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The Double-Edged Sword of Goal Engagement: Consequences of Goal Pursuit in Bipolar Disorder

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Abstract

A series of studies suggest that bipolar disorder is related to high sensitivity to incentives and that incentive sensitivity (or sensitivity of the approach system) can predict the course of mania. Incentive sensitivity in bipolar disorder seems to be related to two processes: a tendency to invest in difficult-to-attain goals and an over-reactivity to cues of goal progress versus thwarting. Both of those processes appear relevant to symptom generation. Hence, bipolar disorder seems related to a greater emphasis on reaching goals and also a problematic reactivity to reaching those highly desired goals. We suggest directions for treatment development focused on these issues in goal regulation.

Keywords

Bipolar Disorder; Incentive Sensitivity; Goal Regulation; Confidence; Goal Setting

For most people, achieving success, experiencing excitement and joy and moving towards core life goals are the best moments in life. Imagine, then, being unable to savour those moments, then move smoothly forward with your life. Burgeoning evidence suggests that bipolar disorder is characterized by over-responsivity to success, leading to poor control during periods of joy and excitement. The reward sensitivity model of mania provides a window into the nature of bipolar disorder as being partly a disorder of goal regulation. Here, we describe evidence concerning elevated reward sensitivity in bipolar disorder, both as a correlate of the disorder and as a predictor of outcomes related to the disorder. We describe a series of ways in which this reward sensitivity seems to shape difficulties in the process of goal regulation. We then discuss new evidence on some ways that people with bipolar disorder cope with these difficult challenges, and some treatment implications of this body of work.

DEFINING BIPOLAR DISORDER

The defining feature of bipolar I disorder is the presence of at least one lifetime episode of a manic episode (American Psychiatric Association, 2011). Mania, in turn, is defined by a distinct period of elevated or irritable mood, accompanied by a set of symptoms such as decreased need for sleep, increased psychomotor activation, extreme self-confidence,

pressured speech, racing thoughts and pursuit of pleasurable activities without attention to potential dangers. To meet criteria, symptoms must be severe enough to interfere with functioning and must either last 1 week or require hospitalization. A milder form of the disorder, bipolar II disorder, is defined by hypomania. Hypomania involves the same symptoms as does mania, but the symptoms need last only 4 days, and they need not be severe enough to interfere with functioning. In addition, bipolar II disorder requires that the person also experience at least one lifetime episode of major depression. A third form of the disorder, cyclothymic disorder, is defined by rapid and chronic fluctuations between manic and depressive symptoms, in which neither the highs nor lows become intense enough to be diagnosed as manic or depressive episodes. Together, bipolar I disorder, bipolar II disorder and cyclothymic disorder are referred to as bipolar spectrum disorders. It is estimated that 1–2% of the population would meet criteria for bipolar I disorder and that up to 4.5% of the population might meet criteria for the full spectrum of bipolar disorders (Merikangas et al., 2007).

Bipolar disorder is one of the most severe of mental illnesses, with high rates of mortality, suicide and hospitalization even with best available treatments (Baldessarini, Pompili, & Tondo, 2006). Outcomes from this disorder, though, are highly variable. Although most people with bipolar disorder tend to have substantial impairments in their functioning and quality of life, as many as one quarter report functioning in the 'good' to 'excellent' range (Gitlin, Swendsen, Heller, & Hammen, 1995; Hammen, Gitlin, & Altshuler, 2000; Harrow, Goldberg, Grossman, & Meltzer, 1990). This diversity of outcomes is highlighted by biographical studies suggesting that many of the world's most famous artists, writers and musicians, including Robert Schumann, Vincent Van Gogh and Virginia Woolf, appear to have suffered from bipolar disorder (Jamison, 1993). Several large-scale studies have suggested that families of persons with bipolar disorder accomplish more than the general population (Coryell et al., 1989; Tsuchiya, Agerbo, Byrne, & Mortensen, 2004; Woodruff, Robins, Winokur, & Reich, 1971). The disorder, then, seems intrinsically linked to variability in the adaptiveness with which people pursue goals and accomplishments in life.

Because of the serious repercussions of mania, studying goal regulation in mania is a difficult endeavour. An episode of mania can wreak havoc on finances, employment, relationships and self-esteem. Given these severe consequences, a heightened desire for goal attainment could simply reflect a healthy desire for recovery among those diagnosed with this disorder. To differentiate the aftermath and the vulnerability, then, it is important to consider how reward sensitivity and goal regulation appear among those who have not yet suffered extreme consequences of the disorder or those who are only at risk for the disorder. Thus, a large body of work has focused on people who experience subsyndromal symptoms of mania, as defined using either the General Behavior Inventory (Depue et al., 1981) or the Hypomanic Personality Scale (Eckblad & Chapman, 1986). Both scales have been found to predict the onset of diagnoses of bipolar disorder over longer follow-up periods (Kwapil et al., 2000; Lewinsohn, Klein, & Seeley, 2000). In this review, we will consider the findings regarding reward sensitivity and bipolar disorder in both diagnosed and at-risk samples.

REWARD SENSITIVITY AND BIPOLAR DISORDER

Without a doubt, bipolar disorder is a complex illness with multifactorial roots, and the genesis of any manic episode is likely to involve the combined influence of many different risk factors. Here, we focus on only one of those risk factors.

Over the past 20 years, several investigators have proposed that manic symptoms are tied to a biologically based system, variously referred to as the behavioural facilitation system, the behavioural activation system and the behavioural approach system (BAS; Depue & Iacono,

1989; Fowles, 1993; Gray, 1990). This system is believed to facilitate a broad range of motivational and cognitive processes in support of incentive-directed (positive goal-directed) behaviour. It is also believed to regulate responses to achieving a reward. That is, it is believed to be related to the regulation of affect, cognition and behaviour while undertaking the pursuit of goals and after the attainment of those goals.

It is helpful to differentiate among the sensitivity, the inputs and the outputs of the BAS. Inputs to the BAS are stimuli that serve as cues of available incentives or potential rewards, or cues indicating the attainment of those incentives. Examples of incentive availability would be an advertisement for a new luxury car, or an offer of a bonus to the best-performing employee next month. Cues of goal attainment would include such things as birth of a child, taking a new job or graduation from college. Incentive cues in laboratory settings can serve as analogues of such life events. Outputs are the manifestations of heightened BAS activity, such as engagement in goal pursuit, positive affect, social engagement, goal setting, excitement and motor activity (Depue & Iacono, 1989).

In addition to the inputs and outputs of the BAS, it is important to consider its *sensitivity*, a property of the system that moderates the relation between inputs and outputs. Given the same input cues, high BAS sensitivity should be reflected in more BAS output. That is, BAS sensitivity should interact with inputs to determine outputs. Allergic sensitivity provides an analogy. Outputs (histamine reactions) depend on the input context (allergen exposure) and also on one's sensitivity to those inputs. Sensitivity (which remains relatively constant over time) determines the amount of output from a given dose of exposure. Although sensitivity might influence reactivity to both incentives and rewards, we use the term reward sensitivity for simplicity.

Behavioural approach system outputs correspond closely to manic symptoms of mood change, inflated self-esteem, increased talkativeness, flight of ideas, increased goal-directed activity and excessive involvement in pleasurable activities. On the basis of this overlap, Depue and Iacono (1989) hypothesized that mania may be the outcome of excessively high BAS activity or sensitivity.

REWARD SENSITIVITY IS ELEVATED IN BIPOLAR DISORDER

Over a decade ago, we documented that people with bipolar I disorder—even those in remission—reported having elevated reward sensitivity (Meyer, Johnson, & Winters, 2001). These data were from the self-report BAS Reward Responsiveness scale, designed to assess individual differences in the tendency to respond to incentive cues with excitement and energy (Carver & White, 1994). Sample items include 'When I'm doing well at something I love to keep at it', and 'When I get something I want, I feel excited and energized'. Other researchers have also documented elevated reward sensitivity among people diagnosed with bipolar I disorder (Lam, Wright, & Smith, 2004; Salavert et al., 2007; Van der Gucht, Morriss, Lancaster, Kinderman, & Bentall, 2009; see Jones, Tai, Evershed, Knowles, & Bentall, 2006 for a non-replication) and those with bipolar spectrum disorder (Alloy & Abramson, 2010; Alloy et al., 2006; Alloy et al., 2008; Alloy et al., 2009; Alloy et al., 2010). The effect has also been observed using behavioural and psychophysiological paradigms (Harmon-Jones et al., 2008; Johnson, Smith, & Rottenberg, 2009; Sutton & Johnson, 2002).

High reward sensitivity does not appear to be an epiphenomenon of symptoms, as levels stay constant while mania fluctuates (Meyer et al., 2001) and are elevated before onset among those at risk for the disorder (Applegate, El-Deredy, & Bentall, 2009; Carver & Johnson, 2009; Fulford, Johnson, & Carver, 2008; Gruber & Johnson, 2009; Johnson & Carver, 2006; Jones & Day 2008; Jones, Shams, & Liversidge, 2007; Mansell, Rigby, Tai, & Lowe, 2008;

Meyer, Beevers, Johnson, & Simmons, 2007; Meyer & Hofmann, 2005; Meyer, Johnson, & Carver, 1999). Nor does this pattern appear to reflect a general hypersensitivity to all valenced cues. For example, bipolar disorder is not consistently related to elevations in threat sensitivity (Johnson et al., 2009; Meyer et al., 2001). Although some mixed findings have emerged (Hayden et al., 2008; Jones et al., 2006; Van der Gucht et al., 2009), a recent review concluded that the more carefully controlled studies with adequate sample sizes have consistently provided support for elevations of reward sensitivity among those with bipolar disorder and those at risk for the disorder (Johnson, Edge, Holmes, & Carver, 2012).

These findings are congruent with biological data. Motivation to pursue incentives appears guided by dopaminergic pathways from the ventral tegmental area to the nucleus accumbens and prefrontal cortex (Depue & Collins, 1999). Evidence from pharmacological, receptor, imaging and genetic studies is consistent with the idea that dopamine receptors and related pathways (as well as other neuro-transmitter systems) are centrally involved in mania (Cousins, Butts, & Young, 2009). Particularly strong evidence has emerged from studies involving administration of stimulants, which increase dopamine activity and also have been shown to trigger manic episodes (Cousins et al., 2009). Moreover, persons with bipolar disorder show unique behavioural (Anand et al., 2000) and kindling effects of stimulants (Strakowski, Sax, Setters, Stanton, & Keck, 1997). These studies are congruent with the idea of a hypersensitivity of dopamine receptors within bipolar disorder. Volumetric studies also indicate deficits early in the course of bipolar disorder in the nucleus accumbens/striatum and prefrontal cortex (areas that can inhibit and channel reward sensitivity) (Strakowski, DelBello, & Adler, 2005).

Reward Sensitivity and Related Indices Predict the Onset and Course of Mania

If reward sensitivity is relevant for vulnerability to mania, one would expect those with higher scores to be at greater risk of manic symptoms over time. Available studies support this idea. Self-report BAS scores (as measured by the BIS/BAS scales) have been found to predict the onset of bipolar spectrum diagnoses among college students at risk for the disorder (Alloy et al., 2010), the onset of bipolar I disorder among those diagnosed with bipolar II disorder (Alloy et al., 2012b) and the onset of bipolar II disorder among those diagnosed with cyclothymic disorder (Alloy et al., 2012a). In longitudinal studies, self-report BAS indices also predicted increases in manic symptoms in diagnosed bipolar I disorder samples (Meyer et al., 2001; Salavert et al., 2007), hypomanic episodes and greater manic symptom severity in diagnosed bipolar spectrum samples (Alloy et al., 2008, 2009) and daily increases in manic symptoms over a 17-day follow-up of students at risk for bipolar disorder (Meyer & Hofmann, 2005).

Summary of Evidence Concerning Reward Sensitivity

Strong support has emerged for reports of elevated reward sensitivity among those with bipolar I disorder, bipolar spectrum disorders and those at risk for the disorder. Elevations in reward sensitivity can be documented during well periods. Reward sensitivity predicts the onset of disorder, and among those with the disorder, it predicts more severe manic symptoms over time.

One concern, though, is that reward sensitivity is an overly broad concept (Johnson, Edge, Holmes, & Carver, 2012). To be effective, the BAS must orchestrate a myriad of psychological and behavioural processes. At a biological level, a good deal of work has focused on differentiating the function of different structures within the reward circuitry (Berridge, 2007). Davidson (1994) has suggested the importance of distinguishing between processes that occur before goal attainment versus those that occur post-goal attainment. In line with this idea, we next consider two ways in which incentive sensitivity might relate to

goal regulation: one pertaining to processes of goal pursuit (pre-goal attainment), the other pertaining to responses to success (post-goal attainment).

BIPOLAR DISORDER IS RELATED TO HEIGHTENED GOAL PURSUIT

Considerable biological research has examined how the approach system guides behaviour when opportunities for reward emerge—that is, engagement of the approach system when cues of incentive are present. Neural models of incentive sensitivity have focused on the nucleus accumbens (NAcc). The NAcc is particularly implicated in coding incentive value (Rangel, Camerer, & Montague, 2008), but additional regions involved include the amygdala, medial prefrontal cortex, orbitofrontal cortex and anterior cingulate cortex (Gan, Walton, & Phillips, 2010; Rangel et al., 2008; Schulz et al., 2008). These regions show a rapid phasic response to cues of incentive in animal studies with single cell recording and also in human functional magnetic resonance imaging (fMRI) research. These regions are also engaged in processing information regarding the receipt (or omission) of rewards (Rangel et al., 2008; Schulz et al., 2008).

Research on the Nacc suggests that a key function of the reward system is motivating effort towards reward. That is, the NAcc does not seem to be responsible for encoding the hedonic experience of a stimulus but rather for influencing how much energy the organism will expend to obtain it (Salamone, Correa, Farrar, Nunes, & Pardo, 2009). Dopamine's central role in this process has been elucidated in animal research on 'effort-based decision making,' in which animals have choices between high-effort/high-reward versus low-effort/low-reward options. Individual differences in dopamine function are most easily observed when obtaining a reward is difficult, thus requiring more effort (Salamone et al., 2009). Human fMRI and positron emission tomography findings also indicate that effort-related decisions correlate with activity in the ventral striatum/NAcc and amygdala (Kurniawan et al., 2010). Given neurobiological models of the reward system, it would seem important to consider whether people with bipolar disorder tend to exert more effort towards reward.

EFFORT TOWARDS REWARD IS ELEVATED IN BIPOLAR DISORDER

There is at least a little direct evidence that effort towards incentives is elevated in bipolar disorder. In two laboratory paradigms, people diagnosed with bipolar disorder have been found to expend more effort in conditions involving potential rewards but not in conditions that involve no reward. For example, Hayden and colleagues (2008) found that people with bipolar disorder worked more quickly when given the opportunity to earn reward on a card-sorting task than healthy controls. These group differences did not emerge in the non-reward condition.

Harmon-Jones and colleagues (2008) suggested that high approach motivation might lead people diagnosed with bipolar disorder to sustain effort and remain engaged as tasks became more difficult. Indeed, animal research suggests that one of the most robust correlates of high dopamine function is the willingness to pursue difficult goals for reward (Salamone et al., 2009). This effect is observed specifically for tasks involving reward (as opposed to punishment). Harmon-Jones et al. used left frontal cortical activation (measured by electroencephalogram [EEG]) to index task engagement. When presented with anagrams of varying difficulty levels (easy, medium, difficult) and a chance to either win money if solved correctly ('reward' trials) or lose money if solved incorrectly ('punishment' trials), people with bipolar disorder showed greater relative left frontal activation in preparation for the difficult reward trials but not the difficult punishment trials. These findings suggest that people diagnosed with bipolar disorder appear to work harder and sustain effort longer given opportunities to earn reward.

Parallel findings emerge when self-report measures are used to assess attitudes towards goals among those with bipolar disorder. Even during remission, people with bipolar disorder endorse more effortful striving towards goals on trait-like measures, compared with controls (Alloy et al., 2009; Fulford, Johnson, & Tuchman, 2009; Scott, Stanton, Garland, & Ferrier, 2000; Spielberger, Parker, & Becker, 1963; Wright, Lam, & Newsom-Davis, 2005). That is, they report being more perfectionistic in their pursuit of goals (Lam, Wright, & Sham, 2005; Spielberger et al., 1963) and seeing goal attainment as more important to their sense of self-worth (Lam et al., 2005; Scott et al., 2000). For example, they are more likely to report that they should be able to excel at anything if they try hard enough (Lam et al., 2005).

Johnson and Carver (2006) reasoned that willingness to expend effort for reward might lead people to tackle extreme life ambitions. We developed a measure we called the Willingly Approached Set of Statistically Unlikely Pursuits (WASSUP) to capture extremely difficult goals, such as becoming a multi-millionaire or being the focus of books and TV shows (Johnson & Carver, 2006). Across studies, people with bipolar disorder and even those at risk for the disorder endorse highly ambitious life goals, such as earning many millions of dollars, being featured on TV programmes or having books written about their life (Carver & Johnson, 2009; Fulford et al., 2008; Gruber & Johnson, 2009; Johnson & Carver, 2006; Johnson & Jones, 2009). The elevated goals do not appear to be a compensation for the bipolar disorder diagnosis. That is, risk for mania also correlates with high WASSUP scores (Carver & Johnson, 2009; Gruber & Johnson, 2009). Endorsement of these ambitions also does not appear to be an artefact of manic symptoms, in that this profile is observed even after controlling for current mood symptoms (Carver & Johnson, 2009; Fulford et al., 2008; Gruber & Johnson, 2009; Johnson & Carver, 2006).

REPORTS OF GOAL STRIVING PREDICT MANIC SYMPTOMS

In several sets of longitudinal analyses, self-reported goal striving predicted increases in manic symptoms among persons with bipolar disorder (Francis-Raniere, Alloy, & Abramson, 2006; Johnson, Carver, & Gotlib, in press; Lee, Lam, Mansell, & Farmer, 2010) and bipolar spectrum disorders (Alloy et al., 2009). Reports of spending more energy pursuing goals and tackling more goals both predict increases in manic symptoms among persons with bipolar I disorder, even among those in remission (Lozano & Johnson, 2001). Increases in goal pursuit, then, are often described as prodromal symptoms of mania (Lam & Wong, 1997; Molnar, Feeney, & Fava, 1988). Heightened goal striving has also been found to predict the onset of bipolar spectrum disorders (Alloy et al., 2012a).

As people take on more goals, they also increase their physical activity. It has been argued that symptoms of increased activation are more sensitive indicators of episode onset than are mood changes (Akiskal & Benazzi, 2005). Indeed, activity, as measured using actigraphs and observer ratings, is highly correlated with manic symptoms (Perry et al. 2009; Wehr, Goodwin, Wirz-Justice, Breitmaier, & Craig, 1982) and serves as an excellent signal of impending manic shifts (Wehr & Wirz-Justice, 1982). Indeed, it has been argued that activation might be a more reliable diagnostic criterion than mood-state changes (Akiskal & Benazzi, 2005). Such increase in physical activity may be an important path by which enhanced goal engagement feeds into onset of mania.

SUMMARY OF GOAL SETTING AND PURSUIT IN BIPOLAR DISORDER

Recent neurobiological models of the BAS emphasize that a primary function of this system is to mobilize effort. Findings suggest that when given opportunities for reward, people with bipolar disorder will work harder and remain engaged with difficult goals. They also report that goal pursuit matters more to their sense of self-worth, and they report pursuit more

difficult life ambitions. Although a higher proportion of this evidence than is desirable comes from self-reports of goal pursuit, at least one relevant study had a behavioural outcome (Hayden et al., 2008), and another had a physiological outcome (Harmon-Jones et al., 2008).

It appears from this literature that greater effort and energy towards difficult goals can have both beneficial and maladaptive effects. On the positive side, setting high goals is one of the strongest predictors of academic success (Locke & Latham, 2002). It seems likely that the willingness to set high goals and expend energy pursuing them could help explain the high rates of creative accomplishment among people with bipolar disorder and the greater occupational success among their family members (Johnson, 2005).

On the negative side, the subjective importance of attaining goals appears to shape periods of over-activity and extreme goal pursuit, and these periods often seem to be early warning signals of impending manic episodes. One may also wonder whether the profound subjective importance of these goals influences how reactive people are to successes and failures. Setting overly ambitious goals may set the stage for repeated frustrations and disappointments, if one has difficulty attaining those goals. Next, we consider how people with bipolar disorder respond to success and failure.

BIPOLAR DISORDER AND REACTIVITY TO SUCCESS AND FRUSTRATION

On the basis of the reasoning described thus far, one would expect that persons who are highly reward sensitive would be more emotionally reactive to success. There is, however, some evidence that appears to contradict this view, suggesting the need for more refined models.

Several laboratory studies have found that people with bipolar disorder seem no happier after success than controls. People diagnosed with bipolar disorder have been found not to report a greater shift in happiness than do healthy controls after receiving (false) positive feedback or after winning on gambling tasks (Farmer et al., 2006; Roiser et al., 2009). People with bipolar disorder also have been found not to show a greater shift in happiness or psychophysiological reactions than healthy controls after watching happy film clips (Gruber & Johnson, 2009). These studies suggest that people with bipolar disorder do not simply have a stronger positive emotional response to rewarding or other positive stimuli.

However, early findings indicate that affective responses to success might last longer among people with bipolar disorder than among healthy controls. Farmer and colleagues (2006) used (false) success feedback during a Go–No Go task as a way to induce positive affect among euthymic individuals with bipolar disorder ($n = 15$) and healthy controls ($n = 19$). That is, after a 2-minute practice block, participants were given feedback that their performance was very fast. Self-rated affect was measured four times over the course of the task, once before this positive affect induction and three times afterward. Participants with bipolar disorder and healthy controls reported similar increases in affect just after receiving the positive feedback. Group differences were observed, though, in time to recovery. By the final rating of happiness, the scores of the control group had returned to baseline levels, whereas scores in the bipolar disorder group remained elevated.

CONFIDENCE

Although their positive feelings do not seem to become excessively elevated after success, it does appear that people with bipolar disorder become overly confident after success. Early evidence of this came from a study of students with subsyndromal symptoms of mania (Stern & Berrenberg, 1979). After (false) success feedback, they were asked to state their

odds of correctly guessing the outcome of a coin toss. Students with a history of subsyndromal symptoms were overly confident, whereas other students were not. The overconfidence emerged only after a small success. In a more recent study, T. D. Meyer and colleagues (2010) showed that students at risk for bipolar disorder, after receiving false success feedback in a chance-based task (dice throwing), were more likely to make global, internal attributions for success than those not at risk for bipolar disorder, suggesting a broader sense of confidence regarding future success.

Further evidence of a surge in confidence after success comes from a questionnaire study. Given hypothetical small successes, persons prone to mania endorsed more of an increase in confidence for future success than did persons who are at low risk of mania (Eisner, Johnson, & Carver, 2008). Across these studies, then, after an initial success persons prone to mania appear to expect more of the same to follow. Equally important, this greater confidence appears to be situational, occurring only after the success experience.

To date, little research has examined the fundamental processes guiding this surge of confidence. There is evidence that given a positive mood state, people with bipolar disorder tend to focus more on potentially positive future events (Gregory, Brewin, Mansell, & Donaldson, 2010) and to engage in a form of positive rumination, which involves focusing on positive features of their self (Johnson, McKenzie, & McMurrich, 2008b). More work is needed, though, on how cognitive processes contribute to the surges of confidence.

Although more work is needed on the processes guiding confidence shifts, there is evidence that this elevation in confidence may shape behaviour. In one study, after an initial success, participants received a choice of difficulty levels for an upcoming eye-hand task. People at risk for bipolar disorder chose a more difficult task for themselves than did those not at risk (Johnson, Ruggero, & Carver, 2005). Thus, not only do people at risk for mania expend more effort during pre-goal attainment periods but also their behaviour post-goal attainment seems to shift, such that they take on more difficult goals. Put differently, there appears to be little pause after success before taking on a new challenge.

This pattern post-attainment appears to be at least somewhat at odds with normative tendencies. Carver and Scheier (Carver, 2003; 1998) proposed that when people make better progress towards a goal than expected (or needed), they experience an involuntary tendency to temporarily ease back in effort towards that particular goal. This easing of effort is proposed to serve an adaptive function, by allowing people to attend to other goals. A recent experience sampling study examined this phenomenon among people with and without bipolar I disorder. Both groups eased back on goal effort in response to progress, but those diagnosed with bipolar disorder did so significantly less than did healthy controls (Fulford, Johnson, Llabre, & Carver, 2010). This finding is consistent with the idea that people with bipolar disorder fail to relax their efforts when doing well at goal attainment: that making progress towards a goal is a cue to them to remain highly engaged in pursuit of that goal. This finding pertains to the pre-attainment period, but it is consistent with a post-attainment tendency to jump directly to the next goal.

These differences in responsiveness to goal progress appear to shape responses to life events. Several studies have examined responses to major life events that involved attaining goals, such as becoming married or graduating from college. For people diagnosed with bipolar disorder, such life events predict increases in manic symptoms over the next several months (Johnson et al., 2000; Johnson et al., 2008a, 2008b). Among persons diagnosed with bipolar spectrum disorders, life events involving goal attainment have been found to predict increases in hypomanic symptoms (Nusslock, Abramson, Harmon-Jones, Alloy, & Hogan,

2007). Hence, certain aspects of reactivity to goal progress or goal attainment may have important implications for the course of symptoms in individuals with bipolar disorder.

RESPONSES TO GOAL FRUSTRATION

The approach system is involved not just in goal pursuit and attainment but also in reactions when obstacles to goal attainment are encountered (Carver & Harmon-Jones, 2009). Obstacles vary in severity. When an obstacle is seen as too large to overcome, responses are depressed affect and disengagement of effort; when there appears to be a possibility of overcoming the obstacle, the responses are frustration or anger and greater effort (e.g., Carver & Scheier, 1998; Frijda, 1986). Given that people with bipolar disorder respond to success with greater confidence of future success, an important question is how they respond to goal thwarting.

There is some evidence that people with bipolar disorder stay overly engaged as they become more frustrated. Evidence was described above that people diagnosed with bipolar disorder stay engaged in efforts as goals become more difficult (Harmon-Jones et al., 2008). Harmon-Jones and colleagues (2002) have also conducted a laboratory study of goal frustration among students at risk for mania. They asked students to listen to pilot radio broadcasts in which the broadcaster described upcoming serious tuition increases at their school. Proneness to mania was associated with greater anger and with a pattern of EEG laterality consistent with more effort engagement.

These profiles from laboratory studies also appear to be observable when naturalistic life events are considered. Wright, Lam, and Brown (2008) used daily monitoring to track symptoms and goal frustrations over a 28-day period. Initial reactions to goal frustration did not differ between groups. Differences emerged, though, in the duration of mood changes. Those with bipolar disorder took more days to recover from a goal frustration than did those without bipolar disorder. This finding is conceptually similar to the pattern described above, in which positive feelings lasted longer for persons with bipolar disorder than for other people.

Wright and her colleagues (2008) developed a scale to assess another type of response to goal frustration—the tendency to disengage effort and become less energetic overall (e.g., 'When an event I look forward to is cancelled, I lose the energy to arrange an alternative'). People with bipolar disorder did not differ from those without bipolar disorder on this measure, suggesting that bipolar disorder does not relate to goal disengagement.

SUMMARY OF RESPONSES TO GOAL PROGRESS

It has been surprisingly hard to find evidence that people with bipolar disorder or those prone to mania are happier immediately after a success than other people. The differences appear more a matter of cognitive responses related to the affect and the duration of the affect, rather than to initial emotional intensity. That is, positive feelings seem to last longer after success among persons with bipolar disorder compared with healthy controls. Interestingly, bipolar disorder also appears related to longer emotional reactions to goal frustration. Although initial positive emotional reactions to success are not stronger, people with bipolar disorder appear to become more confident than do other people afterward.

Most importantly, though, this profile of elevated responsiveness seems to shape symptoms. That is, with goal progress, people diagnosed with bipolar disorder display greater energy and activity the next day after success and increased risk of mania over the next months. Hence, this reactivity appears to play an important role in symptom generation. Indeed, there

is evidence that people with bipolar disorder are aware that that pattern is dangerous, even while they value the pattern of excitement and engagement (Kelly et al., 2011).

COPING RESPONSES TO GOAL DYSREGULATION IN BIPOLAR DISORDER

Thus far, we have presented evidence that bipolar disorder is characterized by becoming overly focused on difficult-to-reach goals, becoming overly confident after initial success, having more sustained emotional responses to both success and frustration and failing to pause when goals are attained or ease up when goal pursuits are going well. There is a distinct need for research on the moderators of these processes. Although relatively little is known on this front, a small set of studies point towards the importance of coping strategies.

Most people have no reason to think about how to diminish their joy and confidence. As a result, little is known about the best ways to down-regulate such states. Nonetheless, recent evidence suggests that, when directed to do so, people with bipolar disorder can use strategies to distance themselves from positive emotion and to take a 'why' perspective rather than an immersed perspective (Gruber, Harvey, & Johnson, 2009).

Indeed, there is evidence that at least some people with bipolar disorder do this on their own. Lam and colleagues asked people with bipolar disorder what they did to control their symptoms when they noticed early signs of mania. Beyond seeking medical care, many people with bipolar disorder reported taking steps to reduce their goal pursuit and activity levels and engaging in calming activities (Lam & Wong, 1997). Those who endorsed these types of coping strategies were less prone to manic episodes in an 18-month follow-up period (Lam, Wong, & Sham, 2001). In sum, available data suggest that many people with bipolar disorder use strategies to avoid excessive goal engagement and that these strategies can be effective.

Conceptually, such strategies appear to require two distinct capacities or skills. The first is being able to recognize manic symptoms in their early stages and also recognize the link between the precipitating behaviours and symptom emergence. The second capacity is being able to exert cognitive control over the precipitating psychological experiences in order to dampen their adverse effects. As noted just earlier, this seems to entail distancing oneself from positive (and presumably also frustrating) emotion rather than becoming immersed in it (Gruber et al., 2009). Both of these capacities are important. Indeed, an important question for future work is the extent to which the cognitive control capacity should be viewed as a co-vulnerability when joined with high incentive sensitivity.

TREATMENT IMPLICATIONS OF THE GOAL DYSREGULATION MODEL

The goal dysregulation model has been used to identify critical moments and processes that could be related to the onset and maintenance of mania among those with bipolar disorder (Johnson & Fulford, 2009; Nusslock, Abramson, Harmon-Jones, Alloy, & Coan, 2009). For people with this disorder, key processes seem to involve setting extremely high goals, expending extraordinary resources towards those goals and reacting in more prolonged ways to goal progress or thwarting. We have used our current understanding of these processes to develop a mania prevention intervention (Johnson & Fulford, 2009). For each potential process, we begin by teaching clients what is known about the triggers and by assessing whether each potential process seems relevant for a given individual.

There is an inherent difficulty here, however. It cannot be assumed that a person will immediately want to change processes that are involved in mania genesis. That is, high goals are inspiring, and bursts of confidence are exciting (c.f. Kelly et al., 2011). Although some clients begin treatment aware of the dangers of these high mood states, others do not. For

those clients who have not considered the potential negative outcomes of these processes, our treatment approach involves motivational interviewing, to help the client consider the pros and cons of high goals, excessive goal pursuit or surges of confidence. For those who want to change, we then use cognitive behavioural strategies to promote better control over these processes. In an open trial (Johnson & Fulford, 2009), the programme led to significant reductions in manic symptoms over time, with effect sizes substantially larger than those obtained with psychoeducation (Lam et al., 2003).

On the whole, it is hoped that clients can learn strategies that help restrain and defuse this reactivity. In the best of all worlds, these strategies are targeted, allowing people to retain a sense of control over their behaviour and thoughts while enjoying their successes. Thus, people with bipolar disorder can learn to harness the strengths associated with active goal engagement while gaining awareness of the potential pitfalls of excessive goal striving.

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Key Practitioner Message

- For people with bipolar disorder, heightened approach motivation appears to be manifested in setting extremely high goals, expending extraordinary resources towards those goals and reacting in more prolonged ways to goal progress or thwarting.
- Early prodromal signs of mania may involve increased goal pursuit and heightened activity.
- Each of these facets could potentially be amenable to cognitive behavioural intervention.