Delay Discounting and Narcissism: A Meta-Analysis With Implications for Narcissistic Personality Disorder

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Abstract

Several psychiatric conditions (e.g., substance use, mood, and personality disorders) are characterized, in part, by greater delay discounting (DD)—a decision-making bias in the direction of preferring smaller, more immediate over larger, delayed rewards. Narcissistic personality disorder (NPD) is highly comorbid with substance use, mood, and other personality disorders, suggesting that DD may be a process underpinning risk for NPD as well. This meta-analysis examined associations between DD and theoretically distinct, clinically relevant dimensions of narcissism (i.e., grandiosity, entitlement, and vulnerability). Literature searches were conducted and articles were included if they were written in English, published in a peer-reviewed journal, contained measures of DD and narcissism and reported their association, and used an adult sample. Narcissism measures had to be systematically categorized according to clinically relevant dimensions (Grijalva et al., 2015; Wright & Edershile, 2018). Seven studies met inclusion criteria ($N = 2,705$). DD was positively associated with narcissism ($r = .21$; 95% confidence interval [.10, .32]), with this association being largely attributable to measures of trait grandiosity that were used in each study ($r = .24$; 95% confidence interval [.11, .37]). No studies included diagnostic NPD assessments. These findings provide empirical evidence that DD is related to trait narcissism and perhaps risk for NPD (e.g., grandiosity listed in Criterion B of the *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition*, alternative model of personality disorders). Considering the positive evidence from this review, and the dearth of research examining DD in individuals with NPD, investigators studying NPD may consider incorporating DD measures in future studies to potentially inform clinical theory and novel adjunctive treatment options.

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Delay discounting (DD) is an aspect of decision-making wherein the rewarding value of a commodity decreases as a function of temporal delay to its availability (Bickel et al., 1999; Madden et al., 1997). Individuals with greater than average DD are said to exhibit a decision-making bias in the direction of preferring smaller, more immediate over larger, delayed rewards (Bickel et al., 1999; Madden et al., 1997). Greater DD is associated with a variety of psychiatric conditions, including substance use disorders, affective disorders, schizophrenia, bulimia nervosa, binge-eating disorder, and borderline personality disorder (Amlung et al., 2019; Bickel & Mueller, 2009, Bickel et al., 2019; MacKillop et al., 2011). As such, DD has been proposed to constitute a "transdiagnostic process" underpinning a wide range of psychiatric conditions (Bickel & Mueller, 2009; Bickel et al., 2019). This insight aligns with the U.S. National Institute of Mental Health's Research Domain Criteria initiative, which advocates characterizing psychiatric conditions in terms of underlying biological and psychological processes rather than groups of symptoms (Cuthbert & Insel, 2013; Insel et al., 2010).

Narcissistic personality disorder (NPD) is highly comorbid with psychiatric conditions associated with greater DD, including substance use, mood, and other personality disorders (Stinson et al., 2008). There is an ongoing debate over the factor structure and operationalization of narcissism (Crowe et al., 2019; Krizan & Herlache, 2018; Miller et al., 2017; Pincus & Lukowitsky, 2010; Wright & Edershile, 2018). However, narcissism is generally thought to encompass three clinically relevant dimensions of personality: grandiosity, characterized by an overriding need for recognition and admiration to maintain and enhance an inflated sense of self-importance; entitlement, characterized by a prioritization of self-interests and expectations for especially favorable treatment; and vulnerability, which involves an inability to regulate affect, self-concept, and behavior when needs or self-interests are threatened. As Wright and Edershile (2018) discussed, the *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition* (*DSM–5*), Section III alternative model of personality disorders (AMPD) NPD diagnostic criteria reflect each of these dimensions. For example, Criterion A contains content related to vulnerability (e.g., "exaggerated self-appraisal may be inflated or deflated or vacillate between extremes"), Criterion B encompasses grandiosity (e.g., "firmly holding to the belief that one is better than others"), and features of entitlement are found in both Criterion A (e.g., "personal standards are […] too low based on a sense of entitlement") and Criterion B (e.g., "Feelings of entitlement, either overt or covert"; American Psychiatric Association, 2013).

Importantly, evidence suggests DD may differentially relate to narcissism dimensions. For example, research linking narcissism to the behavioral activation and inhibition systems has shown that individuals high in grandiosity appear to have greater than average motivation to pursue rewards but only weak motivation to avoid punishments (i.e., "approach-orientation"; Foster & Trimm, 2008). Consistent with such evidence, those high in grandiosity may be more likely to engage in risky patterns of substance use (e.g., problematic alcohol consumption) and sexual behavior (e.g., having unprotected sex and multiple sex partners; Coleman et al., 2020), suggesting such individuals may have greater than average preferences for smaller, more immediate rewards (e.g., intoxication, sexual gratification), even when obtaining them could mean forgoing larger, delayed rewards (e.g., better long-term health). By contrast, individuals high in vulnerability appear to have no

more or less motivation to pursue rewards but stronger than average motivation to avoid punishments (i.e., avoidance-orientation"; Foster & Trimm, 2008), which suggests that DD and vulnerability may be unrelated.

Clinical perspectives posit that individuals with NPD can vacillate between grandiose (e.g., extraverted/approach-oriented) and vulnerable states (e.g., neurotic/avoidance-oriented; Giacomin & Jordan, 2016; Gore & Widiger, 2016; Pincus et al., 2015; Wright & Edershile, 2018) and that both grandiosity and vulnerability may be anchored by core expressions of entitlement (Crowe et al., 2019; Krizan & Herlache, 2018; Wright & Edershile, 2018). Therefore, an examination of how DD relates to all three narcissism dimensions is warranted and may help inform future psychiatric studies (e.g., efforts to account for comorbidity between NPD and other psychiatric conditions or to identify feasible points of intervention). More importantly, others have called for research to identify processes to help better understand NPD (Eaton et al., 2017). To our knowledge, there have been no prior reviews examining potential associations between DD and narcissism. Thus, the purpose of this meta-analysis is to examine potential associations between DD and theoretically distinct, clinically relevant dimensions of narcissism.

Method

Search Strategy and Study Selection

This review followed Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines (Figure 1).[1] Articles were identified through searches of the PubMed, PsycINFO, and Web of Science databases from inception through January 31, 2021. Search terms included (delay discounting OR temporal discounting OR future discounting OR delayed gratification OR deferred gratification OR delayed reward OR intertemporal choice OR intertemporal preference OR impulsivity OR risk-taking) AND (narcissism OR grandiosity OR entitlement OR exhibitionism OR psychopathy OR machiavellianism OR dark triad). The functional search term narciss* was included to produce studies on NPD and trait narcissism. Although the term vulnerability is associated with a specific narcissism dimension, it was not included in the search, as it was expected to produce excessive literature on irrelevant topics (e.g., socioeconomic vulnerability, childhood vulnerability). Search results were limited to full-text journal articles in the English language and reporting studies conducted with humans. After removing duplicates, the search identified 1,985 articles for title and abstract screening. Reference sections of relevant articles and reviews were also searched, yielding no additional articles.

Sulamunn R. M. Coleman and Anthony C. Oliver screened titles and abstracts of these 1,985 articles using the following inclusion criteria: (a) written in English, (b) published in a peer-reviewed journal, (c) contained an assessment of DD, (d) contained a validated assessment of narcissism systematically categorized according to a clinically relevant dimension of narcissism (Grijalva et al., 2015; Wright & Edershile, 2018), (e) reported an association between DD and narcissism, and (f) used an adult sample. This meta-

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[1]This meta-analysis was not preregistered. Access to the data set and codebook associated with the previously unpublished data provided by Buelow and Brunell (2014) was not provided by the authors.

analysis focused on adults because narcissism (e.g., symptoms of NPD) may be highly prevalent during childhood and adolescence but generally decreases over time (Cohen et al., 2005; Hamlat et al., 2020). Articles that both authors recommended were advanced to full-text review (interob-server agreement = 99.7%). Disagreements were discussed until consensus was reached. Seventeen articles advanced to full-text review. Following full-text review, seven articles were selected for inclusion. Finally, authors using the Narcissistic Personality Inventory (NPI; Raskin & Hall, 1979) were contacted for additional data on associations between DD and three NPI subscales, including Leadership/Authority, Grandiose Exhibitionism, and Entitlement/Exploitativeness (Ackerman et al., 2011). Dr. Buelow provided means and standard deviations for the three NPI subscales as well as correlations between DD and the three NPI subscales (Buelow & Brunell, 2014; Table 1). No other authors provided additional data.

Data Extraction

Sulamunn R. M. Coleman and Anthony C. Oliver independently read the full texts of the seven articles that met inclusion criteria and extracted the data presented in Table 1. The primary outcome of interest was the association between DD and clinically relevant dimensions of narcissism. To interpret associations between DD and narcissism dimensions, it is important to understand that the direction of associations may change depending on the index used to quantify DD (Smith & Hantula, 2008). For example, DD measures involve hypothetical choice tasks that require choosing between a smaller, sooner reward and a larger, later reward over different delay intervals (e.g., Would you prefer: (a) $100 today or (b) $1,000 in 1 month? Would you prefer: (a) $100 today or (b) $1,000 in 1 year?). The term "delay interval" refers to the amount of time an individual would have to wait to receive a larger reward (e.g., one month, one year). One way to index DD is to simply count the number of times respondents choose a smaller, sooner reward over a larger, later reward (Griskevicius et al., 2011). Greater count scores correspond to greater DD (i.e., greater preference for smaller, sooner reward). More commonly, data obtained from hypothetical choice tasks are used to generate DD curves (Richards et al., 1999). Once a curve is produced, the data are fit according to quantitative discounting models in which the parameter k is used to index DD (for a detailed explanation of discounting models, see Madden & Johnson, 2010). Larger k values correspond to greater DD. In studies using count scores or k values to index DD, positive associations between DD and narcissism indicate that greater narcissism is associated with a greater preference for a smaller, sooner reward.

An alternative method of calculating DD is to calculate the area under the curve (AUC), which does not require that assumptions be met about the various discounting functions and parameter estimates (Myerson et al., 2001). AUC values range from 0.0 to 1.0. Thus, smaller AUC values indicate greater DD, as they correspond to more rapid devaluation of reward as a function of delay. In studies using AUC to index DD, negative associations between DD and narcissism indicate that greater narcissism is associated with a greater preference for a smaller, sooner reward. To facilitate the interpretation of results in the current meta-analysis, r values derived from AUC values were reverse coded so that all effects faced the same direction (i.e., positive r corresponds to a greater preference for a smaller, sooner reward).

All studies included self-report measures of trait narcissism; no studies containing diagnostic assessments of NPD were identified. In general, most measures of trait narcissism are thought to be captured primarily by one clinically relevant dimension of the construct but may be captured by other dimensions at secondary or tertiary levels (Crowe et al., 2019; Wright & Edershile, 2018). Measures of trait narcissism in the current meta-analysis were coded according to the dimension they are thought to be captured by at a primary level (i.e., grandiosity, entitlement, or vulnerability) based on the categorizations of existing reviews (Grijalva et al., 2015; Wright & Edershile, 2018; Table 1). Importantly, demonstrating that DD broadly associates with trait measures along one or more clinically relevant dimensions of narcissism could suggest which *DSM–5* AMPD NPD criteria are most likely to reflect greater (or lesser) DD. Discrepancies in data extraction were discussed between authors until consensus was reached.

Quality Assessment

Quality of evidence was evaluated using the National Institutes of Health Quality Assessment Tool for Observational Cohort and Cross-Sectional Studies (Table 2; National Heart, Lung, and Blood Institute, 2021), which contains 14 criteria used to evaluate the risk of bias and the validity for each study contained in the meta-analysis (e.g., "Was the participation rate of eligible persons at least 50%?"). The criteria were rated as "yes," "no," or other (i.e., cannot determine ["CD"], not reported ["NR"], or not applicable ["NA"]). Consistent with a recent meta-analysis (Torres-Castro et al., 2021), a total score (i.e., percentage) was provided for each study based on the number of criteria rated as "yes" divided by the number of criteria applicable to the study. Studies with a total score of 75% were assigned a quality rating of "good" (i.e., least risk of bias, results are considered valid), those with a total score of 50%–74% were assigned a quality rating of "fair" (i.e., some bias deemed not sufficient to invalidate the results), and those with a total score of <50% were assigned a quality rating of "poor" (i.e., significant risk of bias). Sulamunn R. M. Coleman and Elias M. Klemperer independently evaluated the quality of evidence for each study, and discrepancies were discussed between authors and resolved by consensus.

Statistical Analysis

Analyses were conducted using the software package Comprehensive Meta-Analysis Version 3 (Borenstein et al., 2013). The measure of effect size used in this study was *r*. Consistent with the recommendations of the statistical software, the mean of effect sizes was used for studies reporting more than one effect per sample (Buelow & Brunell, 2014; Malesza & Kaczmarek, 2018). Random-effects, meta-analysis models were selected a priori to calculate the estimated average effect size and the corresponding 95% confidence intervals (CI). Random-effects models, in which each study's effect is weighted inversely proportional to its variance, were used due to the assumption of significant heterogeneity of effect sizes across studies. Finally, possible publication bias was examined using funnel plots and Egger's regression test (Egger et al., 1997).

Results

Study Characteristics

Included studies were published between 2013 and 2021 (Table 1). Overall sample size was 2,705 across studies (M_{age} = 26.21, SD = 7.49; 54% women). The median sample size was 299. Ten correlations were extracted from the seven articles.

Regarding DD measures and indices (Table 1), a count score was calculated using delay intervals in one study (Jonason et al., 2020). Two studies calculated k scores (Buelow & Brunell, 2014; Crysel et al., 2013) using either Kirby's 27-item Monetary Choice Questionnaire (Kirby et al.,1999) or delay intervals. The remaining studies used delay intervals to calculate AUC (Malesza & Kaczmarek, 2018; Malesza & Kalinowski, 2021a, 2021b; Malesza & Ostaszewski, 2016).

Regarding measures and dimensions of narcissism (Table 1), all studies included measures coded as assessing trait grandiosity (Buelow & Brunell, 2014; Crysel et al., 2013; Jonason et al., 2020; Malesza & Kaczmarek, 2018; Malesza & Kalinowski, 2021a, 2021b; Malesza & Ostaszewski, 2016), such as the Narcissistic Grandiosity Scale (NGS; Crowe et al., 2016; Rosenthal et al., 2020), Dark Triad Dirty Dozen Narcissism subscale (Dirty Dozen; Jonason & Webster, 2010), Short Dark Triad Narcissism subscale (Jones & Paulhus, 2014), or the NPI (Raskin & Hall, 1979). In addition, Buelow and Brunell (2014) provided data on the NPI Leadership/Authority and Grandiose Exhibitionism subscales (Ackerman et al., 2011), both of which were coded as measures of trait grandiosity. One study (Buelow & Brunell, 2014) included the Psychological Entitlement Scale (PES; Campbell et al., 2004) and NPI Entitlement/Exploitativeness subscale (Ackerman et al., 2011), both coded as measures of trait entitlement, and another study (Malesza & Kaczmarek, 2018) included the Hypersensitive Narcissism Scale (HSNS; Hendin & Cheek, 1997), which was coded as a measure of trait vulnerability.

Meta-Analyses (DD and Narcissism Overall or Trait Grandiosity)

The estimated average effect calculated from seven effect sizes of DD and narcissism overall (i.e., collapsing across narcissism dimensions) was small to moderate (r = .21; 95% CI [.10, .32]) (Figure 2). The mean effect size for the data provided by Buelow and Brunell (2014) was calculated using the correlations between DD and the PES, NGS, and NPI full scale, and the mean effect size for the data provided by Malesza and Kaczmarek (2018) was calculated using the correlations between DD and the NPI and HSNS; r was positive and significant for all but one study (Malesza & Ostaszewski, 2016).

There were seven effect sizes used to calculate the estimated average effect size for trait grandiosity (Figure 3). Similar to narcissism overall, the estimated average effect calculated from seven effect sizes of DD and trait grandiosity was small to moderate (r = .24; 95% CI [.11, .37]). The mean effect size for the data provided by Buelow and Brunell (2014) was calculated using the correlations between DD and the NGS and NPI Full Scale. Again, r was positive and significant for all but one study (Malesza & Ostaszewski, 2016).

Two supplemental meta-analyses were conducted making use of the NPI subscale data provided by Buelow and Brunell (2014). For the first analysis (narcissism overall), the mean effect size for the data provided by Buelow and Brunell (2014) was calculated using the correlations between DD and the PES, NGS, Narcissistic Personality Inventory—Leadership/Authority subscale, Narcissistic Personality Inventory —Grandiose Exhibitionism subscale, and Narcissistic Personality Inventory—Entitlement/ Exploitativeness subscale. The results of this meta-analysis ($r = .21$; 95% CI [.10, .32]) were identical to those of the main meta-analysis for narcissism overall (Figure S1 in the online supplemental materials).

For the second analysis (trait grandiosity), we used only the correlations between DD and the NGS, Narcissistic Personality Inventory—Leadership/Authority subscale, and Narcissistic Personality Inventory—Grandiose Exhibitionism subscale to calculate the mean effect for the data provided by Buelow and Brunell (2014). Again, the results of this meta-analysis ($r = .24$; 95% CI [.11, .37]) were identical to the results of the main meta-analysis for trait grandiosity (Figure S2 in the online supplemental materials).

Associations Between DD and Trait Entitlement or Trait Vulnerability

There were too few effect sizes to conduct separate meta-analyses for trait entitlement or vulnerability. DD was positively and significantly associated with trait entitlement measured with the Psychological Entitlement Scale ($r = .29$, p .001) and the NPI Entitlement/ Exploitativeness subscale ($r = .15$, p .001), with small-to-moderate effect sizes comparable with the estimated average effect sizes for DD and narcissism overall and trait grandiosity. DD was unrelated to trait vulnerability ($r = -.08$, p = n.s.).

Quality Assessment and Publication Bias

The quality of evidence was rated as "good" for four studies (Malesza & Kaczmarek, 2018; Malesza & Kalinowski, 2021a, 2021b; Malesza & Ostaszewski, 2016), as "fair" for two studies (Crysel et al., 2013; Jonason et al., 2020), and as "poor" for one study (Buelow & Brunell, 2014; Table 2). One study was rated as "fair" (Crysel et al., 2013) rather than "good" because subjects were recruited from very different populations (United States, India, Canada, Indonesia, and Pakistan), but potential group differences by country of origin were not reported, and it was unclear whether eligibility criteria were applied uniformly to all participants. A second study was rated as "fair" (Jonason et al., 2020) because it was unclear whether any participants were missing data that would have excluded them from the analyses. In addition, given the study's very large age distribution (18–82; M_{age} = 37.11, SD = 12.76), there may have been important age-related differences between participants that were unaccounted for. One study was rated as "poor" (Buelow & Brunell, 2014) because only 31% of the participants completed all measures of narcissism, and it was unclear why the measures were not implemented consistently across participants and less than 50% of eligible participants completed all assessments. In addition, eligibility criteria were not reported. Overall, six of seven (86%) of the studies included in the meta-analysis were rated as "fair" or better, and four of seven (57%) of the studies were rated as "good." Finally, we found no evidence of publication bias for narcissism overall (Figure 4) or trait grandiosity (Figure 5).

Discussion

The purpose of this meta-analysis was to evaluate associations between DD and clinically relevant dimensions of narcissism. Although no studies examining DD and diagnostic assessments of NPD were identified, the aggregated effect sizes presented in the main and supplemental meta-analyses provide a modest but consistent body of empirical evidence for a small-to-moderate positive association between DD and measures of trait narcissism. This association was mostly examined using various measures of trait grandiosity. A positive association between DD and trait entitlement was also observed in one study (Buelow & Brunell, 2014), but there was no association between DD and trait vulnerability in another study (Malesza & Kaczmarek, 2018). Consistent with the *DSM–5* Section III AMPD, these findings suggest that greater DD may be reflected in NPD Criterion B (i.e., grandiosity, attention-seeking) but could be more broadly associated with NPD via features of entitlement. In the spirit of the Research Domain Criteria Framework, the current findings provide initial support for the position that DD may be a process of relevance to NPD that could help to account, in part, for comorbidities between NPD and disorders characterized by greater DD.

In this study, small-to-medium estimated average effect sizes were observed for associations between DD and narcissism overall (i.e., collapsing effect sizes across measures of different narcissism dimensions) and trait grandiosity. In terms of magnitude, the strength of association between DD and trait narcissism is comparable with that of DD and major depressive disorder, schizophrenia, obsessive-compulsive disorder, bulimia nervosa, and binge-eating disorder but not as strong compared with associations between DD and borderline personality disorder, bipolar disorder, or substance use disorders (Amlung et al., 2019; Bickel et al., 2019; MacKillop et al., 2011). Thus, the present findings suggest that DD could be an important process for understanding aspects of narcissism (e.g., grandiosity, entitlement), associated behavioral risks (e.g., problematic alcohol consumption; Coleman et al., 2020), or comorbidities between NPD and other psychiatric conditions.

Importantly, although the debate over the number and operationalization of the primary dimensions of narcissism remains ongoing (Crowe et al., 2019; Krizan & Herlache, 2018; Miller et al., 2017; Wright & Edershile, 2018), it is widely accepted that grandiosity and entitlement are pronounced in individuals with NPD. The current findings indicate that trait grandiosity and perhaps entitlement may be indicative of greater DD. Therefore, it is reasonable to suggest that DD may be greater among those who meet diagnostic criteria for NPD. More importantly, this review highlights a dearth of research in the area of DD and NPD, and research focused on clinical samples or using diagnostic assessments of narcissism is needed to better contextualize the clinical significance of the association between DD and narcissism.

Beyond the clinical literature, a growing body of evidence indicates that trait narcissism, particularly grandiosity, associates with a variety of risky behavior patterns (Buelow & Brunell, 2018), including greater alcohol consumption (Coleman et al., 2020; Hill, 2016; Luhtanen & Crocker, 2005), having unprotected sex and multiple sex partners (Coleman et al., 2020; Martin et al., 2013), making risky financial decisions (Foster et al., 2011),

gambling (Lakey et al., 2008), and even disregarding public health and safety messages during the COVID-19 pandemic (Hardin et al., 2021; Nowak et al., 2020; Venema & Pfattheicher, 2021; Zajenkowski et al., 2020). Because greater DD is associated with many of these same behaviors (Bickel et al., 2019), it may be informative to examine whether interventions that have been shown to reduce DD (e.g., Episodic Future Thinking; Peters & Büchel, 2010; Snider et al., 2016; Stein et al., 2016) are effective for producing reductions in behavioral problems associated with narcissism.

Limitations

This study has several limitations that merit mention. First, as noted earlier, none of the studies in this review included diagnostic assessments of NPD. Although categorizing self-report measures of trait narcissism according to clinically relevant dimensions may provide some insight into how DD could relate to NPD, and measures such as the NPI have been shown to correspond with expert ratings of NPD trait profiles (Miller et al., 2016), this study provides only preliminary evidence that DD may represent a process of relevance to NPD. Second, the topic of interest is relatively understudied, with only seven studies meeting inclusion criteria for this review and only two of those studies examining dimensions other than grandiosity. This small number of studies precluded, for example, a moderation analysis of the association between DD and narcissism by dimensions of narcissism. It will be important to further examine associations between DD and narcissism after more research by a larger group of investigators emerges on this topic. Third, although the Dirty Dozen (Jonason & Webster, 2010) is thought to represent a measure of grandiosity (Grijalva et al., 2015), some evidence demonstrates that it positively correlates with the HSNS (i.e., a measure of vulnerability), which distinguishes it from other measures of grandiosity that negatively correlate with the HSNS (Maples et al., 2014). Given the evidence presented in the current study that DD may be unrelated to vulnerability (Malesza & Kaczmarek, 2018), it is possible that the Dirty Dozen underestimates the association between DD and grandiosity. Relatedly, as the NPI and HSNS have been shown to negatively correlate (Maples et al., 2014), calculating a mean effect size for the data provided by Malesza and Kaczmarek (2018) using the association between DD and the NPI and the association between DD and the HSNS likely obscures the effect of DD for both grandiosity and vulnerability. Furthermore, most measures of grandiosity and vulnerability capture aspects of entitlement, or "self-centered antagonism" more broadly, which encompasses a lack of empathy and a willingness to exploit others to meet entitled expectations (Crowe et al., 2019); however, it was not possible to factor these aspects out of all measures of grandiosity or vulnerability contained in this meta-analysis. Together, these limitations underscore the need for additional research on this topic, particularly research examining associations between DD and narcissism dimensions other than grandiosity. Moreover, it would be informative for future studies to report associations between DD and subscales of narcissism measures such as the NPI or use narcissism measures that contain subscales demonstrated to load primarily onto one narcissism dimension (e.g., the Five-Factor Narcissism Inventory Short Form, Agentic Extraversion, Antagonism, and Neuroticism subscales; Crowe et al., 2019; Miller et al., 2016; Sherman et al., 2015).

Conclusion

In conclusion, this meta-analysis provides evidence that DD and trait narcissism are positively associated. Given the relative consistency of associations between DD and trait narcissism across different samples and measures categorized according to clinically relevant dimensions, these findings have implications for placing NPD among other psychiatric conditions characterized by greater DD. Further research in this domain could help to clarify whether DD represents an important source of transdiagnostic variance underlying NPD and psychiatric comorbidities and whether DD links NPD to risky behaviors and associated downstream functional impairments (e.g., health, relationship, legal, or financial problems).

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

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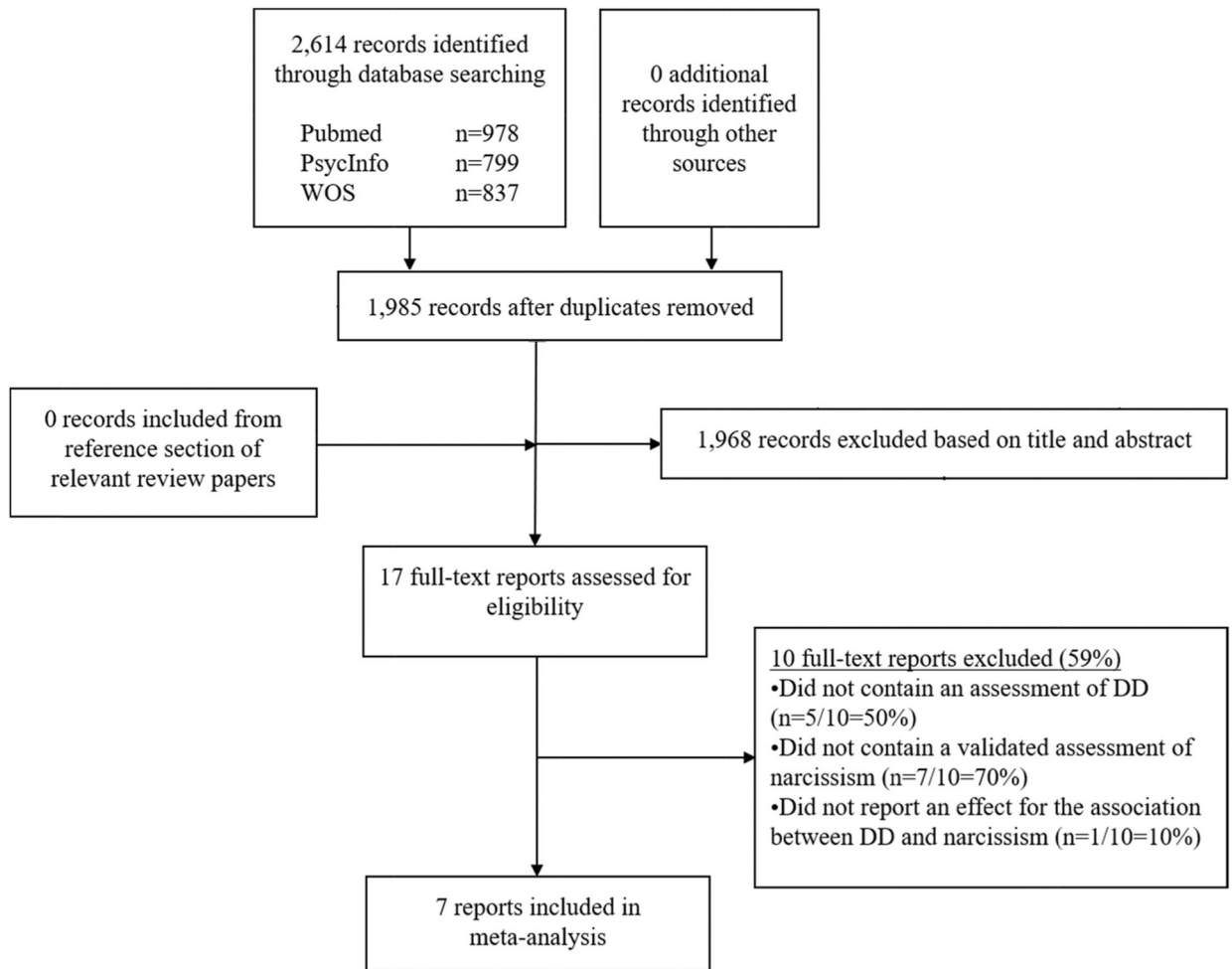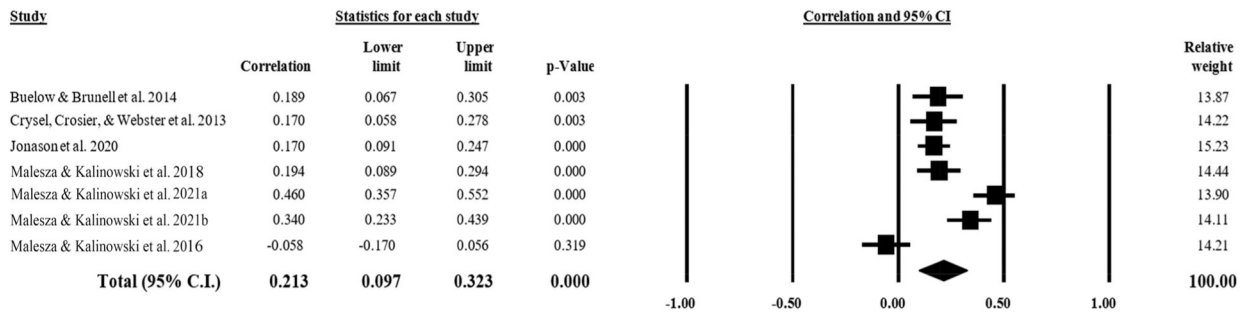
Figure 1. PRISMA Diagram of Included and Excluded Reports
Note. PRISMA = Preferred Reporting Items for Systematic Reviews and Meta-Analyses;
WOS = Web of Science; DD = delay discounting.

Study	Statistics for each study				Correlation and 95% CI	Relative weight
	Correlation	Lower limit	Upper limit	p-Value		
Buelow & Brunell et al. 2014	0.189	0.067	0.305	0.003		13.87
Crysel, Crosier, & Webster et al. 2013	0.170	0.058	0.278	0.003		14.22
Jonason et al. 2020	0.170	0.091	0.247	0.000		15.23
Malesza & Kalinowski et al. 2018	0.194	0.089	0.294	0.000		14.44
Malesza & Kalinowski et al. 2021a	0.460	0.357	0.552	0.000		13.90
Malesza & Kalinowski et al. 2021b	0.340	0.233	0.439	0.000		14.11
Malesza & Kalinowski et al. 2016	-0.058	-0.170	0.056	0.319		14.21
Total (95% C.I.)	**0.213**	**0.097**	**0.323**	**0.000**		**100.00**

-1.00   -0.50   0.00   0.50   1.00

Figure 2. Meta-Analysis of Associations Between Delay Discounting and Narcissism Overall
Note. The study by Buelow and Brunell (2014) presents the average effect for associations between DD and the Psychological Entitlement Scale, DD and the Narcissistic Grandiosity Scale, and DD and the Narcissistic Personality Inventory Full Scale. The study by Malesza and Kaczmarek (2018) presents the average effect for associations between DD and the Narcissistic Personality Inventory Full Scale and DD and the Hypersensitive Narcissism Scale. DD = delay discounting.

Study	Statistics for each study				Correlation and 95% CI	Relative weight
	Correlation	Lower limit	Upper limit	p-Value		
Buelow & Brunell et al. 2014	0.136	0.022	0.246	0.019		14.20
Crysel, Crosier, & Webster et al. 2013	0.170	0.058	0.278	0.003		14.21
Jonason et al. 2020	0.170	0.091	0.247	0.000		14.90
Malesza & Kalinowski et al. 2018	0.440	0.350	0.522	0.000		14.36
Malesza & Kalinowski et al. 2021a	0.460	0.357	0.552	0.000		13.99
Malesza & Kalinowski et al. 2021b	0.340	0.233	0.439	0.000		14.14
Malesza & Kalinowski et al. 2016	-0.058	-0.170	0.056	0.319		14.21
Total (95% C.I.)	**0.244**	**0.107**	**0.371**	**0.001**		**100.00**

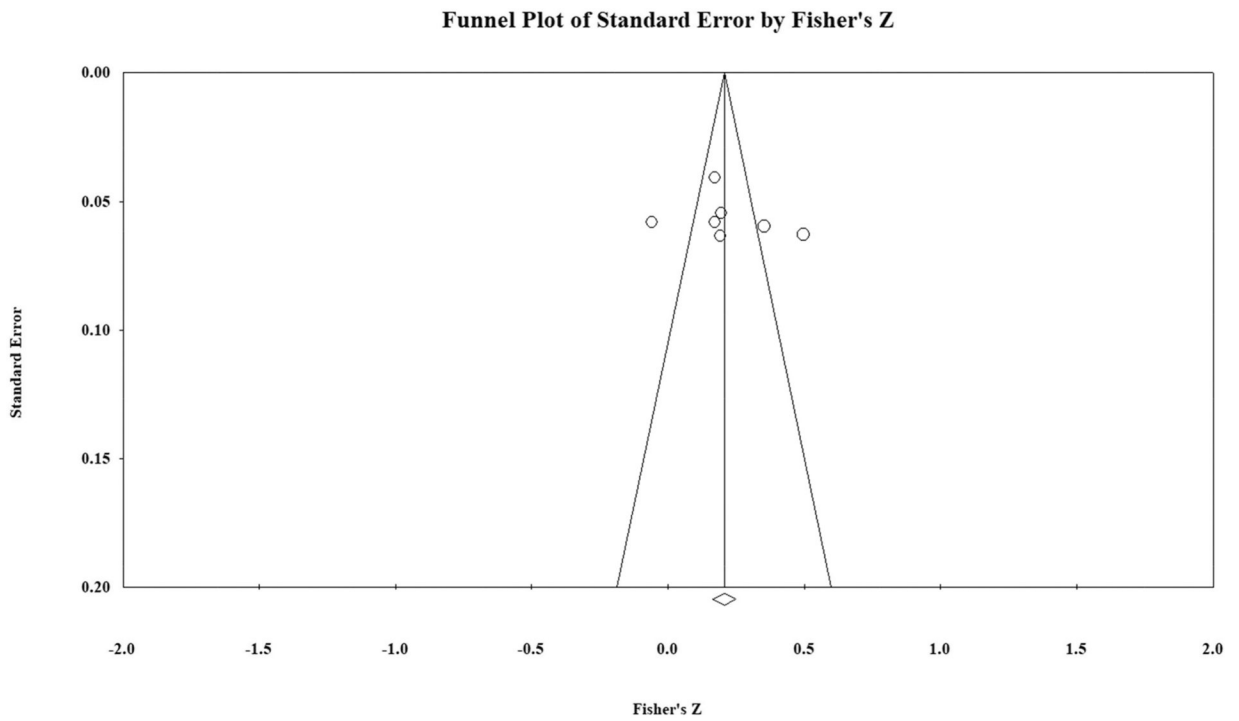**Figure 3. Meta-Analysis of Associations Between Delay Discounting and Grandiosity**
Note. The study by Buelow and Brunell (2014) presents the average effect for associations between DD and the Narcissistic Grandiosity Scale and DD and Narcissistic Personality Inventory Full Scale. DD = delay discounting.

Funnel Plot of Standard Error by Fisher's Z
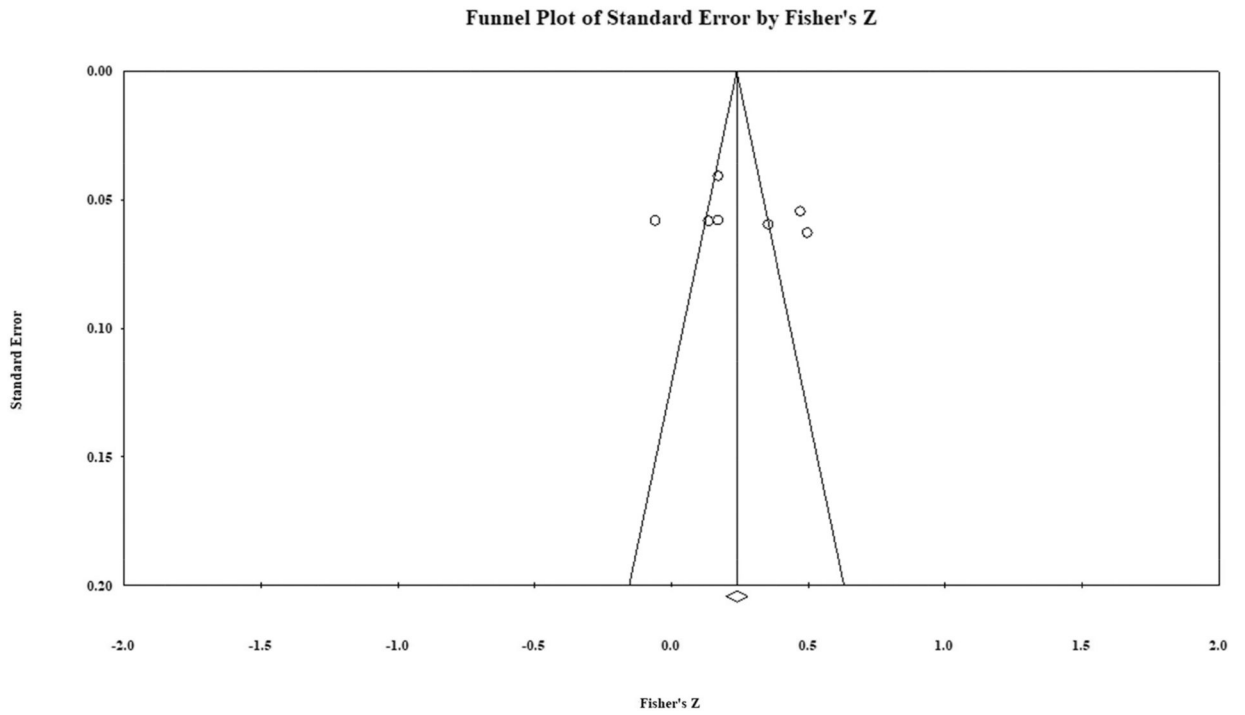

Figure 4. Funnel Plot for Meta-Analysis of Associations Between Delay Discounting and Narcissism Overall

Note. Egger's test: $t(5) = 0.62$, $p = .56$.

Figure 5. Funnel Plot for Meta-Analysis of Associations Between Delay Discounting and Grandiosity

*Note.*Egger's test: $t(5) = 0.54$, $p = .61$.

Table 1

Summary of Studies Examining Associations Between Delay Discounting and Self-Report Measures of Trait Narcissism

Authors	Year	Sample	DD measure	DD index	DD mean (SD)	Narcissism measure	Narcissism dimension	Narcissism mean (SD)	Correlation
Buelow and Brunell	2014	194 University students (United States; other characteristics not reported)	MCQ	k	CNBD	PES	Entitlement	29.05 (11.33)	.292
			MCQ	k	CNBD	NGS	Grandiosity	50.44 (21.12)	.172
		630 University students (United States; M_{age} = 19.16 [SD = 3.92]; 364 women)	MCQ	k	CNBD	NPI	Grandiosity	16.14 (10.15)	.099
						NPI-LA	Grandiosity	5.21 (2.95)[c]	[c].116
						NPI-GE	Grandiosity	3.54 (2.66)[c]	[c].101
						NPI-EE	Entitlement	0.97 (1.05)[c]	[c].151
Crysel et al.	2013	Study 2: 299 General population (roughly half from the United States, remaining half from India, Canada, Indonesia, and Pakistan; M_{age} = 32.60 [SD = 11.10]; 120 women)	Five delay intervals[a]	k	0.46 (0.92)	Dirty Dozen	Grandiosity	2.95 (1.04)	.170
Jonason et al.	2020	602 General population (United States; M_{age} = 37.11 [SD = 12.76]; 319 women)	Seven delay intervals[b]	Count	3.87 (2.65)	SD3	Grandiosity	2.70 (0.68)	.170
Malesza and Kaczmarek	2018	338 University students (Germany; M_{age} = 23.10 [SD = 1.05]; 191 women)	Seven delay intervals[a]	AUC	0.55 (0.14)	NPI	Grandiosity	121.80 (29.3)	.440
			Seven delay intervals[a]	AUC	0.55 (0.14)	HSNS	Vulnerability	27.80 (7.15)	–.080
Malesza and Kalinowski	2021a	255 University students (Germany; M_{age} = 23.52 [SD = 3.70]; 172 women)	Five delay intervals[a]	AUC	0.53 (0.28)	SD3	Grandiosity	33.61 (3.07)	.460
Malesza and Kalinowski	2021b	283 University students (Germany; M_{age} = 22.90 [SD = 3.40]; 148 women)	Five delay intervals[a]	AUC	0.52 (0.38)	NPI	Grandiosity	8.95 (2.06)	.340
Malesza and Ostaszewski	2016	298 University students (Germany; M_{age} = 21.80 [SD = 1.52]; 160 women)	Five delay intervals[a]	AUC	Men = 0.39 (0.13) Women = 0.56 (0.17)	NPI	Grandiosity	Men = 8.19 (2.20) Women = 7.93 (2.54)	–.058

Note. DD = delay discounting; MCQ = Monetary Choice Questionnaire; CNBD = could not be determined; AUC = area under curve; NGS = Narcissistic Grandiosity Scale; NPI = Narcissistic Personality Inventory; NPI-LA = Narcissistic Personality Inventory, Leadership/Authority subscale; NPI-GE = Narcissistic Personality Inventory, Grandiose Exhibitionism subscale; NPI-EE = Narcissistic Personality Inventory, Entitlement/Exploitativeness subscale; PES = Psychological Entitlement Scale; SD3 = Short Dark Triad; HSNS = Hypersensitive Narcissism Scale. Large discrepancies in means and standard deviations on narcissism scales such as the NPI and SD3 are attributable to differences in scale versions and scoring procedures.

[a] Discounting curves were generated according to procedures outline by Richards et al. (1999).

[b] Count scores were obtained according to procedures outline by Griskevicius et al. (2011).

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Table 2

National Institutes of Health Quality Assessment Tool for Observational Cohort and Cross-Sectional Studies

Authors	Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Total score	Quality rating
Buelow and Brunell	2014	Y	Y	N	NR	N	NA	NA	Y	Y	NA	N	NA	NA	N	4/9 (44%)	Poor
Crysel et al.	2013	Y	Y	Y	N	N	NA	NA	Y	Y	NA	Y	NA	NA	N	6/9 (67%)	Fair
Jonason et al.	2020	Y	Y	NR	N	N	NA	NA	Y	Y	NA	Y	NA	NA	N	5/9 (56%)	Fair
Malesza and Kaczmarek	2018	Y	Y	Y	Y	N	NA	NA	Y	Y	NA	Y	NA	NA	N	7/9 (78%)	Good
Malesza and Kalinowski	2021a	Y	Y	Y	Y	N	NA	NA	Y	Y	NA	Y	NA	NA	N	7/9 (78%)	Good
Malesza and Kalinowski	2021b	Y	Y	Y	Y	N	NA	NA	Y	Y	NA	Y	NA	NA	N	7/9 (78%)	Good
Malesza and Ostaszewski	2016	Y	Y	Y	Y	N	NA	NA	Y	Y	NA	Y	NA	NA	N	7/9 (78%)	Good

Note. Rating criteria: 1 = Was the research question or objective in this article clearly stated? 2 = Was the study population clearly specified and defined? 3 = Was the participation rate of eligible persons at least 50%? 4 = Were all subjects selected or recruited from the same or similar populations (including the same time period)? [and] Were inclusion and exclusion criteria for being in the study prespecified and applied uniformly to all participants? 5 = Was a sample size justification, power description, or variance and effect estimates provided? 6 = For the analyses in this article, were the exposure(s) of interest measured prior to the outcome(s) being measured? 7 = Was the timeframe sufficient so that one could reasonably expect to see an association between exposure and outcome if it existed? 8 = For exposures that can vary in amount or level, did the study examine different levels of the exposure as related to the outcome (e.g., categories of exposure, or exposure measured as a continuous variable)? 9 = Were the exposure measures (independent variables) clearly defined, valid, reliable, and implemented consistently across all study participants? 10 = Was the exposure(s) assessed more than once over time? 11 = Were the outcome measures (dependent variables) clearly defined, valid, reliable, and implemented consistently across all study participants? 12 = Were the outcome assessors blinded to the exposure status of participants? 13 = Was loss to follow-up after baseline 20% or less? 14 = Were key potential confounding variables measured and adjusted statistically for their impact on the relationship between exposure(s) and outcome(s)? Abbreviations: Y = yes; N = no; NR = not reported; NA = not applicable. Total score: (number of "yes" ratings)/(number of criteria applicable to the study). Quality ratings: poor = <50%; fair = 50%–74%; good = >75%. Additional guidance for assessing the quality of evidence using the National Institutes of Health Quality Assessment Tool for Observational Cohort and Cross-Sectional Studies can be located at https://www.nhlbi.nih.gov/health-topics/study-quality-assessment-tools.