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PHYSIOLOGICAL AND HEALTH-RELATED CORRELATES OF THE NARCISSISTIC PERSONALITY

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Abstract

Narcissism is a personality trait that is characterized by excessively high self-esteem in combination with low empathy. Since the development of sound instruments to measure the narcissistic personality in the 1970s, scholars have discovered a lot about the interpersonal correlates and consequences of narcissism. For example, people scoring high on narcissism have difficulty maintaining healthy, long-term close relationships and have a tendency to behave aggressively in response to critical feedback. In the current chapter, we summarize known health (Part I) and physiological correlates (Part II) of the narcissistic personality. We review the well-developed literature on narcissism and psychological health, and then move on to less developed research on cognitive performance, health-risk behaviors, and physical-health outcomes, including mortality risk. Research that goes beyond self-reports and examines the physiological underpinnings of the narcissistic personality is very rare, but it is important to use such measures, given narcissistic tendencies to self-enhance. Thus, we thoroughly review the extant literature examining cardiovascular, endocrine, neural, and genetic correlates of narcissism. Given the limited amount of research on this topic, we conclude by discussing potential directions for future research.

Keywords: narcissism, health, well-being, physiological, cardiovascular, endocrine, hormones, neural, genetic

INTRODUCTION

The term narcissism comes from the mythical Greek character Narcissus, who fell in love with himself after he saw his own image reflected in the water. In extreme cases, narcissism can be a clinical disorder (APA, 2000). However, there is also a large body of literature describing narcissism as a personality trait that varies within nonclinical populations (Campbell & Miller, 2011). Narcissism is typically defined as a trait characterized by inflated views of the self in combination with a low regard for others (Konrath, Bushman, & Grove, 2009; Morf & Rhodewalt, 2001; Twenge, Konrath, Foster, Campbell, & Bushman, 2008).

Narcissism is an important trait to understand because narcissistic people have a number of difficulties maintaining healthy and strong interpersonal relationships (Campbell, 1999; Campbell, Bush, Brunell, & Shelton, 2005). Social relationships are fundamental to fulfilling core human needs, such as the need to belong (Baumeister & Leary, 1995; Cacioppo & Patrick, 2008). They are also

implicated in psychological well-being, mental health, and physical health – more socially connected people are more mentally and physically robust, and even live longer than less socially connected people (Cacioppo, Hawkley, & Thisted, 2010; Cohen, 2004; Holt-Lunstad, Smith, & Layton, 2010; House, Landis, & Umberson, 1988).

Since the development of sound instruments to measure the narcissistic personality in the 1970s, scholars have discovered a great deal about the interpersonal correlates and consequences of narcissism. Narcissistic people tend to see other people primarily as means to fulfill their goals, rather than as important in and of themselves. Although at times narcissistic people can recognize others' emotions (Konrath, Corneille, Bushman, & Luminet, 2013), in general, they have difficulty in taking others' perspectives and feeling empathic concern when others are suffering (Bushman, Bonacci, van Dijk, & Baumeister, 2003; Watson, Biderman, & Sawrie, 1994; Watson, Grisham, Trotter, & Biderman, 1984). Narcissistic people make positive first impressions and others find them likeable and attractive, at first (Back, Schmukle, & Egloff, 2010; Dufner, Rauthmann, Czarna, & Denissen, 2013; Paulhus, 1998). However, after repeated social interactions, others grow weary of their social dominance and egotism, and find them less appealing (Dufner et al., 2012; Paulhus, 1998).

Within romantic relationships, narcissistic people tend to show low levels of commitment to their partners, often seeking out other, more impressive or attractive partners (Campbell, Foster, & Finkel, 2002; Le, 2005). The interpersonal problems of narcissistic people also extend to more serious consequences, such as aggressive behavior. Numerous studies have found that narcissism is associated with more aggressive behavior (Davis & Brunell, 2012; Reidy, Zeichner, Foster, & Martinez, 2008), especially when their egos are threatened by insults or social exclusion (Baumeister, Bushman, & Campbell, 2000; Baumeister, Smart, & Boden, 1996; Bushman & Baumeister, 1998; Konrath, Bushman, & Campbell, 2006; Twenge & Campbell, 2003).

In this chapter, we review current research on the health and physiological correlates of narcissism. In Part I, we discuss several health correlates, including subjective well-being and mental health, cognitive performance, vanity-related health behaviors, behaviors related to impulsivity, and other physical-health outcomes, including longevity. In Part II, we discuss physiological correlates in the areas of basic physiological measures, hormones, neural responses, and genetic factors. In Part III, we present our conclusions and some suggestions for future research.

There has been a great deal of research into the relationship between narcissism and well-being and mental health. Yet, as our review will demonstrate, the research on health-risk behaviors is much more limited and we know virtually nothing about the potential long-term consequences of narcissism in terms of disease processes and mortality risk. This is because the vast majority of research on narcissism has been conducted in young adult populations. Moreover, since most measures of well-being and mental health rely on self-reports, this research must be interpreted with caution since the very definition of narcissism implies seeing oneself as better and more powerful (i.e., less vulnerable) than others.

Considering these problems with self-report measures, research on the physiological correlates of narcissism is also important. Such research may help to uncover physiological costs of narcissistic traits that might not be apparent when using self-report measures alone. In addition, studies examining cardiovascular, hormonal, and neural responses to threat may help scholars to better understand why narcissistic people are so behaviorally reactive to ego-threatening feedback.

This chapter is the most comprehensive known review on the health and physiological correlates of narcissism.¹ This is an area that is ripe for

¹ One recent chapter reviewed physiological correlates of narcissism and psychopathy (Krusemark, 2011) and there is some overlap in content between that chapter and our own. However, we also include health correlates of narcissism and update the discussion of physiological correlates with more recent research.

development and we hope that this review inspires new research by pointing to major gaps in the existing literature.

PART I:

HEALTH CORRELATES OF THE NARCISSISTIC PERSONALITY WELL-BEING AND MENTAL HEALTH

In terms of many traditional indicators of well-being and mental health, narcissistic individuals appear to be thriving. For example, compared to less narcissistic people, more narcissistic people are happier (Rose, 2002), have higher levels of life satisfaction and subjective well-being (Rose, 2002; Sedikides, Rudich, Gregg, Kumashiro, & Rusbult, 2004), have a greater sense of meaning in lives (Zondag, Van Halen, & Wojtkowiak, 2009), are more creative (Raskin, 1980), and have higher self-esteem (Aalsma, Lapsley, & Flannery, 2006; Campbell, Rudich, & Sedikides, 2002; Locke, 2009; Raskin, Novacek, & Hogan, 1991; Rose, 2002). More narcissistic people are also less neurotic, anxious, obsessive-compulsive, lonely, and depressed (Aalsma et al., 2006; Akehurst & Thatcher, 2010; Raskin & Novacek, 1989; Sedikides et al., 2004; Spano, 2001; Watson, McKinney, Hawkins, & Morris, 1988).

Yet these results may not be as simple as they seem. First, there are different types of narcissism, with different mental-health and well-being correlates. Second, the signs of good mental health in narcissists may be a result of a measurement confound with self-esteem. Third, there are some correlates of narcissism that are not typically seen as markers of optimal mental health. Fourth, mental-health correlates of narcissism might depend on environmental features. Fifth, when specific measurement paradigms (e.g., implicit measures) or conceptualizations of self-esteem (e.g., stability, contingencies) are used, signals of poor mental health leak out. Finally, correlational studies are important, but they do not clarify the direction of causality. Longitudinal studies can clarify

whether narcissism leads to changes in mental health and well-being, or whether mental health influences changes in narcissism.

DIFFERENT TYPES OF NARCISSISM.

HEALTHY VERSUS UNHEALTHY. The most commonly used measure of narcissism is the Narcissistic Personality Inventory (Raskin & Terry, 1988). This can be used as an overall measure or it can be subdivided into different subscales. One theoretically relevant way to delineate the subscales is into healthy (or adaptive) narcissism versus unhealthy (or maladaptive) narcissism (Reinhard, Konrath, Lopez, & Cameron, 2012). Healthy narcissism is measured in terms of the Authority, Self-Sufficiency, Superiority, and Vanity subscales, while unhealthy narcissism is associated with the Entitlement, Exhibitionism, and Exploitativeness subscales. These distinctions seem to matter in terms of the mental-health and well-being correlates of narcissism. For example, healthy narcissism is associated with lower levels of depression, loneliness, and pessimism, as well as higher self-esteem and greater optimism (Emmons, 1987; Hickman, Watson, & Morris, 1996; Watson & Biderman, 1993). Conversely, unhealthy narcissism is associated with more negative mental-health indicators, such as more pessimism, depression, and anxiety, and lower levels of optimism and self-esteem (Hickman et al., 1996; Raskin & Novacek, 1989; Watson, Taylor, & Morris, 1987). Thus, studies examining narcissism and health should consider analyzing the different kinds of narcissism separately.

OVERT VERSUS COVERT. This distinction between healthy and unhealthy narcissism only applies to overt (or grandiose) narcissism, which is often measured using the Narcissistic Personality Inventory. But, narcissistic traits are sometimes cloaked in a veneer of insecurity and shyness. Covert (or vulnerable) narcissism overlaps with more overt (or grandiose) types of narcissism in that they are both characterized by a high degree of self-preoccupation, desire for recognition, and belief in one's own greatness. However, covert narcissists also

appear to be more timid, low in confidence, and insecure, often worrying that others might negatively evaluate them (Arble, 2008).

Research on overt versus covert narcissism parallels findings on healthy versus unhealthy narcissism. For example, although overt narcissism is associated with all of the positive well-being indicators summarized at the beginning of this section (e.g., happiness and less depression and anxiety), covert narcissism is associated with lower levels of happiness, psychological well-being, optimism, self-esteem, sense of meaning, and satisfaction in life (Hickman et al., 1996; Rose, 2002; Wink, 1991; Zondag et al., 2009). At the same time, it is associated with higher levels of pessimism, depression, and anxiety (Hickman et al., 1996; Rathvon & Holmstrom, 1996; Wink, 1991). Thus, the distinction between these two different kinds of narcissistic self-focus is important in determining the potential implications of narcissism for well-being.

HIGH SELF-ESTEEM MAKES NARCISSISTS APPEAR MENTALLY HEALTHY. Overt narcissism measures (e.g., the NPI) are typically associated with higher self-esteem. This may be interpreted as a mental-health implication of narcissism in itself. However, several scholars have demonstrated that when self-esteem is controlled for, the relationship between narcissism and positive indicators of mental health is reduced or nullified (Rose, 2002; Rosenthal & Hooley, 2010; Sedikides et al., 2004). In other words, narcissistic people might only appear to have good mental health because they have high levels of self-esteem.

SOME LESS OPTIMAL CORRELATES. Narcissistic people may look mentally healthy when we examine some mental-health indicators, but some clues to potential problems appear when we consider other intrapersonal correlates. For example, narcissistic people have difficulty controlling their impulses, which makes them vulnerable to a number of risky and self-defeating behaviors (Vazire & Funder, 2006). Specifically, narcissism is negatively associated with behavioral-inhibition tendencies (i.e., to avoid pain) and positively associated

with behavioral-activation tendencies (i.e., to approach pleasure; Miller et al., 2009). Narcissistic individuals tend to be focused on short-term rewards at the expense of longer-term goals and they are not very concerned about minimizing pain. In other words, narcissism is a risk-positive personality style. Given that the ability to delay gratification (i.e., self-control) is associated with a host of benefits (Baumeister, Vohs, & Tice, 2007; Tangney, Baumeister, & Boone, 2004), it is likely that this tendency toward immediate gratification leads to a number of self-defeating behaviors that limit their ultimate potential to succeed (Miller et al., 2009).

Narcissistic people also exhibit high levels of sensation-seeking, which suggests that some of their risky behaviors may be motivated by thrill-seeking (Crysel, Crosier, & Webster, 2013; Miller et al., 2009). There have been mixed findings with respect to narcissism and boredom. For example, although one study found that overt narcissism is associated with more feelings of boredom (Wink & Donahue, 1997), another study found the opposite pattern (Zondag, 2013). However, both studies found that covert narcissism is associated with more boredom, again demonstrating consistent indicators of low well-being among covert narcissists.

When considering all of these findings together, it appears that the strong inhibition-control problems present within narcissistic people could manifest themselves in high emotional reactivity – which could help to explain the outward signs of strong positive emotion, in addition to aggressive behaviors. Perhaps the nature of well-being among narcissistic people should be more deeply and critically explored. What might look like mental health (e.g., reports of happiness and low anxiety) could have a more manic and unstable tone to it, rather than a calmer and more stable quality (Fulford, Johnson, & Carver, 2008).

ENVIRONMENT MAY MATTER. Another point to consider is that narcissism might be associated with better mental health in certain contexts as compared to others. This issue has received little attention in the literature, but

one intriguing study examined whether the fit between the person and the environment mattered in terms of prosociality versus egotism (Wilson & Csikszentmihalyi, 2007). Adolescents who were part of the *Sloan Study of Youth and Social Development* were assessed on a number of mental-health outcomes. Most notably, the study found that more egotistical people were less likely to experience stress in selfish environments; whereas more prosocial people were more likely to experience stress in selfish environments. However, this study did not measure narcissism directly and we recommend that future research directly examine how narcissistic people respond emotionally to more egotistical as opposed to more prosocial settings.

FRAGILE SELF-ESTEEM. Even when we focus on overall overt narcissism scores, we find that narcissism is still associated with a host of defensive and self-protective strategies, making narcissists' supposedly robust mental health seem more fragile than at first it may appear. (See Bosson et al., 2008, for a review.)

DEFENSIVE SELF-ESTEEM. For example, social cognition studies have found that when narcissistic people are exposed to ego-threatening information, concepts of worthlessness quickly come to their minds and are then suppressed (Horvath & Morf, 2009). Narcissistic people are also prone to self-enhancing biases after receiving performance feedback. If the feedback is positive, then narcissistic people believe that the evaluation technique and evaluator are both sound. However, when they receive negative feedback, they are quick to blame the type of test and the person delivering the feedback, rather than take the feedback to heart, in order to improve or learn (Kernis & Sun, 1994).

CONTINGENT SELF-ESTEEM. Contingent self-esteem is when people base their self-worth on certain domains such as achievement, being a good person, or being attractive (Crocker & Wolfe, 2001). This is considered unstable or defensive because it requires individuals to meet certain expectations (e.g., have high grades), in order to feel good about themselves.

Overt narcissists tend to base their self-esteem on more agentic domains (e.g., competitiveness; Crocker, Luhtanen, Cooper, & Bouvrette, 2003; Zeigler-Hill, Clark, & Pickard, 2008); whereas the self-esteem of covert narcissists is contingent on a number of agentic and communal domains (Zeigler-Hill et al., 2008). This is further evidence for the defensive nature of self-esteem among narcissistic people.

DIVERGENT EXPLICIT AND IMPLICIT SELF-ESTEEM. Explicit self-esteem is measured using self-report scales, such as the Rosenberg Self-Esteem Scale (Rosenberg, 1965). Implicit self-esteem is measured by having participants complete a computerized task in which they quickly categorize words as *pleasant* or *unpleasant*, and *self-related* or *not self-related*. The faster [slower] they respond to self-related words after seeing pleasant [unpleasant] words, the higher their implicit self-esteem (Greenwald & Farnham, 2000). Some research has found that narcissism is associated with high levels of explicit self-esteem, but low levels of implicit self-esteem (Brown & Bosson, 2001; Jordan, Spencer, Zanna, Hoshino-Browne, & Correll, 2003; Zeigler-Hill, 2006). This finding has been interpreted as evidence that narcissistic people secretly do not like themselves. However, the measures of implicit self-esteem used in these studies rely on many communal words (e.g., kind), with which narcissistic people do not typically identify. When implicit responses to agentic (e.g., assertive) as opposed to communal words are examined separately, narcissism is associated with high implicit self-esteem regarding agentic traits, but low implicit self-esteem regarding communal traits – a pattern that parallels the explicit responses of narcissistic people (Campbell, Bosson, Goheen, Lakey, & Kernis, 2007). Without more research, we cannot make any solid conclusions about the divergent nature of explicit versus implicit self-esteem among narcissists.

UNSTABLE SELF-ESTEEM. Narcissistic people may also experience high self-esteem reactivity. On days when they experience negative events (e.g., doing poorly on a test), more narcissistic people's self-esteem is more negatively

impacted than that of less narcissistic people (Rhodewalt, Madrian, & Cheney, 1998; Zeigler-Hill, Myers, & Clark, 2010). However, some studies have found that narcissism is not related to unstable self-esteem (Webster, Kirkpatrick, Nezlek, Smith, & Paddock, 2007) or that it is only related to more unstable self-esteem when average self-esteem levels have been taken into account (Zeigler-Hill, 2006). Yet, even with these inconsistent findings, it is important to consider the potential mental-health implications of frequent fluctuations of feelings of self-worth. If more evidence accumulates for unstable self-esteem among narcissistic people, it would put into question their supposedly robust mental health.

LONGITUDINAL STUDIES. Few studies have focused on the potential long-term health implications of narcissism. Nearly all extant studies have been correlational, making it impossible to determine whether narcissism causes changes in health and well-being, or whether health and well-being affect narcissism. Longitudinal studies can reveal directional relationships, but only a few such studies exist in this area.

One longitudinal study followed undergraduate students over the course of 8 months (Zuckerman & O'Loughlin, 2009). Narcissism was measured using the NPI and the outcome variables were self-esteem and four measures of well-being (i.e., negative affect, positive affect, depression, and vitality). Narcissism was associated with higher concurrent well-being, but this correlation was fully mediated by self-esteem. In addition, narcissism was associated with more negative emotional reactivity after experiencing negative interpersonal events (i.e., more unstable self-esteem). Thus, these findings demonstrate the fragile nature of self-esteem in a narcissistic context. However, narcissism did not predict future well-being. Instead, prospective analyses found that greater initial well-being and lower baseline reactivity to negative events predicted a later increase in narcissism. Thus, this study suggests that narcissism can be fostered by a combination of high levels of well-being and low emotional reactivity. Of course,

with such longitudinal designs, third variables must also be ruled out. For example, it is possible that people from high-income backgrounds are both happier and more narcissistic, and longitudinal studies need to consider such explanations, in order for us to be more confident in any causal relationships they appear to reveal.

In another study, narcissism was not directly measured, however, three measures of narcissism were created from the California Adult Q-sort (CAQ): Willfulness, Hypersensitivity, and Autonomy (Cramer & Jones, 2008). The first two are considered measures of unhealthy narcissism; whereas the third is a measure of healthy narcissism. There were no simple relationships between baseline narcissism (early 30s) and participants' later (mid-70s) psychological health. However, when unhealthy narcissism (Willfulness and Hypersensitivity) was high, participants who also showed an overidentification with others experienced declines in their psychological health over time. In other words, both high unhealthy narcissism and high identification were needed to produce poor mental health.

Although healthy narcissism (Autonomy) did not predict change in psychological health over the long study period, there was a positive relationship between Autonomy and psychological health at every assessment point. Thus, this work parallels correlational studies that have found benefits associated with healthy narcissism and potential risks associated with unhealthy narcissism. However, the fact that healthy narcissism did not predict psychological-health improvement in this longitudinal study is noteworthy. This suggests that psychological health might feed into healthy narcissism, rather than healthy narcissism causing improved psychological health. However, no third variables were included in the model, making causal inferences about the role of narcissism speculative.

Another longitudinal study used the same three measures of narcissism to examine the extent to which narcissism scores predicted changes in health and

well-being between the ages of 43 and 53 (Edelstein, Newton, & Stewart, 2012). In that study, the authors found that only Hypersensitivity (unhealthy narcissism) predicted more depressive symptoms, more physical health problems, lower life satisfaction, and lower levels of well-being. Increases in Willfulness (unhealthy narcissism) and Autonomy (healthy narcissism) during the 10-year period predicted better mental and physical health at age 53. Again, no third variables were included in the model, making causal inferences about the role of narcissism speculative. However, across the two studies, the most consistent finding was that Hypersensitivity (a type of unhealthy narcissism) is associated with poor health and well-being many years later.

One additional longitudinal study followed 93 females from their undergraduate years to ages 21, 43, and 52 (Wink & Donahue, 1995). Covert narcissists were highly individualistic and creative. However, this did not translate into real-world successes at midlife (e.g., career, marital status). Instead, covert narcissism was associated with pathology: At age 43, it was related to psychological distress, depression, anger, unhappy intimate relationships, and the use of psychotherapy. On the other hand, overt narcissism predicted stable, high-status careers at age 43 and 52, and did not correlate with pathology at either age 21 or 43. Although the general sample had relatively low levels of substance abuse, by age 43, overtly narcissistic people had a higher tendency to use drugs and also experienced difficulty with aging because of threats to self-esteem that came from aging-related declines in attractiveness. Finally, overt narcissists who prioritized family over career at an early age experienced more divorces in their mid-30s.

Taken together, the longitudinal studies are inconsistent in their findings, with narcissism predicting null results, positive mental health, and poor mental health (See Table 1 for a summary). We recommend additional studies to clarify under which circumstances, and for whom, narcissism might be linked to positive versus negative mental-health outcomes.

**TABLE 1. SUMMARY OF LONGITUDINAL STUDIES EXAMINING THE RELATIONSHIP
BETWEEN NARCISSISM AND LATER WELL-BEING**

Study	Results	Timespan
Zuckerman & O'Loughlin, 2009	-Narcissism does not predict future well-being. -Well-being and low emotional reactivity predict future narcissism.	8 months
Cramer & Jones, 2008	-The combination of unhealthy narcissism (Hypersensitivity, Willfulness) and overidentification predicts future poor psychological health. -Healthy narcissism (Autonomy) does not predict future psychological health.	40+ years
Edelstein et al., 2012	-Unhealthy narcissism (Hypersensitivity) predicts more depressive symptoms, more physical health problems, and lower levels of life satisfaction and well-being. -Increases in Willfulness (unhealthy) and Autonomy (healthy) predicted better mental and physical health.	10 years
Wink & Donahue, 1995	-Covert narcissism predicts poor psychological health. -Overt narcissism is associated with career success, but is also associated with substance use and relationship difficulties.	30+ years

SUMMARY: WELL-BEING, MENTAL HEALTH, AND NARCISSISM. At first glance, narcissism appears to be associated with robust mental health. However, a closer look reveals cracks in narcissists' allegedly thriving veneers. These cracks originate from the various definitions of narcissism (healthy versus unhealthy, or overt versus covert), from its complex relationship with self-esteem (which makes narcissists appear to be mentally healthier than they really are), from the correlation between narcissism and self-defeating behaviors, and from the various ways in which their self-esteem disintegrates when examined more closely. Longitudinal studies are useful to help better our understanding of potential mental-health consequences of narcissistic tendencies. Future research should also move beyond simple trait-driven explanations for mental health, toward more complex models that integrate features of narcissistic people's environments.

COGNITIVE PERFORMANCE

INTELLIGENCE. Narcissistic people believe that they are very intelligent (Gabriel, Critelli, & Ee, 1994; Paulhus & Williams, 2002), but are they really? Several studies have been conducted on this topic and they have consistently found that narcissistic people have inflated views of their own intelligence (Gabriel et al., 1994; Paulhus & Williams, 2002), academic performance (Farwell & Wohlwend-Lloyd, 1998), and creativity (Raskin, 1980). However, some studies have found that narcissistic people have objectively higher levels of intelligence (Paulhus & Williams, 2002), academic performance (Study 2; Farwell & Wohlwend-Lloyd, 1998), and creativity (Raskin, 1980), although their self-ratings are indeed inflated. Such results are inconsistent with those of other studies, which have found no significant relationships between narcissism and objective measures of intelligence (Baggette & Tobacyk, 1988; Barry, Frick, & Killian, 2003; Gabriel et al., 1994) and academic performance (Study 1: Farwell & Wohlwend-Lloyd, 1998). A meta-analytic integration of these findings would be

useful in determining overall effect sizes for objective measures of intelligence, but for subjective measures, the results are consistently inflated.

COGNITIVE-PERCEPTUAL STYLE. People perceive and organize information in their environments differently, with some doing this more holistically and some doing this more analytically (Messick, 1984). People with holistic cognitive-perceptual styles are context-dependent, focus on the whole rather than small parts, and notice interrelationships between features in their environment; whereas people with analytic cognitive-perceptual styles are more context-independent in their thinking and perception, and see objects in their environment as separate and disconnected from each other (Witkin, Moore, Goodenough, & Cox, 1977). Our research has found that narcissistic people have less holistic and more analytic cognitive-perceptual styles (Konrath et al., 2009). In other words, they are better at decontextualizing information (visual or cognitive) from its context than people who score low in narcissism. This is demonstrated by their better performance on tasks that require visual disembedding skills such as the Embedded Figures Test (Witkin, 1971) and some visual illusions (Happé, 1996). They also have a more decontextualized information-processing style that makes them less susceptible to certain cognitive heuristics (e.g., the representativeness heuristic; Kahneman & Tversky, 1973; Tversky & Kahneman, 1974). We recommend future research on cognitive abilities and tendencies of narcissistic people.

HEALTH-RISK BEHAVIORS. We now turn to links between narcissism and health-risk behaviors, which include a variety of health-related lifestyle choices. Some of these seem to be motivated by desires to look attractive and some seem to be related to the impulsivity and pleasure-seeking that are characteristic of narcissism. This section draws on research from a wide variety of fields, seeking to better understand practical implications of narcissism, in terms of day-to-day behavioral health choices. The overall long-term health implications of narcissism are bound to be mixed, with vanity-related urges motivating narcissistic people to

stay fit and attractive – which may eventually lead to better overall physical health – and thrill-seeking urges pushing them toward riskier behaviors – which may be associated with a higher risk of disease or injury.

VANITY-RELATED HEALTH BEHAVIORS

SELF-CARE AND GROOMING. Narcissistic people can be readily identified by their physical appearance. For example, in one study, participants completed a measure of narcissism (the NPI) and were photographed. Observers were shown the photographs and then asked to rate the targets' personalities, including narcissistic traits (Vazire, Naumann, Rentfrow, & Gosling, 2008). Observers' narcissism ratings of these photographs were positively correlated with participants' NPI scores, indicating that snap judgments of narcissism can be relatively accurate. A number of cues were positively correlated with participants' NPI scores, including expensive and stylish clothes, an appearance that seemed to require a lot of preparation, and attractiveness. Cues indicating narcissism in males included being more muscular and, in females, the wearing of makeup and showing cleavage helped observers to detect narcissism. Indeed it seems that, intentionally or not, narcissists may alter their appearance to mirror their motives.

SUNBED USE. A desire to look attractive is one key motivator of people who frequent tanning salons (Leary & Jones, 1993) and is also a key motivator of narcissistic individuals (Gabriel et al., 1994; Jackson, Ervin, & Hodge, 1992). Yet sunbed use is associated with an increased risk of skin cancers (Boniol, Autier, Boyle, & Gandini, 2012). There is virtually no research on the relationship between narcissism and tanning behaviors, even though it seems likely that the prevalence of such behaviors would be higher among narcissistic people. One study compared the narcissism scores of sunbed users to nonusers among a population of young (ages 20 to 35) German women (Fiala, Kopp, & Günther, 1997). That study found that the sunbed users scored higher on aspects of narcissism related to devaluing other people. However, no studies that we are

aware of have directly correlated narcissism with the degree of sunbed exposure nor does this correlational evidence imply that narcissism causes more sunbed use. Future research is needed to better understand the relationship between narcissism and tanning behaviors.

ORAL HEALTH. Unhealthy teeth and gums predict poor health outcomes, including the presence of more inflammatory markers such as c-reactive protein (Ajwani, Mattila, Narhi, Tilvis, & Ainamo, 2003) and a higher risk of heart disease (Humphrey, Fu, Buckley, Freeman, & Helfand, 2008). Since good oral care could be motivated in part by concerns regarding one's physical appearance, it is possible that narcissistic people might take better care of their teeth and gums, as compared to others. Only one study that we know of has examined the link between narcissism and oral health (Dumitrescu, Zetu, Zetu, & Păcurar, 2013). Those researchers found that narcissism was associated with better than average self-perceived oral health among a group of Romanian medical students, but less frequent self-reported tooth-brushing. Narcissism was not associated with the number of cavities or the presence of gingival bleeding. Thus, it is possible that narcissistic people inflate their overall oral-health status, despite being no better than average in terms of objective indicators (e.g., cavities) and worse than average in terms of oral hygiene. More research is needed on this topic.

EXERCISE. Regular physical activity is an important preventative health behavior, keeping people both mentally and physically healthy (Antonucci et al., 2012). Narcissism might be associated with more exercise to the extent that narcissistic males want to appear fit and muscular. Indeed some research has found that narcissism is associated with increased levels of self-reported physical activity (Brown & Graham, 2008; Jackson et al., 1992; Spano, 2001), including, at times, excessive levels of exercise (Campbell & Waller, 2010). However, another study compared a group of high-level exercising women to a control group of nonexercising women and found no differences in narcissism between the two groups (Davis, Claridge, & Cerullo, 1997b). As with other health-

behavior research, the exclusive reliance on self-reported responses makes these results difficult to interpret, since it is possible that narcissistic people may inflate their physical-fitness levels. Thus, future work should use objective tools such as pedometers or accelerometers to assess physical activity.

EATING, BMI, AND BODY IMAGE. Unhealthy narcissism (as measured by the OMNI) and covert (vulnerable) narcissism are both positively correlated with eating disorder symptoms among female eating-disorder patients (Campbell & Waller, 2010; Maples, Collins, Miller, Fischer, & Seibert, 2011; Waller, Sines, Meyer, & Mountford, 2008), members of proanorexic online communities (Zerach, 2014), and even in nonclinical samples (Waller et al., 2008). Among eating-disorder patients in therapy, narcissism is associated with an increased dropout rate (Campbell, Waller, & Pistrang, 2009). Unhealthy narcissism is also positively associated with a higher body mass index or BMI (Davis, Claridge, & Cerullo, 1997a; Davis et al., 1997b) and more weight preoccupation (Davis et al., 1997a), but is negatively associated with body esteem (Davis et al., 1997b). Thus, unhealthy narcissism is linked to serious body-image problems. Arguably less pathological forms of narcissism (as measured by the NPI) have the opposite or null relationships with body-image issues. For example, there is no relationship between NPI narcissism and BMI (Davis, Claridge, & Brewer, 1996; Davis et al., 1997a, 1997b) or weight preoccupation (Davis et al., 1997a), but there is a positive relationship between NPI narcissism and body esteem (J. Brown & Graham, 2008; C. Davis, et al., 1997b; Jackson et al., 1992). Among males, this increased body esteem is especially focused around upper-body strength (Brown & Graham, 2008). Thus, healthier forms of narcissism do not seem to be associated with the same degree of body-image problems as less healthy forms of narcissism.

THRILL-SEEKING OR BEHAVIORS RELATED TO IMPULSIVITY

More narcissistic people are more likely to take risks, across a variety of domains, as compared to less narcissistic people (Aalsma et al., 2006; Campbell, Goodie, & Foster, 2004; Crysel et al., 2013; Foster, Shenesey, & Goff, 2009). Research has found that this is because these people overemphasize the benefits of such risky behaviors, while simultaneously minimizing the risks (Foster et al., 2009). This is in line with their exaggerated tendencies to approach pleasure at any cost (Miller et al., 2009).

FINANCIAL RISK-TAKING. Some research has examined how these tendencies may apply to financial decision-making. Narcissistic people tend to make risky financial decisions. For example, they are more likely to invest in volatile stocks, which is associated with more financial losses during economically unstable periods (Foster, Reidy, Misra, & Goff, 2011). Not surprisingly then, narcissistic people are more likely to gamble or bet, and for larger amounts of money, than less narcissistic people – a finding that has been objectively verified in standardized gambling tasks such as the Iowa Gambling Task (Campbell et al., 2004; Lakey, Rose, Campbell, & Goodie, 2008). This tendency is especially pronounced when they are ego-threatened (Crysel et al., 2013). In addition, narcissistic people tend to have difficulties with compulsive spending (Rose, 2007). Taken together, narcissism is associated with poor financial decision-making.

SEXUAL RISK-TAKING. There is much research to indicate that narcissistic people exhibit low levels of commitment in their intimate relationships, with a low need for intimacy and a strong desire for multiple partners (Campbell, Foster, et al., 2002; Foster, Shrira, & Campbell, 2006). Narcissistic people have a distinct preference for short-term relationships (e.g., one-night stands, “friends with benefits”) and a strong desire to avoid long-term relationships (Adams, Luevano, & Jonason, 2014; Jonason & Buss, 2012; Jonason, Luevano, & Adams, 2012; Konrath, Meier, & Bushman, 2014, Study 6). They are also more risk-tolerant when it comes to being caught engaging in romantic-cheating behaviors (Adams

et al., 2014) and they score higher on sexual sensation-seeking, which involves seeking novelty and variety in sexual acts (Konrath, Meier, et al., 2014). In themselves, these preferences and behaviors are only concerning if they are accompanied by fewer safe-sex practices. Indeed, among people living with HIV or AIDS, narcissism is associated with a number of unsafe sex practices, including a higher likelihood of having sex after substance use and a lower likelihood of using condoms with a new partner (Martin, Benotsch, Perschbacher Lance, & Green, 2013). This result remains even when controlling for plausible confounding factors (e.g., demographic variables, substance use). Similar results were also found among a sample of healthy college students (Salazar, 2013). Of course, all of these studies are limited by their self-report nature: Sexual behaviors may be minimized, exaggerated, or misremembered. Future studies should consider using experience-sampling methods to more reliably gauge the sexual behaviors of narcissistic people. In addition, like most narcissism studies, the correlational nature of the data makes causal inferences impossible.

All of the above studies covered consensual sexual behaviors, however, there has also been some research on narcissism and nonconsensual sexual behaviors (Bushman et al., 2003; Imhoff, Bergmann, Banse, & Schmidt, 2013; Jones & Olderbak, 2014; Ryan, Weikel, & Sprechini, 2008; Widman & McNulty, 2010). Narcissistic males have less empathy for rape victims and are more likely to endorse rape myths (Bushman et al., 2003). They are also more likely to enjoy videos that depict rape, as long as the videos also first include mutually consensual affection. They are not more likely to enjoy videos that show rape or affection by themselves (Bushman et al., 2003). Finally, in experimental lab paradigms, narcissism is associated with more aggressive or punishing actions in the context of sexually arousing stimuli (Bushman et al., 2003; Imhoff et al., 2013). Taken together, these studies suggest that narcissistic males might be more likely to perpetrate sexually coercive or pushy behaviors (Jones & Olderbak, 2014; Ryan et al., 2008; Widman & McNulty, 2010).

SUBSTANCE USE AND ADDICTION. Narcissism is linked to a variety of problems with substance use and addiction. Narcissistic people are more likely to use and abuse alcohol (James & Taylor, 2007; Jang, Vernon, & Livesley, 2000; Luhtanen & Crocker, 2005; MacLaren & Best, 2013; Sawrie, Watson, Sherbak, Greene, & Arredondo, 1997) and other drugs (Aalsma et al., 2006; Carter, Johnson, Exline, Post, & Pagano, 2012; James & Taylor, 2007; MacLaren & Best, 2013; Porcerelli & Sandler, 1995). This is especially true for more unhealthy aspects of narcissism. For example, one study found that male athletes who admitted prior steroid use had higher unhealthy narcissism scores than other athletes who did not use steroids (Porcerelli & Sandler, 1995). Other research has found that narcissism is linked to compulsive shopping (Rose, 2007) and Internet use (Choi et al., 2011; Ekşí, 2012; Kim, Namkoong, Ku, & Kim, 2008), with some research specifically reporting a link between covert narcissism and compulsive Internet use (Choi et al., 2011). However, one study did not find a link between narcissism and problematic Internet use (Odacı & Çelik, 2013). Still, taken together, there is much evidence that narcissism is linked to addictive-like tendencies across a variety of domains.

DRIVING BEHAVIOR. Motor vehicle crashes are one of the leading causes of mortality in the United States, leading to over 32,000 deaths in 2011 (U.S. National Highway Traffic Safety Administration, 2011) and causing enormous economic costs: There were \$70 billion in estimated lifetime costs associated with crash-related deaths and injuries in 2005 (Naumann, Dellinger, Zaloshnja, Lawrence, & Miller, 2010). Since motor vehicle crashes are largely preventable, it is important to understand the role of personality traits such as narcissism in relation to risky driving behavior. Narcissists' documented tendencies to be low in empathy (Watson et al., 1994), overconfident (Lakey et al., 2008), impulsive (Vazire & Funder, 2006), and "in a hurry" (O'Brien, Anastasio, & Bushman, 2011) may contribute to showing little concern for other drivers, feelings of invincibility, poor judgments in unexpected traffic situations, excessive speed,

and multitasking while driving. Because narcissistic people are more likely to abuse alcohol (Luhtanen & Crocker, 2005; Sawrie et al., 1997), they also may be more likely to drive while under the influence.

Several studies have examined the relationship between narcissism and driving behavior. In one study, college students completed the Narcissistic Personality Inventory and measures of driver vengeance, aggression, and attributions (Lustman, Wiesenthal, & Flett, 2010). Not surprisingly, narcissistic participants reported that they had better driving abilities than most people. Importantly, more narcissistic participants also scored higher on self-reported aggressive responses to hypothetical driving scenarios. For example, narcissistic people were more likely to say that they would confront the other driver (high aggression), rather than do nothing (low aggression), when given scenarios such as this one: *You are driving along a busy street when the vehicle in front of you stops, puts on its hazard flashers, and lets a passenger out. This causes a traffic delay.* Similar results have been conceptually replicated in other studies (Roseborough, Wiesenthal, Flett, & Cribbie, 2011).

Moreover, narcissism is associated with more aggressive driving behavior (e.g., tailgating, cursing, obscene gestures), even when controlling for anger, and this aggressive driving, in turn, predicts a higher likelihood of motor vehicle collisions and traffic violations (Edwards, Warren, Tubré, Zyphur, & Hoffner-Prillaman, 2013). Certain situations are especially likely to trigger angry and aggressive responses to other drivers (e.g., slow driving) among narcissistic people (Britt & Garrity, 2006). Other research has found that it is the unhealthy aspects of narcissism (e.g., exhibitionism, entitlement) that are specifically associated with aggressive driving behavior; whereas the healthier aspects of narcissism (e.g., superiority, vanity) are associated with less aggressive driving behavior (Schreer, 2002).

Since aggressive driving increases the risk of a motor vehicle crash (Chliaoutakis et al., 2002; Galovski, Malta, & Blanchard, 2006), the finding that

narcissism is consistently associated with aggressive driving is important. However, studies to date have relied on correlational and self-reported data. Thus, we recommend that future researchers use longitudinal designs that measure narcissism at one time point and examine whether it later predicts an increase in objectively documented risky driving behaviors and outcomes.

SLEEP HABITS

Most adults need between 7 to 8 hours of sleep in order to properly function both mentally and physically (Ferrara & De Gennaro, 2001). Indeed, a single night of less sleep is associated with reduced cognitive performance and chronic lack of sleep predicts disease and mortality risk (Ferrara & De Gennaro, 2001). In our lab, we have been exploring the relationship between sleep and narcissism (Konrath, Tan, Sun, & Bonadonna, 2014). Our work is the only known research on this topic to date. We are finding that unhealthy narcissism (on the NPI) is associated with increased depressive symptoms (Beck Depression Inventory), which, in turn, are associated with poorer sleep quality (Pittsburgh Sleep Quality Index). The converse relationships exist for healthy narcissism: Healthy narcissism is associated with fewer depressive symptoms, which, in turn, predict better sleep quality. Although this study is the first to examine the sleep habits of narcissistic people, it is limited by its reliance on a self-report measure. Even though the PSQI is a validated and widely used measure, future studies should assess actual sleep behavior to confirm these results.

PHYSICAL FUNCTIONING, DISEASE, AND MORTALITY RISK

There are no known studies directly examining the links between narcissism and physical-health outcomes, such as physical functioning (i.e., the ability to perform daily living tasks, walking speed), disease risk, or mortality risk. Long-term health implications of narcissistic traits are important to understand because the constant vigilance required to maintain unrealistically

positive views of the self, in combination with weak social connections, may be physiologically taxing on narcissists' bodies (see Part II).

There is limited research on the link between narcissism and subjective evaluations of physical health, with one study finding no correlation between the two (Jackson et al., 1992). However, in a longitudinal study, unhealthy narcissism (Hypersensitivity) predicted more self-reported physical health problems among women across a 10-year period, while increases in a different type of unhealthy narcissism (Willfulness) and healthy narcissism (Autonomy) during the 10-year period predicted fewer physical health problems (Edelstein et al., 2012).

Although such research on the physical-health correlates of narcissism is extremely limited, there have been studies of processes related to narcissism that may provide some clues. For example, a number of studies conducted in the late 1970s and 1980s by Scherwitz and colleagues examined the relationship between self-focus, cardiovascular disease, and mortality risk. In these studies, self-focus (or self-involvement) was operationalized as the number of first-person singular pronouns used in free speech responses during an interview (e.g., I, me, my). The researchers found that more self-focused men exhibited greater physiological (e.g., blood pressure, heart rate) reactivity to a number of different laboratory-induced stressors (Scherwitz, Berton, & Leventhal, 1978), poorer treadmill running ability (Scherwitz et al., 1983), a greater number of occluded arteries in their hearts (Scherwitz et al., 1983), a higher number of previous heart attacks (Scherwitz et al., 1983), and a higher risk of later coronary heart disease (Scherwitz, Graham, Grandits, Buehler, & Billings, 1986). In addition, men with more self-focus at one time point were more likely to be deceased at a later time point (Scherwitz et al., 1986). However, the researchers did not measure the use of other-focused pronouns (e.g., we, our), so it is unclear whether these men had the narcissistic profile of both a high self-focus and a low interest in others. It is also unclear whether their self-focus was positive, which would indicate

narcissistic traits, versus negative, which would be a signal of depressive symptoms.

Other research has examined the links between motives for helping behavior and later mortality risk, finding that older adults who volunteered for self-related reasons (e.g., to feel good about oneself) had a higher later mortality risk 4 years later than those who volunteered for other-related reasons (e.g., compassion; Konrath, Fuhrel-Forbis, Lou, & Brown, 2012). These results remained consistent when considering a number of plausible confounding factors (e.g., demographic variables, baseline health). We recommend that researchers conduct studies that directly examine whether narcissistic traits are associated with later increases in health problems and mortality risk. Given the prior research, we expect there to be links between narcissism and cardiovascular-related outcomes, in particular.

PART II:

PHYSIOLOGICAL CORRELATES OF THE NARCISSISTIC PERSONALITY

Research on neurophysiological correlates of the narcissistic personality is in its beginning stages (Krusemark, 2011). One strong characteristic feature of narcissism is relying on defense mechanisms in order to deal with threats to one's ego (see Part I). Various studies have shown that continued and chronic reliance on these defense mechanisms is correlated with harmful physiological outcomes (Rutledge, 2006).

CARDIOVASCULAR AND SKIN-CONDUCTANCE RESPONSES

Some research has examined the links between narcissism and physiological reactivity to threats (Kelsey, Ornduff, McCann, & Reiff, 2001; Kelsey, Ornduff, Reiff, & Arthur, 2002; Sommer, Kirkland, Newman, Estrella, & Andreassi, 2009). For example, one study examined the physiological responses

of male college students to aversive stimuli (i.e., loud noises; Kelsey et al., 2001). Narcissistic participants showed an incongruous pattern between their skin conductance and their cardiovascular responses to the anticipation of this noise. Narcissists reported low feelings of anxiety and also exhibited blunted skin-conductance reactivity. However, at the same time, their cardiovascular responses suggested that they were on high alert and vigilantly preparing for the aversive stimuli (e.g., more preejection period reactivity, more heart rate deceleration). In other words, their cardiovascular responses suggested a heightened and sustained fight-or-flight response in this threatening context. The authors suggested that patterns such as these are correlated with both psychopathy and heart disease.

Other studies have replicated and extended these findings in females (Kelsey et al., 2002). Moreover, researchers have been able to explain the incongruity between the skin-conductance and cardiovascular responses by examining whether type of narcissism predicted different responses. Indeed, covert narcissism is associated with more blunted skin-conductance responses to aversive stimuli; whereas overt narcissism is associated with heightened cardiovascular reactivity.

The actual presence of aversive stimuli is not needed to elicit such physiologically toxic responses. In fact, simply imagining a rejection experience (versus an acceptance experience) is enough to increase blood pressure and heart rate among narcissistic people, especially those scoring high on entitlement, which is one unhealthy form of narcissism (Sommer et al., 2009). Taken together, these studies point to potential stress-regulation problems among narcissistic people.

HORMONES

Hormones can both cause and affect behavior. In the case of narcissism, for example, it is possible that certain hormonal profiles (e.g., high testosterone) could accentuate narcissistic patterns. It is also possible that high levels of

narcissism or ego-enhancing situations could affect hormones. Yet aside from an emerging literature on narcissism and cortisol, very little is known about the relationship between narcissism and hormones.

CORTISOL. The hypothalamic–pituitary–adrenal (HPA) axis is an important stress-response system in the human body and salivary cortisol concentrations are one key marker of its activation. Cortisol responses are often triggered by the threat of social evaluation (Dickerson & Kemeny, 2004) and long-term continuous activation of the HPA axis has been linked to poor mental and physical health (Chrousos & Gold, 1992), including a higher risk of mortality due to cardiovascular problems (Kumari, Shipley, Stafford, & Kivimaki, 2011; Vogelzangs et al., 2010). Therefore, HPA reactivity may be a link between narcissism and long-term health outcomes.

A few studies have examined links between narcissism and cortisol. In one study, half of the participants were randomly assigned to complete the Trier Social Stress Test, which induces social-evaluative threat by having participants give an impromptu speech. The other half were assigned to complete a control task (Edelstein, Yim, & Quas, 2010). Cortisol levels were assessed before, during, and after the speech (or control task). The researchers found that narcissism was associated with an increased cortisol response in the speech condition, but not in the control condition. This effect was only observed among males; there was no relationship between narcissism and cortisol among females in either condition. These results suggest that there are short-term physiological costs for male narcissists that may have long-term adverse consequences.

More recent research has found that narcissism is associated with higher basal cortisol concentrations, in the absence of any stressor (Reinhard et al., 2012). This is especially true for men who score high in unhealthy narcissism, rather than healthier aspects of narcissism. Moreover, other research that extended these findings into participants' everyday lives via multiple daily cortisol collections and experience-sampling methods yielded conceptually parallel results

(Cheng, Tracy, & Miller, 2013). In this research, which involved only female participants, narcissistic people show increased neuroendocrine reactivity on days during which they experienced high levels of negative emotions. This includes higher levels of both cortisol and alpha-amylase, which is an enzyme that signals sympathetic nervous system arousal (Rohleder, Nater, Wolf, Ehlert, & Kirschbaum, 2004).

The research on narcissism and cortisol reactivity is only just beginning and yet it is apparent that this area warrants further exploration. In particular, the role of gender is inconsistent, with two studies having found high reactivity especially among male (and not female) participants, and one study which examined only female participants and observed high cortisol reactivity among them. One consideration for future research is that the apparent gender differences may be explained by gender roles, rather than biological sex per se. Perhaps masculine gender roles, which are correlated with narcissism (Carroll, 1989; Watson et al., 1987), would help to explain why narcissists are so reactive to stress. Future research should measure gender roles to examine whether this possibility has merit.

OXYTOCIN. Oxytocin, which is widely known as the “cuddle” or “love” hormone, is released during a number of bonding-relevant behaviors related to reproduction (e.g., sexual activity) and parenting (e.g., childbirth, breastfeeding; Carter, 1992, 1998; Carter, Williams, Witt, & Insel, 1992). Recent research has found that oxytocin is also important for facilitating other types of social relationships and plays a role in stress regulation as well (Heinrichs, Baumgartner, Kirschbaum, & Ehlert, 2003; Linnen, Ellenbogen, Cardoso, & Joober, 2012). For example, one experimental study found that nasally administered oxytocin (as compared to a placebo) caused participants to rate themselves as warmer and more altruistic (Cardoso, Ellenbogen, & Linnen, 2012). Since narcissistic people score low on such measures, this is a notable finding. Moreover, there is a large and established body of literature showing that oxytocin administration causes

improved emotion-reading skills and more prosocial behaviors (MacDonald & MacDonald, 2010; Shahrestani, Kemp, & Guastella, 2013). Other experimental studies have found that nasally administered oxytocin (as compared to a placebo) leads to attenuated cortisol responses during social-evaluative threats (Heinrichs et al., 2003; Linnen et al., 2012), even among people with clinical disorders (e.g., Borderline Personality Disorder; Simeon et al., 2011).

However, we know of no work that explicitly links oxytocin with narcissism. Such research would be promising, especially when considering that narcissistic people have dual problems with social bonding and stress regulation – both of which can possibly be improved through oxytocin administration. It is important for future researchers to be aware that oxytocin's effects are not always straightforward; they depend upon the person and situation (Bartz, Zaki, Bolger, & Ochsner, 2011). Still, we recommend future work in this area.

TESTOSTERONE. Testosterone is commonly thought of as a male sex hormone, but it is also present to a lesser degree in women. There are no known studies that have directly examined the link between narcissism and testosterone. However, we would hypothesize the existence of such a link based on some striking parallels between correlates of testosterone and correlates of narcissism. For example, testosterone levels are negatively associated with empathic tendencies. Experimentally administered testosterone reduces the ability of people to mimic emotional facial expressions (Hermans, Putman, & Van Honk, 2006), and decreases the ability to recognize emotional facial expressions (i.e., cognitive empathy; Van Honk et al., 2011; Van Honk et al., 2004). Testosterone is also associated with poor bonding and poor relationships. Partnered men have lower testosterone levels than single men, and men with lower testosterone levels at one time point are more likely to be in a relationship at a later time point (van Anders & Goldey, 2010; van Anders & Watson, 2006). Men with higher testosterone at one time point are less likely to get married and have a higher risk of later marital problems and divorce if they are married (Booth & Dabbs, 1993; Gray,

Kahlenberg, Barrett, Lipson, & Ellison, 2002). In addition, testosterone levels are lower among fathers than among nonfathers, and among more committed husbands than less committed ones (Gray et al., 2002; Storey, Walsh, Quinton, & Wynne-Edwards, 2000). Taken together, this research suggests that high testosterone, like narcissism, predicts poor long-term relationship outcomes.

Similar to narcissism, testosterone is also associated with increased striving for dominance (Grant & France, 2001; Mazur & Booth, 1998), motivation for power (Schultheiss, Campbell, & McClelland, 1999), and aggressive behavior (Book, Starzyk, & Quinsey, 2001). Moreover, testosterone seems to respond to ego-boosting situations: Testosterone levels rise after winning or vicariously winning sports games (Bernhardt, Dabbs, Fielden, & Lutter, 1998; Booth, Shelley, Mazur, Tharp, & Kittok, 1989). In addition, testosterone is positively associated with financial risk-taking on the Iowa Gambling Task, among both male and female participants (Stanton, Liening, & Schultheiss, 2011). Experimental research has found that it also shifts participants' focus, making them more reward-seeking rather than punishment-avoidant (Van Honk et al., 2004), which is parallel to the narcissistic tendency to seek pleasure rather than avoid pain (Miller et al., 2009). Overconfidence is directly correlated with testosterone (Johnson et al., 2006). However, this effect is explained by gender; when researchers control for the fact that males have more overconfidence and higher testosterone, there is no longer a significant correlation.

Given these striking areas of overlap between testosterone and narcissism, we recommend research that directly assesses links between them. It is also important for researchers to know that people are well aware of testosterone's reputation – so much so that if they believe that they are receiving a dose of testosterone in a study, they will act in accordance with this reputation (Eisenegger, Naef, Snozzi, Heinrichs, & Fehr, 2009). Thus researchers in testosterone administration studies should always ask participants to report whether they believed they received testosterone or the placebo.

NEURAL CORRELATES

Although much is known about psychological and behavioral characteristics associated with narcissism, we know very little about underlying neural mechanisms that may help to create, maintain, or explain narcissistic processes. A few recent studies offer some initial clues.

For example, in a recent study in our lab, we examined the relationship between narcissism (on the NPI) and neural responses to social exclusion in adolescent males while they were playing Cyberball, a game that involves social exclusion by peers (Cascio, Konrath, & Falk, 2014). During social-exclusion experiences (versus inclusion experiences), adults exhibit increased activation in the dorsal anterior cingulate cortex (dACC) and anterior insula (AI; Eisenberger, 2012; Eisenberger & Lieberman, 2004; Eisenberger, Lieberman, & Williams, 2003), and adolescents and young adults also show subgenual anterior cingulate cortex (subACC) activation (Masten et al., 2009; Onoda et al., 2009). Given their hypersensitivity to rejection (Twenge & Campbell, 2003) and social-evaluative threat (Edelstein et al., 2010; Kelsey et al., 2001; Kelsey et al., 2002; Sommer et al., 2009), we expected that narcissistic teens would minimize their self-reported reactions to being socially excluded, while simultaneously showing increased neural activation in social pain-related areas of the brain. The results supported our hypothesis and concur with behavioral and physiological research finding that narcissistic people are hypersensitive to rejection.

Another study examined whether participants' covert narcissism scores predicted different neural responses to different types of reward (Choi et al., 2013). This study varied the types of feedback given after a simple categorization task: none (control), performance feedback ("correct" or not), social reward ("great" or not), or monetary reward (small cash prize for correct answers). Covert narcissism was not correlated with neural responses during these tasks. Although this may have been a result of the small ($N = 15$) sample size (Choi et

al., 2013), it is difficult to draw any definitive conclusions since there were no correlations or *p*-values presented in the paper.

Another study examined the relationship between narcissism (assessed using the Narcissism Inventory; Denecke & Hilgenstock, 1989) and neural activity while empathizing with emotional faces (compared to viewing smoothed faces) among a group of 34 participants (Fan et al., 2011). The results of this work are difficult to interpret considering that the authors only compared the top third of narcissism scorers to the bottom third of narcissism scorers, rather than correlating the full narcissism measure with the degree of change in activation while empathizing (compared to not empathizing). However, there did appear to be some differences in the brain activity of individuals with high as opposed to low narcissism scores. In the right anterior insula (AI), those with low narcissism scores had increased activity while empathizing with emotional facial expressions versus viewing neutral (smoothed) images, but no changes in activity were observed among those with high narcissism scores. In the right DLPFC, right posterior cingulate cortex, and right pre-motor cortex, individuals with low narcissism scores did not show activity changes across the empathy versus control task, but those with high narcissism scores did exhibit *decreases* in neural activity in these regions while empathizing, as compared to viewing the control images.

Although this chapter mainly covers correlates of the (subclinical) narcissistic personality, we also include a study comparing Narcissistic Personality Disorder patients to controls, because of the limited information available about neural processes related to narcissism. In this study, the authors used voxel-based morphometry to examine brain-volume differences between 17 NPD patients and 17 matched controls (Schulze et al., 2013). They found that NPD patients had significantly less gray-matter volume in the left anterior insula, and marginally less in the right anterior insula. Interestingly, the left AI volume was positively correlated with a measure of dispositional empathic concern, suggesting that the smaller left anterior insula area in NPD patients might be

related to their being less empathic. The NPD patients also had less gray-matter volume in the rostral and median cingulate cortex, and in the dorsolateral and medial areas of the prefrontal cortex, areas that have been linked to empathy in prior research (Fan, Duncan, de Greck, & Northoff, 2011; Lamm, Decety, & Singer, 2011).

Narcissistic people tend to self-enhance, especially concerning agentic traits (e.g., intelligence) as opposed to communal traits (e.g., warmth; Campbell, Rudich, et al., 2002; Gabriel et al., 1994). Thus, examining neural regions associated with self-enhancement may also be of interest. Indeed, the more people see themselves as “above average,” the less activity they have in the orbitofrontal cortex (OFC) and the dorsal anterior cingulated cortex (dACC) regions as they make self-related judgments (Beer & Hughes, 2010).

Transcranial magnetic stimulation (TMS) is a useful technique to help uncover causal effects of certain regions of the brain. It has been applied to better understand which regions may be implicated in self-enhancement. One TMS study asked 12 college students to rate 144 traits (one-third positive, one-third neutral, and one-third negative) as they pertained to themselves as opposed to their best friend (Kwan et al., 2007). Self-enhancement was operationalized as seeing the self as having more positive and fewer negative traits than one’s best friend. Using a within-subjects experimental design, TMS was applied to one of four brain regions: control (vertex), precuneus (PZ), supplementary motor area (SMA), and medial prefrontal cortex (MPFC). The researchers found that when the MPFC region was activated via TMS, there was less self-enhancement. This suggests that the MPFC plays at least a partial role in increasing self-enhancement. They also found that stimulation of the SMA area led to more self-enhancement, indicating that the SMA plays a role in reducing self-enhancement.

A later study by members of the same research team examined whether TMS differentially affected egoistic (or agentic) self-enhancement (e.g., traits like ambitious, popular), as compared to moralistic (or communal) self-enhancement

(e.g., traits like considerate, moral; Barrios et al., 2008). In another within-subjects experiment, 10 female college students were randomly assigned to receive TMS on one of three brain regions: control (vertex), PZ, and MPFC. Again, the researchers found that when the MPFC region was activated via TMS, there was less self-enhancement. But, this was only true for egoistic, and not moralistic, traits. Interestingly, egoistic self-enhancement is the kind that is linked to the narcissistic personality (Campbell, Rudich et al., 2002; Gabriel et al., 1994).

An additional study by a different research team examined whether the effect of TMS on self-enhancement depends upon the brain region and the latency of TMS application (Luber, Lou, Keenan, & Lisanby, 2012). In a within-subjects experiment, 18 participants were randomly assigned to receive TMS on one of three brain regions: MPFC, right lateral parietal, or left lateral parietal, and after one of five stimulus onset asynchronies (SOA) between the trait presentation and the TMS pulse: 0, 80, 160, 240, or 480 ms. The researchers found that self-enhancement biases were significantly reduced after MPFC stimulation at the 160 ms SOA. The effects were so dramatic that MPFC stimulation at this onset caused participants to have a strong other-enhancement bias. In the right lateral parietal region, TMS also reduced self-enhancement at the 160 ms SOA; whereas in the left lateral parietal region, TMS reduced self-enhancement only at the 240 ms SOA.

Despite prior studies [Barrios et al. (2008) and Kwan et al. (2007)] finding effects at 500 ms SOAs, in this study, no effects were found at comparable SOAs (480 ms). Thus, the authors reasoned that some methodological differences may help to explain these differences across studies and labs (e.g., strength of stimulation, number of exposures to trait words). Future research should carefully vary both the SOA and the neural region to build a better understanding of the neural regions involved in self-enhancement processes.

As can be seen in Table 2, there is some convergence in key regions that come up when examining the narcissistic personality or related processes. Of

these, the most consistently implicated regions are the AI, the dACC, and the MPFC. Future research is needed to better understand neural processes related to narcissism.

GENETIC FACTORS

HERITABILITY. Several studies involving a variety of populations and narcissism measures have suggested that narcissism is strongly affected by genetic factors. These studies compared correlations between traits in monozygotic (identical) versus dizygotic (fraternal) twins. Stronger correlations in monozygotic twins indicate that genetic factors are at play. Indeed, the proportion of the variance in narcissistic traits that can be attributed to genetic factors (i.e., the heritability, which is referred to as a^2) ranges from 53 to 64% in Canadian and American adult samples (Jang, Livesley, Vernon, & Jackson, 1996; Livesley, Jang, Jackson, & Vernon, 1993; Vernon, Villani, Vickers, & Harris, 2008). In terms of environmental effects, these studies all found that no proportion of the variance can be explained by shared environmental factors (i.e., having been raised in the same family; referred to as c^2). Instead, the rest of the variance (between 36 to 47%) can be attributed to nonshared environmental factors (i.e., unique to each individual; referred to as e^2). Similar results have been reported among American children [$a^2 = .66$, $c^2 = .00$, $e^2 = .34$; (Coolidge, Thede, & Jang, 2001)] and in Chinese samples [$a^2 = .47$, $c^2 = .00$, $e^2 = .53$; (Luo, Cai, Sedikides, & Song, 2014)].

TABLE 2. SUMMARY OF NEURAL REGIONS ASSOCIATED WITH NARCISSISM AND RELATED PROCESSES

Study	Population	Neural regions implicated
Cascio, Konrath, & Falk, 2014	Adolescent males	Narcissistic participants have more activation in ‘social pain’ neural regions (AI, dACC, subACC) while being socially excluded, as compared to included.
Choi et al., 2013	Adolescents	No correlation between covert narcissism and responses to different types of rewards. May be due to small sample size.
Fan et al., 2011	Adults	Individuals with high narcissism scores do not show activation in the right AI region while empathizing, but those with low narcissism scores do. Individuals with high narcissism scores show less activation in the right DLPFC, posterior cingulate cortex, and right pre-motor cortex regions while empathizing, but those with low narcissism scores do not.
Schulze et al., 2013	NPD patients vs. controls	NPD patients have less gray-matter volume in the left and right AI, the rostral and median cingulate cortex, and the dorsolateral and medial areas of the prefrontal cortex.
Beer & Hughes, 2010	College students	People who see themselves as “above average” have less OFC and dACC activity while making trait judgments about the self.
Barrios et al., 2008	College students	TMS stimulation of MPFC causes reduced self-enhancement, especially on egoistic (not moralistic) traits.
Kwan et al., 2007	College students	TMS stimulation of MPFC causes reduced self-enhancement, while stimulation of SMA causes increased self-enhancement.
Luber et al., 2012	Adults	TMS stimulation of MPFC and right lateral parietal region at 160 ms SOA causes reduced self-enhancement. Stimulation of the left lateral parietal region at 240 ms SOA causes reduced self-enhancement.

Thus, narcissistic traits have some genetic basis, although their large nonshared environmental basis suggests that outside factors may influence these

traits. Indeed, increases in trait narcissism among American college students over the past 30 years suggest a strong role for environmental and cultural factors in building and maintaining narcissism (Twenge et al., 2008). Moreover, some other research has found that a single manipulation to increase similarity with others, interdependence, or empathy can temporarily reduce narcissistic tendencies and the negative consequences associated with those tendencies (Finkel, Campbell, Buffardi, Kumashiro, & Rusbult, 2009; Giacomin & Jordan, 2014; Konrath et al., 2006).

SINGLE-GENE STUDIES. Some genetic studies examine the role of specific genes in predicting traits and behaviors. Although no research that we are aware of has linked narcissistic personality traits with specific genes, oxytocin receptor (OXTR) genes are potentially promising candidates. OXTR genes are strongly implicated in prosociality and stress regulation (Ebstein, Knafo, Mankuta, Chew, & Lai, 2012; Kumsta & Heinrichs, 2013). For example, in some variants of the gene (SNPs such as rs53576), GG genotypes have been linked to higher levels of sociability, empathy, and trust, as compared to A-allele carriers (Krueger et al., 2012; Rodrigues, Saslow, Garcia, John, & Keltner, 2009; Tost et al., 2010). OXTR GG genotypes are also associated with better emotion-recognition performance (SNPs rs53576, rs2254298, and rs2228485; Lucht et al., 2013; Rodrigues et al., 2009; Wu & Su, 2013). Observers also rate GG carriers as more empathic than A-allele carriers (Kogan et al., 2011). Yet to the extent that such relationships have been observed, they have been limited to only certain SNPs (Israel et al., 2009; Wu, Li, & Su, 2012) and have relatively small effect sizes (Bakermans-Kranenburg & van IJzendoorn, 2013).

OXTR genes may also be linked to lower levels of aggressiveness. For example, in one study, CC carriers (rs237885) were associated with lower parental ratings of callous and unemotional traits among aggressive children, as compared to AA allele carriers (Beitchman et al., 2012). Another study found that alcohol did not lead to the typically observed increase in behavioral aggression

among GG allele carriers of rs4564970 and rs1488467 (Johansson et al., 2012). These findings point to the need for future research to consider contextual factors when examining the potential effects of OXTR genes. For example, some studies have found interactions between OXTR genotype and environmental threat in predicting prosociality (Poulin, Holman, & Buffone, 2012). Since narcissism is linked to threat sensitivity, threat is a likely moderator of any genetic effects. Moreover, although cross-cultural research has been limited, one study found that the OXTR genotype had opposite outcomes in Korea as compared to the US (Kim et al., 2010). Thus, both immediate environmental and broader cultural contexts appear to moderate OXTR effects.

Other genes may also be implicated in narcissistic tendencies and we recommend an exploration of genes that have been shown to be linked to aggression (e.g., COMT, MAOA; Vassos, Collier, & Fazel, 2013). Finally, although single-gene approaches are quite commonly used, it is likely that future research will find that clusters of genes will better predict narcissistic traits and behaviors.

PART III:

CONCLUSIONS AND FUTURE RESEARCH

This thorough review of the literature has revealed that we know the most about the psychological correlates of narcissism, such as well-being and mental health. There has been some research on the health behaviors of narcissistic people, but there have not yet been systematic or objective approaches examining narcissism and behavioral health. There are also major gaps in the extant literature on the physiological correlates of narcissism. For example, there has been limited research on narcissism and subjective physical health, physical functioning (e.g., functional status), disease processes, and mortality risk, perhaps because, to date, most research on narcissism has focused on younger populations. Knowledge

about the physiological markers related to stress reactivity (e.g., cardiovascular variables, skin conductance, and cortisol) is in its beginning stages, but is promising; whereas knowledge about how narcissism is associated with other hormones (e.g., oxytocin, testosterone) is nonexistent. Finally, research on the neural and specific gene correlates of narcissistic personalities is also just beginning. The topic of health and physiological correlates of narcissism is in its infancy and is ripe for discovery and innovation.

Narcissism has been increasing among young Americans over the past 30 years (Twenge et al., 2008) and there may be long-term health implications of these trends as this cohort ages. Yet, it is difficult to determine exactly what those implications might be when considering the gaps in the narcissism literature (summarized above). In addition, because of the nature of narcissism (i.e., that it is a trait that varies by individual), most of the research so far has been correlational. Correlational studies can tell us that there is a relationship between two variables, but they cannot tell us why that relationship exists. It is possible, for example, that high levels of narcissism cause people to be highly reactive to stress. But, it is also possible that being extremely sensitive to stress can lead to a state of narcissistic self-focus. A number of potential third variables (e.g., socioeconomic status, access to social support) might also explain such a correlation.

Thus, future research should use longitudinal designs to examine whether narcissism assessed at one time point predicts later health and physiological outcomes, controlling for baseline levels of those same indicators. Such studies should also include a number of third variables to rule out the possibility that they might be confounding factors, since longitudinal studies still suffer from the third-variable problem. Although such longitudinal studies exist, to date, they have mainly focus on mental health variables as outcomes (Cramer & Jones, 2008; Edelstein et al., 2012; Wink & Donahue, 1995; Zuckerman & O'Loughlin, 2009).

More longitudinal studies are needed, especially ones focused on physical health and physiological variables as outcomes.

One available dataset that we recommend is that of the National Longitudinal Study of Adolescent Health (Add Health). This study is based on a nationally representative sample of adolescents. Data collection began in 1994–1995, and there have been four waves of data collection since then. The study measures social, economic, psychological, and physical-health outcomes. At the time of the first collection of data, participants were in grades 7 to 12 and, in the most recent wave (2007–2008), they were between 24 to 32 years old. Although narcissism is not directly assessed in this study, a reliable and valid narcissism scale was recently developed using items from the Wave 3 assessment (ages 18 to 25). The Add Health Narcissism Scale (AHNS) is positively correlated with self-esteem, sensation-seeking, risk-taking, and self-reported violent behavior (e.g., weapon use, hurting someone so badly that they went to the hospital), and a number of other narcissism scales (Davis & Brunell, 2012). Further examination of the data from the Add Health study would allow researchers to examine which Wave 1 and 2 variables predict later narcissism and, importantly for this chapter, whether narcissism in Wave 3 predicts later health outcomes.

Moving beyond longitudinal studies, researchers should attempt to create experimental proxies of narcissistic tendencies (e.g., induce temporary states of inflated self-esteem and low empathy) to examine potential causal mechanisms within controlled laboratory settings, to the extent that this is possible. Although these studies could never approximate the daily lived experience of being narcissistic, they might help to uncover some interesting physiological consequences of narcissistic states. In one recent study, participants completed a version of the Trier Social Stress Test in which they were asked to give a speech for a job interview (Abelson et al., 2014). Some of the participants were randomly assigned to a condition in which they were told to promote themselves so they would stand out from other applications (self-focus condition), while others were

told to focus on how they could help others and promote the greater good if they got the job (other-focus condition). Although there were no differences in self-reported anxiety, participants in the self-focus condition had significantly higher cortisol responses than participants in the other-focus condition. Although this study was not designed to test physiological effects of narcissistic-like traits, it does provide some initial evidence that a more self-focused stance can have immediate detrimental physiological consequences.

Another consideration for future research is the fact that the vast majority of evidence discussed in this chapter is from Western cultures, and it is important to better understand how narcissism may be associated with health indicators across cultures. In addition, research involving diverse samples in terms of age, socioeconomic status, and ethnicity is also recommended.

Our comprehensive review of the extant literature on health and physiological correlates of narcissism demonstrates a paucity of knowledge on this topic relative to the vast amount of knowledge that has been accumulated regarding other correlates of narcissistic traits. Given the development of reliable and valid physiological methodologies (e.g., salivary hormone assessments) and health-assessment technologies (e.g., portable heart rate and physical activity monitors) in recent years, the exploration of research questions on this topic should now be easier than ever before.

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