analysis including these variables as additional predictors of the individual effect sizes did not reveal significant effects, neither for the GDP,  $\gamma = -0.00$ ,  $SE = 0.00$ ,  $p = .45$ , nor the number of Internet users,  $\gamma = 0.00$ ,  $SE = 0.00$ ,  $p = .63$ . In contrast, the effect of power distance remained marginally significant,  $\gamma = 0.03$ ,  $SE = 0.02$ ,  $p = .06$  (the  $ps$  for all other cultural values were  $> .35$ ).

the available research was guided by the former assumption (e.g., Panek et al., 2013; Utz et al., 2012): SNSs such as Facebook are thought to act as platforms for people to enact their narcissistic tendencies, such as posting self-promoting status updates or photos. Recent longitudinal analyses corroborated this view and showed that narcissism prospectively predicted Facebook use over time (at least for men), whereas a reverse effect was not found (Walters & Horton, 2015). In contrast, some authors speculated that social media might also be a cause of narcissism and contribute to the spreading narcissistic behaviors in today's societies: Experimental studies observed increased narcissism scores after participants interacted with their own SNSs profile (Gentile, Twenge, Freeman, & Campbell, 2010); thus, the intense self-focus initiated by many SNS activities also seems to promote users' narcissism. Taken together, these results indicate that the relationship between narcissism and SNS behavior might follow the pattern of a reinforcing spiral (Slater, 2014): Individual dispositions guide media-related behavior and engaging with the media in turn reinforces the dispositions. Because our research does not provide additional evidence for or against this assumption, further studies are needed testing this proposition in a longitudinal design. Second, the presented results primarily pertain to grandiose narcissism; research on the vulnerable form of narcissism is sparse. The present review identified only four studies reporting on the link between vulnerable narcissism and SNSs behaviors. Because these studies showed that the vulnerable form of narcissism was not as strongly linked to social networking behavior as the grandiose form clearly more studies are needed to explore the reasons why vulnerable narcissists are less attracted to SNSs (e.g., fear of negative feedback). Third, this review focused on self-assessed narcissistic tendencies. In light of increasing evidence that peer reports from knowledgeable others

exhibit incremental validity in predicting various behavioral outcomes (Oh, Wang, & Mount, 2011) it seems worthwhile to replicate the presented findings by contrasting self- and peer perspectives. Fourth, narcissism exhibits pronounced associations with basic traits of personality such as extraversion or disagreeableness (Miller et al., 2011). It is unknown how much of the identified SNS effects owe to narcissism itself or, rather, stem from other correlated personality traits. Therefore, future research is encouraged to identify those effects that are unique to narcissism, for example, using meta-analytic structural equation models (Cheung, 2015). Finally, although research on narcissism and SNS has dramatically increased in recent years, respective research is still rather new. Any results on the development of this relationship over time can only be preliminary. Therefore, research spanning a longer period of time needs to determine whether the identified association indeed represents a stable, time-invariant effect or, rather, changes over time.

### **Implications for Future Research**

Research on narcissism and SNS use now spans nearly a decade and several dozens of academic publications. With this meta-analysis, empirical approaches to the link between narcissism and social networking behavior can and should enter a new stage. Future research is encouraged to concentrate on the following areas: First, longitudinal research is needed in order to disentangle causal pathways. The quest for cross-sectional associations yielded important findings, but now it is time to focus on longitudinal research. This verdict not only applies to the research questions pertinent to this meta-analysis but it applies to research on social networking behavior more generally. In stark contrast to the number of studies dealing with social networking sites and the attention by media that those studies on social networking sites often attract, longitudinal evidence is rare (for some

notable exceptions see recent longitudinal research on Facebook use and psychological adjustment: Kross et al., 2013; Saslow et al., 2013; Teppers, Luyckx, Klimstra, & Goossens, 2014; Verduyn et al., 2015).

Second, with the plentitude of applications integrated into social networking platforms, questions as to how long or how frequent individuals engage in social networking behavior lose importance. Considering the consequences of new media technologies per se on individuals and societies is certainly not obsolete (cf. Gerbner, 1998; McLuhan & Fiore, 1967), but on the individual level, a fine-grained analysis of activities is beneficial. Our meta-analysis demonstrated that narcissism is more strongly related to behavior that enables self-presentations than to mere duration. Theory-guided analyses on the exact activities narcissism is associated with appear to be warranted in the research to come. Beyond self-reports of media use, we envisage studies that apply unobtrusive methods to observe individuals' SNS behavior (Gosling & Mason, 2015).

Third, future research needs to put an emphasis on the moderators of the narcissism-social networking behavior link. Our meta-analysis identified a substantial amount of variance between samples that the moderators we examined accounted only about 20 percent of. For example, whereas prior studies suggested not only a steady increase of narcissism in adolescence (Carlson & Gjerde, 2009; Cramer, 2011) but also pronounced gender differences (Grijalva et al., 2015), age and gender of the sample did not affect the core relationship in our meta-analysis. Regarding unobserved moderation effects, we believe the features of SNS communication that generally suit narcissistic tendencies (the access to a large number of other people, the possibility to tailor the information presented, and the asynchronicity of online communication; cf., Valkenburg & Peter, 2011) are more

appealing for some narcissists than for others. Personality factors, competences, and traits might explain some of this variance. For example, narcissists who are more computer literate (e.g., regarding photo editing programs or the different layers of SNS privacy settings; cf., Vitak & Ellison, 2013) might find engaging in SNS behavior (such as posting photos) more appealing than narcissists who are or perceive themselves to be less computer literate. Likewise the features of SNS communication might suit narcissistic tendencies better in some situations than in other situations. For example, the high accessibility of other people on SNSs might be particularly motivating for narcissists to engage in SNS behavior (such as posting information about the next summer holidays) when offline communication is cumbersome to initiate (e.g., on an off-work day).

### **Conclusion**

In summary, the association between narcissism and social networking behavior proves to be a phenomenon that is supported by empirical research. It does not vary with the platform (e.g., Facebook vs. Twitter), with the average age or gender composition of the sample, or with the year the study was conducted. It is, however, restricted to the grandiose form of narcissism. Moreover, it fluctuates with the power distance in a culture and the specific SNS behavior under study. Future research is expected to incorporate longitudinal designs, to engage in a theory-guided assessment of behavioral patterns on social networking sites, and to intensify the search for moderating variables.

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All articles included in the meta-analysis are listed in the online supplement.

Table 1.

*Meta-Analysis of Narcissism and Social Networking Behavior*

	$k_1$	$k_2$	$N$	$r$	$SD_r$	$\rho$	$SE_\rho$	95% CI	$\tau_{(2)}$	$\tau_{(3)}$	$I^2_{(2)}$	$I^2_{(3)}$	80% CRI
Overall	289	62	25,631	.14	.13	.17*	.02	[.13, .20]	.08*	.08*	.42	.41	[.02, .31]
<i>Type of narcissism</i>													
Grandiose narcissism	266	60	25,168	.14	.13	.17*	.02	[.13, .21]	.08*	.08*	.40	.44	[.02, .32]
Vulnerable narcissism	14	4	602	.10	.17	.08 <sup>c</sup>	.08	[-.07, .24]	.00	.14	.00	.73	[-.10, .27]
<i>Type of SNS<sup>a</sup></i>													
Facebook	157	43	13,011	.13	.15	.16*	.03	[.10, .21]	.10*	.09*	.45	.36	[-.01, .32]
Twitter	40	8	5,668	.14	.08	.16*	.03	[.11, .22]	.05*	.00 <sup>†</sup>	.56	.00	[.10, .23]
Other	69	17	9,335	.15	.11	.21*	.04	[.14, .27]	.07*	.07	.38	.49	[.08, .33]
<i>Type of behavior<sup>a</sup></i>													
Usage duration	28	21	7,233	.13	.16	.14*	.04	[.06, .22]	.00 <sup>†</sup>	.15*	.00	.91	[-.04, .33]
Usage frequency	29	11	3,715	.15	.13	.16*	.07	[.02, .31]	.00 <sup>†</sup>	.14	.00	.78	[-.02, .34]
Usage intensity <sup>b</sup>	14	9	2,614	.17	.16	.18*	.07	[.04, .33]	.08	.07	.41	.31	[.04, .32]
Number of friends	43	34	14,481	.15	.18	.20*	.05	[.09, .31]	.09	.11	.37	.51	[.02, .38]
Written self-presentation	70	27	11,922	.14	.11	.15*	.03	[.10, .20]	.07*	.05	.47	.28	[.04, .26]
Visual self-presentation	23	15	5,478	.15	.13	.23*	.05	[.14, .33]	.04	.11	.08	.80	[.08, .38]
Group memberships	5	5	1,319	.08	.16	.07 <sup>c</sup>	.06	[-.05, .20]	.00 <sup>†</sup>	.13	.00	.78	[-.09, .24]
<i>World region<sup>a</sup></i>													
North America	175	31	10,799	.14	.12	.17*	.02	[.13, .22]	.06*	.08*	.30	.50	[.04, .31]
Europe	34	13	3,496	.13	.16	.20*	.09	[.02, .38]	.13*	.05	.70	.10	[.03, .37]
Asia	27	8	4,310	.19	.14	.22*	.08	[.06, .38]	.09*	.08	.49	.39	[.07, .37]

Note.  $k_1$  = Number of effect sizes;  $k_2$  = Number of samples;  $N$  = Total sample size;  $\rho$  = Pooled correlation corrected for artifacts;  $SE_\rho$  = Standard error of  $\rho$ ; 95% CI = 95% confidence interval of  $\rho$ ;  $\tau$  = Random effect of  $\rho$  at level 2 or 3 ( $SD$ );  $I^2$  = Proportion of total variance in  $r$  due to random variance (Cheung, 2014); 80% CRI = 80% credibility interval of  $\rho$ ; <sup>a</sup> Based on grandiose narcissism scales; <sup>b</sup> as measured with the Facebook Intensity Scale (Ellison et al., 2007); <sup>c</sup> Includes only adjustments for sampling error but not for measurement error.

\*  $p < .05$ ; <sup>†</sup> constrained parameter due to non-identification.

Table 2.

*Moderating Effects of the Association between Grandiose Narcissism and Social Networking**Behavior*

	Model 1: SNSs behaviors			Model 2: Culture		
	$\gamma$	$SE_{\gamma}$	$ z $	$\gamma$	$SE_{\gamma}$	$ z $
Intercept	0.12*	0.03	4.32	0.17*	0.03	5.64
Unreliability <sup>a</sup>	-0.09	0.06	1.42	-0.08	0.07	1.28
1. Usage frequency <sup>b</sup>	-0.00	0.03	0.06			
2. Usage intensity <sup>b</sup>	0.15*	0.04	3.50			
3. Number of friends <sup>b</sup>	0.07*	0.03	2.68			
4. Written self-presentation <sup>b</sup>	0.04	0.03	1.66			
5. Visual self-presentation <sup>b</sup>	0.06*	0.03	2.06			
6. Group memberships <sup>b</sup>	-0.02	0.05	0.70			
7. Other behaviors <sup>b</sup>	0.04	0.03	1.43			
8. Power distance <sup>c</sup>				0.03*	0.01	2.26
9. Individualism <sup>c</sup>				0.01	0.01	0.65
10. Masculinity <sup>c</sup>				0.00	0.01	0.20
11. Uncertainty avoidance <sup>c</sup>				0.01	0.01	0.99
$\tau_{(2)} / \tau_{(3)}$	0.07* / 0.09*			0.08* / 0.08*		
$\Delta R^2_{(2)} / \Delta R^2_{(3)}$	.18 / .00			.01 / .17		
$k_1 / k_2$	266 / 60			250 / 55		

Note.  $\gamma$  = Fixed effects regression weight;  $SE_{\gamma}$  = Standard error of  $\gamma$ ;  $\tau$  = Random effect of  $\rho$  at level 2 or 3 ( $SD$ );  $\Delta R^2$  = Proportion of explained random variance (Cheung, 2014) as change in  $R^2$  after controlling for unreliability;  $k_1$  = Number of effect sizes;  $k_2$  = Number of samples. Codings: <sup>a</sup> 1 – coefficient alpha; <sup>b</sup> Dummy coded using usage duration as reference category; <sup>c</sup> Rescaled to the interval [-5, 5].

\*  $p < .05$

Table 3.

*Exploratory Moderator Analyses*

	$\gamma$	$SE_{\gamma}$	$ z $
Intercept	0.12*	0.04	3.21
1. Unreliability <sup>a</sup>	-0.04	0.07	0.49
2. Percentage of female respondents <sup>b</sup>	0.00	0.00	0.47
3. Mean age of sample <sup>c</sup>	-0.00	0.00	0.68
4. Publication year <sup>d</sup>	-0.00	0.01	0.26
5. Narcissism instrument <sup>e</sup>	0.01	0.02	0.38
6. Construct specificity <sup>f</sup>	0.04	0.02	1.70
7a. Social networking site <sup>g</sup> : Twitter	0.01	0.02	0.59
7b. other SNSs	0.02	0.03	0.72
8. Transformed effect size <sup>h</sup>	-0.02	0.04	0.63
$\tau_{(2)} / \tau_{(3)}$	0.08* / 0.08*		
$\Delta R^2_{(2)} / \Delta R^2_{(3)}$	.03 / .05		
$k_1 / k_2$	266 / 60		

*Note.*  $\gamma$  = Fixed effects regression weight;  $SE_{\gamma}$  = Standard error of  $\gamma$ ;  $\tau$  = Random effect of  $\rho$  at level 2 or 3 (*SD*);  $\Delta R^2$  = Proportion of explained random variance (Cheung, 2014) as change in  $R^2$  after controlling for unreliability only;  $k_1$  = Number of effect sizes;  $k_2$  = Number of samples. Codings: <sup>a</sup> 1 – coefficient alpha; <sup>b</sup> centered at 50 percent; <sup>c</sup> centered at 20 years; <sup>d</sup> centered at the year 2013; <sup>e</sup> 1 = Narcissistic Personality Instrument (Raskin & Terry, 1988) versus -1 = other instrument; <sup>f</sup> 1 = global trait versus 0 = facet; <sup>g</sup> Dummy coded using Facebook as reference category; <sup>h</sup> 0 = untransformed correlation coefficient versus 1 = transformed effect size (e.g., odds ratio, standardized regression weight).

\*  $p < .05$

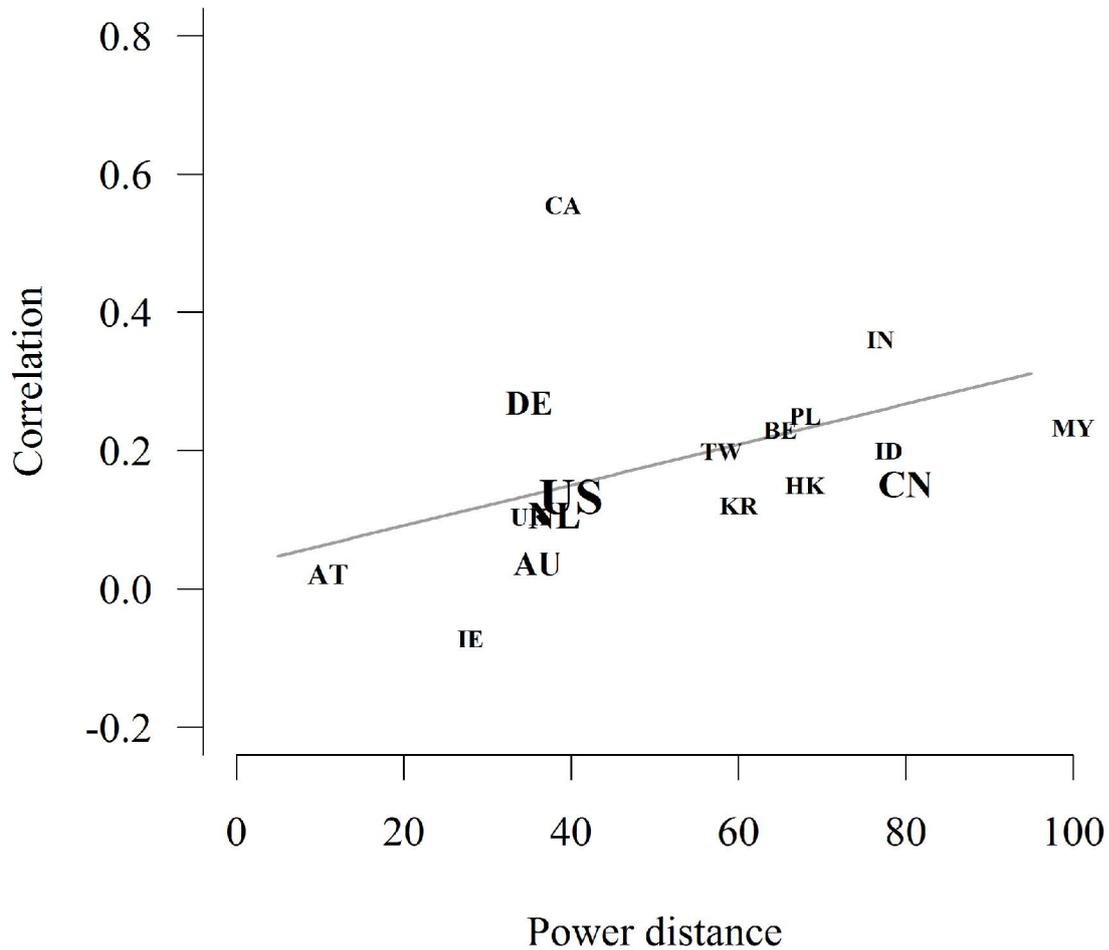
Table 4.

*PET-PEESE Analyses for Publication Bias*

	$B_0$ (SE)	$t$	$B_1$ (SE)	$t$	$B_2$ (SE)	$t$
PET	0.18* (0.02)	8.73	0.11 (0.29)	0.38	-0.19* (0.06)	-3.13
PEESE	<b>0.18*</b> (0.02)	10.76	0.51 (2.41)	0.21	-0.19* (0.06)	-3.11

*Note.*  $B_0$  = Intercept (i.e., the corrected estimate of the overall effect);  $B_1$  = Regression weight for the standard error (PET) or the variance (PEESE) of the individual effect (i.e., the test for funnel plot asymmetry);  $B_2$  = Regression weight for the unreliability (i.e.,  $1 - \text{coefficient alpha}$ ). PET-PEESE estimate of the overall effect corrected for publication bias is in bold.

\*  $p < .05$



*Figure 1.* Effect of power distance on the correlation between grandiose narcissism and social networking behavior. Letters indicate the pooled effects within countries (AT = Austria, AU = Australia, BE = Belgium, CA = Canada, CN = China, DE = Germany, GB = Great Britain, HK = Hong Kong, ID = Indonesia, IE = Ireland, IN = India, KR = South Korea, MY = Malaysia, NL = Netherlands, PL = Poland, US = United States); the font sizes correspond to the number of included samples. The solid line represents the regression line from Table 2.

Online Supplement for

“Narcissism and Social Networking Behavior: A Meta-Analysis”

Supplement A: Summary of Search Process.....	2
Supplement B: Studies excluded from the meta-analysis .....	3
Supplement C: Coding of narcissism scales. ....	13
Supplement D: Reliabilities of the narcissism scales.....	16
Supplement E: Descriptive statistics for moderators .....	18
Supplement F: Outlier analyses.....	21
Supplement G: Funnel Plot .....	24
Supplement H: P-curve analyses.....	25
Supplement I: Studies included in the Meta-Analysis .....	32

The data and syntax files are available at <https://osf.io/5qde9/>.

**Supplement A: Summary of Search Process**

<b>Identified studies:</b>	
From scientific databases	119
From ProQuest database	150
From Google Scholar	1,000
Considered relevant after screening of title and abstract	111
<b>Excluded studies:</b>	
Not published between 1997 and 2015 (criterion A)	0
Not written in English or German (criterion B)	0
No validated narcissism scale (criterion C)	7
No self-reported narcissism scale (criterion D)	0
No social networking behavior (criterion E)	28
No effect size reported (criterion F)	19
No sample size reported (criterion G)	0
Clinical population (criterion H)	0
<b>Included studies:</b>	<b>57</b>

*Note.* All excluded studies are listed in Supplement B.

**Supplement B: Studies excluded from the meta-analysis**

Study	Reason
Ahadzadeh, Sharif, Wei, & Emami (2014)	No social networking behavior
Ahn, Kwolek, & Bowman (2015)	No social networking behavior
Ang, Tan, & Mansor (2011)	No social networking behavior
Back, Schmukle, & Egloff (2008)	No social networking behavior
Bibby (2008)	No social networking behavior
Blaising (2015)	No effect size reported
Blumer (2012)	No social networking behavior
Boswell (2012)	No validated narcissism scale
Brown & Bobkowski (2011)	No effect size reported
Buckles, Trapnell, & Paulhus (2014)	No social networking behavior
Buffardi (2011)	No effect size reported
Clifton (2011)	No effect sizes reported
Crisan (2015)	No effect size reported
DeWall, Buffardi, Bonser, & Campbell (2011)	No social networking behavior
Ekşi (2012)	No social networking behavior
Fanti, Demetriou, & Hawa (2012)	No social networking behavior
Forsberg (2014)	No effect size reported
Hawk, ter Bogt, van den Eijnden, & Nelemans (2015)	No effect size reported
Horton, Reid, Barber, Miracle, & Green (2014)	No narcissism trait
Huang & Liu (2012)	No social networking behavior
Huling (2011)	No social networking behavior
Kauten, Lui, Stary, & Barry (2015)	No social networking behavior
Keipi, Oksanen, & Räsänen (2015)	No social networking behavior
Kim, Namkoong, Ku, & Kim (2008)	No social networking behavior
Krishnan & Atkin (2014)	No effect size reported
Liu, Ang, & Lwin (2013)	No social networking behavior
Livingstone (2008)	No effect size reported
Ljepava, Orr, Locke, & Ross (2013)	No social networking behavior
Long & Zhang (2014)	No effect size reported
Lyons, Mehl, & Pennebaker (2006)	No validated narcissism scale
Malik & Khan (2015)	No social networking behavior

Study	Reason
Marcus, Machilek, & Schütz (2006)	No social networking behavior
Marshall, Lefringhausen, & Ferenci (2015)	No effect size reported
Menard & Pincus (2012)	No social networking behavior
Nadkarni & Hofmann (2012)	No effect size reported
Odaci & Çelik (2013)	No social networking behavior
Pearson & Hussain (2015)	No social networking behavior
Qiu, Lin, & Leung (2010)	No effect size reported
Rodman & Fry (2009)	No effect size reported
Rosen (2007)	No empirical study
Ryan & Xenos (2011)	No social networking behavior
Saad (2012)	No effect size reported
Shi, Yue, & He (2013)	No validated narcissism scale
Smith, Mendez, & White (2014)	No social networking behavior
Smith-Duff (2013)	No validated narcissism scale
Sorokowski et al. (2015)	No effect size reported
Subramanian, Wise, Davis, Bhandari, & Morris (2014)	No validated narcissism scale
Tobin (2014)	No social networking behavior
Twenge (2013)	No empirical study
Vieth & Kommers (2014)	No social networking behavior
Wang & Stefanone (2013)	No social networking behavior
Weathers (2013)	No effect sizes reported
Yue, Shi, & Cai (2013)	Unclear description of measures
Zerach (2014)	No social networking behavior

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### Supplement C: Coding of narcissism scales.

The narcissism instruments were classified as either operationalizing a grandiose or a vulnerable form of narcissism. Following Miller and colleagues (2011) the *Narcissistic Personality Inventory* (NPI; Raskin & Terry, 1988) was considered a prototypical example of grandiose narcissism. Therefore, various short versions of the NPI such as the NPI-16 (Ames, Rose, & Anderson, 2006), the narcissism subscale of the *Dirty Dozen* (Jonason & Webster, 2010), and a child version of the NPI (Ang & Raine, 2009) were also classified as measures of grandiose narcissism. Moreover, the *Short Dark Triad* (Jones & Paulhus, 2014), the narcissistic personality disorder subscale of the *Millon Clinical Multiaxial Inventory-III* (Millon, Millon, Davis, & Anderson, 2006), and the *Vanity Scale* (Egan & McCorkindale, 2007) that showed pronounced validity correlations with the NPI (e.g., Egan & McCorkindale, 2007; Glover, Miller, Lynam, Crego, & Widiger, 2012; Jones & Paulhus, 2014) were considered representative of grandiose narcissism. In contrast, the *Hypersensitive Narcissism Scale* (Hendin & Cheek, 1997) was viewed as a prototypical example of a scale measuring vulnerable narcissism (cf. Miller et al., 2011). Similarly, the German *Narzissmusinventar* (Neumann & Bierhoff, 2004) was subsumed in this category.

Finally, two instruments represented mixtures of both forms of narcissism: First, the two facets of the *Narcissistic Admiration and Rivalry Questionnaire* (Back et al., 2013) exhibit divergent validity correlations with the NPI, an indicator of grandiose narcissism, and the *Pathological Narcissism Inventory* (Pincus et al., 2009), an indicator of vulnerable narcissism (cf. Miller et al., 2011). Second, the *Psychological Entitlement Scale* (Campbell et al., 2004), albeit showing convergent validity with the NPI, also exhibits pronounced correlations with the vulnerable form of narcissism (Miller et al., 2011).

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**Supplement D: Reliabilities of the narcissism scales**

A reliability generalization (cf. Sánchez-Meca, López-López, & López-Pina, 2013) was conducted to study the reliability of the narcissism scores. Forty-one samples (including a total of 18,159 participants) reported a total of 214 coefficient alpha reliabilities ( $M = .74$ ,  $SD = .13$ ). These reliabilities were pooled using the same meta-analytic approach as described in the main study. Sampling variances were calculated following Bonnett (2010). The reliability generalization resulted in a pooled coefficient alpha reliability of  $.76$ ,  $SE = .01$ ,  $p < .001$ . However, the reliabilities also exhibited significant heterogeneity,  $\tau_{(2)} = .09$ ,  $p < .001$ ,  $I^2_{(2)} = .75$ , and  $\tau_{(3)} = .05$ ,  $p = .01$ ,  $I^2_{(3)} = .23$ . To examine the heterogeneity in more detail moderator analyses investigated the effect of three variables (see Table S1): the number of items in the administered instrument, the type of instrument (NPI versus other), and the construct specificity (i.e., the global narcissism trait versus a specific facet). After controlling for the moderators the intercept and, thus, the mean reliability increased slightly to  $.78$ ,  $SE = .02$ ,  $p < .001$ . As expected the reliabilities increased with the number of administered items,  $p < .001$ . Moreover, the NPI resulted in slightly lower reliabilities as compared to other instruments,  $p = .005$ . Together, the moderators explained about 42 percent in the level-2 random variance. Overall, the administered narcissism scales exhibited satisfactory reliabilities.

Table S1.

*Reliability generalization of narcissism scores*

	$\gamma$	$SE_{\gamma}$	$ z $
Intercept	0.78*	0.02	31.18
1. Number of items <sup>a</sup>	0.01*	0.00	5.34
2. Narcissism instrument <sup>b</sup>	-0.05*	0.02	2.81
3. Construct specificity <sup>c</sup>	0.02	0.03	0.87
$\tau_{(2)} / \tau_{(3)}$	0.07* / 0.06*		
$R^2_{(2)} / R^2_{(3)}$	.42 / .00		
$k_1 / k_2$	214 / 41		

Note.  $\gamma$  = Fixed effects regression weight;  $SE_{\gamma}$  = Standard error of  $\gamma$ ;  $\tau^2$  = Random variance of  $\rho$  at level 2 or 3;  $R^2$  = Proportion of explained random variance (Cheung, 2014);  $k_1$  = Number of effect sizes;  $k_2$  = Number of samples. Codings: <sup>a</sup> Centered at the mean of 17; <sup>b</sup> 1 = Narcissistic Personality Instrument (Raskin & Terry, 1988) versus -1 = other instrument; <sup>c</sup> 1 = global trait versus 0 = facet.

\*  $p < .05$

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**Supplement E: Descriptive statistics for moderators**

Table S2.

*Descriptive statistics for moderators*

				Correlations			
		<i>M</i>	<i>SD</i>	1.	2.	3.	4.
1.	Percentage of women	62.84	17.82				
2.	Mean age	23.98	5.88	-.19			
3.	Narcissism scale (1 = NPI vs. -1 = other)	0.71	0.71	.10	.14		
4.	Construct specificity (1 = global trait vs. 0 = facet)	0.62	0.49	.00	-.20	-.12	
5.	SNS type: Facebook (1 = Facebook vs. 0 = other SNS)	0.58	0.49	.08	-.08	.15	.12
6.	SNS type: Twitter (1 = Twitter vs. 0 = other SNS)	0.14	0.35	.07	.18	.06	-.22
7.	SNS type: other SNS (1 = other SNS vs. 0 = Facebook / Twitter)	0.28	0.45	-.14	-.05	-.21	.03
8.	SNS behavior: Number of friends (1 = number of friends vs. 0 = other)	0.16	0.37	.05	-.13	-.03	.07
9.	SNS behavior: Written self-presentation (1 = written vs. 0 = other)	0.26	0.44	-.06	.13	.06	-.14
10.	SNS behavior: Visual self-presentation (1 = visual vs. 0 = other)	0.09	0.28	-.02	.03	-.01	.16
11.	SNS behavior: Usage duration (1 = usage duration vs. 0 = other)	0.10	0.30	-.05	.02	.07	.07
12.	SNS behavior: Usage frequency (1 = usage frequency vs. 0 = other)	0.11	0.32	.05	.36	.02	-.03
13.	SNS behavior: Usage intensity (1 = usage intensity vs. 0 = other)	0.05	0.22	.06	-.08	.05	.01
14.	SNS behavior: Group memberships (1 = group membership vs. 0 = other)	0.02	0.14	.05	.01	-.01	.11
15.	SNS behavior: other SNS behaviors (1 = other behavior vs. 0 = other)	0.21	0.41	-.01	-.28	-.13	-.09
16.	Transformed effect size (1 = transformed vs. 0 = untransformed)	0.06	0.24	-.09	-.06	-.02	.02
17.	Reliability	0.74	0.13	-.19	-.02	-.15	.47
18.	Publication year	2012.90	1.37	.09	.23	-.08	-.07
19.	Individualism	79.70	22.66	.15	.23	.31	-.10
20.	Power distance	43.22	13.85	-.11	-.15	-.15	-.03
21.	Masculinity	59.21	12.36	.08	.11	.26	.17
22.	Uncertainty avoidance	47.76	10.29	-.04	-.04	-.27	.20

Table S2. (continued)

		Correlations									
		5.	6.	7.	8.	9.	10.	11.	12.	13.	
1.	Percentage of women										
2.	Mean age										
3.	Narcissism scale (1 = NPI vs. -1 = other)										
4.	Construct specificity (1 = global trait vs. 0 = facet)										
5.	SNS type: Facebook (1 = Facebook vs. 0 = other SNS)										
6.	SNS type: Twitter (1 = Twitter vs. 0 = other SNS)	-.48									
7.	SNS type: other SNS (1 = other SNS vs. 0 = Facebook / Twitter)	-.73	-.25								
8.	SNS behavior: Number of friends (1 = number of friends vs. 0 = other)	.11	-.15	.00							
9.	SNS behavior: Written self-presentation (1 = written vs. 0 = other)	-.04	.23	-.14	-.26						
10.	SNS behavior: Visual self-presentation (1 = visual vs. 0 = other)	-.16	-.13	.28	-.14	-.18					
11.	SNS behavior: Usage duration (1 = usage duration vs. 0 = other)	.00	-.14	.10	-.15	-.20	-.10				
12.	SNS behavior: Usage frequency (1 = usage frequency vs. 0 = other)	.00	.20	-.15	-.16	-.21	-.11	-.12			
13.	SNS behavior: Usage intensity (1 = usage intensity vs. 0 = other)	.16	-.09	-.10	-.10	-.13	-.07	-.08	-.08		
14.	SNS behavior: Group memberships (1 = group membership vs. 0 = other)	.03	-.06	.02	-.06	-.09	-.04	-.05	-.05	-.03	
15.	SNS behavior: other SNS behaviors (1 = other behavior vs. 0 = other)	-.03	-.01	.05	-.23	-.30	-.16	-.17	-.18	-.12	
16.	Transformed effect size (1 = transformed vs. 0 = untransformed)	.02	-.10	.06	.04	.04	-.03	-.09	-.05	.01	
17.	Reliability	-.10	-.13	.21	.01	-.02	.14	.10	-.05	-.12	
18.	Publication year	.16	-.01	-.17	-.12	.02	.08	.03	.05	.09	
19.	Individualism	.05	.20	-.21	.01	-.06	.00	-.09	.17	.00	
20.	Power distance	-.07	-.09	.15	.01	.09	-.03	.07	-.10	.04	
21.	Masculinity	.01	.09	-.08	-.17	.03	.07	.10	.08	.06	
22.	Uncertainty avoidance	.11	-.07	-.07	.01	-.01	.06	-.10	-.07	.10	

Table S2. (continued)

		Correlations							
		14.	15.	16.	17.	18.	19.	20.	21.
1.	Percentage of women								
2.	Mean age								
3.	Narcissism scale (1 = NPI vs. -1 = other)								
4.	Construct specificity (1 = global trait vs. 0 = facet)								
5.	SNS type: Facebook (1 = Facebook vs. 0 = other SNS)								
6.	SNS type: Twitter (1 = Twitter vs. 0 = other SNS)								
7.	SNS type: other SNS (1 = other SNS vs. 0 = Facebook / Twitter)								
8.	SNS behavior: Number of friends (1 = number of friends vs. 0 = other)								
9.	SNS behavior: Written self-presentation (1 = written vs. 0 = other)								
10.	SNS behavior: Visual self-presentation (1 = visual vs. 0 = other)								
11.	SNS behavior: Usage duration (1 = usage duration vs. 0 = other)								
12.	SNS behavior: Usage frequency (1 = usage frequency vs. 0 = other)								
13.	SNS behavior: Usage intensity (1 = usage intensity vs. 0 = other)								
14.	SNS behavior: Group memberships (1 = group membership vs. 0 = other)								
15.	SNS behavior: other SNS behaviors (1 = other behavior vs. 0 = other)	-07							
16.	Transformed effect size (1 = transformed vs. 0 = untransformed)	-04	.04						
17.	Reliability	.00	-.05	.11					
18.	Publication year	.01	-.08	-.04	-.05				
19.	Individualism	.01	-.01	-.22	-.16	.03			
20.	Power distance	-.08	-.06	.18	.14	.03	-.75		
21.	Masculinity	.04	-.11	-.26	-.01	.05	.07	-.07	
22.	Uncertainty avoidance	.12	.00	-.10	.05	.04	-.04	-.35	-.22

## Supplement F: Outlier analyses

Table S4.

*Meta-Analysis of Narcissism and Social Networking Behavior without Outliers*

	$k_I$	$k_o$	$\rho_o$	$SE_o$	95% CI	$\tau_{o(2)}$	$\tau_{o(3)}$	$I^2_{o(2)}$	$I^2_{o(3)}$	80% CRI
Overall	283	6	.17*	.02	[.14, .21]	.07*	.05*	.49	.27	[.05, .29]
<i>Type of narcissism</i>										
Grandiose narcissism	260	6	.18*	.02	[.14, .21]	.07*	.06*	.47	.31	[.06, .30]
Vulnerable narcissism	14	0	.08 <sup>d</sup>	.08	[-.07, .24]	.00	.14	.00	.73	[-.10, .27]
<i>Type of SNS<sup>a</sup></i>										
Facebook	151	6	.17*	.03	[.12, .22]	.09*	.05	.55	.17	[.05, .30]
Twitter	40	0	.16*	.03	[.11, .22]	.05*	.00	.56	.00	[.10, .23]
Other	69	0	.21*	.04	[.14, .27]	.07*	.07	.38	.49	[.08, .33]
<i>Type of behavior<sup>a</sup></i>										
Usage duration	27	1	.12*	.03	[.05, .19]	.00 <sup>†</sup>	.10*	.00	.82	[-.00, .25]
Usage frequency	29	0	.16*	.07	[.02, .31]	.00 <sup>†</sup>	.14	.00	.78	[-.02, .34]
Usage intensity <sup>b</sup>	14	0	.18*	.07	[.04, .33]	.08	.07	.41	.31	[.04, .32]
Number of friends	40	3	.28*	.05	[.19, .37]	.10	.00	.78	.00	[.16, .40]
Written self-presentation	69	1	.16*	.02	[.11, .21]	.06*	.04	.49	.21	[.06, .25]
Visual self-presentation	22	1	.20*	.04	[.11, .28]	.03	.06	.12	.58	[.11, .29]
Group memberships	5	0	.07 <sup>c</sup>	.06	[-.05, .20]	.00 <sup>†</sup>	.13	.00	.78	[-.09, .24]
<i>World region<sup>a</sup></i>										
North America	172	3	.17*	.02	[.14, .21]	.06*	.04	.47	.22	[.08, .27]
Europe	34	0	.20*	.09	[.02, .38]	.13*	.05	.70	.10	[.03, .37]
Asia	26	1	.20*	.07	[.07, .33]	.06	.07	.37	.47	[.08, .32]

Note.  $k_I$  = Number of included effect sizes;  $k_o$  = Number of excluded outliers;  $\rho_o$  = Pooled, corrected correlation without outliers;  $SE_o$  = Standard error of  $\rho_o$ ; 95% CI = 95% confidence interval of  $\rho$ ;  $\tau^2_o$  = Random variance of  $\rho_o$  at level 2 and 3;  $I^2_o$  = Proportion of total variance in  $r$  due to random variance (Cheung, 2014); 80% CRI = 80% credibility interval of  $\rho_o$ ; <sup>a</sup> Based on grandiose narcissism scales; <sup>b</sup> as measured with the Facebook Intensity Scale (Ellison et al., 2007); <sup>c</sup> Includes only adjustments for sampling error but not for measurement error.

\*  $p < .05$ ; <sup>†</sup> constrained parameter due to non-identification.

Table S5.

*Moderating Effects of the Association between Grandiose Narcissism and Social Networking*

*Behavior without Outliers*

	Model 1: SNSs behaviors			Model 2: Culture		
	$\gamma$	$SE_{\gamma}$	$ z $	$\gamma$	$SE_{\gamma}$	$ z $
Intercept	0.12*	0.03	4.66	0.17*	0.03	6.66
Unreliability <sup>a</sup>	-0.13*	0.06	2.19	-0.12	0.06	1.95
1. Usage frequency <sup>b</sup>	0.02	0.03	0.54			
2. Usage intensity <sup>b</sup>	0.14*	0.04	3.52			
3. Number of friends <sup>b</sup>	0.10*	0.02	3.89			
4. Written self-presentation <sup>b</sup>	0.06*	0.02	2.55			
5. Visual self-presentation <sup>b</sup>	0.05*	0.03	1.99			
6. Group memberships <sup>b</sup>	-0.04	0.05	0.74			
7. Other behaviors <sup>b</sup>	0.05	0.02	1.84			
8. Power distance <sup>c</sup>				0.03*	0.01	2.46
9. Individualism <sup>c</sup>				0.01	0.01	0.86
10. Masculinity <sup>c</sup>				0.00	0.01	0.45
11. Uncertainty avoidance <sup>c</sup>				0.01	0.01	1.26
$\tau_{(2)} / \tau_{(3)}$	0.06* / 0.07*			0.07* / 0.06*		
$\Delta R^2_{(2)} / \Delta R^2_{(3)}$	.24 / .00			.01 / .20		
$k_1 / k_2$	260 / 60			245 / 55		

*Note.*  $\gamma$  = Fixed effects regression weight;  $SE_{\gamma}$  = Standard error of  $\gamma$ ;  $\tau^2$  = Random variance of  $\rho$  at level 2 or 3;  $\Delta R^2$  = Proportion of explained random variance (Cheung, 2014) as change in  $R^2$  after controlling for unreliability;  $k_1$  = Number of effect sizes;  $k_2$  = Number of samples. Codings: <sup>a</sup> 1 – coefficient alpha; <sup>b</sup> Dummy coded using usage duration as reference category; <sup>c</sup> Rescaled to the interval [-5, 5].

\*  $p < .05$

Table S6.

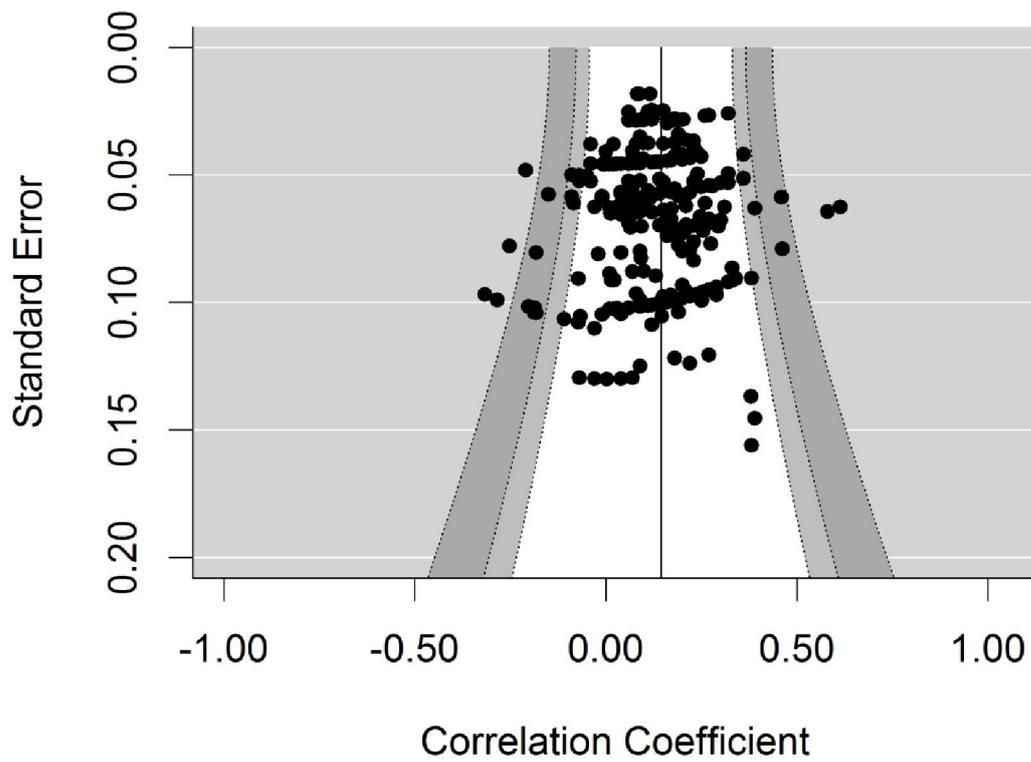
*Exploratory Moderator Analyses without Outliers*

	$\gamma$	$SE_{\gamma}$	$ z $
Intercept	0.13*	0.03	4.07
1. Unreliability <sup>a</sup>	-0.08	0.07	1.22
2. Percentage of female respondents <sup>b</sup>	-0.00	0.00	0.45
3. Mean age of sample <sup>c</sup>	0.00	0.00	0.43
4. Publication year <sup>d</sup>	0.01	0.01	0.83
5. Narcissism instrument <sup>e</sup>	0.01	0.02	0.60
6. Construct specificity <sup>f</sup>	0.03	0.02	1.64
7a. Social networking site <sup>g</sup> : Twitter	0.01	0.02	0.66
7b. other SNSs	0.02	0.02	0.95
8. Transformed effect size <sup>h</sup>	-0.02	0.03	0.49
$\tau_{(2)} / \tau_{(3)}$	0.08* / 0.06*		
$\Delta R^2_{(2)} / \Delta R^2_{(3)}$	.03 / .08		
$k_1 / k_2$	260 / 60		

*Note.*  $\gamma$  = Fixed effects regression weight;  $SE_{\gamma}$  = Standard error of  $\gamma$ ;  $\tau^2$  = Random variance of  $\rho$  at level 2 or 3;  $\Delta R^2$  = Proportion of explained random variance (Cheung, 2014) as change in  $R^2$  after controlling for unreliability only;  $k_1$  = Number of effect sizes;  $k_2$  = Number of samples. Codings: <sup>a</sup> 1 – coefficient alpha; <sup>b</sup> centered at 50 percent; <sup>c</sup> centered at 20 years; <sup>d</sup> centered at the year 2013; <sup>e</sup> 1 = Narcissistic Personality Instrument (Raskin & Terry, 1988) versus -1 = other instrument; <sup>f</sup> 1 = global trait versus 0 = facet; <sup>g</sup> Dummy coded using Facebook as reference category; <sup>h</sup> 0 = untransformed correlation coefficient versus 1 = transformed effect size (e.g., odds ratio, standardized regression weight).

\*  $p < .05$

**Supplement G: Funnel Plot**



*Figure S1.* Contour-enhanced funnel plot with 90% (white), 95% (light gray), and 99% (dark gray) confidence intervals around the pooled effect (horizontal line).

### Supplement H: *P*-curve analyses

The *p*-curve analyses (Simonsohn, Nelson, & Simmons, 2014) determined whether the published findings provide evidence for a true phenomenon or more likely reflect an artifact of publication bias and questionable research practices (QRP) such as *p*-hacking (e.g., excluding participants or selectively reporting variables to achieve significant results). These analyses examine the distribution of the *p*-values between .00 and .05 for the published effects (i.e. unpublished and non-significant effects are not considered). If these *p*-values are significantly right-skewed, there is positive evidence for the alternative hypothesis (i.e., a true correlation between narcissism and social networking behavior). In contrast, if the null hypothesis holds (i.e., no true correlation) the *p*-values exhibit a uniform distribution. Moreover, a significant left-skew would hint at QRP.

Following Simonsohn and colleagues (2014) Table S7 lists all published studies that identified significant effects and formulated explicit *a priori* predictions regarding the association between narcissism and social networking behavior. Because *p*-curve analyses require independent *p* values, the first effect from each study is reported (cf. Simonsohn et al., 2014). Moreover, the format of the disclosure table slightly differs from the recommendations by Simonsohn and colleagues (Simonsohn et al., 2014; Simonsohn, Simmons, & Nelson, 2015) because the present meta-analysis did not focus on experimental designs. Moreover, most primary studies reported their results in tables; therefore, they are not readily available from the third column in this table. The *p*-curve analyses for the selected studies that formulated explicit predictions regarding the association between overt narcissism and social networking behavior indicated significantly right-skewed half,  $Z = -13.93, p < .001$ , and full *p*-curves,  $Z = -15.26, p < .001$  (see blue line in Figure S2). This provides evidence for the examined effect as a true phenomenon and not as a result of intense *p*-hacking.

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Running head: NARCISSISM AND SOCIAL NETWORKING SITES

Table S7.

*P-Curve Disclosure Table*

<b>Original paper</b>	<b>Quoted text from original paper indicating prediction of interest to researchers</b>	<b>Quoted text from original paper with results</b>	<b>Results</b>
Abdullah et al. (2014)	This model posited that people who have higher level of narcissism will demonstrate higher level of FB usage	Results in Table 6.3 indicate significant and positive relationships between narcissism and all the three FB usage dimensions, namely, the number of Facebook friends ( $r = .32, p \leq 0.01$ ) [...]	$r(300) = .32$
Barry et al. (2015)	It was hypothesized that the number of selfies posted, the proportion of total posts that were selfies, and the frequency of selfie posts would be positively correlated with dimensions of narcissism.	The proportion of total posts that were classified as selfies [...] were unrelated to the dimensions of narcissism.	$r(126) = .10$
Bergman et al. (2011)	Narcissism will be positively related to the reported number of SNS friends.	Narcissism had a significant, positive relationship with the reported [...] number of SNS friends.	$r(359) = .24$
Błachnio et al. (2016)	H1: Narcissism is positively related to Facebook personal importance (1a), instrumental Facebook use (1b), social Facebook use (1c), and Facebook intensity (1d).	[Not explicitly mentioned in text.]	$r(651) = .25$
Brailovskaia & Bierhoff (2012)	Basierend auf den vorgestellten Befunden und Überlegungen scheint die Annahme begründet zu sein, dass sich sowohl offene als auch verdeckte Narzissten durch eine erhöhte Selbstdarstellung und soziale Interaktion auf der Plattform StudiVZ auszeichnen (Hypothese 3).	Beide Narzissmusformen [...] korrelieren signifikant positiv mit der Anzahl insgesamt verwendeter Worte (offener Narzissmus: $r = .19$ [...]).	$r(179) = .19$
Buffardi & Campbell (2008)	Consistent with past research on narcissistic self-regulation, narcissism should be associated with (a) a greater amount of social activity (Hypothesis 1) [...].	As predicted, higher scores on the NPI were related to higher quantities of interaction on Facebook.	$r(127) = .23$
Carpenter (2012)	Initially, individuals who are high in GE [...] are predicted to have a high friend count [...].	Also, it was predicted that GE would be associated with a higher friend count [...]. GE was again the only substantial predictor of friend count.	$r(292) = .17$
Chen (2014)	The personality traits of extroversion, openness, neuroticism, and narcissism will correlate positively with number of Facebook friends while controlling for gender and Facebook usage.	Number of Facebook friends showed the strongest positive relationship with extroversion ( $.47, p < .001$ ), followed by narcissism ( $.31, p < .001$ ).	$r(207) = .31$

Original paper	Quoted text from original paper indicating prediction of interest to researchers	Quoted text from original paper with results	Results
Davenport (2014)	Narcissism will have a stronger positive relationship with Twitter active usage than Facebook active usage.	Results from the regression analyses indicated that narcissism was a significant, positive predictor for frequency of active usage on both Facebook (“FB Status”) and Twitter (“Tweets”).	$r(513) = .18$
Fox (2014)	We expect that narcissism (H1) [...] will be associated with (a) greater social networking site use.	Trait [...] narcissism [...] [was] correlated with time spent on social networking sites. Controlling for age, narcissism and trait self-objectification were found to be significant predictors, supporting H1a and H4a.	$r(798) = .19$
Garcia & Sikström (2014)	[...] we expected that the Dark Triad is manifested in the status updates.	[Not explicitly mentioned in text.]	$r(302) = .04$
Huang (2014)	Adolescents in urban China who are more narcissistic tend to use social media more.	Results in Table 5.4 show that superiority, exploitativeness, and self-absorption significantly and positively correlated with each kind of social media use.	$r(1539) = .11$
Lee (2014)	Narcissism will be positively associated with self-presentational information on Wall.	In addition, narcissistic rivalry was positively related to the frequency of updating Status.	$r(234) = .17$
Leung (2013)	Internet users who are more narcissistic will report a higher frequency of content generation using social .media	As shown in Table 3, the narcissistic dimension of exhibitionism significantly correlated with Facebook ( $r = .23, p < .001$ ) [...] use.	$r(594) = .23$
Mahajan (2013)	Higher scores on [...] number of friends, number of status updates, number of photos and amount of time spent on facebook will be associated narcissism and loneliness.	[Not explicitly mentioned in text.]	$r(105) = .08$
Mara (2010)	Je stärker die narzisistische Veranlagung von studiVZ-Usern, desto höher ist die Anzahl ihrer „geaddeten“ Freunde.	Zwar ist bei beiden Geschlechtern eine positive Korrelation zwischennarzisstischer Persönlichkeitstendenz und der Anzahl geaddeter studiVZ Freunde erkennbar, allerdings ist dieser Zusammenhang unterschiedlich stark: [...] im Fall der männlichen User ein Korrelationskoeffizient in der Höhe von 0,23 (Spearmans Rho; $p < 0,001$ ) festgestellt werden kann [...]	$r(285) = .23$
McKinney et al. (2012)	Are there positive relationships between narcissism and both the frequency of using Facebook to provide	However, narcissism was significantly and positively related to the number of Facebook friends ( $r = .16, p < .05$ )	$r(231) = .16$

Original paper	Quoted text from original paper indicating prediction of interest to researchers	Quoted text from original paper with results	Results
	information about oneself and the number of Facebook friends?		
Mehdizadeh (2010)	Individuals with high narcissism scores will be correlated with a greater amount of Facebook activity.	A Pearson correlation addressed the relationship between narcissism and Facebook activity. As predicted, higher scores on the NPI-16 were positively correlated with the number of times Facebook was checked per day, $r = 0.462, p < 0.01$ .	$r(98) = .462$
Mo & Leung (2015)	The higher subjects score in narcissism, the more they will use Weibo.	Table 5 indicates that intensity of Weibo use was significantly linked to narcissism personality traits ( $\beta = 0.14, p < 0.01$ ).	$r(429) = .36$
Ong (2011)	Narcissism will predict a higher frequency of updating Facebook status over and above extraversion.	After controlling for age, grade and gender, the first two hierarchical regression analyses found narcissism to significantly predict [...] the frequency of Facebook status updates ( $\Delta R^2 = .03, \Delta F(1, 247) = 9.08, p < .01, b = .21$ ) over and above extraversion.	$r(273) = .19$
Panek (2013)	Narcissism is positively related to Facebook status posting frequency.	Our hypotheses were supported, as (H1) narcissism significantly predicted Facebook status updates, $t(423) = 1.99, p < .05$ .	$r(476) = .16$
Pettijohn et al. (2012)	As secondary hypotheses, we also predicted positive relationships between [...] Facebook use and narcissism	Facebook intensity was not correlated with narcissism, $r(198) = .06, p = .32$	$r(198) = .06$
Poon & Leung (2014)	Subjects who are more narcissistic will report a higher frequency of online content production.	In particular, it is significantly linked to content generation in social networking sites ( $r = .17, p < .001$ ).	$r(342) = .17$
Walters et al. (2015)	We expected that narcissism would predict prospectively time spent on Facebook.	[...] score on the NPI-16 was positively and significantly related to how many times participants reported accessing Facebook since the last survey ( $r = .12, p = .002, N = 600$ )	$r(598) = .12$
Weiser et al. (2015)	[...] it was expected that narcissism would be positively related to the frequency of posing selfies on SNSs.	[Not explicitly mentioned in text.]	$r(1,202) = .32$
Winter (2014)	Narcissism is (a) positively related to the number of posted status updates [...].	The second step significantly added to the explanation of variance ( $F(7,162) = 3.06, p = .005, R^2 = .117$ ): Here, narcissism was a significant predictor ( $b = .260, p = .001$ ), showing that narcissists particularly made use of	$r(168) = .255$

Original paper	Quoted text from original paper indicating prediction of interest to researchers	Quoted text from original paper with results	Results
		the possibility to present themselves via status updates (which supports H2a).	

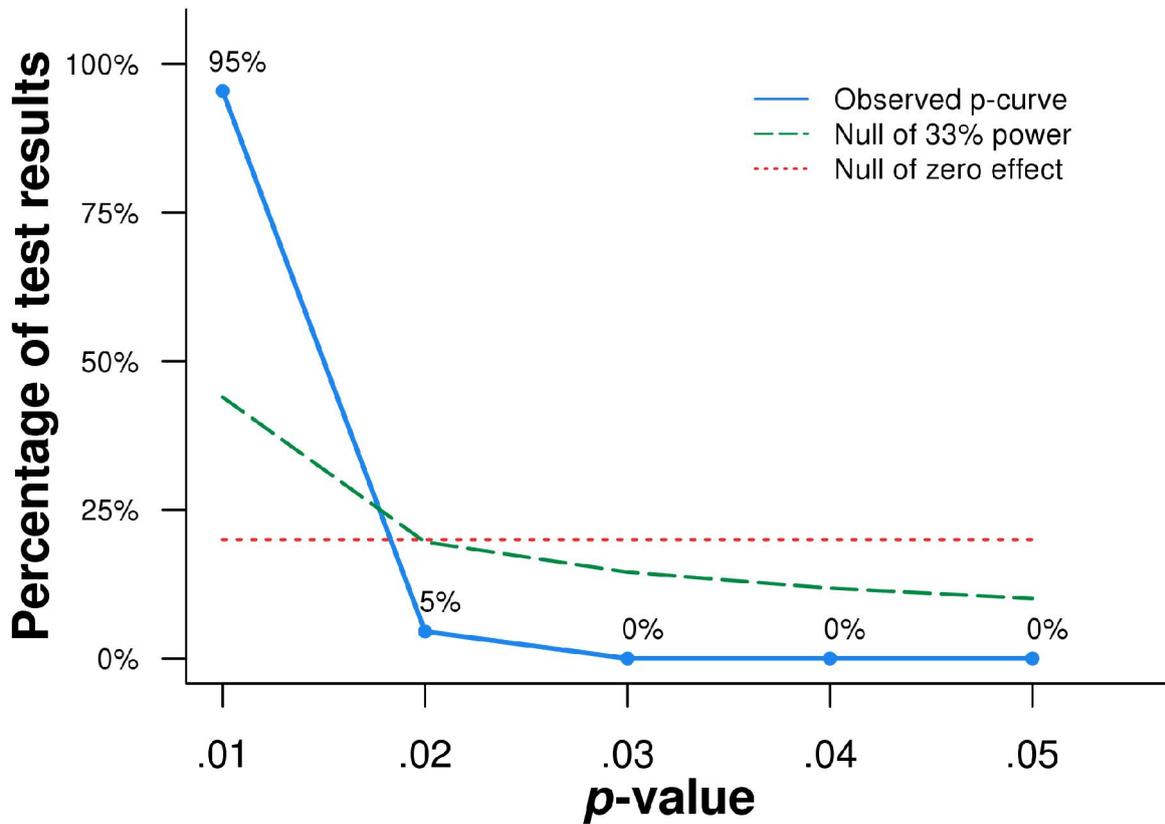


Figure S2. P-curve for 22 published studies with significant effects.

Note: Significant right-skew ( $p < .001$ ) indicates that the published research findings reflect evidentiary value for the association between narcissism and social networking behavior, and little evidence for publication bias and intense  $p$ -hacking.

**Supplement I: Studies included in the Meta-Analysis**

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