The Dominance Behavioral System and Psychopathology: Evidence from Self-Report, Observational, and Biological Studies

Sheri L. Johnson[1], **Liane J. Leedom**[2], and **Luma Muhtadie**[1]
[1]Department of Psychology, University of California, Berkeley

[2]Department of Psychology, University of Bridgeport, Bridgeport CT

Abstract

The dominance behavioral system (DBS) can be conceptualized as a biologically-based system which guides dominance motivation, dominant and subordinate behavior, and responsivity to perceptions of power and subordination. A growing body of research suggests that problems with the DBS are evident across a broad range of psychopathologies. We begin by describing psychological, social, and biological correlates of the dominance behavioral system (DBS). Extensive research suggests that externalizing disorders, mania-proneness, and narcissistic traits are related to heightened dominance motivation and behaviors. Mania and narcissistic traits also appear related to inflated self-perceptions of power. Anxiety and depression are related to subordination and submissiveness, as well as a desire to avoid subordination. Models of the DBS have received support from research with humans and animals; from self-report, observational, and biological methods; and using naturalistic and experimental paradigms. Limitations of available research include the relative lack of longitudinal studies using multiple measures of the DBS and the absence of relevant studies using diagnosed samples to study narcissistic personality disorder and bipolar disorder. We provide suggestions for future research on the DBS and psychopathology, including investigations of whether the DBS can be used to differentiate specific disorder outcomes; the need for more sophisticated biological research; and the value of longitudinal dynamical research. Implications of using the DBS as a tool in clinical assessment and treatment are discussed.

This paper reviews evidence that the dominance behavioral system (DBS) is related to psychopathology. We begin with an overview describing psychological and social outcomes associated with the DBS, as well as the paradigms that have been used to measure the behavior and biology of this system. Against this backdrop of basic literature, we review a substantial body of work suggesting that the DBS is integrally related to psychopathology. Support for the links between the DBS and abnormal behavior has emerged from a wide array of paradigms and using a wide variety of measures. These literatures have nonetheless remained in separate silos, with little cross-fertilization across studies using self-report, observational, and biological measures; across human and animal literatures or across various forms of psychopathology. Given evidence that the DBS is involved in a number of

Corresponding Author: Sheri L. Johnson, Department of Psychology, 3210 Tolman Hall, University of California, Berkeley, CA 94720. sljohnson@berkeley.edu. Telephone: 415-347-6755.

clinical diagnoses, we argue for more refined research on the mechanisms and processes linking the DBS to different psychopathologies.

Despite the variability in the terminology used by different authors and in different fields of study, there is agreement regarding the existence of such a system in all mammals and regarding the ultimate goal this system serves: namely, control over social and material resources, or what we will call *power*. Authors have variably referred to the DBS as the rank regulation system (Zuroff, Fournier, Patall, & Leybman, 2010), the hierarchical domain (Bugental, 2000), or the power system (Shaver, Segev, & Mikulincer, 2011). Herein, we will use the term Dominance Behavioral System, or DBS. The DBS encompasses a series of biological, psychological, and behavioral components. These components serve the organism's goal of control over social and material resources that are critical for survival and reproduction. The DBS motivates behavior, directs sensory processing, and ensures efficient, rapid learning of behaviors that increase the likelihood of attaining this goal.

The human DBS and its components evolved in the context of both competition and the need for peaceful group living. The evolution of group living did not eliminate the competitive element of social interactions, and competition is associated with costs to individuals and the social group, especially when it involves aggression (Archer, 2006a). In humans and higher primates, strategies for acquiring power, including those that provide lower-cost alternatives to direct competition, are complex. Dominance and submissive behaviors serve to regulate aggression and conflict while ensuring that dominant individuals generally have first access to the resources that garner the greatest reproductive success (Fournier, Moskowitz, & Zuroff, 2002).

The DBS and its Components

The pursuit of power begins with monitoring cues in the social environment that pose opportunities or threats to the goal of power. Such cues acquire perceptual salience over the course of development. Beginning in preschool, children appraise situations for opportunities to garner material and social resources (Hawley, 2002). Very young children also have an awareness of their own and others' ability to control these resources (Hawley, 1999), an ability which has been referred to as "resource holding potential" (Zuroff et al., 2010). Over the course of development, experiences of progress or failure toward the goal of power coalesce to form an internal working model (Hawley, 1999; Zuroff et al., 2010), which becomes an integral part of the self-concept and serves as a template to guide thoughts, emotions, and the selection of behavioral strategies related to the goal of power. Individuals use these working models to actively compare the *actual* state of the DBS (with respect to power) against the *desired* goal, to make judgments about the possibility of achieving the desired state, and to develop and enact strategies aimed at achieving power on the basis of past successes and failures. In the present paper, we will use three distinct terms to refer to the components of the DBS: *dominance motivation, dominance behavior*, and *power*, including self-perceptions thereof.

Dominance Motivation

Dominance motivation describes an individual's drive and energy to pursue power, a concept that shares much in common with Winter's (1994) definition of the power motive. Winter described individuals who wanted to feel as though they were most powerful. He noted that individuals with a high power motive tend to construe the world in terms of power and to use power in categorizing human intention. Persons motivated for dominance are likely to be more sensitive to cues signaling opportunities for, or threats to, power (McClelland, 1985; Winter, 1994). Dominance motivation appears to be bipolar in that some people strive for power whereas others try to avoid it (McClelland, 1975). Inflexibly

submissive individuals, for example, do not feel comfortable with having power (Josephs, Sellers, Newman, & Mehta, 2006).

Dominance motivation predicts an array of outcomes. According to evolutionary theory, a major motive for power is to procure reproductive resources (Buss, 1981). Consistent with this theory, dominance motivation has been found to be more predictive of sexual activity than affiliation motivation, even in women (Schultheiss, Dargel, & Rohde, 2003). Dominance motivation also shapes how people define their life goals. People with high dominance motivation are more invested in obtaining the admiration and social attention of others; accordingly, dominance motivation is associated with setting life goals that are related to extrinsic admiration, such as goals of fame and wealth (Duriez, Vansteenkiste, Soenens, & De Witte, 2007).

Dominance Behavior

Individuals with high dominance motivation are more likely to engage in dominance behaviors. These are the strategies, or DBS outputs, enacted in the service of attaining power. Definitions of dominance behavior have varied across fields. For ethologists, dominance behaviors are typically defined by examining outcomes of aggressive interchanges with conspecifics. In research with non-human primates, for example, dominance behavior is typically described in the context of a dyadic interaction in which one member of the dyad expresses aggressive behavior or gestures that signal aggression, and the other responds with submissive behavior (Bernstein, 1980; Dunbar, 1988). In coding dominance hierarchies, animal researchers also take into account submissive behaviors, or those that might avoid conflict, such as abandoning food when another animal approaches (Sapolsky, 1990).

Definitions of dominance behavior in human research tend to be broader than those in ethology in two ways. First, rather than focusing on the *outcome* of encounters, research psychologists often focus on behaviors that are enacted in an effort to enhance power (Anderson & Kilduff, 2009), irrespective of their success in actually achieving this goal. Second, dominance behaviors in humans are not confined to competitive behaviors; they also include behaviors aimed at ingratiating oneself to authorities, coalition building, and assertiveness (Mazur & Booth, 1998). Shaver, Segev, and Mikulincer (2011) incorporate behaviors such as asserting one's dominance, authority, rights, or competence; expressing confidence in one's strengths, values, and opinions; deterring others from competing for or exerting control over one's resources; and verbally or physically attacking (or threatening to attack) others until power is restored. Gilbert (1997) describes behaviors designed to promote social status and inclusion, including efforts to enhance how much one is liked, valued, respected, and wanted.

This emphasis on both prosocial and aggressive forms of dominance behavior is captured by the interpersonal circumplex model in which social behavior is represented by two orthogonal axes: dominance/submissiveness and warmth/hostility (Gurtman, 1992; Horowitz, 2004; Kemper, 1990; Leary, 1957). The interpersonal circumplex has been used both to describe behaviors in a specific situation and to consider trait-like behavioral tendencies across situations. Within this model, different manifestations of dominance behavior are differentiated along the warmth/hostility dimension (Wiggins, 1979). Dominance coupled with hostility can involve antisocial strategies for taking resources and threatening subordinates, such as manipulative behavior, intimidation, and social or physical aggression. Dominance coupled with warmth can take prosocial forms, such as alliance formation and cooperation, reciprocoal resource exchange, engagement in high status (socially valued) behaviors, leadership, and persuasion (Hawley, 2002). Dominance and aggressive behavior frequently co-occur (Graham-Kevan & Archer, 2009; Winstok, 2009),

but even in non-human primates, prosocial dominance strategies may be more effective in procuring power than aggressive strategies (de Waal, Aureli, & Judge, 2000). One important developmental goal in humans is to learn socially competent ways to achieve dominance flexibly, using prosocial strategies (Hawley, 2002). Indeed, rates of physical aggression are highest in preschool and diminish with adequate socialization (Tremblay, 2002). Thwarted dominance strivings are more likely to provoke withdrawal or aggression earlier in development, but as children acquire self-regulatory skills, dominance motivation manifests in more adaptive strategies and thus becomes associated with social success (Schaal, Tremblay, Soussignan, & Susman, 1996).

Power

Power has been defined as "the ability to provide or withhold valued resources or administer punishments" to others (Anderson & Berdahl, 2002, p. 1362). Resources may be physical or social, such as higher esteem from others, praise, and positive attention (Hawley, 1999). Power can be distinguished from, but nonetheless subsumes, rank or status, which tend to have positive connotations. Rank is typically used to describe the individual's relative position in a hierarchical cultural, political, or economic domain (e.g., prime minister, military general, or member of the upper class), whereas status describes the ability to gain the respect and social attention of other individuals (Gilbert, 1997). Kemper (1990), for example, has defined status as the ability to achieve one's goals with voluntary compliance from others. Status is likely to be based in part on respected abilities, such as intellect or interpersonal skill, which enable an individual to more easily procure resources (Barkow, 1989). In keeping with this idea that power can be achieved through the respect and admiration of others, one index of power is the extent to which others confer attention upon a target individual (Hawley, 2007). In one experiment, rhesus macaques traded rewards for the opportunity to view images of high status macaques but required rewards to view images of low status macaques (Deaner, Khera, & Platt, 2005). In humans, Gilbert (1997) referred to this ability to garner others' respect and attention as "social attention holding potential." Herein, we will use the term *power* to refer broadly to the ability to control resources, regardless of whether this is achieved using aggressive, coercive, or prosocial strategies.

Although individuals tend to show some consistency in their self-perceptions of power across relationships (Anderson, John, & Keltner, 2010), an individual's level of power is likely to vary across social contexts. For example, a man who perceives himself as subordinate in his position as a mailroom worker of a large corporation may feel respected and admired in his role as church deacon or captain of his weekend softball team (Sapolsky, 2004). Although most individuals flexibly calibrate their dominance motivation and behaviors so that they are commensurate with these shifts in power experienced across contexts, some individuals demonstrate rigid or context-insensitive patterns of submissive or dominant behavior such that these behaviors become maladaptive. It is this latter phenomenon that has tended to be the focus of research linking the DBS to psychopathology.

Power and powerlessness have profound psychological and physiological sequelae. In a comprehensive review of the literature, Keltner and colleagues (2003) theorized that because power enhances access to rewards, it activates the approach system, a neurobiological system that facilitates motivation and behavior in the pursuit of rewards (Depue & Collins, 1999). As a consequence of this approach system activation, many different motivational, cognitive, and behavioral outcomes of power are expected. Power has been associated with greater positive emotion, more confidence, more automatic (rapid) cognitive processing, and more expressivity (Anderson & Galinsky, 2006; Berdhal & Martorana, 2006). Power also relates to a bias to detect sexual opportunities in ambiguous situations and to more sexually flirtatious behavior (Gonzaga, Keltner, & Ward, 2008). In addition to activating the

approach system, power is also thought to deactivate the behavioral inhibition system, rendering individuals less sensitive to potential threats and thus more impulsive (Keltner et al., 2003). Accordingly, power is related to some frankly negative outcomes, including more social norm violations (Magee & Langner, 2008), diminished social sensitivity and attention to others (Keltner & Robinson, 1997; Operario & Fiske, 2001), and a diminished compassion for others when they are experiencing distress (van Kleef et al., 2008).

Powerlessness (and self-perceptions thereof) has been the focus of substantial research. People who are powerless are more vulnerable to social and material threats (Hall, Halberstadt, & O'Brien, 1997) and to losing the favor of powerful others. Powerless individuals are more likely to encounter interference from others when approaching potential rewards (Anderson & Berdahl, 2002; Keltner et al., 2003), and they tend to be aware of these social threats and constraints on their behavior. Powerlessness is proposed to activate the behavioral inhibition system, which increases reactivity to cues of threat. Powerless persons may over-estimate social threats, such as being disliked or rejected (Langner & Keltner, 2008).

The DBS and Emotion

The emotional concomitants of the DBS have been well studied. When power is threatened, anger is a likely emotional outcome and even likelier when dominance motivation is high (Archer & Webb, 2006). Other work has focused on the self-conscious emotions of pride and shame, which are seen as representing opposite ends of a dimension of internalized schemas of dominance/subordination status (Weisfeld & Wendorf, 2000). Both emotions are based on self-evaluations of one's ability to achieve valued social outcomes (Mascolo & Fischer, 1995). Pride has been conceptualized as an emotion triggered by the perception that one is doing well in meeting social standards that would garner the respect and attention, or social attention holding potential, of others (Tracy & Robbins, 2007b). Tracy and Robbins (2007a) have further differentiated between two types of pride: authentic and hubristic. Whereas the former is based on a specific action or accomplishment, the latter stems from global attributions of one's value that may not be founded in specific actions or accomplishments. Shame is triggered when an individual perceives the self as unattractive to others, or when social attention holding potential is low (Gilbert, 2007). Shame can be triggered by hostile interactions with dominant others (Gilbert & Irons, 2005) and is associated with submissive behavior (Gilbert, 2000a). Nonverbal expressions of shame involve hiding the self, such as averting one's gaze and covering one's face with the hands (Mascolo & Fischer, 1995). Internal sensations include feelings of inferiority, decreased confidence, and lower self-perceived status (Wicker, Payne, & Morgan, 1993).

The affective and cognitive repercussions of attaining – or failing to attain – power are likely to differ based on a person's level of dominance motivation. Theory (McClelland, Koestner, & Weinberger, 1989) and research (Chen, Lee-Chai, & Bargh, 2001; Fodor & Wick, 2009) suggest that high dominance motivation leads to greater reactivity to changes in power. People with high dominance motivation have been found to demonstrate more emotional reactivity when faced with dominance challenges (Fodor, Wick, & Hartsen, 2006). By contrast, some individuals are motivated to pursue submissive roles and when placed in positions of power, and these individuals exhibit cognitive performance decrements during competition (Josephs et al., 2006). Thus it appears crucial to consider dominance motivation and power conjointly in predicting outcomes.

Assessing the Human Dominance Behavioral System

Many different assessment approaches have been used to measure the components of the DBS (see Table 1). Key approaches include self-report, observational, and biological indices. We briefly review the advantages and disadvantages of each approach.

Self-Report Measures

Self-report measures are popular, in part because of their ease of administration, but also because scales have been developed to index the separable components of the DBS – namely, dominance motivation, dominance behavior, self-perceived power and shame. The most commonly used self-report measure of dominance motivation is the dominance subscale of the Personality Research Form (PRF), but as shown in Table 1, many other broad personality scales include subscales to assess dominance behavior or motivation. Validation studies indicate that self-reported dominance motivation, dominance behavior, self-perceived power, and the related emotion of shame can be reliably distinguished from other social and psychological traits, such as need for achievement (Mudrack, 1993). Two caveats are important, though. First, many self-report instruments contain items that combine both motivational and behavioral components of the DBS. Second, self-report ratings of dominance motivation and behavior may be susceptible to systematic biases. For example, dominance ratings have been found to correlate with overly positive self-ratings of task performance (Jackson, Stillman, Burke, & Englert, 2007) and with measures of social desirability (Mehrabian, 1996).

Implicit Measures

To address the influence of self-awareness and presentational biases, several implicit measures of dominance motivation have been developed in order to capture more automatic processes (Sheldon, King, Houser-Marko, Osbaldiston, & Gunz, 2007), such as the Picture Story Exercise Need for Power Index (PSE N Pow; Winter, 1992, 1994) and the Implicit Association Test (IAT; Greenwald, McGhee, & Schwarz, 1998). Implicit measures of dominance motivation tend to have low but significant correlations with each other and with explicit measures of dominance motivation (Schultheiss, Yankova, Dirilikvo, & Schad, 2009; Sheldon et al., 2007). As shown in Table 1, implicit measures of dominance motivation have also demonstrated strong validity in predicting emotions, behavior, and biological indices in laboratory studies of social dominance.

Observational Measures

Observational studies have assessed dominance motivation and behavior in children and adults within institutional and laboratory settings. Researchers have used judges', caretakers', and peers' ratings of live and videotaped interactions. Empirical work has shown that individual differences in dominance can be reliably rated as early as toddlerhood (Hawley & Little, 1999; Russon & Waite, 1991) and the preschool years (Roseth, Pellegrini, Bohn, Van Ryzin, & Vance, 2007). For example, by preschool, some children demonstrate higher rates of directive behavior than others, and these children are more likely to succeed in a conflict over possession of an object, more likely to initiate interactions, and less likely to be submissive in a conflict (Boyce, 2004). Toddlers and preschoolers who are rated as more dominant are looked at more by peers in observations of group play situations and are rated as more likeable by their peers (Hawley, 2002). In studies of children, caretakers can effectively rate which children tend to win disputes and control resources, and these ratings appear to have validity in predicting other social and personality scales (Hawley, 2002).

Biological Measures

Although the DBS is likely to involve a host of biochemical substrates, salivary and serum (free) testosterone (i.e., not bound to a carrier substance in the blood) have been the most frequently studied biological indices of this system (Schultheiss & Wirth, 2008). Free testosterone is correlated with self-report, observational, and implicit measures of dominance motivation in healthy adult men and women (Archer, 2006a, 2006b; Grant & France, 2001; Mazur & Booth, 1998; Schultheiss et al., 2005; Sellers, Mehl, & Josephs, 2007). Testosterone also seems to correlate with several other facets of the DBS.

For example, testosterone has been consistently shown to correlate with dominance behaviors (Archer, 2006a). Single measurements of basal testosterone have been found to predict ratings of dominance behavior in laboratory paradigms (Grant & France, 2001; van Honk et al., 1999) and among adolescents (Udry, 1988) and college roommates (Cashdan, 1995) in naturalistic settings. Basal testosterone has also been found to predict more extreme dominance behaviors: in a large prison study, male inmates with a history of violent interpersonal crimes had higher basal testosterone levels than did those with a history of property crimes. Moreover, basal testosterone levels predicted more rule-breaking within the prison setting, especially rules involving overt confrontation (Dabbs, Carr, Frady, & Riad, 1995). Just as high testosterone individuals display more dominance behaviors (i.e., behaviors aimed at achieving or maintaining power), low testosterone individuals appear motivated to maintain *low status* (Mehta, Wuehrmann, & Josephs, 2009). For example, when experimentally placed into a high status position, individuals with low testosterone showed evidence of discomfort, including increases in emotional and autonomic arousal, poorer performance on complex cognitive tasks, and greater implicit attention to status.

Some studies suggest that high testosterone is also related to aggressive behavior, defined by intent to inflict harm of a psychological, social, material, or physical nature (Mazur & Booth, 1998; Parrott & Giancola, 2007). Researchers have found that testosterone predicts a range of aggressive behaviors (Windle & Windle, 1995), including bullying in the work place (Parkins, Fishbein, & Ritchey, 2006), violence of men towards their wives (Booth, Mazur, & Dabbs, 1993), fighting and confrontations in prisons (Dabbs et al., 1995), and willingness to administer larger shocks to competitors in laboratory studies (Berman, Gladue, & Taylor, 1993). Nonetheless, findings of meta-analyses suggest that testosterone administration does not consistently increase aggressive behavior compared to placebo, and that naturalistically occurring testosterone levels are more robustly correlated with dominance traits than with aggressive personality traits (Archer, 2006a). Taken together, these findings suggest that the effects of testosterone on aggressive behavior may be mediated by dominance motivation (Archer, 2006a). Testosterone may predict the use of a range of dominance behaviors, both aggressive and non-aggressive, particularly when individuals with high dominance motivation experience challenges to power.

Testosterone also appears to be related to self-perceived power and its behavioral concomitants. We noted earlier that power is related to greater reward sensitivity, more approach behavior, and higher levels of confidence. Consistent with this, higher testosterone levels have been found to predict greater confidence (Carré & McCormick, 2008; Cashdan, 1995), and a range of social approach behaviors in laboratory and naturalistic settings, including more forwardness in approaching an older person, greater speed in approaching a younger woman, a more relaxed and confident style during dyadic interactions, and greater sexual activity, including higher rates of heterosexual partners and sexual infidelity (Dabbs, Bernieri, Strong, Campo, & Milun, 2001; Dabbs & Morris, 1990; Daitzman & Zuckerman, 1980; Egan & Angus, 2004). Other studies suggest that high testosterone, like power, relates to diminished sensitivity to threat. For example, low testosterone is associated with potentiation of the startle response (Hermans, Putman, Baas, Koppeschaar, & van Honk,

2006), exaggerated skin conductance responses to negatively valenced stimuli (van Honk et al., 2004), and sensitivity to loss (van Honk et al., 2004). Also congruent with findings regarding power, high testosterone relates to lower interpersonal sensitivity, indexed by diminished tendencies to mimic others' facial expressions (Hermans, Putman, & van Honk, 2006) or attend to fearful faces (van Honk, Peper, & Schutter, 2005). Given these effects on interpersonal interactions, it is perhaps not surprising that high testosterone has also been related to less chance of becoming or staying married (Dabbs & Morris, 1990), and to poorer quality of marital and parental relationships (Booth et al., 1993; Gray, Kahlenberg, Barrett, Lipson, & Ellison, 2002; Julian & McKenry, 1989).

Research on testosterone also provides insight into the reinforcing properties of dominance behavior. An increase in power often leads to an increase in testosterone (Archer, 2006a). Animal research suggests that increases in testosterone are highly reinforcing. For example, rodents will self-administer testosterone via oral, intravenous and intracerebroventricular routes, sometimes to the point of death (Wood, 2004). Testosterone has been shown to amplify activity of the nucleus accumbens, a key region in the approach system (Hermans et al., 2010). In humans, testosterone is a schedule III controlled substance because of the potential for abuse (US DEA, 2009).

Importantly, testosterone does not operate in isolation. Testosterone function is guided by other hormones and interacts with other neurotransmitter systems that are centrally involved in various psychological disorders. The function of the testosterone system is intricately woven together with stress reactivity and cortisol. Heightened cortisol levels appear to diminish sensitivity to testosterone (Shirtcliff, Granger, Booth, & Johnson, 2005) and testosterone also suppresses cortisol reactivity to stress (Kirby, Geraghty, Ubuka, Bentley, & Kaufer, 2009; Williamson, Bingham, & Viau, 2005). Dopamine is involved in approach motivation (Depue & Collins, 1999), which, as previously mentioned, is a major correlate of power (Keltner et al., 2003). Dopaminergic neurons in the nucleus accumbens encode the expected value of rewards (Salamone, Correa, Farrar, Nunes, & Pardo, 2009; Schultz, 2009), and increases in power and testosterone both have been found to amplify activity of the nucleus accumbens (Hermans et al., 2010; Zink et al., 2008). Animal research has shown that social defeat reduces serotonin function (McGuire & Troisi, 1998) and that testosterone administration improves serotonin function (Clark & Henderson, 2003). Improved serotonin function also can increase dominance behavior (Tse & Bond, 2002). Given that dopamine and serotonin regulate a broad range of basic reward- and emotion-relevant processes (Carver, Johnson, & Joormann, 2008), and that cortisol levels shift with a wide range of stressors (Dickerson & Kemeny, 2004), we do not review dopamine, serotonin, or cortisol here.

There are substantial gender and age differences in testosterone levels, and these will be important for interpreting some of the mixed findings regarding psychopathology. Boys demonstrate much more of an increase in testosterone with age and puberty than do girls (Matchock, Dorn, & Susman, 2007). After puberty, testosterone levels are more varied and show stronger diurnal rhythms in boys than in girls (Granger et al., 2003). By late life, men's testosterone levels diminish to half of the levels observed during their thirties (Gavrilova & Lindau, 2009). A significant percentage of men over the age of 40 show clinically low testosterone levels (Bassil, Alkaade, & Morley, 2009). In adolescence and early adulthood, women's testosterone levels are about one-third as high as those observed among men (Shirtcliff, Dahl, & Pollak, 2009). Testosterone declines more gradually in women than in men, such that by late life, older women tend to have testosterone levels that are about half of those observed among men (Gavrilova & Lindau, 2009). The higher prevalence of depression and lower prevalence of externalizing disorders in women compared to men (Kessler, 2003; Kessler et al., 2003a), as well as the higher risk of externalizing disorders in

younger populations, provides an important rationale for studying the effects of sex hormones on psychopathology (Brown et al., 2008).

Summary of Approaches for Assessing the DBS

Multiple paradigms are available for assessing the DBS, and each of these has its weaknesses and strengths. In terms of weaknesses, self-report measures are subject to reporting biases, observational data tend to illuminate constructs in only one context and are expensive to gather (Rothbart & Bates, 2006), and biological studies fall short of identifying the specific facets of the DBS that might be involved in the observed responses and behaviors. These limitations, inherent in any single paradigm, are best addressed by considering convergent findings across multiple paradigms. Self-report measures are designed to pinpoint specific DBS components (i.e., dominance motivation, behavior, power) and allow the researcher to gather data about a person's predispositions over long periods of time and across contexts. Implicit measures may avoid some of the biases of self-report measures. Naturalistic observations provide greater objectivity and help elucidate how a person responds in a specific context. Biological measures circumvent deliberate or unconscious biases in responding. We consider evidence from each of these measurement approaches as we review the relations of the DBS to psychopathology.

Dominance Behavioral System: Links to Psychopathology

Thus far, we have reviewed evidence from self-report, observational, and biological studies that linked the DBS to physiological, social, and psychological characteristics. Specifically, this research suggests that the DBS guides a broad range of affective, cognitive, and social parameters. In the forthcoming section, we describe how inflexible or extreme manifestations of these DBS-relevant motivations and behaviors relate in important ways to several psychopathologies. We begin by describing findings regarding externalizing syndromes, we then turn our attention to narcissistic personality traits and mania, and finally, we cover depression and anxiety disorders. Although DBS models have been developed for other disorders (cf. paranoia; Gilbert, Boxall, Cheung, & Irons, 2005), we have chosen to focus on those that have yielded substantial empirical research related to the DBS.

Externalizing Syndromes

In this section, we will consider conduct disorder and disruptive behavior disorders in children, and antisocial personality disorder, psychopathy, and alcohol/substance abuse in adults. These conditions have been found to be highly correlated (Krueger, McGue, & Iacono, 2001) and to involve shared genetic vulnerability (Kendler, Prescott, Myers, & Neale, 2003). As we shall discuss, models and evidence concerning the DBS also suggest strong parallels.

Disruptive behavior disorders in children include conduct disorder and oppositional defiant disorder. Conduct disorder is defined by aggression, property destruction, deceitfulness, theft, or rule violation. Oppositional defiant disorder is defined by a pattern of aggressive, noncompliant, defiant, and argumentative behavior that lasts for at least 6 months and causes significant impairment in either social or academic functioning (APA, 2000a). Antisocial personality disorder, which is diagnosed in adulthood but often manifests in childhood as conduct disorder, is defined by persistent and pervasive disregard for, or violation of, the rights of others (APA, 2000). Although there is significant overlap between antisocial personality disorder and psychopathy, diagnosis of the latter is distinguished by an emphasis on internal and psychological traits. That is, scales designed to measure psychopathy typically include emotional traits (e.g., a lack of shame, guilt, or remorse), interpersonal

traits (an absence of empathy, an egocentric perspective), and behaviors reflecting poor self-control (e.g., impulsive behavior, difficulty maintaining employment, and financial debt; Hare, 1991, 2003).

Theory—In evolutionary models of the DBS and externalizing disorders, authors have emphasized how biological variability in dominance motivation might be adaptive at a group level, and how contextual factors might also influence the adaptiveness of dominance behaviors. Most theory in this area has focused on antisocial behavior and psychopathy. Price (1967) has theorized that from an evolutionary perspective, groups with stably established dominance hierarchies would have an advantage in procuring food, safety, and other resources. Given that individual differences in dominance motivation and behavior are likely to facilitate the establishment of such hierarchies, it is plausible that evolutionary pressures would select for the biological substrates undergirding individual differences in dominance motivation and behavior. One consequence of this variability is that some persons will demonstrate extremely high levels of dominance motivation and behavior, and such extremes are hypothesized to produce pathological syndromes, such as antisocial and psychopathic traits. Many authors have suggested that psychopathic/antisocial traits might have evolutionarily adaptive benefits in terms of enhancing mating success and procuring resources in the short-term (Glenn, Kurzban, & Raine, 2011), albeit at the expense of longer-term attachments. This idea is supported by at least one study that found psychopathy to be associated with greater frequency of poaching the mates of others (Jonason, Koenig, & Tost, 2010).

Theory also emphasizes that both the likelihood and benefits of extreme dominance in the form of psychopathic/antisocial behavior will be context-dependent (Glenn, Kurzban, et al., 2011). For example, scarcity and uneven distribution of resources will amplify tendencies toward dominance behavior. Other authors have suggested that individual or social characteristics that place a person at a competitive disadvantage for garnering resources and mating opportunities will increase the likelihood of psychopathy and antisocial personality disorder. In support of this idea, these disorders are correlated with poverty, lower intelligence, large number of siblings, and poorer social skills (Mealy, 1995). In sum, theory has related externalizing syndromes, and particularly antisocial and psychopathic traits, to extreme levels of dominance motivation and behavior. The excessive pursuit of power at the expense of forming longer-term social attachments is theorized to be driven by a confluence of factors, including biology, social-context, and individual differences related to the ability to garner resources by various means.

The symptoms of many different externalizing disorders as defined by the DSM-IV-TR are consistent with excessively dominant behavior (APA, 2000). For example, the diagnostic criteria for oppositional defiant disorder include lack of acceptance of authority. Similarly, many of the features of antisocial personality and psychopathy overlap substantially with traits shown to be highly correlated with self-perceived power (Keltner et al., 2003), such as impulsivity, grandiosity, increased sexual activity, decreased behavioral inhibition, and decreased empathy. The proposed DSM-5 diagnosis for antisocial personality disorder features symptoms of entitlement and power-seeking (APA, 2011).

Self-Report and Observational Findings—As shown in Table 2, several researchers have noted that the Multidimensional Personality Questionnaire Social Potency subscale (Tellegen & Waller, 2008) – a measure of dominance motivation – is correlated positively with externalizing symptoms, including psychopathy scores (Hall, Benning, & Patrick, 2004; Hicks, Markon, Patrick, Krueger, & Newman, 2004), non-comorbid conduct disorder diagnoses (Krueger, Caspi, Moffitt, Silva, & McGee, 1996), and substance abuse diagnoses (Krueger et al., 1996). Moreover, dominance motivation predicts externalizing behavior in

studies involving both men and women (Carey, Henson, Carey, & Maisto, 2007; Krueger et al., 1996). A broad measure of self-reported dominance motivation and behavior has also been found to correlate with externalizing in the form of criminal behavior (Costello & Dunaway, 2003). As mentioned previously, people who are motivated to achieve dominance are expected to be more concerned about cues of power or status (Winter, 1994), and indeed, concern about dominance, as measured with the Iowa-Netherlands Comparison Orientation Measure, has been found to correlate with heavy drinking in a large college student sample (Carey et al., 2007).

Dominance motivation may be particularly relevant to the interpersonal symptoms of psychopathy. Symptom specificity has been examined in studies using a factor score of the Psychopathy Checklist-Revised (PCL-R) that has been labeled Fearless Dominance, or Arrogant and Deceitful Interpersonal Style (Patrick, Hicks, Krueger, & Lang, 2005). Fearless Dominance is stable across adolescence and into early adulthood (Blonigen, Hicks, Krueger, Patrick, & Iacono, 2006) and over a 10-year period of adulthood (Witt et al., 2010). More importantly, Fearless Dominance has been shown to correlate positively with measures of dominance motivation such as the MPQ Social Potency scale (Benning, Patrick, Blonigen, Hicks, & Iacono, 2005; Verona, Patrick, & Joiner, 2001).

Psychopathy has also been related to tendencies towards more dominance behavior, as measured by both self-report (Edens, 2009) and observer ratings (Kosson, Steuerwald, Forth, & Kirkhart, 1997). In one longitudinal study, a conjoint index of dominance behavior and rule-breaking was found to predict the onset of substance use disorders in early adulthood (Tarter et al., 2007). The Fearless Dominance scale of the PCL-R has also been found to correlate with dominance behavior (Patrick, Edens, Poythress, Lilienfeld, & Benning, 2006; Vitacco & Kosson, 2010). Other researchers have considered more specific aspects of dominance behavior. For example, Cale and Lilienfeld (2006) found that psychopathy scores were highly correlated with the Perceived Ego Threat Questionnaire (PETQ; Bushman & Baumeister, 1998), which assesses the degree of anger experienced in response to threats to power, including insults, disrespect, and commands. These authors also found psychopathy to be correlated with receiving discipline for aggressive responses to threats to power among prison inmates. Thus in psychopathy, threats to power appear to be especially salient triggers of dominant behavior, particularly dominance in the form of aggression.

Biological Evidence—As summarized in Table 2, many studies have examined testosterone in externalizing syndromes. Several studies of adolescents have documented elevated testosterone in externalizing syndromes, including conduct disorder (Udry, 1990), antisocial behavior (Olweus, Mattsson, Schalling, & Löw, 1988), substance abuse (Tarter et al., 2007), and among adolescents with delinquent peers (Fang et al., 2009; Kirillova, Vanyukov, Kirisci, & Reynolds, 2008). In studies of adults, testosterone was found to be elevated among persons with antisocial symptoms compared with controls (Booth, Johnson, & Granger, 1999; Sjoberg et al., 2008) and among persons diagnosed with Type 2 alcoholism, a form of alcoholism that co-occurs with externalizing symptoms (Dabbs & Morris, 1990; Stalenheim, Eriksson, von Knorring, & Wide, 1998). In a longitudinal study, testosterone levels at age 12-14 predicted the onset of substance use disorders at age 22, and the effects were mediated by dominance and norm-violating behaviors (Tarter et al., 2007).

Other studies of testosterone have focused on more specific aspects of interpersonal behavior. In an item analysis to examine specific antisocial and aggressive behaviors, testosterone related most strongly to the tendency to protest or disobey commands (Olweus et al., 1988). These findings are consistent with other studies that found testosterone to be specifically related to externalizing symptoms involving aggression (Aromaki, Lindman, &

Eriksson, 1999; Pajer et al., 2006). Although it may be particularly fruitful to examine testosterone in conjunction with aggressive responses to dominance challenges, the links of testosterone with symptoms such as alcohol abuse suggest the importance of an ongoing focus on a range of behaviors beyond aggression.

Despite the wealth of positive findings, inconsistencies remain in the literature on testosterone and externalizing syndromes, with some studies documenting nonsignificant correlations between testosterone and conduct disorder symptoms (Constantino, Roose, & Woodring, 1993; Nottelmann et al., 1987) or disruptive behavior disorders (Granger et al., 2003). One study found that testosterone was unrelated to conduct disorder symptoms cross-sectionally, but predicted the emergence of antisocial behaviors longitudinally (van Bokhoven, Matthys, van Goozen, & van Engeland, 2006). In light of these mixed findings, several issues are worth considering when evaluating the links of testosterone with externalizing disorders, including gender, developmental stage, and social environment. We turn to these issues next.

Gender, Age, and Social Environment—In regard to gender, findings indicate that testosterone is directly correlated with externalizing behavior in adolescent boys but not in girls (Booth, Johnson, Granger, Crouter, & McHale, 2003; Fang, et al., 2009; Maras et al., 2003). Studies that have examined the effects of testosterone across genders also have not yielded significant relationships with externalizing behaviors, at least not cross-sectionally (Dorn et al., 2009; Glenn, Kurzban, et al., 2011; Nottelmann et al., 1987). It remains possible that more specific models will attain support among girls. For example, Pajer and colleagues (2006) found that testosterone was elevated only among those adolescent girls whose conduct disorder symptoms included aggression, suggesting that testosterone may relate to aggression more than to general externalizing syndromes in girls. Granger and colleagues (2003) did not find externalizing symptoms in girls to be related to mean testosterone levels across the day, but did find that disruptions of daily testosterone rhythms related to externalizing symptoms after controlling for pubertal development. Overall, the evidence for testosterone as a risk factor for externalizing symptoms appears to be far more robust in males than in females. In addition, a more precise characterization of externalizing symptoms and hormonal profiles may need to be considered in research with females.

In considering developmental influences on hormone levels, it is notable that many of the null testosterone findings for males have been obtained in studies of adolescents. As highlighted previously, testosterone increases steeply during puberty in males, and this surge may increase error variance and interfere with the predictive validity of baseline levels over time. Several authors have argued that early pubertal maturation might be more important to externalizing syndromes than absolute testosterone levels (Dorn et al., 2009; Drigotas & Udry, 1993). In line with this argument, early puberty in boys has been associated with externalizing behavior (Kaltiala-Heino, Marttunen, Rantanen, & Rimpelä, 2003; Williams & Dunlop, 1999), peer deviance (Kirillova et al., 2008), and substance use (Dawes et al., 1999; Kirillova et al., 2008; Tarter et al., 2009; Wiesner & Ittel, 2002). In one longitudinal study, testosterone levels between ages 9 to 11 and 11 to 15 were correlated with risk for externalizing disorders, whereas tesosterone levels after that developmental period were not directly related to externalizing disorders (Kirillova et al., 2008). Similarly, testosterone levels at age 11 and 12 were found to relate to problem behavior (Drigotas & Udry, 1993) and substance abuse (Tarter et al., 2007) concurrently and prospectively, but testosterone levels at later ages were not. Notably, some of the authors who obtained weak relationships between testosterone and antisocial behavior collapsed across pubertal status in their analyses (cf. Nottelmann et al., 1987; Olweus, Mattsson, Schalling, & Löw, 1980) or examined younger age groups (cf. Constantino 1993; Dorn et al., 2009). Thus it appears that

researchers need to take age of pubertal onset into account when evaluating the role of testosterone in externalizing symptoms.

In addition to gender and development, the social environment may also be a key factor in the relation between testosterone and externalizing syndromes, consistent with evolutionary theory. Social factors, such as poverty, parental conflict, and deviant peer groups can all increase risk for externalizing disorders (Burt, Krueger, McGue, & Iacono, 2003; Ge, Brody, Conger, Simons, & Murry, 2002; Lahey, Loeber, Burke, & Applegate, 2005; Wadsworth & Achenbach, 2005). High testosterone levels have been found to relate more strongly to externalizing symptoms in boys who have poor relationships with their parents than in boys who have strong relationships with their parents (Booth et al., 2003), and this may be particularly true during adolescence (Fang et al., 2009). In other work, testosterone levels were related to conduct disorder symptoms, but only among boys with deviant peers (Rowe, Maughan, Worthman, Costello, & Angold, 2004). Among boys who did not have deviant peers, testosterone levels were instead related to leadership. Kirillova and colleagues (2008) reported that the effects of early puberty on substance abuse appear to be mediated by peer deviance. The social environment has also been found to moderate the influence of testosterone on externalizing syndromes in studies of adults. For example, testosterone was only found to relate to adult criminal behavior in men with low scores on a measure of social integration that incorporated educational achievement, participation in organized groups, job stability, and marital status (Booth & Osgood, 1993). In another large-scale study, testosterone interacted with low SES to predict antisocial personality disorder, alcoholism, and drug abuse (Dabbs & Morris, 1990). Consistent with evolutionary theory, then, testosterone may relate more strongly to externalizing symptoms in the context of high-risk social environments.

Summary of the DBS Findings Regarding Externalizing Syndromes—Self-report and observational research suggests that elevations in dominance motivation, behavior, and self-perceived power are related to conduct disorder, externalizing disorders, substance abuse, and psychopathy. Although most research has been conducted with all-male samples, parallel findings have emerged in samples that included both males and females. Moreover, findings relating the DBS to these disorders have emerged in large-scale studies using varied samples and assessment techniques. The biological findings with males generally converge with the self-report and observational research. Specifically, research suggests that elevated testosterone is related to conduct disorder, antisocial behavior, and substance abuse in males. Moreover, testosterone and dominance motivation appear to be particularly relevant to the interpersonal symptoms of externalizing syndromes, especially aggressive responses to threats to power. Among adolescent males, higher testosterone levels during a critical developmental window that marks earlier pubertal onset are most strongly related to externalizing behavior. Testosterone also appears to be related to externalizing behavior in adult men. Finally, the biological research suggests a number of ways in which DBS models of externalizing syndromes could be refined by considering social environments that are known to increase risk for externalizing symptoms.

Narcissism

The DSM-IV-TR defines narcissistic personality disorder by the presence of a set of stable traits that interfere with functioning, including an exaggerated sense of self-importance, fantasies of unlimited success and power, beliefs that one is special, excessive need for admiration, proneness to envy, contemptuous attitudes and behavior toward others, entitlement, exploitive behavior, lack of empathy, beliefs that others are envious of oneself, and arrogance (APA, 2000). These symptoms overlap with behaviors that one might expect to find in conjunction with extremely high dominance motivation and self-perceived power.

In this section, we focus exclusively on self-report and observational studies because we were unable to identify studies involving biological measures of narcissism.

Theory—Psychodynamic and social psychology models of narcissistic personality disorder have both emphasized that the pursuit of dominance functions to protect self-esteem: the narcissist hopes to support grandiose views of the self by achieving power (Kohut, 1977; Morf & Rhodewalt, 2001; Raskin, Novacek, & Hogan, 1991). In one psychodynamic theory, Kohut (1977) has suggested that the excessively high dominance motivation observed in narcissism might stem from parental styles that failed to provide the warmth, empathy, or respect that are needed to endow the child with a sense of self-worth, coupled with tendencies to rely on the child's accomplishments as a way of bolstering the parents' self-esteem. Social psychology models place more of an emphasis on the function of dominance behavior within the current interpersonal system. Baumeister and colleagues (2000) have argued that individuals with narcissistic traits employ dominance behaviors to assert and defend their highly grandiose self-views. Their model focuses on the aggressive behaviors of narcissists and posits that aggression is most likely when individuals with narcissistically inflated views of their own personal superiority encounter others who explicitly dispute these self-perceptions. Kirkpatrick and colleagues (2002) expanded this theory to argue that from an evolutionary perspective, the most important goal would be to protect "one's relative standing on functionally important dimensions such as desirability as a mate and social status" (p.758). To do so, winning competitions between members of one's in-group would be particularly important.

Self-Report and Observational Evidence—Dominance motivation is one of the personality traits used to screen for narcissistic tendencies. More specifically, the most widely used scale for assessing narcissistic traits, the Narcissistic Personality Inventory (NPI), includes two factor-analytically supported subscales pertaining to dominance motivation: Exploitiveness and Leadership. The Exploitiveness subscale includes items that capture the desire for power, tendencies to show off, and a sense of being entitled to respect, all of which could be considered as aspects of dominance motivation. The Leadership subscale captures a range of ways in which a person prefers to be in positions of social power, such as "I would prefer to be a leader" and "I like having authority over other people," but is also consistent with dominance motivation. Across factor analytic studies, items capturing a desire for power and leadership, or dominance motivation, have been shown to be core facets of the NPI (Raskin & Terry, 1988).

As shown in Table 3, empirical research suggests that the overlap between dominance motivation and narcissistic traits generalizes across measures. Self-reports of high trait dominance motivation as measured with multiple scales have been found to be robustly correlated with measures of narcissistic traits (r's =.57 to.71; (Bradlee & Emmons, 1992; Patrick, Curtin, & Tellegen, 2002; Raskin et al., 1991; Rodebaugh, Gianoli, Turkheimer, & Oltmanns, 2010). In a study of how the NPI related to a large number of personality variables, no personality variable was more closely related to the NPI than was dominance motivation (Emmons, 1984). Gurtman (1992) used the circumplex model as a way of understanding the subscales of the NPI and noted the strong overlap between NPI subscales and dominance motivation and behavior. Broader findings also fit with the idea that narcissistic traits are related to high dominance motivation. We noted above that dominance motivation shapes a tendency to pursue life ambitions related to extrinsic admiration, such as goals of achieving fame and wealth. In one study, narcissistic traits, as measured by the NPI, were found to correlate with ambitious life goals for achieving fame and wealth (Fulford, Johnson, & Carver, 2008).

Narcissistic traits also appear to be related to more dominant behavior (Emmons, 1984; Gurtman, 1994; Pincus et al., 2009; Raskin & Terry, 1988). Narcissistic traits, indexed by NPI scores, have been found to correlate with observer ratings of dominant behaviors, such as bragging, aggression, and confidence (Paulhus, 1998). Much of the aforementioned research has relied on self-reports of narcissism, which raises concerns that individuals might minimize their own narcissistic traits (Klonsky, Oltmanns, & Turkheimer, 2002). Studies correlating observer ratings of narcissistic traits with observer ratings of dominant behavior, however, have obtained results that are at least as strong, if not stronger, than studies relying on self-reports of dominance motivation and narcissistic traits (Raskin et al., 1991; Rodebaugh et al., 2010). Thus, the association between narcissistic traits and dominance behavior appears to hold across different measurement approaches.

Observational laboratory studies provide a more detailed look at the ways in which the desire for dominance may shape the behavior of individuals with narcissistic traits. In response to negative feedback from a confederate, persons with high NPI scores report higher perceptions of threat and demonstrate more aggressive responses directed at the confederate who provided the negative feedback (Bushman & Baumeister, 1998). Narcissism has been found to be more related to aggression toward competitors when there is explicit competition for a specific resource – specifically, time with an attractive member of the opposite sex (Kirkpatrick, Waugh, Valencia, & Webster, 2002). In another study, participants were given rigged negative feedback about how their social sensitivity compared to that of another person, and were then given a chance to evaluate that other person. High NPI scores predicted more negative evaluations of the person to whom they had been unfavorably compared. Thus being perceived negatively by others appears to be highly threatening for individuals with narcissistic traits, and this threat triggers competitive and even aggressive behavior toward potential competitors. Congruently, the NPI has also been found to correlate with tendencies to endorse being angered by others' attempts to assert dominance through insults or commands (Cale & Lilienfeld, 2006). As summarized by Bushman and Baumeister (1998), "narcissists care passionately about being superior to others" (p. 220), which can be considered one indicator of excessive dominance motivation.

In addition to the studies relating narcissism to dominance motivation and behavior, there is some evidence to suggest that narcissistic personality traits are associated with higher self-perceptions of power. Factor analyses of the Narcissistic Personality Inventory identify two subscales that are parallel with the behaviors observed among persons who have attained high power: Superiority and Self-Absorption (Raskin & Terry, 1988). Consistent with this, NPI scores have been found to correlate with self-rated power (Anderson et al., 2010). Narcissistic traits have also been found to correlate with self-evaluations that are higher than peer evaluations (John & Robins, 1994; Paulhus, 1998). Inflated self-perceptions of power might help to explain some of the social problems observed in narcissistic personality disorder insofar as people who over-estimate their power tend to be less liked by their peers over time (Anderson, Srivastava, Beer, Spataro, & Chatman, 2006; Paulhus, 1998).

Consistent with the idea of heightened self-perceptions of power, narcissistic traits also appear to be related to pride. As mentioned previously, research has distinguished between two forms of pride: authentic pride, which is based on specific accomplishments, and hubristic pride, which is based on global self-evaluations. NPI scores have been found to correlate negatively with tendencies toward authentic pride, but positively with tendencies toward hubristic pride (Tracy, Cheng, Robins, & Trzesniewski, 2009), suggesting that narcissism may be particularly related to overly positive global evaluations of self.

To the extent that narcissistic traits relate to inflated self-perceptions of power, one might expect narcissistic individuals to experience less shame (Kernberg, 1998). On the other

hand, some authors have suggested that the emphasis placed on achieving power might leave the narcissistic individual vulnerable to periods of intense shame when these defensive strategies fail (Pincus et al., 2009). According to this latter view, achieving superiority may matter greatly, but evaluations of whether or not this goal has been achieved tend to vary (Morf & Rhodewalt, 1993). Empirical findings regarding links between narcissistic traits and shame are mixed, and these inconsistencies appear to stem from the measure of narcissism used. The NPI is negatively correlated with shame (Harder & Lewis, 1987; Wright, O'Leary, & Balkin, 1989), particularly with shame measures that focus on public humiliation, such as the ASGS, as compared with shame measures that focus on personal disappointment, such as the PFQ2 (Harder & Zalma, 1990). By contrast, the Pathological Narcissism Inventory (PNI), which is designed to capture more severe forms of narcissism, is related to higher shame proneness scores and less consistently to self-perceived power (Pincus et al., 2009). Discrepancies across measures underscore the need to develop more nuanced theory about the specific conditions under which narcissism protects positive views of the self and conditions under which it fails to do so (Pincus et al., 2009).

Summary of the DBS Findings Regarding Narcissism—Clinical features of narcissistic personality disorder overlap with some of the problems that one might expect to observe in conjunction with a dysregulated DBS. Specifically, empirical research using self-report and observational measures suggests that individuals with narcissistic traits exhibit elevated levels of dominance motivation and dominance behavior along with inflated self-perceptions of power. Much of the research on narcissistic personality traits has focused on subsyndromal symptoms measured using the NPI. One self-report scale was recently designed to capture more pathological narcissistic traits, and responses on this scale are less clearly related to shame and self-perceptions of power. Therefore, there remains a need understand both how the DBS relates to pathological narcissism and to characterize the links between the DBS and narcissism biologically and longitudinally.

Mania

Bipolar I disorder is defined by at least one lifetime episode of mania. Manic episodes are characterized by a period of distinctly euphoric or irritable mood, accompanied by other symptoms, such as being overly confident, requiring less sleep, increased talking, racing thoughts, and engagement in rewarding activities without regard for the negative consequences (e.g., risky sexual activity, excessive spending, and other disinhibited behaviors). To qualify as a full manic episode, symptoms must last at least one week or necessitate hospitalization. Many people with a history of manic episodes will experience depressive episodes as well. Although some studies of clinically diagnosed samples are available, research on the DBS in mania has often relied on analog samples. Many of these studies have defined risk for mania using the Hypomanic Personality Scale (HPS; Eckblad & Chapman, 1986), which covers subsyndromal symptoms of mania and related personality traits. The HPS has been found to have excellent validity in predicting the onset of manic and hypomanic episodes (Kwapil et al., 2000).

Theory—Price (1967), noting the strong parallels between the behavior of "alpha" animals and the symptoms of mania, suggested that mania was an excessive reaction to achieving power. Gardner (1982) expanded this theory to suggest that this propensity to be overly sensitive to signals of power might be biologically driven. Cardinal symptoms of mania – including grandiosity, heightened sexuality, and excessive talking – overlap with the behavioral correlates of power, and so it has been theorized that self-perceptions of power may be particularly elevated during manic episodes (Gilbert, McEwan, Bellew, Mills, & Gale, 2009). By contrast, during the depressive phase of the illness, individuals with bipolar disorder often focus on feelings of failure and tend to view themselves as subordinate and

submissive (Gilbert, McEwan, Bellew, et al., 2009). In this section, we will focus on research specific to mania and we will turn to depression in the following section.

Self-Report and Observational Findings—As shown in Table 4, dominance motivation has been found to correlate with the HPS (Johnson, Carver, & Siegel, 2011) and with diagnosed bipolar disorder. Individuals diagnosed with bipolar disorder who were asked about their life ambitions while in remission endorsed pursuing extremely ambitious extrinsically-oriented goals (wealth and fame), which could be related to dominance motivation (Johnson, Eisner, & Carver, 2009). The investment in extrinsically-oriented goals does not appear to be an artifact of symptoms, in that the profile remained present after controlling for subsyndromal manic symptoms and has been found to predict the onset of mania (Alloy et al., in press). Heightened investment in highly ambitious extrinsic goals also has been documented across seven samples of persons at risk for bipolar disorder (Carver & Johnson, 2009; Gruber & Johnson, 2009; Johnson & Carver, 2006; Johnson et al., 2011). Observational studies suggest that risk for mania is also related to dominance behavior, as assessed by self and peer ratings (Taylor & Mansell, 2008). Self-ratings of negative and positive forms of dominance behavior were correlated with the HPS, but peers tended to rate individuals with high HPS scores as showing only positive forms of dominance behavior.

As shown in Table 4, people diagnosed with bipolar disorder and those at risk for the disorder also appear to endorse high self-perceptions of power on self-report measures (Gilbert, McEwan, Mitra, et al., 2009; Johnson et al., 2011). Whereas these studies suggest that elevated self-perceptions of power can be documented even outside of episode, theorists have suggested that self-perceptions of power may be particularly inflated during manic episodes. Gardner (1982) reported that people experiencing manic episodes rated themselves as having elevated power, but his study did not include a control group of people with remitted bipolar disorder. Ratings of social comparisons appear to correlate positively with good moods and negatively with depressive symptoms among individuals with bipolar disorder (Gilbert, McEwan, Hay, Irons, & Cheung, 2007). When experiencing depressive symptoms, individuals diagnosed with bipolar disorder also endorse engaging in high rates of submissive behavior (Gilbert, McEwan, et al., 2007). No study has followed people with bipolar disorder over time to understand how self-perceptions of power might fluctuate with symptoms.

Biological Evidence—A few naturalistic and treatment studies have examined the relations between testosterone and mania in adult men (see Table 4). The findings of one naturalistic study suggest that testosterone is modestly correlated with mania in men from a low SES background, but not in high SES men (Dabbs, Hopper, & Jurkovic, 1990). These findings echo those in externalizing disorders, in that testosterone may have more bearing on symptoms in high risk contexts. When healthy men are given high doses of exogenous testosterone, 10 to 30% exhibit manic symptoms (Daly et al., 2003; Pope & Katz, 1988). Only one randomized trial has been conducted to compare testosterone administration to no treatment. In that study, 16% of men reported hypomanic or manic episodes while taking testosterone compared with none in the control condition (Pope, Kouri, & Hudson, 2000). Research is needed examining whether testosterone is correlated with mania in other age groups or among women.

Consistent with the links between the DBS and mania, an animal model of mania has been developed using a competition paradigm that places two food-deprived rats at a feeder. The rat that monopolizes the feeder tends to display a set of behaviors that are analogous to manic symptoms, including increased energy and locomotion, heightened pursuit of reward, and aggression (Malatynska & Knapp, 2005). Interestingly, multiple anti-manic agents have been found to quell these dominance behaviors (Malatynska & Knapp, 2005).

Summary of the DBS Findings Regarding Mania—Even during well periods, people diagnosed with bipolar disorder and those at risk for the disorder endorse high levels of dominance motivation and self-perceived power. Dominance behavior has been found to correlate with measures of risk for mania, but such behavior tends to be perceived positively by peers. More research is needed to examine the DBS among persons diagnosed with bipolar disorder given that much of the extant research is based on analog samples. Individuals diagnosed with bipolar disorder have been shown to exhibit increased motivation for extrinsic recognition, which can be conceptualized as one aspect of dominance motivation. Bipolar disorder appears to involve a chronically elevated desire for power, coupled with extreme variability in self-perceptions of power as mood states shift. It is possible that in the context of a heightened need for power, fluctuations in perceived power trigger manic and depressive symptoms, but longitudinal research is needed to determine whether shifts in self-perceived power drive symptoms or are driven by them. Congruent with findings obtained from self-report and observational studies, a small number of biological findings indicate that testosterone increases can induce manic symptoms.

Depression

Most depression rating scales encompass a range of symptoms, including those relevant to mood (e.g., sad mood or anhedonia), physical symptoms (weight loss, disrupted sleep, loss of appetite, psychomotor agitation or retardation), and cognitive symptoms (feelings of worthlessness, diminished ability to concentrate, and suicidal ideation). To qualify as a major depressive episode in the DSM-IV-TR, mood changes must be accompanied by five symptoms that persist for at least two weeks, and the symptoms must be severe enough to disrupt functioning or cause significant distress (APA, 2000). Some of the studies of the DBS consider dysthymic disorder, a chronic form of depression in which a person experiences at least two symptoms of depression that persist for at least two years.

Theory—Extensive theory has been developed on the DBS in depression. Much of that theory focuses on involuntary subordination as a final common pathway into depression. Due to space limitations, we highlight only the major tenets of theory here, but the reader is referred to other sources for more in-depth coverage (see Gilbert, 1992, 2000b; Gilbert & Allan, 1998; Sloman, 2000). In a battle for dominance, submissive behaviors, which have been called involuntary subordination behaviors, signal that the organism accepts defeat. These behaviors are functionally adaptive, in that they end the competition and fighting, thereby limiting physical injury or risk of death. In humans, competition for power is often not physical (Sloman, Gilbert, & Hasey, 2003). Rather, loss of power may result either from direct challenges or from loss of important social resource holding potential. Even when power has been lost due to a change in social resource holding potential, submissive behavior has a number of important functions. Communicating acceptance of the subordinate status should reduce the probability of ongoing punishment or conflict, and it may elicit help from others. Experiences of involuntary subordination that create a subjective sense of defeat are therefore expected to trigger submissive behaviors, a response initially labeled the Involuntary Subordinate Strategy (Price, Sloman, Gardner, & Gilbert, 1994), and more recently labeled the Involuntary Defeat Strategy (Sloman, 2000). The Involuntary Defeat Strategy may involve escape, or at times when escape is not feasible, submissive behavior.

Research validates that even nondepressed individuals with self-perceived powerlessness will engage in more submissive behaviors during interactions with a superior (Fournier et al., 2002). If the organism is able to escape, gain help from others, or if a new, more stable, social rank system is achieved, Involuntary Defeat has achieved its function, and the strategy should terminate. Depression is theorized to reflect a failure to terminate the Involuntary

Defeat Strategy (Sloman, 2000; Sloman & Price, 1987; Sloman, Price, Gilbert, & Gardner, 1994). That is, depression is hypothesized to result from an inability to recover from subordination experiences, typically because escape is blocked (Gilbert, 1992). Other authors have suggested that depression might be caused by excessive social comparison and the tendency to view oneself as inferior (Swallow & Kuiper, 1988).

Self-Report and Observational Findings—The central tenet of the Involuntary Defeat Strategy theory is supported by several studies suggesting that individuals with depression experience a subjective sense of subordination (see Table 5). For example, self-reported feelings of inferiority and subordination were correlated with depressive symptoms in both clinical and nonclinical samples (Allan & Gilbert, 1997; Gilbert & Allan, 1998; Gilbert, Allan, & Trent, 1995; Gilbert, McEwan, Bellew, et al., 2009; Troop & Baker, 2008; Wyatt & Gilbert, 1998) and with severity of depression history in a diagnosed sample (Sturman & Mongrain, 2008). Several studies have also found correlations between depressive symptoms and tendencies to experience shame (Harder, Cutler, & Rockart, 1992; Harder & Lewis, 1987; Hoblitzelle, 1987; Tangney, Wagner, & Gramzow, 1992; Wright et al., 1989), particularly shame from others (Gilbert, Cheung, Grandfield, Campey, & Irons, 2003; Gilbert, McEwan, Bellew, et al., 2009; Harder & Zalma, 1990). Studies using a variety of measures thus suggest that depressive symptoms are highly correlated with feelings of subordination. Consistent with the human findings, repeated social defeat has been shown to induce depressive symptoms, including weight loss, poor sleep, social withdrawal, and diminished motivation for and interest in reward in animals (Becker et al., 2008; Fuchs & Flügge, 2002; Keeney et al., 2006; Rygula et al., 2005).

According to the Involuntary Defeat Strategy theory, perceptions of subordination should trigger submissive behavior in depressed individuals. Consistent with this idea, tendencies toward submissive behavior correlate with depressive symptoms (Gilbert, Broomhead, et al., 2007; Gilbert, McEwan, Bellew, et al., 2009; Mehrabian & Bernath, 1991; Troop & Baker, 2008; Wyatt & Gilbert, 1998), and to persist even after symptoms remit (Vittengl, Clark, & Jarrett, 2003). One caveat though, is that difficulties with assertiveness, although related to depression, were not any more pronounced than other interpersonal concerns for people experiencing depressive symptoms in one study (Horowitz, Rosenberg, Baer, Ureño, & Villaseñor, 1988).

Experiences of involuntary subordination might have their origins in childhood or the more recent past (Gilbert, 2000b; Sloman et al., 2003). Individuals with high depression scores have been shown to endorse experiences of shame and put-downs from their parents, which are correlated with adulthood experiences of subordination, submissiveness, and shame (Gilbert et al., 2003). In one study of college students, self-reported experiences of submissiveness and subordination during childhood were more related to depressive symptoms than were measures of early threat or experiences of being devalued (Gilbert et al., 2003). In one eight-year longitudinal study, Andrews (1995) found that body shame mediated the link between early childhood abuse and recurrent episodes of major depression during adulthood. Shame was more correlated with depression than was a more general measure of self-esteem. Beyond these early experiences, extensive research on the triggers of depression fit with the idea of diminished social resource holding potential (Allen & Badcock, 2003). For example, one of the best validated triggers for major depression is the experience of major life events involving loss or failure – events that could be conceptualized as symbolizing defeat (Brown & Harris, 1989). Beyond specific life changes, depression is robustly predicted by broad social contexts involving subordination, such as poverty. For example, people living at or below the poverty level have been shown to have a 3.8-fold increase in depression risk compared with those whose income is at least three times the poverty level (Kessler et al., 2003b). Interestingly, the SES ladder, a self-report

measure of self-perceived power relative to others in the same country, is a more robust predictor of psychological distress than are objective income and education levels (Singh-Manoux, Marmot, & Adler, 2005). Although these findings regarding social predictors are consistent with many different models of depression, they are easily understood as markers of low power, and as such, fit well with the subordination model of depression.

In addition to self-perceived power, a person's desired power (or dominance motivation) may help shape whether depression unfolds as a consequence of reductions in social resource holding potential. Individuals who strive for high status goals, such as wealth, have been shown to be at higher risk for depressive symptoms (Kasser & Ryan, 1993). Gilbert, Broomhead and colleagues (2007) have argued that rather than striving for unusually high status, most people who are depressed strive to avoid submissive roles. Self-ratings on a scale designed to measure striving to avoid inferiority have been found to correlate with depressive symptoms (Gilbert, Broomhead, et al., 2007; Gilbert, McEwan, Bellew, et al., 2009). Moreover, the Striving to Avoid Inferiority scale was more powerfully related to depression than was the Hypercompetitive Attitudes Scale (Ryckman, Hammer, Kaczor, & Gold, 1990), a scale designed to capture the desire to win at all costs (Gilbert, Broomhead, et al., 2007).

One would expect that wanting a higher rank would intensify the negative outcomes of low perceived rank. Across studies, striving to avoid inferiority and submissiveness jointly predict risk for depression (Gilbert, Broomhead, et al., 2007; Gilbert, McEwan, Bellew, et al., 2009). The mismatch, then, between wanting not to be submissive and actual life experiences of defeat may set the stage for the development of depressive symptoms.

Biological Evidence—There is a large literature on testosterone and depression. We consider findings regarding testosterone separately by age group and gender, and we do not include studies that have failed to differentiate gender and age groups in analyses. Given the age-related declines in testosterone in males, one would expect late life to be an important window for studying such effects. We therefore begin by describing studies of older men, and then turn to the literature in other age and gender groups.

As shown in Table 5, low testosterone has been found to relate to higher depressive symptom scores in two large samples of older men (Barrett-Connor, Von Mühlen, & Kritz-Silverstein, 1999; Morsink et al., 2007), but one nonreplication also exists (T'Sjoen et al., 2005). Some studies clarify that depression risk may be confined to men with hypogonadism (abnormally low testosterone levels), with no difference in depression rates observed in men with average or high testosterone levels (Booth et al., 1999; Zitzmann, Faber, & Nieschlag, 2006). Indeed, questionnaires used to assess behavioral symptoms of testosterone deficiency include symptoms of depression, such as negative mood, low energy, and decreased enjoyment of pleasurable activities (Okun, McDonald, & DeLong, 2002), and researchers have identified high levels of depressive symptoms (Booth et al., 1999; Morsink et al., 2007; Zitzmann et al., 2006) and diagnosable depression (Shores, Moceri, Sloan, Matsumoto, & Kivlahan, 2005; Shores et al., 2004) in men who have clinically significant deficits in testosterone. Nevertheless, testosterone deficiencies may relate more to milder depressive symptoms than to severe symptoms (Delhez, Hansenne, & Legros, 2003) and to dysthymic disorder more than to major depressive disorder (Seidman et al., 2002). Overall, there is reason to believe that hypogonadism is a risk factor for mild and chronic depressive symptoms in elderly men.

Genetic findings also support the idea that abnormally low testosterone function may be related to depression. A polymorphism involving a shorter repeat length in the androgen receptor CAG diminishes androgen receptor sensitivity, and testosterone levels were

unrelated to depression in the absence of this polymorphism. Among persons with a shorter CAG repeat length, low testosterone was related to a five-fold increase in depression risk (Seidman, Araujo, Roose, & McKinlay, 2001). This effect was replicated in one study of younger African-American men but has not been verified in other ethnic groups (Colangelo et al., 2007). Thus, some evidence suggests that genes that reduce testosterone function can increase depression risk among men.

Beyond naturalistic studies, experimental evidence also suggests that testosterone deficiencies relate to depression. Androgen deprivation agents, which deplete testosterone, are used as one form of treatment for severe sexual offenders. In a double-blind controlled trial, about 10% of men taking androgen deprivation agents developed depressive symptoms compared with none of the men in the placebo control group, and these depressive symptoms were relieved by testosterone replacement therapy but not by placebo (Schmidt et al., 2004).

Historically, testosterone was used as an antidepressant (Danziger, Schroeder, & Unger, 1944), and researchers have begun to reconsider this approach. In open trials, six out of eight studies of testosterone supplements for the treatment of depression in older men yielded positive results (Shamlian & Cole, 2006). Findings have been more mixed in randomized controlled trials, with only five out of 12 trials yielding positive results, and one yielding equivocal results (Shamlian & Cole, 2006). Several treatment studies converge with the naturalistic findings, in that testosterone supplementation reduced depressive symptoms among those individuals with clinically significant testosterone deficits (Loizides, Swierzewski, O'Neill, Griesser, & Smith, 2004; McNicholas, Dean, Mulder, Carnegie, & Jones, 2003; Wang et al., 2004) and was more effective in treating dysthymic disorder than major depressive disorder (Seidman et al., 2009).

Clinically significant deficits in testosterone are rare in younger males and in women, so it may be harder to obtain effects when considering healthy variations in testosterone within these populations. Indeed, studies have not shown links between testosterone levels and depressive symptoms in younger adult men (Colangelo et al., 2007; Dabbs et al., 1990) and boys aged 9 through 14 (Nottelmann et al., 1987). Similarly, most studies have not found evidence for the direct effects of low testosterone on risk for depression among adolescent girls (Booth et al., 2003; Granger et al., 2003; Susman, Dorn, & Chrousos, 1991), middle-aged women (Haren et al., 2007), or elderly women (Barrett-Connor, von Mühlen, Laughlin, & Kripke, 1999; Erdincler, Bugay, Ertan, & Eker, 2004; Pope & Katz, 1988). In the only exception to this pattern of null results, Morsink and colleagues (2007) found evidence that testosterone deficits were related to depression in women aged 70 and older, which may be explained by declines in testosterone that occur later in life.

Given that hypogonadism is rare in women and younger males, it may be important to consider more refined testosterone indices and potential moderators. For example, in one study of younger males, diurnal rhythms in testosterone (diminished amplitude of change across the day) were found to be more strongly related to depressive symptoms than were mean levels across the day (Granger et al., 2003). In another study of adolescent girls and boys, the effects of testosterone were found to be most pronounced against a backdrop of social risk factors for depression, such as disrupted parent-child relationships (Booth et al., 2003).

In sum, hypogonadism in elderly men is related to risk for depression, particularly risk for milder chronic symptoms, and testosterone supplements appear to relieve these forms of depressive symptoms. In younger individuals and in women, who rarely exhibit testosterone deficiencies, the influence of low testosterone on depressive symptoms may only be

apparent with more sophisticated analyses, such as those incorporating diurnal rhythms or the social environment. A single randomized control trial has examined the effects of antidepressant medication on DBS components. Results of that study indicated that nondepressed individuals who were prescribed Citalopram appeared less submissive to members of their household and exhibited more dominant interactions with strangers (Tse & Bond, 2002). Given these findings, it may be fruitful for more studies to examine the influence of antidepressant medication on submissive behavior in depressed individuals, and how this variable relates to the overall treatment response.

Summary of the DBS Findings Regarding Depression—Self-report and observational data suggest that depression is related to perceived subordination, and many of the social triggers for depression can be conceptualized as indicators of a loss of social resource holding potential. Rather than focusing on elevated dominance motivation, theory in this area centers on the motive to avoid inferiority, and scales designed to capture this motivation are consistently related to depression, providing support for the involuntary subordination model. Biological data suggest that extreme deficits in testosterone can trigger depression, and testosterone supplements can relieve symptoms that are attributable to these deficits. In examining testosterone, it is important to consider that clinically significant deficits of testosterone are rare in younger males and women, and accordingly, naturalistic research has been most productive in exploring the effects of testosterone in older men and women over the age of 70.

Anxiety

The conceptual models and the empirical findings regarding DBS in depression and anxiety are highly parallel, and this overlap may help explain the frequent co-occurrence of anxiety and depression. Most studies of anxiety have focused on symptom severity scales, which tend to cover the frequency and intensity of anxious mood, as well as somatic cues of anxiety. Studies of diagnosed anxiety have tended to focus on social anxiety disorder, which is defined in the DSM-IV-TR by an intense and persistent fear of social or performance situations in which an individual fears that he or she will be scrutinized and, ultimately, humiliated (APA, 2000).

Theory—As with depression, anxiety has been theorized to involve concerns about social power, involuntary subordination, and involuntary defeat strategies, or submissiveness. We will note subtle distinctions between anxiety and depression, however, as we cover studies that attempt to differentiate between the DBS profiles of these two disorders. Trower and Gilbert (1989) suggest that persons with social anxiety are overly focused on dominance hierarchies and competition at the cost of a focus on connectedness. We will focus on aspects of this theory that are relevant to the DBS (see Trower & Gilbert, 1989 for more discussion). Within this model, early life experiences of insecure attachment set the stage for a hypersensitivity to how one compares to others, resulting in an overemphasis on social comparison (one form of dominance motivation). Social anxiety disorder is also characterized by self-perceptions of subordinate status (Aderka, Weisman, Shahar, & Gilboa-Schechtman, 2009). Accordingly, the individual sets a goal of avoiding rejection, harm, or ostracism by the social group member who has the highest power. Within this framework, social attention is interpreted as an indicator of inclusion (Gilbert, 1997), and angry responses, while posing a threat to power, may nonetheless be seen as conferring attention, which is preferable to ostracism. Thus to avoid rejection or ostracism, the socially anxious individual is theorized to engage in submissive behaviors. Within this framework, then, social anxiety is expected to relate to vigilance to cues of social rank, low self-perceptions of power, and engagement in submissive behavior.

Other authors have theorized that social anxiety is caused by a hypersensitivity to dominance cues (Mineka & Õhman, 2002; Trower & Gilbert, 1989). Different models of how this might be expressed have been developed. Öhman (1986) hypothesized that angry faces, conceptualized as a cue of threat to power, would be particularly salient and threatening to persons with social anxiety disorder. This theory, then, predicts an opposite pattern of results compared to Gilbert's model, in that persons with social anxiety disorder are expected to be particularly sensitive to cues such as angry faces.

Self-Report and Observational Findings—An extensive literature has considered the role of the DBS in anxiety, and particularly social anxiety (see Table 6). We begin with a discussion of findings for anxiety generally and then turn to findings regarding social anxiety. Consistent with theory, high scores on anxiety measures appear to relate to low self-perceptions of power. Individuals with high anxiety scores describe feeling that they are overlooked, rejected, and have subordinate status (Gilbert, McEwan, Bellew, et al., 2009). Consistent with these low self-perceptions of power, anxiety is correlated with higher shame-proneness (Harder et al., 1992; Tangney et al., 1992) and self-reported submissive behavior (Allan & Gilbert, 1997; Gilbert, Broomhead, et al., 2007; Gilbert, McEwan, Bellew, et al., 2009; Mehrabian & Bernath, 1991; Mehrabian & O'Reilly, 1980).

Most of the research on power and anxiety is cross-sectional and naturalistic, but there is some experimental evidence to support the idea that subordination can provoke anxiety. In a study of college students who took part in a 25-second competition, losing led to increases in anxiety levels, and the strength of this response was moderated by baseline anxiety levels (Halvari & Gjesme, 1995). Although longer-term studies are not available, these findings are consistent with the idea that anxiety might unfold as a consequence of diminished power.

One might expect dominance motivation to intensify reactivity to subordination, and several studies have highlighted the importance of dominance motivation. In one study, implicit measures of dominance motivation were found to predict more anxiety in response to rigged negative social feedback (Fodor & Wick, 2009). Although the study did not include clinical measures of anxiety, the findings fit with the idea that anxious responses are most likely to be observed in individuals with high dominance motivation who are experiencing threats to their social power. Consistent with this idea, aspirations for financial success have been related to higher anxiety scores (Kasser & Ryan, 1993). In the largest study to date (Krueger et al., 1996), however, individuals with anxiety disorders were not found to endorse higher dominance motivation than were non-disordered individuals. As with depression though, Gilbert and colleagues have argued that anxiety stems more from a desire to avoid inferiority than from a desire to achieve superiority (Gilbert, Broomhead, et al., 2007), and there is evidence that self-rated striving to avoid inferiority is correlated with anxiety scores (Gilbert, Broomhead, et al., 2007; Gilbert, McEwan, Bellew, et al., 2009). Striving to avoid inferiority thus appears to be more central to anxiety than does striving for dominance.

As with studies of general anxiety, studies of social anxiety have provided support for key aspects of the DBS model, including subordination, shame, and submissive behavior. Lennox and Wolfe (1984) found that social anxiety symptoms were related to high scores on the Attention to Social Comparison Information scale, a measure of sensitivity to, and motivation to avoid, social disapproval. By contrast, Antony, Rowa, Liss, Swallow, and Swinson (2005) did not find heightened attention to social comparison information among persons diagnosed with social anxiety disorder. Despite mixed findings regarding vigilance to cues of social rank, researchers have nonetheless found that people with social anxiety disorder tend to compare themselves unfavourably to others (Antony et al., 2005) and report more shame-proneness (Harder & Lewis, 1987; Tangney et al., 1992), particularly on shame measures that capture how one might be perceived socially (Harder & Zalma, 1990).

Socially anxious individuals also appear to engage in more submissive behavior than do non-anxious controls, as indexed by self-report (Allan & Gilbert, 1997; Cain, Pincus, & Grosse Holtforth, 2010; Gilbert, Broomhead, et al., 2007; Gilbert, McEwan, Bellew, et al., 2009; Horowitz et al., 1988; Mehrabian & O'Reilly, 1980; Trower & Gilbert, 1989; Trower, Sherling, Beech, Horrop, & Gilbert, 1998) and observational measures (Heerey & Kring, 2007; Walters & Hope, 1998). On the whole, these findings suggest that social anxiety is related to self-perceptions of powerlessness and engagement in submissive behavior.

More than 70 articles have examined responses to angry faces in individuals with social anxiety disorder compared with healthy controls (see Staugaard, 2010 for review). Although group differences are less apparent when people view faces for longer periods of times, there is evidence that social anxiety disorder is related to more automatic attention to angry faces during the early phase of processing (e.g., < 500 milliseconds), as measured by eye-tracking and visual probe studies. Studies using evoked potentials also indicate that individuals with social anxiety disorders attend more to angry faces than do controls (Staugaard, 2010). Converging evidence thus supports the idea that social anxiety disorder relates to greater automatic reactivity to angry faces.

Biological Findings—A small number of human studies have examined testosterone in relation to anxiety disorders (see Table 6). One rationale for this work is that testosterone has been shown to enhance the function of GABA, a target of anxiolytic medications (Yang, Jones, & Henderson, 2005). Another rationale is that animal studies have found that testosterone administration reduces threat-sensitive behaviors (Bing et al., 1998; Bitran, Kellogg, & Hilvers, 1993; Boissy & Bouissou, 1994; Svensson, Åkesson, Engel, & Söderpalm, 2003). Correspondingly, gonadectomy (Edinger & Frye, 2004, 2006; Fernandez-Guasti & Martinez-Mota, 2005; Frye, Edinger, & Sumida, 2008; Toufexis, 2007; Umathe, Bhutada, Jain, Dixit, & Wanjari, 2008), genetic variations leading to diminished testosterone function (Frye, Koonce, Edinger, Osborne, & Walf, 2008; Pope & Katz, 1988; Umehara et al., 2006), and diminished testosterone levels observed with older age (Frye, Edinger, Lephart, & Walf, 2010) are related to greater threat sensitivity in animals, and testosterone administration appears to reduce this threat sensitivity (Bitran et al., 1993; Edinger & Frye, 2004; Fernandez-Guasti & Martinez-Mota, 2005; Frye, Edinger, et al., 2008; Frye & Edinger, 2004; Frye et al., 2010; Frye, Koonce, et al., 2008; Toufexis, 2007). Although most research has focused on male animals, the anxiolytic effects of testosterone have also been observed in female animals (Frye & Lacey, 2001). Although it is hard to differentiate depression and anxiety in animals, most researchers have interpreted the above findings as relevant to anxiety.

Extant findings regarding testosterone and anxiety in humans have been more mixed. Low mean testosterone levels and greater amplitude of change across the day have both been related to anxiety and depressive symptoms in boys but not in girls (Granger et al., 2003). Other studies have failed to find the expected correlation of low testosterone with anxiety (Olweus et al., 1980; Susman et al., 1991). In the only available pharmacological manipulation study, a single administration of testosterone did not influence self-rated anxiety among young adult women (van Honk et al., 2005). The small number of human studies, the lack of studies involving longer-term administration of testosterone, and the inconsistent pattern of findings preclude strong conclusions regarding the influence of testosterone and its precursors on anxiety.

Drawing on the idea that testosterone correlates with dominance motivation, some researchers have examined testosterone as an index of responsivity to social challenges in humans. Maner, Miller, Schmidt, & Eckel (2008) used changes in testosterone to index reactivity to threats to power. Specifically, participants completed a competitive task with a

confederate, and the results were rigged so that one participant won by a wide margin and the other lost by a wide margin. Findings suggested that losing had a more pronounced effect on socially anxious men, as indexed by steeper drops in testosterone levels after losing compared with men who were not socially anxious. The same effect was not observed in women.

In sum, despite extensive animal research supporting the link between testosterone and anxiety in animals, androgens do not appear to be consistently related to anxiety in humans, and findings are particularly weak among females. One study suggests that social anxiety may be related to a greater reactivity of the testosterone system to stressors among men. Given the small number of human studies, the absence of studies across the lifespan, and the inconsistencies with the animal literature, more research in this area is needed.

Studies of the Unique Relations of Anxiety and Depression to the DBS—Many researchers have documented strong parallels in the DBS-relevant findings for depression and anxiety, with both syndromes related to perceptions of involuntary subordination, coupled with self-rated striving to avoid inferiority (cf. Allan & Gilbert, 1997; Gilbert, Allan, Brough, Melley, & Miles, 2002; Gilbert, McEwan, Bellew, et al., 2009; Tangney et al., 1992). The parallels are not surprising given the extremely high rates of comorbidity for anxiety and depressive disorders (Kessler et al., 2003). Some researchers have conducted analyses to examine the statistical overlap between depression and anxiety with dominance constructs (see Table 7). In those analyses, social anxiety has been found to correlate with perceived inferiority, submissive behavior, shame, and diminished dominance motivation, even after controlling for depression (Aderka et al., 2009; Alden & Phillips, 1990; Gilbert, 2000a; Gilbert et al., 2005; Naragon-Gainey, Watson, & Markon, 2009). In contrast, depression was unrelated to these indices after controlling for social anxiety. Indeed, the only study to report that depression was associated with these DBS indices after controlling for anxiety failed to consider either subsyndromal symptoms of anxiety or specific symptoms of social anxiety (Uhmann, Beesdo-Baum, Becker, & Hoyer, 2010). Taken together, these findings suggest that the experience of submissiveness may be more centrally related to social anxiety than to depression. It is possible that comorbid depression may be secondary to social anxiety and its repercussions. It is also possible that other mechanisms influence whether depression develops in the context of submissiveness.

Theory has suggested that depression will unfold in the context of entrapment. One form of entrapment is the inability to escape from or accept involuntary subordination (Gilbert, 1992, 2000b; Price, 1972; Taylor, Gooding, Wood, & Tarrier, 2011). A recent review found substantial support for the association between entrapment and depression, but only mixed support for the association between entrapment and anxiety disorders (Taylor et al., 2011). These studies have relied on entrapment measures that assess broad feelings of hopelessness and defeat, which makes them equally relevant to a hopelessness theory of depression as to a DBS model of depression (Abramson, Metalsky, & Alloy, 1989; Gilbert, 2000b). Further research is thus needed to determine whether DBS-specific variables have the capacity to differentiate depression from anxiety.

Summary of the DBS Findings Regarding Anxiety—Anxiety is correlated with perceptions of subordination, submissive behavior, and motivation to avoid low social rank. There is evidence that people with anxiety disorders, and particularly those with social anxiety, show marked behavioral and biological reactivity to threats to their power. The links between anxiety and the DBS, manifesting as low self-perceptions of power and the desire to avoid inferiority, are observed even after controlling for depression. The DBS appears to be particularly relevant to social anxiety. Despite robust evidence for the negative

relation between testosterone and anxiety in animal studies, the findings of human studies are more mixed.

Summary and Discussion

We have reviewed evidence that the DBS is related to a range of psychological and social outcomes, including emotions, sensitivity to threats and rewards, self-esteem, risk-taking behavior, and interpersonal sensitivity and functioning. Beyond this basic research, the role of the DBS has been documented across multiple psychological disorders, suggesting that the DBS may serve as a useful transdiagnostic framework for understanding personality, mood, and externalizing psychopathologies.

Externalizing disorders, mania, and narcissism have each been related to elevations in dominance motivation, and correspondingly, to higher rates of dominance behavior. The findings also appear fairly consistent across a range of measures, including self-report, observational, and biological indices. The role of the DBS in externalizing disorders has been supported in major epidemiological surveys (Krueger et al., 1996) and in longitudinal research. Narcissistic personality traits and mania also appear to be related to inflated self-perceptions of power, as indexed by self-report and observational methods. Complementing the self-report and behavioralresearch, biological measures of the DBS, such as early puberty and related surges of testosterone, predict the onset of externalizing symptoms.

In contrast to the aforementioned disorders, the DBS profile that emerges for the internalizing disorders of depression and anxiety involves motivation to avoid inferiority, engagement in submissive behavior, and low self-perceived power or subordination, as assessed by both self-report and observational ratings. Many of the social triggers of depression fit with a model of subordination. Although much of this work is cross-sectional, at least one team has found that submissiveness remained stably present as depressive symptoms remitted (Vittengl et al., 2003).

Biological studies indicate that clinically significant testosterone deficits precede depression. That is, genetic, pharmacological, and age-related testosterone deficits, when severe enough, appear to increase risk for depression in men and perhaps in women over the age of 70. Testosterone supplementation appears to relieve symptoms of depression that are secondary to testosterone depletion, and antidepressants appear to relieve symptoms of subordination in nondepressed individuals. Although few human studies of testosterone and anxiety are available, multiple experimental animal studies indicate that testosterone deficits can increase threat sensitivity and decrease reward sensitivity. Together, these findings suggest that testosterone, a principal hormonal correlate of the DBS, can predict the onset of depressive symptoms.

Future Directions

Although a large body of research linking the DBS and psychological disorders has accrued, many weaknesses remain in the extant literature. Some of these weaknesses vary by disorder, as most research teams are focused on one or two specific disorders. As a result, conceptual advances and methodological innovations developed in the study of one form of psychopathology have rarely been transferred to studies of other psychopathologies. In the depression field, researchers have been particularly sensitive to understanding the effects of clinically significant deficits in testosterone, have tested the effects of hormones separately by age and gender, and have contrasted effects on subsyndromal and clinically significant symptoms. By contrast, research on narcissism has largely ignored hormones, but has provided excellent examples of laboratory-based observational paradigms for elucidating the nature of dominance behavior. The research on externalizing disorders has provided

examples of how social context can amplify the effects of testosterone levels, and has provided insight into the specific symptom profiles that are associated with the DBS. There is considerable need for studies that compare multiple psychopathologies using self-report, observational, and biological measures of the DBS, while attending to age, gender, and social context, as well as symptom profiles and severity. Ideally, such research would involve laboratory-based experimental studies. Some of the limitations of the current research apply across psychopathologies. These limitations include the need for DBS research using more refined biological measures, considering the ability to differentiate psychopathologies, and longitudinally examining dynamical DBS processes as symptoms fluctuate. We turn to these issues next.

Can the Dominance Behavioral System Differentiate Between Psychopathologies?

The study of the DBS fits with a growing attention to transdiagnostic risk factors – those that operate across diagnostic categories. The substantial overlap in the DBS profiles associated with anxiety and depression is congruent with their high rates of co-occurrence (Kendler, Gardner, Gatz, & Pedersen, 2007). The overlap in DBS findings across several externalizing disorders, narcissism, and mania is also consistent with the high comorbidity within externalizing disorders (Krueger et al., 2001) and with evidence that narcissistic traits are correlated with antisocial behavior (Costello & Dunaway, 2003), psychopathy (Cooke & Michie, 2001), conduct disorder (Barry, Frick, & Killian, 2003), and mania (Schiavone, Dorz, Conforti, Scarso, & Borgherini, 2004).

Internalizing and externalizing disorders are clearly characterized by opposing DBS profiles, but a key question is whether DBS profiles might differ within the internalizing or externalizing disorders. Conceptually, it has been suggested that depression rather than anxiety will result when the individual is unable to escape from involuntary subordination (Gilbert, 2000b). In other psychopathologies, emergent findings point toward other possible distinctions. For example, whereas the dominance behaviors associated with externalizing disorders and narcissism tend to comprise aggressive responses to dominance challenges, in one study so far, risk for mania was related to dominance behaviors that were evaluated positively by peers. These findings suggest that considering the warmth-hostility dimension of interpersonal style in conjunction with the DBS might differentiate between disorders. In general, future research would benefit from the development of greater theoretical specificity and from more careful cross-diagnostic comparisons.

Although greater specificity in defining and measuring the specific components of the DBS might help to differentiate symptom outcomes, an alternate model is that the DBS increases risk for broad shared factors that underlie many different syndromes, akin to the general increase in vulnerability associated with genetic or personality dispositions (Hettema, Neale, Myers, Prescott, & Kendler, 2006; Kendler et al., 2003). In other words, many of the DBS variables share similarities across externalizing psychopathologies and across internalizing psychopathologies. If these commonalities continue to emerge in transdiagnostic research, other psychological and social risk factors would have to be considered in conjunction with DBS components to predict divergent outcomes. For example, psychopathy involves elevations of dominance motivation but also deficits in empathy (Hare, 2003; Patrick et al., 2005). In another example, testosterone seems to be especially related to risk of externalizing symptoms in the context of peer deviance or poverty, and to symptoms of depression in the context of interpersonal stress. In these cases, social context appears to be guide the role of the DBS in symptom expression. These and other psychological and social risk factors may interact with DBS components to shape particular symptom profiles within the broad categories of externalizing and internalizing disorders.

The Need for More Refined Biological Research on the Dominance System and Psychopathology

Findings are mixed concerning whether testosterone correlates with psychopathologies among women. Clearly, more attention to the biological correlates of the DBS in women is needed. DHEA and its sulfated form, DHEA-S, act as precursors to testosterone and estradiol (Williams & Wilson, 1998). In several large-scale studies, lower DHEA-S has been observed in depressed older women (Barrett-Connor, von Mühlen, Laughlin, et al., 1999; Haren et al., 2007; Morsink et al., 2007; Schmidt, Murphy, Haq, Danaceau, & St Clair, 2002). In small double-blind studies, DHEA treatment produced significantly more reductions in Hamilton Depression Inventory scores in both genders than did placebo (Schmidt et al., 2005; Wolkowitz et al., 1999) and appeared particularly effective for dysthymic symptoms (Bloch, Scmidt, Danaceau, Adams, & Rubinow, 1999). Drawing on this early evidence, Canadian guidelines for depression treatment recommend DHEA as a potential treatment option when other options have failed (Ravindran et al., 2009). DHEA may also be relevant for understanding mania, in that a series of case reports suggest that manic episodes can be triggered by DHEA (Dean, 2000; Kline & Jaggers, 1999; Markowitz, Carson, & Jackson, 1999; Vacheron-Trystram, Cheref, Gauillard, & Plas, 2002). The lack of correlation between DHEA and externalizing disorders in most available studies (Constantino, Grosz, et al., 1993; Dorn et al., 2009; Nottelmann et al., 1987 although see Dmitrieva, Oades, Hauffa, & Eggers, 2001) suggests that a more specific model of how biological components of the DBS relate to different psychopathologies can be developed. To this end, a more comprehensive and fine-grained understanding of the key biological substrates involved in the DBS is needed.

As described previously, testosterone interacts with a range of other hormones and neurotransmitters that are implicated in various psychological disorders, including cortisol, serotonin, dopamine, and oxytocin. In addition to influencing the chemical milieu of testosterone, each of these substances may also have the capacity to shape its behavioral expression. Several examples suggest the importance of better attention to these other biological variables. One study found higher testosterone was only related to psychopathy when controlling for cortisol levels (Glenn, Raine, Schug, Gao, & Granger, 2011). Serotonin is strongly implicated in impulsivity and aggression (Carver et al., 2008; Higley, Mehlman, Poland, & Taub, 1996) and thus may help to shape whether dominance motivation and behaviors are applied in socially acceptable or aggressive ways. Oxytocin may also influence whether prosocial versus antisocial expressions of dominance are engendered (MacDonald & MacDonald, 2010). Dopamine guides motivation to pursue resources (Depue & Morrone-Strupinsky, 2005) and so will likely modulate the responsivity of the DBS to cues of power and to the receipt of power. Animal research suggests that social defeat triggers a range of neurobiological changes that are relevant to understanding psychopathology, including changes in neuropeptide Y, CCK-8, and substance P (Panksepp, Burgdorf, Beinfeld, Kroes, & Moskal, 2007). Most of the dominance research to date has failed to consider the complex interactions among these important biochemical compounds in the development of psychopathology.

The Need for Longitudinal Research on Dynamical Processes

The DBS is an adaptive system that adjusts to changing social contingencies and resources, and accordingly, testosterone, DHEA, and cortisol levels fluctuate in response to dominance-relevant situations. For example, testosterone levels among men increase after winning a chess game or a tennis match (Archer, 2006a; Mazur, Booth, & Dabbs, 1992). With the exception of one study demonstrating that anxiety may predict steeper drops in testosterone after losing a competition (Maner et al., 2008), very little research has considered how these dynamic processes may relate to psychopathology.

Few clinical researchers have considered the ways in which dominance motivation or elevated self-perceptions of power might develop (see Andrews, 1995; Gilbert et al., 2003 for exceptions). It has been theorized that insecure attachment causes individuals to become overly concerned with social comparison, and empirical research supports links between insecure attachment and self-perceptions of powerlessness and submissive behavior (Gilbert, McEwan, et al., 2007; Sloman et al., 2003). Research also suggests that individuals with a history of sexual abuse (Brotman et al., 2007) and the offspring of parents with substance use disorders (Elkins, McGue, Malone, & Iacono, 2004) demonstrate elevated dominance motivation. The depression literature has shown that early childhood experiences may be as critical to the development of the disorder as current experiences of subordination (Gilbert et al., 2003). It appears that some people respond to childhood experiences of subordination with context-insensitive subordination behaviors. Thus theory underscores the need to consider how dominance motivation and self-perceived power shift in response to different contexts across various psychopathologies.

The dynamic course of symptoms is another important area of consideration: little attention has been paid to the influence of repeated experiences of disorder symptoms on the DBS over time. For example, people seeking treatment for substance abuse report high levels of shame (O'Connor, Berry, Weiss, & Gilbert, 2002). How do repeated experiences of losing power and other consequences of mental illness stigma influence beliefs about rank and the importance of achieving rank? This is a particularly important question in regard to narcissism and mania given that much of the research on dominance has assessed at-risk populations rather than clinically diagnosed samples. It is conceivable that manic symptoms and their negative consequences may diminish self-perceptions of power over time. Given the dynamic nature of the DBS and its responsiveness to context, more longitudinal and developmental research are needed for a better understanding of how failures of the DBS to flexibly adapt to varying social environments might serve as predictors of psychiatric symptoms.

Clinical Applications

We have highlighted aspects of the DBS that appear to be associated with the etiology and course of several psychological disorders. In addition to its potential utility in understanding a client's presenting problems, there are several ways in which a clinician's awareness of a client's dominance profile could guide therapeutic work. To begin, dominance motivation has the capacity to influence the therapeutic relationship. For persons with high dominance motivation, directive interventions may trigger anger and reactance, Indeed, researchers have shown that domineering behavior in clients predicts poorer psychotherapeutic outcomes, particularly in the context of structured psychotherapies (Borkovec, Newman, Pincus, & Lytle, 2002; Ruiz et al., 2004). By contrast, for persons with chronic experiences of subordination, submissiveness may be an overly rehearsed response to directives, and it would seem wise to avoid replicating this pattern in therapy.

Exaggerated or context-inappropriate expressions of various DBS components could also comprise a direct target of psychotherapy. Although unchecked dominance motivation can lead to aggression or feelings of failure if the level of actual power attained falls short of the desired level, when expressed in effective and prosocial ways, dominance motivation can predict strong leadership and other positive social outcomes. Adaptive implementation of the strong desire for action and resources that characterizes dominance motivation depends on strong social skills and self-regulatory abilities, which can be fostered in therapy. Accordingly, heightened dominance motivation could be channeled in a positive way that supports interpersonal connectedness. Another approach would be to consider whether an

individual's dominance motivation is balanced with other needs, such as connectedness with others (Sloman et al., 2003).

For individuals who struggle with experiences of subordination, therapeutic rapport might be better established by understanding that this strategy probably evolved to protect against conflict and maintain peace within complex hierarchies. Nonetheless, empirical evidence suggests that even small moments of victory and dominance can relieve anxiety, and so intervention techniques that allow a person to escape from chronic and persistence subordination by promoting experiences of mastery are likely to be valuable (Williams & Zane, 1989). As mentioned previously, antidepressants have also been shown to reduce submissiveness in healthy persons and this could be a target for future research. Finally, compassionate mind training is a form of psychotherapy that aims to relieve experiences of shame and internalized cognitions related to subordination (Gilbert & Procter, 2006). In pilot studies, people who took part in this intervention reported diminished levels of shame and submissiveness, which were related to decreases in anxiety and depressive symptoms.

Conclusion

Our goal was to integrate a broad set of findings relating the DBS to psychopathology, which have emerged from divergent lines of inquiry, including human and animal literatures; naturalistic and experimental studies; and using self-report, observational, and biological techniques. The substantial converging evidence obtained from this wide array of paradigms underscores the important role of the DBS in psychopathology. We believe that the DBS model has the potential to enhance understanding of the etiology and course of many psychopathologies, and to refine clinical interventions. We hope this review will foster greater consideration of the need to understand the DBS more broadly and the potential value of this system in elucidating susceptibility to different psychopathologies.

Acknowledgments

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Table 1

Commonly Used Self-Report Measures of DBS-Relevant Constructs

Scale	Content	Format	Reliability	Validity
California Psychological Inventory Dominance Scale (CPI Do; Gough & Bradley, 1996)	Dominance behavior	46 true/false statements covering self-rated leadership, persistence, confidence, assertiveness, persuasiveness, and social initiative	Internal consistency, alpha =.83; test-retest reliability (*r*): One-year =.67, 5-year =.65, and 25-year =.82	Positively correlated with the Personality Research Form Dominance, *rs*=.71 to.78; 16PF Dominance, *r*=50; and NEO-PI-R Assertiveness, *r* =.55 scales.
Personality Research Form – Dominance scale (PRF Do; Jackson, 1999)	Dominance motivation and behavior	16 true/false items covering self-rated dominance and use of/comfort with dominance behaviors	Internal consistency, alpha =. 85Two-week test-retest reliability =.91	Positively correlated with the California Psychological Inventory Dominance, *rs* =. 71 to.78, and 16PF Dominance, *r* =.48 scales
Multidimensional Personality Questionnaire – Social Potency scale (MPQ SPS; Tellegen & Waller, 2008)	Dominance motivation and behavior	14 true/false self-report items covering persuasiveness, strength, leadership, and enjoyment of dominance	Internal consistency, alpha =.87 Thirty-day test-retest reliability, *r*=.82	Positively correlated with a leadership measure, *r*=.45
Pleasure-Arousability-Dominance Scales (PAD Do; Mehrabian, 1995a; Mehrabian, 1995b, 1995c; Mehrabian, 1996)	Dominance motivation and behavior	26 statements covering self-rated dominance-submissiveness behavior	Internal consistency, alpha =.91	Dominance Scale is positively correlated with Extraversion, Achieving Tendency, Autonomy, and Aggression
Rank Style with Peers Questionnaire (RSPQ; Zuroff et al., 2010)	Strategies for pursuing power: 3 subscales	17 items covering self-rated Dominant Leadership, Ruthless Self-Advancement, and Coalition Building	One month test-retest reliability, *rs*=.62 for Dominant Leadership, .56 for Coalition Building, .67 for Ruthless Self-Advancement	Factor-analytic studies support the 3 subscales. Dominant Leadership is elevated in narcissism and is negatively correlated with anxiety and depression. Ruthless Self-Advancement is elevated in narcissism and psychopathy
Submissive Behavior Scale (SBS; Allan & Gilbert, 1997)	Submissive behavior/low self-perceived power	16 items covering self-rated frequency of engaging in submissive social behavior	Internal consistency, alpha =.89, four-month test-retest *r*=.84	Negatively correlated with assertive behavior subscales, *rs*=-.41 to -.51
Sense of Power Scale (Pow; Anderson & Galinsky, 2006)	Self-perceived power	8 statements reflecting self-perceived power in relation to others	Internal consistency, alpha =.88	Positively correlated with actual standing in power hierarchies
Authentic and Hubristic Pride Scales (AHPS; Tracy & Robbins, 2007a)	Authentic and hubristic pride	14 items covering self-rated tendencies to feel authentic pride (form of pride based on specific actions and abilities) and hubristic pride (form of pride based on global self-perceptions)	Internal consistency, alpha =.84 to .88 for Authentic Pride, .87 to .90 for Hubristic Pride	Confirmatory factor analyses support a two-factor solution differentiating authentic from hubristic pride. Authentic Pride is positively correlated with self-esteem, *r* =.44, and negatively correlated with shame-proneness, *r*=-.28. Hubristic Pride is positively correlated with shame-proneness, *r*=.09 and negatively correlated with self-esteem, *r*=-.14.
Adapted Shame and Guilt Scale (ASGS; Hoblitzelle, 1982)	Shame proneness	16 items covering self-rated tendencies to experience shame	Internal consistency, alpha =.83 to .86 Two-week test-retest reliability, *r* =.93	Factor analyses support a two-factor solution differentiating Shame from Guilt

Scale	Content	Format	Reliability	Validity
Personal Feelings Questionnaire-Revised (PFQ-2; Harder & Zalma, 1990)	Shame proneness	10 items covering self-rated tendencies to experience shame	Internal consistency, alpha =.78, two-week test-retest reliability, r =.91	Factor analyses support a two-factor solution differentiating Shame from Guilt.
Test of Self-Conscious Affect Shame Proneness subscale (TOSCA; Tangney, Burggraf, Hamme, & Domingos, 1988)	Affective, cognitive, behavioral responses associated with shame proneness	Participants rate their likelihood of shame in response to a series of brief scenarios	Across four studies, internal consistency, alphas =.74 to .82, one to five week test-retest reliability, r =.79.	Positively correlated with Shame subscale of Adapted Shame and Guilt Scale, rs=.39 to .43 across two studies.
Attention to Social Comparison Information Scale (CAS; Lennox & Wolfe, 1984)	Sensitivity to/motivation to avoid, social disapproval	13 self-rated items covering attention to social comparison information	Across nine undergraduate samples, internal consistency, alphas =.79 to .90	Positively correlated with neuroticism, r=0.29, and fear of negative evaluation, r=0.64, negatively correlated with self-esteem
Iowa-Netherlands Comparison Orientation Measure (INCOM; Gibbons & Buunk, 1999)	Tendency to engage in social comparison	11 items covering people's tendency to compare themselves with others	Internal consistency, alphas =.78 to .85 across 22 samples, one-year test-retest reliability, r =.60	Positively correlated with measures of conformity and other-orientation, such as public self-consciousness, rs=.38 to .49, and with neuroticism measures, rs=.28 to .37.
Social Comparison Scale (SCS; Allan & Gilbert, 1995)	Social comparison on dimensions relevant to power	11 self-rated items comparing individual to others along dimensions of inferior-superior, incompetent-competent, unlikable-likable	Internal consistency, alpha =.88 to .91	Perceptions of poor social comparison correlated with neuroticism, r=-.41.
MacArthur Scale of Subjective Social Status (SES ladder; MacArthur Research Network on SES and Health, 2007)	Perceived social status	A picture of a 10-rung ladder presented. Respondents are asked to "think of this ladder as representing where people stand in society…" and to place an 'X' on the rung on which they feel they stand.	Not applicable (this is a single item scale)	Scores have been related to childhood SES, education, employment, income, satisfaction with standard of living, and feelings of financial security. Cross-culturally, low scores have been associated with a range of health indices, including depression, cardiovascular risk, diabetes, respiratory illness, and mortality
Picture Story Exercise Need for Power scale (PSE N Pow; Winter, 1992, 1994)	Implicit motives for power	Eight pictures depicting various scenes are briefly presented. Respondents are given five minutes to write a story about what is happening in each scene. Scores are based on the frequency of power themes.	Internal consistency, alpha =.78 to .86. Two-week test-retest reliability r=.39 (Schultheiss, Liening, & Schad, 2008)	Higher Need for Power predicts testosterone increases after victory and decreases after defeat in dominance contests with rigged feedback (Schultheiss et al., 1999, 2005)
Implicit Association Test (IAT; Greenwald et al., 1998)	Dominance-relevant self-schemas	Participants are presented with dominance and submissiveness words on a computer and asked to repond whether these words fit into categories pertaining to 'self.' Dominant individuals respond quickly when dominance and 'self' words are paired.	Several versions of the IAT have shown acceptable internal consistency	Achieves higher correlations with laboratory measures of dominant behavior than do self-rating scales

Table 2

Studies of the DBS in Externalizing Disorders

Self-Report and Observational Findings

Author and Year	Sample	Gender	Age	DBS Measure	Externalizing Measure	Results
Benning et al. (2005)	353 individual twins	Male	Born 1961-1964	MPQ SPS	PPI FD	Dominance motivation correlated with psychopathy, $r=.49$.
*Cale & Lilienfeld (2006)	98 inmates	Male	18-59; M =23.7	PETQ, designed to capture angry responses to power threats; disciplinary reports of incidents involving ego threats	PPI combined with the SRP-II	Psychopathy correlated with reactivity to power threats challenges as measured by the PETQ, $r=.43$ and by disciplinary reports, $r=.37$.
Carey et al. (2007)	495 undergraduates	Both	College aged	INCOM	RAPI	Frequent social comparison was correlated with alcohol problems, $r=.15$.
Costello & Dunaway (2003)	377 middle and high school students	47% male	M =15	Dominance was evaluated using 7 items from the NPI to capture perceived superiority over others and the importance of achieving superiority	22-item index of criminal behaviors	Dominance was correlated with criminal behavior, $r=.22$.
Edens (2009)	1062 inmates	Male	M =34	PAI Dom scale	PAI Antisocial and Externalizing scales	Although most inmates had elevated PAI scores, dominance behavior correlated with antisocial symptoms, $r=.07$.
Hall et al. (2004)	310 inmates	Male	45; M =31.5	MPQ SPS	PCL-R FD	Dominance motivation correlated with psychopathy, $r=.38$
Hicks et al. (2004)	215 prisoners	Male	M high psychopathy =31.1 M low psychopathy =30.5	MPQ-BF SPS	PCL-R 30 or 20	In cluster analyses, dominance motivation was higher in individuals scoring higher (vs. lower) on psychopathy.
Kosson et al. (1997), Study 2	92 undergraduates	49% male	17-45	IM-P, a measure covering dominant behaviors	PCL-SV	Dominance behavior correlated with psychopathy, $r=.50$.
*Krueger et al. (1996)	897 Dunnedin community residents	52% male	18	MPQ SPS	DIS substance dependence and conduct disorder diagnoses	Conduct disorder and substance dependence diagnoses were associated with elevated dominance motivation.
Patrick et al. (2006)	89 offenders	Male	M =32.5	PAI DOM scale	PCL-R FD subscale	Dominance behavior correlated with the psychopathic trait of Fearless Dominance, $r=.50$.
*Tarter et al. (2007)	179 students	Male	M=11.62 at baseline	DPQ SPS combined with rule-breaking	K-SADS Substance Use Disorder	Path analysis indicated that a combined index of dominant behavior and rule breaking predicted substance use disorder at age 22.

Author and Year	Sample	Gender	Age	DBS Measure	Externalizing Measure	Results
Verona et al. (2001)	313 prison inmates	Male	M =32.4	MPQ SPS	PCL-R	The psychopathic trait of fearless dominance (PCL-R FD) correlated more with dominance motivation (MPQ SPS), r=.30, than with nine other MPQ scales.
Vitacco & Kosson (2010)	592 European inmates	Male	M =26.09	IM-P: ratings of dominance behavior during an interview	PCL-R	Dominance behavior correlated with psychopathy, r=.30.
Biological Findings						
Aromäki et al. (1999)	13 prisoners convicted of violent crimes and 16 controls	Male	Adult	Blood serum T levels	Semi-structured interview for DSM-III-R antisocial personality disorder	AM and PM T levels correlated with antisocial personality disorder in violent men, r=0.50, but not in controls.
*Booth et al. (2003)	400 children in working and middle class families with at least two children	Both	6-18; M =13	AM saliva total T, adjusted for sampling time and pubertal status	RBS	In regression analyses, T correlated with risky behavior, particularly in boys with poor parental relationships. T correlated with risky behavior only among those girls with poor mother-child relationships.
Booth & Osgood (1993)	4,462 Vietnam veterans	Male	30-44	AM Serum T	Criminal behavior index	T correlated strongly with adult criminal behavior, but only among men with low social integration.
*Booth et al. (1999)	4,393 military veterans	Male	M =37	AM serum T	12-item scale of antisocial behaviors such as getting drunk, skipping school, and stealing	T correlated with antisocial behavior, r=.15.
Constantino et al. (1993)	18 inpatients with CBCL Aggression scores > 98th percentile and conduct disorder diagnoses; 11 control participants matched on age and race	Male	4-10	Serum T	DSM-III-R conduct disorder diagnosis	Conduct disorder group did not differ from the control group on T
*Dabbs et al. (1990)	5236 US military veterans	Male	Median =37	Serum T	DIS	Among low SES veterans, T correlated with drug abuse, r=.19, alcoholism, r=.13, and antisocial personality, r=.19. Among high SES veterans, T demonstrated smaller but significant correlations with drug abuse, alcoholism, and antisocial personality rs =.06–.07.
Dmitrieva et al. (2001)	28 diagnosed with conduct disorder, free of medications; 13 age-matched patients treated at same clinic	Male	10-18	Tanner Sexual Maturation Staging Scale (Tanner, 1978), serum T	Conduct disorder diagnoses from review of record by 2 raters, CBCL, CPTQ	Elevated T was only observed among conduct disorder participants younger than 14.

Author and Year	Sample	Gender	Age	DBS Measure	Externalizing Measure	Results
Dom et al. (2009)	180 patients with disruptive behavior disorder; control group matched on age, gender, race, and SES	78% male	6–11; M=9	Saliva T	K-SADS disruptive behavior disorders	T was unrelated to disruptive behavior disorders.
Fang et al. (2009)	344 youths with elevated low-density lipoprotein cholesterol	48% male	M =12.6	Serum free T	CBCL Delinquent Behavior scale	T correlated positively with delinquency for boys, but only among those with low family cohesion. T correlated negatively with delinquency among girls.
Glenn et al. (2011)	178 adults	88% male	18–45	Three AM saliva samples of T on each of two consecutive days; cortisol levels measured before and 20 and 40 minutes after two stressors	PCL–R	T was unrelated to psychopathy. The ratio of T to cortisol correlated with higher psychopathy, r^2 =.05.
*Granger et al. (2003)	213 adolescents	50% male	M =13.66	Saliva samples collected three times per day on multiple days to model mean T level and diurnal variation	Disruptive behavior scale based on latent modeling of CBCL, A-YSR, and DISC	In growth curve models, T was unrelated to disruptive behavior in boys. Among girls, declines in T across the day were associated with disruptive behavior after controlling for pubertal development.
Kirillova et al. (2008)	478 boys whose fathers were stratified on whether they met criteria for substance abuse	Male	9–13 at time 1	Serum T and Tanner Sexual Maturation Staging Scale	K-SADS for conduct disorder and substance abuse disorder, PDS	T was elevated in boys with conduct disorder at time 1 and 2 years later. In path analyses, early pubertal development predicted greater peer delinquency, which predicted substance abuse disorders 2 years later.
Maras et al. (2003)	87 boys from a longitudinal study of infants with delivery complications or family difficulties	41% male	14	Serum T	High Externalizing = T 60 on either CBCL or TRF; Low Externalizing =T <60 on CBCL and TRF	T correlated with Externalizing in boys, but not girls.
*Nottelmann et al. (1987)	108 children	52% male	9–14	AM serum T	CBCL	T was unrelated to Delinquency at baseline, but predicted Delinquency one year later.
*Olweus et al. (1980, 1988)	58students	Male	15–17	AM serum T averaged across 2 samples	Antisocial behavior questionnaire developed for this study, OMAI	T correlated with one subscale of the antisocial behavior (Difficulty Tolerating Frustration), r =.28, and with aggression (OMAI), r =.44. T correlated with specific items covering aggressive responses to commands and challenges.
Pajer et al. (2006)	87 students	Female	15–17	Serum T,	DISC	T was elevated, but only in girls with aggressive forms of conduct disorder.
Rowe et al. (2004)	Representative sample of 789 males living in Western NC	Male	9–15	Serum T	CAPA conduct disorder diagnoses	T related to conduct disorder, but only in boys with deviant peers.

Author and Year	Sample	Gender	Age	DBS Measure	Externalizing Measure	Results
Sjoberg et al. (2008)	95 participants with alcoholism and criminal records and 40 controls	Male	Adults	Cerebrospinal fluid T	SCID	T was higher in men with antisocial personality disorder than in those without antisocial personality disorder, particularly those with a low activity MAOA genotype.
Stålenheim et al. (1998)	61 males going under major forensic investigation	Male	Adults	Serum total T and free T	SCID, PCL-R	Serum total T was related to antisocial personality disorder and Type II alcoholism (SCID), both ps < .05, and to psychopathic traits (PCL-R Interpersonal/Affective scores), p < .05, but not to PCL-R Antisocial Impulsivity Factor scores.
*Tarter et al. (2007)	179 students	Male	M=11.62 at baseline	AM serum T	Joint index of dominance (DPQ SPS) and rule-breaking	In path analyses, baseline T predicted an index combining dominant behavior and rule breaking at age 16.
Udry (1990) Drigotas & Udry (1993)	101 students	Male	13–16	Serum T	ACL	In path analyses, T correlated with conduct disorder symptoms at baseline. Baseline free T (controlling for bound T) predicted problem behavior one year later, but T at later ages was unrelated to problem behavior.
van Bokhoven et al. (2006)	96 students; 13 met conduct disorder criteria	Male	13 at Time 1	Saliva T at ages 13, 16 and 21	DISC conduct disorder diagnoses and 21-item delinquency questionnaire developed for this study	T at baseline was not related to conduct disorder at age 16, or to delinquency at ages 13 and 16, but T was correlated with delinquency at age 21.

Note. ACL =Adjective Check List (Gough & Heilbrun, 1965); CAPA =Child and Adolescent Psychiatric Assessment (Angold & Costello, 2000); CBCL =Child Behavior Checklist (Achenbach, 1991a); CIDI =Composite International Diagnostic Interview (Robins et al., 1988); CPTQ =Conners Parent-Teacher Rating Scale (Goyette, Conners, & Ulrich, 1978); CRPBI =Children's Report of Parental Behavior Inventory (Schaefer, 1965); DISC =Diagnostic Interview Schedule for Children (Shaffer, Fisher, Lucas, Dulcan, & Schwab-Stone, 1996, 2000); DIS =Diagnostic Interview Schedule (Helzer, 1992: Robins, Helzer, Croughan, & Ratcliff, 1981; Robins, Helzer, Ratcliff, & Seyfried, 1982); DPQ SPS =Differential Personality Questionnaire Social Potency Scale (Tellegen, 1982); DUSI-R = Drug Use Screening Inventory Revised (Tarter, 1990); EPPS =Edwards Personal Preference Schedule (Edwards, 1959); IAS-R =Revised Interpersonal Adjective Scales (Wiggins, Trapnell, & Phillips, 1988); IM-P =Interpersonal Measure of Psychopathy (Kosson et al., 1997); INCOM =Iowa-Netherlands Comparison Orientation Measure; K-SADS =Schedule of Affective Disorders and Schizophrenia for School-Aged Children (Kaufman, Birmaher, Brent, Rao, & Ryan, 1996); M =mean; MPQ SPS =Multidimensional Personality Questionnaire Social Potency Scale (Tellegen & Waller, 2008); MPQ-BF =Brief Form of the Multidimensional Personality Questionnaire (Patrick et al., 2002); OMAI =Olweus Multi-faceted Agression Inventory for Boys (Olweus, 1975); NPI =Narcissistic Personality Inventory (Raskin & Hall, 1981; Raskin & Hall, 1979); PAI =Personality Assessment Inventory (Morey, 1991); PAI Dom =PAI Dominance Scale; PCL-R =Psychopathy Checklist-Revised (Hare, 1991, 2003; Harpur, Hare, & Hakstian, 1989); PCL-R FD =Psychopathy Checklist-Revised Fearless Dominance Subscale; PCL-SV =Psychopathy Checklist: Screening Version (Forth, Brown, Hart, & Hare, 1996); PDS =Peer Delinquency Scale (Loeber, 1989); PETQ =Perceived Ego Threat Questionnaire (Bushman & Baumeister, 1998); PPI =Psychopathic Personality Inventory (Lilienfeld & Andrews, 1996); PPI FD =PPI Fearless Dominance Factor Score; RAPI =Rutgers Alcohol Problems Index (White & Labouvie, 1989); RBS =Risky Behavior Scale (Eccles & B., 1990); SCID =Structured Clinical Interview for DSM Disorders (First, Spitzer, Gibbon, & Williams, 1995); SRP-II =Self-Report Psychopathy Scale-II (Hare, 1991); T =testosterone; TRF =Teacher Report Form (Achenbach, 1991b).

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Findings from this study are described in another table.

Table 3

Studies of the DBS and Narcissistic Personality Traits

Author and Year	Sample	Gender	Age	DBS Measure	Narcissism Measure	Results
Anderson, John & Keltner (2010)	263 undergraduates	Both	College aged	Pow	NPI	Perceptions of power correlated with narcissism, $r = .46$.
Bradlee & Emmons (1992)	147 undergraduates	40% male	College aged	PRF Do	NPI	Dominance motivation correlated with all seven factors of the NPI, but most strongly with Authority, $r = .75$, and Entitlement, $r = .65$.
Bushman & Baumeister (1988)	Undergraduates Study 1 $n = 260$ Study 2 $n = 280$	50% male in both samples	College aged	Study 1: Willingness to engage in aggression (playing loud noise bursts) in response to ego threat (negative feedback) Study 2: Aggressive responses and perceived threat in response to feedback	NPI	Narcissism correlated with level of aggressiveness shown to a confederate who had given negative feedback, $r = .37$, but this aggression did not generalize to other confederates. Narcissism correlated with higher ratings of threat in response to negative feedback, $r = .33$.
*Cale & Lilienfeld (2006)	98 inmates	Male	18-59; M =23.7	PETQ designed to capture angry response to threats to power	NPI	Reactivity to power threats correlated with narcissism, $r = .41$.
Emmons (1984), Study 2	127 undergraduates	51% male	College aged	EPPS Need for Dominance, and for 45 persons, the 16 PF	NPI	Dominance motivation (EPPS) and dominance behavior (16 PF) correlated with narcissism (NPI total and all factor scores).
*Fulford et al. (2008)	233 undergraduates	Both	College aged	WASSUP Subscales for Popular Fame and Wealth	NPI	Narcissism correlated with higher lifetime ambitions related to extrinsic recognition.
Gurtman (1992)	279 undergraduates	34% male	College aged	IIP	NPI	In multivariate analyses, dominant behavior correlated with narcissism.
*Harder & Lewis (1987)	120 undergraduates	Both		Single item rating of shame-proneness (and other shame measures with poor psychometric characteristics)	NPI	Lower shame-proneness correlated with higher narcissism, $r = .37$.
*Harder & Zalma (1990)	63 undergraduates	59% male	M =18.46	ASGS Shame, PFQ-2 Shame	NPI	ASGS Shame, but not PFQ-2 Shame, correlated negatively with narcissism, $r = -.48$.
Morf & Rhodewalt (1993)	216 undergraduates	Male	College aged	Participants received feedback that they were less socially sensitive than another person (a competitor), and then were given a chance to evaluate that person. They then rated their competitor.	NPI	Narcissism correlated with more negative ratings of a competitor, $p < .001$.
Oliver & John (1994)	102 MBA students	Both	Median =27	Self, peer, and staff ratings after participants interacted in small groups on a decision-making task. Inflated self-evaluations were indexed by comparing self-	Composite measure based on staff ratings of DSM-III-R criteria, NPI, CPI Narcissism scale,	Narcissism correlated with inflated self-evaluations compared to staff or peer ratings, $r = .48$.

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Author and Year	Sample	Gender	Age	DBS Measure	Narcissism Measure	Results
				evaluations to peer and staff ratings.	and CAQ Narcissism ratings	
Patrick et al. (2002)	340 undergraduates	27% male	College aged	MPQ SPS	NPI	Dominance motivation correlated with narcissism, *r*=.60.
Paulhus (1998)	124 undergraduates	Both	College aged	Peer dominance ratings on items such as "tends to brag," arrogant, and confident Discrepancy scores to assess overly positive ratings of self compared to peer ratings after seven 20-minute meetings	NPI	NPI scores correlated with higher peer ratings of several dominant behaviors, and with overly positive self ratings compared to peer ratings, *r* =.40. Overly positive self-evaluations (self-peer discrepancy scores) predicted more negative peer evaluations over time.
Pincus et al. (2009) studies 3 and 4	Study 3: 399 undergraduates Study 4: 26 outpatients	Study 3: 50% male Study 4: 23% male	College aged	Study 3: IIP and the ESS Study 4: IIP	PNI NPI	Across studies, NPI scores correlated with more dominant behavior (IIP) and lower shame-proneness (ESS). PNI scores were not correlated with dominant behavior and were correlated with higher shame-proneness.
Raskin & Terry (1988)	Undergraduates, Study 1 *n* =384 Study 2 *n* =57 Study 3 *n* =128	Both	College aged	Study 1 and 3: ICL Study 2: Staff ratings after two days of tasks and interactions	NPI	Narcissism correlated with self-rated ICL Managerial/Autocratic traits, *r*s =.57 -.71, and with staff ratings of dominant behavior, *r* =.71.
Raskin et al. (1991)	Undergraduates Sample 1 *n* =84 Sample 2 *n* =57 Sample 3 *n* =300	Both	18-33	Sample 1: ICL Sample 2: CPI Do Sample 3: PRF Do	NPI	Across samples, path analyses suggested that dominant motivation (CPI Do PRF Do) and behavior (ICL Managerial/ Autocratic traits) was centrally related to narcissism.
Rodebaugh et al. (2010)	990 college freshman who had lived together on a dormitory floor for three months	28.5% male	M =18.62	IIP rated by self and peers	MAPP Narcissistic Personality Disorder	In peer and self ratings, dominant behavior (IIP) correlated with narcissism (NPI). This correlation was more pronounced in peer ratings, *r* =.75, than in self ratings, *r* =.55.
Tracy et al. (2009)	2327 undergraduates	35% male	College aged	AHPS	NPI	Narcissism correlated negatively with Authentic Pride, *r* =-.34, and positively with Hubristic Pride, *r*=.22.
*Wright et al. (1989)	100 undergraduates	38% male	College aged	ASGS Shame	NPI	Narcissism correlated with lower shame (ASGS), *r* =-.21.

Note. 16 PF =Sixteen Personality Factor Questionnaire (Cattell, Eber, & Tatsouka, 1970); AHPS =Authentic and Hubristic Pride Scales; ASGS =Adapted Shame and Guilt Scale; CAQ =California Adult Q-Set (Block, 1978); CPI Do =California Psychological Inventory Dominance Scale; EPPS =Edwards Personal Preference Schedule; ESS =Experience of Shame Scale (Andrews, Qian, & Valentine, 2002); ICL =Interpersonal Checklist (Leary, 1957); IIP =Inventory of Interpersonal Problems; MAPP =Multisource Assessment of Personality Pathology (Thomas, 2003); NPI =Narcissistic Personality Inventory; PETQ =Perceived Ego Threat Questionnaire; PFQ-2 =Personal Feelings Questionnaire; PNI =Pathological Narcissism Inventory (Pincus et al., 2009); Pow =Sense of Power Scale; PRF Do =Personality Research Form Dominance Scale; WASSUP =Willingly Approached Set of Statistically Unlikely Pursuits (Johnson & Carver, 2006).

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Findings from this study are described in another table.

Table 4

Studies of the DBS in Mania

Self-Report and Observational Findings

Author & Year	Sample	Gender	Age	DBS Measure	Mania Measure	Results
Carver & Johnson (2006)	Undergraduates Study 1 n =177 Study 2 n =888	Both	College aged	WASSUP Popular Fame and Wealth Subscales	HPS	Mania risk correlated with higher lifetime ambitions related to extrinsic recognition in both studies.
Carver & Johnson (2009)	238 undergraduates	Both	College aged	WASSUP Popular Fame and Wealth Subscales	HPS	Mania risk correlated with higher lifetime ambitions related to extrinsic recognition.
Carver, Johnson, & Siegel, 2010	Undergraduates Study 1 n =454 Study 2 n =780 Study 3 n =329	Both	College aged	Study 1: WASSUP Popular Fame and Wealth Subscales, PRF Do Study 2: WASSUP Popular Fame and Wealth Subscales, Status Seeking Scale (SSS) Study 3: Self-ratings of overly dominant behaviors	HPS	Mania risk correlated with higher lifetime ambitions related to extrinsic recognition (WASSUP), dominance motivation (PRF Do), high perceived rank (SSS) and engagement in overly dominant social behaviors.
*Fulford et al. (2008)	233 undergraduates	Both	College aged	WASSUP Popular Fame and Wealth Subscales	HPS	Mania risk correlated with higher lifetime ambitions related to extrinsic recognition
Gilbert, McEwan et al. (2007)	40 outpatients with bipolar disorder	Both	M =44	SCS, SBS	Clinical diagnosis of bipolar disorder in remission; BDI and ISS to assess current mood symptoms	Depressive symptoms (BDI) correlated with more submissive behavior (SBS), r =. 51, and lower perceived social comparison (SCS), r =- .45. In regression analyses, positive moods (ISS well-being) were related to higher social comparison (SCS), r =.25.
Gilbert, McEwan, Mitra et al. (2009)	49 outpatients clinically diagnosed with bipolar disorder and 202 unselected students	Both		SCS	TEMPS-A Hyperthymic Temperament scale	Higher social comparison correlated with manic temperament among students and patients (*rs* not provided).
Gruber & Johnson (2009)	302 students	Both	17-22	WASSUP Popular Fame and Wealth Subscales, DPES	HPS	Mania risk correlated with higher lifetime ambitions related to extrinsic recognition (WASSUP Popular Fame, r =.34 and Money, r =.16) and to trait-like tendencies to pride (DPES), r =.29.
Johnson, Eisner, & Carver (2009)	83 students diagnosed with bipolar disorder, major depressive disorder, or no mood disorder	Both	17-22	WASSUP Popular Fame and Wealth Subscales	SCID diagnoses; CESD and SRMI to control for symptom levels	People with bipolar disorder reported higher lifetime ambitions related to extrinsic recognition than did those with depression or no disorder.
Taylor & Mansell (2008)	60 undergraduates	Both	17-22	Observer and self-rated negative high arousal behavior (adjectives include dominating, selfish, and overconfident) and positive high arousal	HPS	Mania risk was correlated with self- and peer-ratings of positive dominant behaviors (e.g., ambitious), and with self-ratings, but not peer ratings, of negative domineering

Author & Year	Sample	Gender	Age	DBS Measure	Mania Measure	Results
Biological Findings						
*Dabbs et al. (1990)	5236 US military veterans	Male	M =37	Serum samples of T	DIS number of symptoms	behavior (e.g., dominating and overconfident). T correlated with mania only among low SES veterans.
Daly et al. (2003)	20 healthy controls	Male	18-42	Randomly assigned to receive methyl testosterone vs. placebo for 6 days	Visual analog scale of mood	Methyl testosterone was associated with increases in several symptoms of mania, including aggressiveness, irritability, energy, sexual arousal and distractibility.
Pope & Katz (1988)	41 bodybuilders/football players	95% male	17-51; M =26.1	Persons taking steroids for body-building	SCID	While taking steroids, 12.2% of people met criteria for a full manic episode and another 19.5% reported a hypomanic episode; none reported manic symptoms when not taking steroids.
Pope et al. (2000)	56 healthy participants	Male	20-50	T for 6 weeks compared to placebo	YMRS and daily diaries of manic symptoms for 25 weeks	T related to higher mania scores on the YMRS, $p < .002$ and daily diaries, $p < .003$; 16% reported hypomanic or manic episodes when taking T.

Note. BDI =Beck Depression Inventory (Beck & Steer, 1993); CESD =Center for Epidemiological Studies Depression Scale (Radloff, 1977); DIS =Diagnostic Interview Schedule; DPES =Dispositional Positive Emotion Scale (Shiota, Keltner, & John, 2006); HPS =Hypomanic Personality Scale (Eckblad & Chapman, 1986); ISS =Internal State Scale (Bauer et al., 1991); PRF Do =Personality Research Form Dominance Scale; SBS =Submissive Behavior Scale; SCID =Structured Clinical Interview for DSM Disorders; SCS =Social Comparison Scale; SRMI =Self-Rating Mania Inventory (Altman, Hedeker, Peterson, & Davis, 1997); SSSS =Self-Perceived Social Status Scale (Buttermore, James, & Kirkpatrick, 2005); T =testosterone; TEMPS-A =The Temperament Evaluation of Memphis, Pisa, Paris and San Diego-Auto Questionnaire Version (Akiskal et al., 2005); WASSUP =Willingly Approached Set of Statistically Unlikely Pursuits; YMRS =Young Mania Rating Scale (Young, Briggs, & Meyer, 1978).

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Findings from this study are described in another table.

Table 5

Studies of DBS in Depression

Self-Report and Observational Findings

Author & Year	Sample	Gender	Age	DBS Measure	Depression Measure	Result
*Allan & Gilbert (1997)	Study 1: 332 undergraduates and 136 psychiatric outpatients Study 2: 154 undergraduates	Both	Study 1: Student M =22.9 and Clinical M =39.7 Study 2: M =23.5	SBS	Study 1: SCL-90-R Depression Score Study 2: CESD	Submissive behavior correlated with the SCL-90-R Depression among students, r =.48, and patients, r =.53, and with the CESD among students, r =.30.
Andrews (1995)	101 community members	Female	32-56	Bodily Shame interview	PSE Depression diagnoses at baseline and over 8-year follow-up	Bodily shame was elevated among those with recurrent and chronic depression compared to those with a single episode or no depression.
Gilbert & Allan (1998)	302 students and 90 depressed outpatients	Both	M =22.9	SCS, SBS	CESD, BDI	Submissiveness (SBS) and low perceived social comparison (SCS) uniquely related to depression in both samples.
Gilbert, Allan, & Goss (1996)	90 university and graduate students	Female	M =24.6	Four items to capture childhood experiences of parental put-downs and shaming, rated separately for mothers and fathers.	GHQ-28 Depression scale	Experiences of maternal, r =.29, and paternal shaming, r =.22, correlated with depression.
Gilbert et al. (1995)	50 college and nursing students; 29 people who met criteria for neurotic depression	25% male	M =32	SBS, SCS	BDI	Submissive behavior (SBS) and low social comparison (SCS) correlated with depression in both samples, all rs > |.47|.
*Gilbert, Broomhead et al. (2007)	207 outpatients diagnosed with depression	13% male	M =21.77	SAIS, HCA, SCS, SBS	DASS21	DBS indices accounted for 34% of the variance in depression. In a regression model, SBS, SAIS, and SCS were most strongly related to depression.
Gilbert et al. (2003)	225 undergraduates	24% male	M =24.53	SCS, OAS; ELES developed in this study to measure childhood threat, submissiveness and being devalued	CESD	Shame (OAS) and childhood submissiveness (ELES) correlated with depression. In a regression model of multiple scales covering childhood experiences, only childhood submissiveness (ELES) uniquely predicted depression.
*Gilbert, McEwan, Bellew et al. (2009)	45 outpatients and 17 inpatients	42% male	M =44.32	SAIS, SCS, SBS, OAS	DASS21	Depression correlated with more striving to avoid inferiority (SAIS), r =.52, submissive behavior (SBS), r =.42, shame (OAS), r =.54, and

Author & Year	Sample	Gender	Age	DBS Measure	Depression Measure	Result
						lower social comparison (SCS), $r=-.45$.
*Harder, Cutler, Rockart (1992)	71 undergraduates	Both	College aged	ASGS Shame	SCL-90-R Depression	Shame proneness correlated with depression, $r=.38$.
*Harder & Lewis (1987)	120 undergraduates	Both	College aged	Single item rating of shame-proneness (and other shame measures with poor psychometric characteristics)	BDI	Shame proneness correlated with depression, $r=.50$
*Harder & Zalma (1990)	63 undergraduates	59% male	M =18.46	ASQS Shame Proneness, PFQ-2 Shame	BDI	Depression correlated with ASGS Shame, $r=.39$ and PFQ2 Shame, $r=.41$. Shame was more closely related to depression than was guilt.
Hoblitzelle (1987)	Undergraduates Study 1 $n=71$ Study 2 $n=124$	Both	College aged	ASGS Shame	Study 1: SDS Study 2: SDS, BDI	Study 1: Shame correlated with depression, $r=.42$ Study 2: Shame correlated with depression (SDS $r=.57$, BDI $r=.44$).
*Horowitz et al. (1988)	103 outpatients	14% male	20-64; M=32.7	IIP	SCL-90-R Depression	Submissiveness correlated with depression, $r=.35$, but submissiveness was not more elevated than other interpersonal problems on the IIP.
*Kasser & Ryan (1993), Study 2	198 students	Both	M =20	Aspiration Index	CESD	High aspirations for financial success, $r=.24$, and low aspirations for affiliation, $r=-.21$, were related to higher depression.
*Mehrabian & Bernath (1991)	Undergraduates Study 1 $n=124$ Study 2 $n=129$	Both	College aged	PAD Do	29 measures of depression and anxiety	Submissiveness was related to depression in both samples.
Sturman & Mongrain (2008)	146 graduate students with a history of major depression	28% male	Median =28	SCS	SCID diagnoses of major depressive disorder telephone interviews at 16 month follow-up to assess depressive recurrence	Low perceptions of social comparison were related to more previous depressive episodes (SCID), r =-.30, but did not predict depressive recurrence at follow-up.
*Tangney et al. (1992)	Undergraduates Study 1 $n=245$ Study 2 $n=234$	Both	College aged	SCAAI, TOSCA	SCL-90 Depression scale, BDI	Shame proneness (SCAAI, TOSCA) related to depression (SCL-90, BDI).
Troop & Baker (2008)	74 white-color office personnel	Females	M =24.6	SCS, SBS	BDI-II	Depression correlated with submissive behavior (SBS), $r=.58$ and perceptions of poor social comparison (SCS), $r=-.55$.

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Author & Year	Sample	Gender	Age	DBS Measure	Depression Measure	Result
Vittengl et al. (2003)	118 patients with major depressive disorder	25.4% male	M =42.73	IIP	Baseline clinical diagnosis of major depressive episode	Most IIP subscales were elevated at baseline; after recovery from depression, only Submissiveness remained elevated.
*Wright et al. (1989)	100 undergraduates	38% male	College aged	ASGS Shame	SDS	Shame correlated with depression, $r=.48$
Wyatt & Gilbert (1998)	113 undergraduate students	22% male	M =24.88	OAS, SCS, SBS	CESD	Depression correlated with submissive behavior (SBS), $r=.35$, shame (OAS), $r=.54$, and low perceived social comparison (SCS), $r=-.48$.
Biological Findings in Males						
Barrett-Connor, von Mühlen, & Kritz-Silverstein (1999)	856 community residents	Males	50-89	Serum available T	BDI	Men with high depression scores had T levels 17% lower than those with lower depression scores.
*Booth et al. (2003)	315 boys in working and middle class families	Males	6-18; M =13	AM saliva total T, adjusted for sampling time variability, pubertal status	Adolescents: CESD Children: CDI	Lower T related to depression only among boys with poor parent relationships.
*Booth et al. (1999)	4,393 military veterans	Males	M =37	AM serum T	DIS	In the lower range of T (<590), deficits in T were related to higher depression rates.
Colangelo et al. (2007)	1246 community residents (525 black; 721 white)	Males	<40; M =35	AM serum T; CAG, a gene encoding for androgen receptor function	CESD	No main effects of T. Among African American men only, low T related to depression among those with a polymorphism of the CAG gene.
*Dabbs et al. (1990)	5236 US military veterans	Males	M =37	Serum T	DIS number of depressive symptoms	T was unrelated to depression.
Delhez, Hansenne, & Legros (2003)	153 community members	Males	50-70	AM serum free T	CRS	T was correlated with lower depression, $r=-.17$.
*Granger et al. (2003)	106 students	Males	M =13.66	Saliva T gathered three times per day on multiple days to model latent constructs for mean T level and diurnal variation	Anxiety-depression score derived from CBCL, YSR, and DISC	Lower T and T that decreased more slowly across the day were related to higher anxiety–depression among boys.
Loizides et al. (2004)	638 hypogonadal men	Males	M =52.7	Testim T replacement tmt for 30 days	Daily ratings of positive and negative mood	T was related to less negative mood and more positive mood over time.
McNicholas et al. (2003)	208 hypogonadal men	Males	31-80	Testim T replacement tmt compared low dose T patch	Self-ratings of positive and negative mood	Although tmt groups did not differ in mood at the end of treatment, only Testim produced significant increases

Author & Year	Sample	Gender	Age	DBS Measure	Depression Measure	Result
						in positive mood and decreases in negative mood.
Morsink et al. (2007)	1406 well-functioning elderly men who were not taking steroids	Males	70-79	Serum total and free T assessed after an overnight fast	CESD	Those with total T levels in the lower quartile had higher depressive symptoms.
*Nottelmann et al. 1987	56 students	Males	9-14	AM serum T	CBCL	T was unrelated to depression.
Okun et al. (2002)	5 hypogonadal patients with Parkinson's disease	Males	59-87	T replacement tmt	Clinical interview after 1-4 months of treatment	T replacement tmt was related to improvement in depressed mood.
Schmidt et al. (2004)	31 participants with no psychiatric history	Males	M =30.8	All received Lupron, a medication that induces hypogonadalism. After 1 month, men were randomly assigned to receive T replacement tmt or placebo.	BDI	Among men taking Lupron, about 10% developed depressive symptoms. Within those prescribed Lupron, depression scores were significantly lower in the tmt group than the placebo group.
Seidman et al. (2001)	1000 community residents	Males	48-79; M =62.6	Average of two AM serum total T assays; polymorphic CAG repeat region resides on exon 1 of the androgen receptor gene	CES-D	Lower T was associated with depression only among men with the shorter CAG RLs. Depression scores were particularly elevated for men in the lowest quintile of the T distribution.
Seidman et al. (2002)	Participants who met DSM-IV criteria for major depressive disorder (N=13) or dysthymic disorder (N=32) and a comparison group (N=175) from a community representative sample	Males	60	Average of two AM serum total T assays	SCID, CESD	The dysthymic disorder group had lower T levels (295 ng/dl) than the major depressive disorder (425 ng/dl) and no depression groups (423 ng/dl).
Seidman et al. (2009)	23 men with dysthymic disorder and low T	Males	40-65	Randomly assigned to receive T replacement tmt or placebo for 40-48 days	HDRS 21 item version	Those receiving T replacement tmt had lower depression scores at 6 weeks than did those receiving placebo.
Shamlian & Cole (2006)	Review of androgen supplement trials in older men	Males	Older men	Wide range of androgen tmt	varied	Six of 8 open trials had positive results, and 5 of 12 randomized trials had positive results.
Shores et al. (2004)	278 community members with no prior depressive disorder	Males	50; M =62.6	Total T < or 2.5ng/mL. Assay methods not described.	ICD-9 depression diagnoses	Hypogonadal men had an increased rate of depressive illness (18.5%) compared to men with normative T (10.4%) in the two years after baseline
Shores et al. (2005)	748 men receiving medical care through the VA system with no prior depressive illness recorded	Males	45; M =67.1	294 hypogonadal men compared to men with T in the normative range	ICD-9 depression diagnoses	Low T predicted higher rates of depressive diagnosis over the next two years (21.7%)

Author & Year	Sample	Gender	Age	DBS Measure	Depression Measure	Result
*Susman et al. (1991)	56 students	Males	10-15	Serum T assays averaged across 3 samples	CBCL Internalizing Problem Behavior Scores, DISC number of depression symptoms	compared to normative T levels (7.1%). T was unrelated to depression.
T'Sjoen et al. (2005)	283 community members	Males	70-85	AM serum total T; AR CAG repeat length	GDS measured over 4-year follow-up	Depression was unrelated to T at baseline or follow-up.
Wang et al. (2004)	123 hypogonadal adults	Males	M =51.4	T replacement tmt for 42 months	Diaries of mood	Positive and negative mood scores improved rapidly with T tmt, and mood gains were sustained for one year.
Zitzmann et al. (2006)	434 andrological outpatients	Males	50-86	AM free and total T	Self-reported depression	Low total T was related to higher depression: 15% of men with total T levels <10 reported depression symptoms.
Biological Findings in Females						
*Booth et al. (2003)	214 working and middle class participants	Females	6-18; M =13	AM saliva total T, adjusted for sampling time variability, pubertal status	CESD CDI	Low T was related to depression only among those girls ages 14-18 with poor father–daughter relationship quality.
Erdinçler et al. (2004)	74 depressed and nondepressed outpatients	Females	> 60	Serum T gathered without regard to time of day	GDS, clinical interview to assess DSM-IV depression	T was unrelated to depression.
*Granger et al. (2003)	107 adolescents	Females	M =13.66	AM saliva three times per day for three days to model latent constructs for T mean level and diurnal variation	Anxiety-depression scale based on latent modeling of CBCL, YSR, and DISC	T was unrelated to depression.
Haren et al. (2007)	244 African Americans	Females	45-69; M =56.9	Serum total T	CESD	T was unrelated to depression.
Morsink et al. (2007)	1449 well-functioning participants; those taking steroids or with total T >130 ng/dl were excluded.	Females	70-79	Free T assessed after an overnight fast	CESD	T correlated negatively with depression.
*Nottelmann et al. 1987	52 students	Females	9-14	AM serum T	CBCL	T was unrelated to depression.
Schmidt et al. (2002)	Community participants Study 1 *n* =42 Study 2 *n* =50	Females	40-55; M =48	Plasma samples gathered at various times of day for total T, free T	SCID, SADS-L, CESD to assess onset of minor or major depression after menopause	T was unrelated to depression.
*Susman et al. (1991)	52 students	Females	9-14	Serum T assays averaged across 3 samples gathered in an hour	CBCL Internalizing scores, and DISC number of depression symptoms	T was unrelated to depression.

Note. ASGS =Adapted Shame and Guilt Scale; BDI =Beck Depression Inventory; CBCL =Child Behavior Checklist; CDI =Children's Depression Inventory (Kovacs, 1981); CESD =Center for Epidemiological Studies Depression Scale; CRS =Carroll Rating Scale for Depression (Carroll, 1981); DASS21 =Depression, Anxiety and Stress Scale (Lovibond & Lovibond, 1995); DIS =Diagnostic Interview Schedule; DISC =Diagnostic Interview Schedule for Children; DSM-IV =Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (APA, 1994); ELES =Early Life Experiences

Scale (Gilbert et al., 2003); GDS =Geriatric Depression Scale(Yesavage, 1991); GHQ-28 =General Health Questionnaire-28 item version (Goldberg & Hillier, 1979); GOI =Goal Orientation Inventory (Dykman, 1998); HCA =Hypercompetitive Attitudes Scale (Ryckman et al., 1990); HDRS=Hamilton Rating Scale for Depression (Hamilton, 1967); ICD-9-CM =International Classification of Diseases, 9th Revision, Clinical Modification (US US DHHS, 1991); IIP =Inventory of Interpersonal Problems; K-SADS =Schedule of Affective Disorders and Schizophrenia for School-Aged Children; OAS =Other as Shamer Scale (Allan, Gilbert, & Goss, 1994; Goss, Gilbert, & Allan, 1994); PAD Do =Pleasure-Arousal-Dominance Scales Dominance Subscale; PFQ-2 =Personal Feelings Questionnaire-Revised; PSE =Present State Examination (Cooper, 1977); SADS-L =Schedule of Affective Disorders and Schizophrenia-Lifetime Version (Spitzer & Endicott, 1979); SAIS =Striving to Avoid Inferiority Scale (Gilbert, Broomhead, et al., 2007); SBS =Submissive Behavior Scale; SCAAI =Self-Conscious Affect and Attribution Inventory (Tangney et al., 1988); SCID =Structured Clinical Interview for DSM Diagnoses; SCL-90 =Symptom Checklist-90 (Derogatis, Lipman, Rickels, & al, 1974); SCL-90-R =SCL-90-Revised (Derogatis & Lazarus, 1994); SCS =Social Comparison Scale; SDS =Self-Rating Depression Scale (Zung, 1965); SES =socioeconomic status; STAI =State-Trait Anxiety Inventory (Spielberger, Gorsuch, & Lushene, 1970); T =testosterone; tmt = treatment; TOSCA =Test of Self-Conscious Affect; YSR =Youth Self Report (Achenbach, 1991c).

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Findings from this study are described in another table.

Table 6

Studies of the DBS in Anxiety

Self-Report and Observational Findings

Author & Year	Sample	Gender	Age	DBS Measure	Anxiety Measure	Results
*Allan & Gilbert (1997)	332 students and 136 psychiatric outpatients	Both	$M_{students}$ =22.9 $M_{clinical}$ =39.7	SBS	SCL-90-R Anxiety	Submissiveness correlated with anxiety, r=.36 among students and r=.48 among patients.
Antony et al. (2005)	59 people with social phobia and 58 healthy controls	Both	M =34	Modified RSCD completed daily for 2 weeks	SCID social phobia diagnoses	The social phobia group did not report engaging in more social comparisons
Cain et al. (2010)	77 socially phobic outpatients	57% male	M =32.78	IIP	SCID-IV social phobia diagnoses	Persons with social phobia endorsed elevated submissiveness compared to normative data.
Fodor & Wick (2009)	259 undergraduates	Both	College aged	PSE N Pow	ABS, electromyographic recording of brow supercilii	Need for power predicted greater increase in self-reported anxiety and facial expressions of anxiety in response to negative feedback on a speech.
*Gilbert, Broomhead et al. (2007)	207 outpatients diagnosed with depression	13% male	M =21.77	SAIS, HCA, SCS, SBS	DASS21	In a regression model, only submissive behavior (SBS) uniquely related to anxiety, r^2=.28
*Gilbert, McEwan, Bellew et al. (2009)	45 outpatients and 17 inpatients	42% male	M =44.32	SAIS, SCS, SBS, OAS	DASS21	Anxiety correlated with self-ratings of more insecure striving (SAIS), r=.52, lower social comparison (SCS), r=-.36, more submissive behavior (SBS), r=.46, and more shame (OAS), r=.54.
Halvari & Gjesme (1995)	33 undergraduates who engaged in sports	64% male	20-32	Outcome of competition for a 25 second motor task	SCAT before and after the competition, STAI State Anxiety Scale	Those who did well in the competition experienced a significant drop in anxiety (SCAT), whereas those who did poorly experienced a significant increase in anxiety.
*Harder, Cutler, Rockart (1992)	71 undergraduates	Both	College aged	ASGS Shame	SCL-90-R	Shame proneness correlated with anxiety, r=.31.
*Harder & Lewis (1987)	120 undergraduates	Both		Single item rating of shame (other measures with poor psychometric characteristics)	SAS	Shame proneness correlated with social anxiety, r=.31.
*Harder & Zalma (1990)	63 undergraduates	59% male	M =18.46	ASGS Shame, PFQ-2 Shame	SAS	Social anxiety correlated with ASGS Shame, r=.39 and demonstrated a nonsignificant positive correlation with the PFQ2 Shame, r=.23.
Heerey & Kring (2007)	120 undergraduates	Both	Not specified	Behavioral ratings of dyadic social interactions	IAS	Socially anxious participants engaged in more reassurance-seeking behavior.

Author & Year	Sample	Gender	Age	DBS Measure	Anxiety Measure	Results
*Horowitz et al. (1988)	103 outpatients	14% male	20-64 (M=32.7)	IIP	SCL-90-R Anxiety	Submissiveness correlated with anxiety, r=.32, but anxiety was related to many interpersonal problems on the IIP.
*Kasser & Ryan (1993), Study 2	198 students	Both	M =20	Aspiration Index	STAI	High aspirations for financial success, r=.32, and low aspirations for affiliation, r=-.37, related to higher anxiety (STAI).
Lennox & Wolfe (1984)	224 college students	Both	College aged	CAS	FNE	Social anxiety correlated with threat from social comparisons, r=.64.
*Mehrabian & Bernath (1991)	Undergraduates Study 1 n=124 Study 2 n=129	Both	College aged	PAD Do	29 measures of depression and anxiety	Submissiveness correlated with anxiety in both samples.
Mehrabian & O'Reilly (1980)	211 undergraduates	Both	College aged	PAD Do	STAI	Submissiveness correlated with trait anxiety; r=-.37.
*Krueger et al. (1996)	897 Dunedin community residents	52% male	18	MPQ SPS	DIS Diagnoses	Dominance motivation was unrelated to anxiety disorder
*Tangney et al. (1992)	Undergraduates Study 1 n=245 Study 2 n=234	Both	College aged	SCAAI, TOSCA	SCL-90 Anxiety and Social Phobia scales, STAI	Shame proneness was related to all anxiety indices.
Trower et al. (1998)	24 students	29% male	First year undergraduates	After a stressful dyadic interaction, participants were asked to rate their dominance from a videotape of the interaction.	High and low scores on the FNE scale	Students in the socially anxious group rated themselves as less dominant than did those in the control group.
Walters & Hope 1998	53 people diagnosed with social phobia and 28 healthy controls	Both	Not specified	Behavioral coding of a structured social interaction with a stranger	ADIS-R Social Phobia Diagnoses	The social phobia group engaged in less dominant behavior (commands, bragging) than the control group.
Biological Findings						
*Granger et al. (2003)	213 students	50% male	M =13.66	Saliva samples gathered three times per day on multiple days to form latent constructs for T M level and diurnal variation	Anxiety-depression scale formed using latent modeling of the CBCL, A-YSR, and DISC.	Low mean T and slower diurnal decline of T over the day related to anxiety/depressive symptoms but only among boys.
Maner et al. (2008)	64 undergraduates	36% male	M =18.9	Baseline T and change in T in response to competition	SPS	Basal T was unrelated to anxiety. Social anxiety predicted more of a drop in T after losing the competition among men, not women.
*Olweus et al. (1980)	58 students	Male	15-17	Serum samples of T averaged across 2 morning sample	MCA	T was unrelated to anxiety.
*Susman et al. (1991)	108 students	52% male	9-14	Serum levels of T averaged across 3 samples gathered in an hour	DISC number of anxiety symptoms, CBCL Internalizing scale	Contrary to hypotheses, higher T related to anxiety at baseline among boys. T was unrelated to anxiety among girls.

Author & Year	Sample	Gender	Age	DBS Measure	Anxiety Measure	Results
van Honk et al. (2005)	16 community residents	Females	19-26	Single dose of 5 mg T or placebo	STAI	T was unrelated to anxiety.

Note. ABS =Affect Balance Scale (Downey & Feldman, 1996); A-CBCL =Abbreviated Version of the Child Behavior Checklist (Achenbach, 1991a); ADIS-R =Anxiety Disorders Interview Schedule-Revised (DiNardo & Barlow, 1988); ASGS =Adapted Shame and Guilt Scale; CAS =Concern for Appropriateness Protective Social Comparison Scale; CBCL =Child Behavior Checklist; DASS21 =Depression, Anxiety and Stress Scale; DISC =Diagnostic Interview Schedule for Children; DIS =Diagnostic Interview Schedule; FNE =Fear of Negative Evaluation Scale (Watson & Friend, 1969); HCA =Hypercompetitive Attitudes Scale; IAS =Interaction Anxiousness Scale (Leary & Kowalski, 1993); IIP =Inventory of Interpersonal Problems; M =mean; MCA =Multi-Component Anxiety Inventory (Schalling, Cronholm, & Asberg, 1975); MPQ SPS =Multidimensional Personality Questionnaire Social Potency Scale; OAS =Other as Shamer Scale; PAD Do =Pleasure-Arousal-Dominance Scales – Dominance Scale; PFQ-2 =Personal Feelings Questionnaire-Revised; PSE N Pow =Picture Story Exercise Need for Power; RSCD =Rochester Social Comparison Diary (Wheeler & Miyake, 1992); SAIS =Striving to Avoid Inferiority Scale; SAS =Social Anxiety Scale (Fenigstein, Scheier, & Buss, 1975); SBS =Submissive Behavior Scale; SCAAI =Self-Conscious Affect and Attribution Inventory; SCAT =Sport Competition Anxiety Test (Martens, 1977); SCS =Social Comparison Scale; SCID =Structured Clinical Interview for DSM Diagnoses; SCL-90 =The Symptom Checklist 90; SCL-90-R =Symptom Checklist-90-Revised; SPS =Social Phobia Scale (Mattick & Clarke, 1998); STAI =The State-Trait Anxiety Inventory; T =testosterone; TOSCA =Test of Self-Conscious Affect.

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Findings from this study are described in another table.

Table 7

Studies Examining the Unique Relations of Depression and Anxiety and the DBS

Author & Year	Sample	Gender	Age	DBS Measure	Anxiety and Depression Measures	Results
Aderka et al. (2009)	102 community residents	29% male	M = 29.5	SBS, SCS	LSAS-SR, BDI	In an SEM model, lower social comparison (SCS) and submissive behavior (SBS) were uniquely related to social anxiety (LSAS-SR), but not depression (BDI).
Alden & Phillips (1990)	465 undergraduates	46% male	College aged	IIP	SAD and BDI were used to form 4 groups: control, social anxiety, depression, social anxiety with comorbid depression	Depression without anxiety was unrelated to submissiveness. Social anxiety, either alone or in combination with depression, was related to submissiveness.
Gilbert (2000a)	109 psychology students and 50 depressed inpatients	Both	Student M = 25; patient M = 39	TOSCA, PFQ-2, OAS, SBS, SCS	CESD, BDI, SIAS	Depressed inpatients endorsed more shame-proneness (TOSCA, PFQ2, OAS), lower perceived social comparison (SCS), more submissive behavior (SBS), and less pride (TOSCA) than students. In conjoint analyses of depression and anxiety, shame (TOSCA, PFQ2, OAS) was correlated with social anxiety but not depression.
Gilbert et al. (2002)	193 undergraduates and 81 psychiatric inpatients (58% diagnosed with primary depression)	23% male undergraduates and 39% male patients)	Student M = 22.9; Patient M = 36.8 years	SBS, SCS, OAS	MASQ	Anxiety and depressive scales both correlated with submissive behavior (SBS), perceptions of lower social comparison (SCS), and shame (OAS) in both samples. In path analyses, shame was more correlated with anxious arousal than with anhedonic depression.
Gilbert et al. (2005)	71 psychiatric patients	51% male	16 – 69; M = 40.9	SBS, SCS, SPD	BDI, SIAS, SPS	Submissive behavior (SBS) correlated with social phobia (SPS) after controlling for depression (BDI).
Naragon-Gainey et al. (2009)	350 undergraduates and 204 psychiatric outpatients	Both	Student M = 19.2 Patient M = 44.0	Ascendance, a measure of dominance motivation and behavior factor-analytically derived from multiple scales	Composite measures of depression and anxiety based on BDI-II, IDAS, PSRS, SIAS, SPS	In conjoint analyses of anxiety and depression, lower ascendance related to social anxiety but not to depression.
Uhman et al. (2010)	198 outpatients	Both	Adult	IIP	CIDI diagnoses of GAD, PTSD without GAD, other anxiety without GAD, and depression without GAD	Depression and each anxiety diagnosis related to submissiveness.

Note. BDI = Beck Depression Inventory; BDI-II = Beck Depression Inventory–Second Edition (Beck, Steer, & Brown, 1996); CESD = Center for Epidemiological Studies Depression Scale; CIDI = Composite International Diagnostic Interview; GAD = generalized anxiety disorder; IDAS = Inventory of Depression and Anxiety Symptoms (Watson et al., 2007); IIP = Inventory of Interpersonal Problems; LSAS-SR = Liebowitz Social Anxiety Scale-Self-Report (Liebowitz, 1987); OAS = Other as Shamer Scale; PFQ-2 = Personal Feelings Questionnaire-Revised; PSRS = Phobic Stimuli Response Scales (Cutshall & Watson, 2004); PTSD = post-traumatic stress disorder; SAD = Social Avoidance and Distress Scale (Watson & Friend, 1969); SBS = Submissive Behavior Scale; SCS = Social Comparison

Scale; SIAS =Social Interaction Anxiety Scale; SPD =Social Power Differential Scale (Birchwood, Meaden, Trower, Gilbert, & Plaistow, 2000); SPS =Social Phobia Scale; TOSCA =Test of Self-Conscious Affect.

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Findings from this study are described in another table.