An explorative study on coping flexibility with behavioral approach system-activating stimuli:

A comparison of people with and without bipolar disorder

1. Introduction[1]

Research on the impact of life events on the symptom expression and the timing and severity of mood episodes of bipolar disorder (BD) is very promising. A growing body of evidence has shown that life events relating to negative or goal-striving dimensions increase the risk of episode recurrence, predict chronicity, and impede recovery in people with BD (Alloy et al., 2005; Dienes et al., 2006; Johnson, 2005a; Johnson et al., 2008a; Kemner et al., 2015; Kessing et al., 2004; Nusslock et al., 2007; Tsuchiya et al., 2003). However, there is a lack of research examining the significance of different kinds of life event for different components of coping among people with BD.

1.1. Coping with BAS-relevant life events

The negative and positive aspects of life events have been extensively studied (Johnson, 2005a; Johnson et al., 2008a; Johnson et al., 2016). Life events can be put in context through the Behavioral Approach System (BAS) dysregulation theory (Alloy and Abramson, 2010; Urosevic et al., 2010), which divides them into BAS-activating or BAS-deactivating types (Alloy and Abramson, 2010). The polarity-specific nature of life events can lead to manic/hypomanic or depressive mood symptoms through excessive BAS activation or deactivation, respectively (Johnson, 2005a; Johnson et al., 2008a; Johnson et al., 2016; Nusslock et al., 2007).

[1] Abbreviations used in this study: PF: Problem-focused; EF: Emotion-focused; AA: Behavioral-activation/emotion-amplifying; DD: Behavioral-deactivation/emotion-diminishing; ISS: Internal State Scale; ACT: Activation; WB: Well-being.

Due to impaired BAS, individuals with BD are hypersensitive to cues signaling an opportunity for reward and those signifying failure and loss of reward (Urosevic et al., 2010). Research has demonstrated the pertinent mechanism (Alloy et al., 2009; Depue and Iacono, 1989; Harmon-Jones et al., 2002; Johnson, 2005b; Johnson and Carver, 2006; Johnson et al., 2008a; Nusslock et al., 2007; Urosevic et al., 2008; Wright et al., 2009). When vulnerable individuals experience events relevant to BAS activation—such as the offer of a reward, encouragement of goal striving and attainment, provocation of anger—their hypersensitive BAS becomes excessively activated when they get an opportunity for active coping. Such a situation potentially leads to (hypo)manic symptoms. Alternatively, in response to BAS-deactivating life events, such as imminent failure, loss, or nonattainment of goals, a hypersensitive BAS is excessively deactivated, leading to a shutdown of BAS without an opportunity for active coping. Such a situation potentially leads to depressive symptoms. However, poor emotion regulation is signified in the response to BAS-relevant contextual cues (Urosevic et al., 2008). If such sensitivity is deemed to be related to a biological vulnerability, improving the ability to cope with life events is desirable, and the fit and adaptability of coping are critical to understanding how individuals with BD are likely to cope with different life events.

1.2. Coping flexibility

To depict coping more completely, Cheng (2001, 2003) conceptualized coping flexibility as: 1) variability in cognitive appraisal (perceived controllability) and coping patterns across different situations; and 2) the ability to achieve a good fit between coping strategies and situational demands. Effective coping involving a good fit indicates a good match between the nature of coping strategies

and the characteristics of the situation. Typically, problem-focused coping is assumed to be adaptive in controllable situations, whereas emotion-focused coping in uncontrollable situations (Lazarus, 1999; Roubinov et al., 2015). However, emotion-focused coping can sometimes be linked to controllable stressors (Mah et al., 2008), and problem-focused coping is also suggested to deal with uncontrollable situations (Danielsen et al., 2013). Research has shown, however, that using problem-focused coping in controllable life events may not benefit individuals with BD during a manic phase (Urosevic et al., 2008), because it would further increase BAS activation and thus could easily exacerbate (hypo)manic symptoms. Using emotion-focused coping in facing uncontrollable life events may also cause harm to individuals with BD during a depressive phase (Wright et al., 2009), as it would further reduce their volition to manage their mood state.

In the past decade, the coping flexibility model has been applied to normal populations and people with a medical illness, and samples have usually involved university students, working adults, patients with severe acute respiratory syndrome, or patients with functional dyspepsia (Cheng, 2001, 2003; Cheng et al., 1999; Cheng et al., 2000; Cheng et al., 2004; Cheng et al., 2012). The model has yet to be applied to people with mental health concerns. As an individual's decision-making process can be influenced by his or her affective state (Forgas and Eich, 2013), the fluctuating mood of BD may affect appraisal or coping responses during the transactional process. Thus, the goodness of fit concept in coping flexibility may be applied differently to people with and without BD. Coping strategies relating to the behavioral dimension (i.e., behavioral deactivation and activation) and the emotional dimension (i.e., emotion diminishing and amplifying) have also been proposed. Behavioral-

activation coping shares similar components with problem-focused coping, while emotion-diminishing coping shares corresponding elements with emotion-focused coping. However, the usual application of coping (Lazarus, 1999) may not be appropriate for people with BD who are dealing with fluctuating mood states (Edge et al., 2013; Lam and Wong, 1997; Lam et al., 2001; Wong and Lam, 1999). Further research is needed to clarify the use of different kinds of coping strategies for people with and without BD. Furthermore, it is pertinent to test the possible moderating effect of coping between BD diagnosis and mood states.

1.3. BAS sensitivity level and psychosocial functioning level

Due to the traits of BAS hypersensitivity and poor emotion regulation (Gray, 1994; Nusslock et al., 2009; Urosevic et al., 2008), people with BD may be prone to poor coping, in terms of over- or under-responsiveness, with respect to reward-relevant environmental cues. Alternatively, impairment in psychosocial function can be treated as a risk factor for affective symptoms in BD (Gitlin et al., 1995; Nolen et al., 2004; Weinstock and Miller, 2008, 2010). Research has shown that coping mitigates the effect of psychosocial functional impairment on subsequent mood symptoms (Morris et al., 2005; Yang, 2006). It seems that coping may have additional value beyond BAS sensitivity level or psychosocial functioning level in explaining mood states. Therefore, it warrants further investigation by incorporating these two essential elements, which is the intention of the present study.

1.4. Hypothesis

The present study aimed to examine the relationships between different components of coping flexibility (in terms of controllability appraisal and different coping strategies), BAS-relevant stimuli

and mood states by taking BAS sensitivity and psychosocial functioning levels into consideration, in people with and without BD. Due to limited resources, only BAS-activating stimuli were presented in measuring coping flexibility and emphasis was on positive mood states. Through a cross-sectional design, it was hypothesized that coping flexibility has an additional value over BAS sensitivity level or psychosocial functional level in explaining mood states. Specifically, the fit index may be more applicable for people in the healthy control group. Further identification of the moderating role of other components of coping flexibility was explored.

2. Methods

2.1. Participants and procedures

Participants were 90 individuals diagnosed with BD I or II and 90 healthy controls who were fluent in Chinese and aged 18-65 with primary education level or above. They were recruited using convenience sampling from a list of psychiatric outpatients at a regional hospital in Hong Kong and from the wider community, respectively. Diagnoses of BD I or II were confirmed by attending psychiatrists using the Structured Clinical Interview for DSM-IV Axis I disorders (First et al., 1996). Individuals with BD had to have been in a state of full remission for more than two months according to the recommendations of the International Society of Bipolar Disorders task force (Tohen et al., 2009), that is, symptomatic remission signaled by a score lower than 5 on the Young Mania Rating Scale (Young et al., 1978) and lower than 7 on the Hamilton Rating Scale for Depression (Hamilton, 1967). Exclusion criteria included a comorbid diagnosis of schizophrenia, schizoaffective disorders, substance misuse, organic brain syndromes, or intellectual disability. Ethical approval was obtained

from the Institutional Review Board of The University of Hong Kong and the Hong Kong West Cluster of the Hospital Authority (UW13-176).

Potential participants meeting the inclusion criteria were approached individually. Their baseline pre-event affective symptoms, BAS sensitivity, and psychosocial functioning levels were assessed after receipt of a signed consent form. Subsequently, they were shown video clips depicting two compulsory and two elective BAS-activating life events. Perceived controllability and corresponding coping strategies for each of these life event scenarios were reported. Finally, the participants' overall post-event mood states were assessed. Each participant was offered a coupon worth HK$20 (or US$2.50) for taking part in the study.

2.2. Measures

2.2.1. Coping flexibility

Coping flexibility was measured by means of the Coping Flexibility Questionnaire (Cheng, 2001, 2003), which attempts to capture simultaneous person-situation transactional processes. Life event scenarios were developed for use in measuring appraisal and coping responses. For this, a focus group was formed comprising four people with a history of BD. The focus group discussed, agreed on, and modified ten BAS activation-relevant life event scenarios with reference to the Life Events Scale (LES; Francis-Raniere et al., 2006). The LES was originally designed to assess 193 defined life event categories spanning various domains which include a wide array of BAS-activating and BAS-deactivating events. To make the life event scenarios vivid in this study, they were all role-played and

videotaped by the author (SC) and a research assistant. The ten life event scenarios were elaborated at the individual/achievement and interpersonal/relationship level:

(i) You received appreciation from family or friends for the completion of household tasks,

(ii) You received a huge amount of money so that you could achieve your life goals,

(iii) You got a job that you really wanted,

(iv) You were accepted into desired social group,

(v) You received a positive reaction from family or friends about doing well at work,

(vi) At work, your boss gave you a raise or a promotion due to good performance,

(vii) You planned, organized, or prepared a vacation or trip,

(viii) You won a significant award for your achievements at work,

(ix) You hosted a social event, and

(x) You accomplished an important task at work.

Each scenario was role-played for a couple of minutes. A pilot trial of these ten life event scenario clips was run with a group of ten people with BD. The pilot group verified the content of the life event scenarios to be BAS-activating. Such a presentation of visual stimuli has been found to be a reliable means to induce positive mood change (Martin, 1990). In the actual field study, two compulsory and two elective scenarios were presented. The participants were asked to watch the video clips and to vividly imagine encountering the situation portrayed in real life. The coping indices were established in terms of the following scores:

(a) The perceived controllability score. After watching the video clips, the participants rated the

perceived controllability of the stimuli on a six-point scale, with a higher score indicating greater perceived controllability. The scores included the average and the variance of the perceived controllability across the four life events.

(b) The coping strategies score. A list of coping strategies was compiled that included strategies of problem-focused (PF) and emotion-focused (EF) coping (Carver, 1997; Carver et al., 1989), behavioral-activation and behavioral-deactivation coping (Lam and Wong, 1997; Lam et al., 2001; Wong and Lam, 1999), and emotion-amplifying and emotion-diminishing coping (Edge et al., 2013). Participants reported their repertoire of coping responses after their cognitive appraisal. The operationalization of the coping strategies score involved two major dimensions: (a) mean and variability in the number of PF and EF coping strategies, and (b) mean and variability in the number of behavioral-activation/emotion-amplifying (AA) and behavioral-deactivation/emotion-diminishing (DD) coping strategies across the four stimuli.

(c) Strategy-situation fit. This score represents the goodness-of-fit hypothesis specified by the transactional theory of coping (Lazarus and Folkman, 1984). A response that meets the goodness-of-fit criteria (i.e., Fit1 = assumes using PF coping for controllable stimuli and EF coping for uncontrollable stimuli; Fit2 = assumes using AA coping for controllable stimuli and DD coping for uncontrollable stimuli) scored 1, whereas all other responses scored 0. The strategy-situation fit score was derived by averaging the scores of the four stimuli, so possible average scores ranged between 0 and 1.

2.2.2. BAS trait sensitivity

BAS trait sensitivity was measured by the Behavioral-Inhibition System/Behavioral-Approach System (BIS/BAS) scales (Carver and White, 1994). An overall BAS score was derived by summing the three subscales, namely Reward Responsiveness, Drive, and Fun-Seeking, to represent an individual's BAS sensitivity level (Bowins, 2012). Higher scores indicated greater sensitivity. All the participant-report assessment tools were translated with reference to the guidelines for the translation and adaptation of psychometric scales (Wild et al., 2005). The translated materials (in Chinese) are available on request by email from the corresponding author.

2.2.3. Psychosocial functioning level

The Functioning Assessment Short Test (FAST; Rosa et al., 2007) is a brief interview-administered instrument designed to assess the psychosocial functioning level of people with BD. It comprises six specific areas of psychosocial functioning: autonomy, occupational functioning, cognitive functioning, financial issues, interpersonal relationships, and leisure time. The global score, achieved by summing the six areas, is used to represent an individual's psychosocial functioning level. A lower score indicated a higher psychosocial functional level.

2.2.4. Mood states

The baseline pre-event affective symptoms (including depressive and manic moods) were measured by the Modified Hamilton Rating Scale for Depression (MHRSD; Miller et al., 1985) and the Bech-Rafaelsen Mania Scale (BRMS; Bech et al., 1979), respectively. Both scales use a standardized interview format with higher scores representing higher symptom severity.

Post-event mood states were measured by the Internal State Scale (ISS; Bauer et al., 1991), which consists of four subscales: Activation (ACT), Well-being (WB), Perceived Conflict, and Depression Index. The ISS is a self-report instrument that is sensitive to changes in affective states. Higher scores, specifically the subscales of ACT and WB, indicate elevated mood states. Translations and cultural adaptations of the scale were also carried out (Wild et al., 2005). For the present study, Mansell and Lam's (2006) present state version of the ISS was used, in which only the ACT and WB subscales were reported. The assessment was completed immediately post-mood induction, so that the instant mood states after viewing the videotaped vignettes were tracked.

2.2.5. Sociodemographic factors

Each participant's gender, age, marital status, educational level, employment status, and residential status were recorded; these were the sociodemographic factors used in the present study.

2.3. Statistical analysis

The data were analyzed using SPSS version 20.0. First, sequential regression was employed to determine if adding information about coping flexibility improved the prediction of mood states beyond the BAS sensitivity and psychosocial functioning levels. When determining the moderating effect of coping, hierarchical regression analyses were performed by strictly following the procedures, as recommended by Frazier, Tix, and Barron (2004). The predictor and moderator variables were standardized to reduce multicollinearity.

3. Results

3.1. General characteristics of the participants

A total of 180 participants were recruited in the study, half of whom had a diagnosis of BD. Detailed descriptive information on basic sociodemographic factors, measured variables, and outcomes is shown in Tables 1 and 2. Generally, about 60% of participants were female in both groups. Regarding education level, nearly 30% had reached university level or above in the BD group, while more than 60% in the control group had reached that level. More than half (55.5%) of the participants were single in the BD group, while the majority (64.4%) of those in the control group were married. One-fifth of the participants in the BD group were living alone, but only a few (1.1%) of the control group were living by themselves. Half of the BD group's participants had a paid job, but most of the participants (82.2%) in the control group were in paid work. The baseline affective symptoms (t = 1.870, p = 0.063 for MHRSD; t = 1.684, p = 0.094 for BRMS) were comparable between the two groups, implying that further comparison of post-event mood states (ISS-ACT and ISS-WB) could be performed. The overall MANCOVA revealed a statistically significant main effect for group (F(2, 171) = 3.949, Wilks' λ = .956, p = .021): participants in the BD group scored significantly higher in the ISS-ACT subscale than those in the control group.

3.2. Sequential multiple regression

When the participants of both the BD and control groups were considered, the results of the regression analysis showed that the overall models comprising demographic factors, group, BAS sensitivity level, psychosocial functioning level, and significant components of coping flexibility could explain 14.5–22.6% of the variance in mood states (Table 3). After controlling of demographic factors and group variables, BAS sensitivity level explained 5.4% (F(1, 171) = 10.510, p < 0.001) and 7.9% (F(1,

171) = 16.271, $p < 0.001$) of the variance in the ISS-ACT and ISS-WB subscales, respectively. In the final block, AA and EF coping accounted for an additional 2.4% ($F(1, 169) = 4.839$, $p < 0.05$) and 4% ($F(1, 169) = 7.976$, $p < 0.01$) of the variance in the ISS-ACT subscale, respectively. In contrast, only AA coping could account for the additional 4.8% ($F(1, 169) = 10.568$, $p < 0.001$) of the variance in the ISS-WB subscale.

When only the control group was considered, the overall models could explain 22.3–25.6% of the variance in mood states (Table 4). Specifically, BAS sensitivity level explained 5.1% ($F(1, 82) = 5.016$, $p < 0.05$) and 16.9% ($F(1, 82) = 17.207$, $p < 0.001$) of the variance in the ISS-ACT and ISS-WB subscales, respectively. In the final block, AA coping and Fit1 index accounted for an additional 4.1% ($F(1, 80) = 4.337$, $p < 0.05$) and 5.8% ($F(1, 80) = 6.234$, $p < 0.05$) variance in the ISS-WB subscale, respectively. However, only AA coping could explain the additional 4.2% ($F(1, 80) = 4.308$, $p < 0.05$) of the variance in the ISS-ACT subscale.

When the BD group alone was considered, the overall models explained 25.2–31.1% of the variance in mood states (Table 5). Only coping flexibility improved the prediction of mood states. In the final block, perceived controllability and AA coping accounted for an additional 7.8% ($F(1, 80) = 9.064$, $p < 0.01$) and 6.1% ($F(1, 80) = 6.968$, $p < 0.01$) variance in the ISS-WB subscale, respectively. Only EF coping accounted for the additional 7.5% ($F(1, 80) = 8.001$, $p < 0.01$) of the variance in the ISS-ACT subscale.

All significant and insignificant coping variables were included in the sequential multiple regressions. However, for the sake of clarity in the presentation of the results, only significant data are presented in Tables 3 to 5.

3.3. Moderating effect of coping flexibility

The results show that only the ISS-WB subscale was a significant outcome variable. When the effects of sociodemographic factors were controlled, two components of coping flexibility (Fit1 index and perceived controllability) moderated the association between BD diagnosis and the ISS-WB, which are indeed conceptually relevant. The interaction effects between diagnosis and Fit1 index (β = 0.190, $p < 0.01$) and between diagnosis and perceived controllability (β = 0.201, $p < 0.01$) were significant. As recommended by Aiken and West (1991) and Cohen et al. (2003), significant moderator effects were interpreted by computing the predicted values of the outcome variables for representative groups, including those with a mean score ± 1 standard deviation of the moderator variables. The various interaction effects are summarized in Figures 1 and 2.

4. Discussion

4.1. Limitations of the present study

First, the convenience sampling of the control group could not provide a good comparison with the study group. A control group demographically matched in terms of age, gender, and education level is far preferable for better comparison. Second, this study was about the potential to cope with life events in the promotion of recovery and improving outcomes in people with BD. Using mood state as an outcome measure may have limited the implications to functional recovery only. Future

research can extend the application to personal recovery orientation by using other outcome measures, such as stages of recovery scales (Tse et al., 2014a). Third, regarding the internal validity of the experimental design, there was no detailed test of the efficacy of the video clips depicting BAS-activating life events. The participants' responses to the experimentally devised scenarios may not reflect their experiences in daily life, as individual life experiences may contribute to changes that are not easily controlled. Moreover, their mood state outcomes may not fully indicate their mood symptoms within the short duration of the videos. Thus, further research on actual coping in naturalistic settings should be considered. Despite these limitations, the present explorative study has made several preliminary contributions to the body of knowledge.

4.2. Additional value of coping flexibility

This study has examined the effects of coping flexibility on mood states in relation to BAS sensitivity and psychosocial functioning levels among individuals with BD and healthy controls. Coping flexibility has an additional value in predicting mood states beyond BAS sensitivity and psychosocial functioning levels, as indicated by the sequential multiple regression. This is concordant with previous studies demonstrating an emotion-amplifying effect on a variety of emotional states (Nolen-Hoeksema et al., 2013). Moreover, the emotion amplification found in response to BAS-activating life events may also exacerbate the normative interaction between emotions and goals, which can be generalized across both healthy and clinical populations (Carver and Scheier, 1998; Martin et al., 2004). The additional role of EF coping is consistent with previous research showing an association

between emotion-focused positive rumination and a higher level of positive affect or mood symptoms (Feldman et al., 2008; Fulford et al., 2008; Johnson et al., 2008b).

4.3. The moderating effect of fit index

On the other hand, the fit index added value in explaining mood symptoms in the control group. It also significantly moderated the relationship between BD diagnosis and mood states. In general, mood states increased with fit index in the control group but remained relatively stable in the BD group. As such, a good strategy-situation fit in coping is linked to adaptive psychological well-being (Cheng, 2001; Cheng et al., 2007; Fresco et al., 2006; Gan et al., 2004; Katz et al., 2005; Mino and Kanemitsu, 2005) in which an improvement in mood is seen in individuals who are more flexible. The application of fit index to a healthy control group indicates adaptiveness. However, this seems to be inapplicable to people with BD, as an unfavorable outcome can be seen in the light of their propensity to maintain their (hypo)manic symptoms (Alloy et al., 2009). Maintenance of BAS activation, as reflected by a high level of ISS-WB, is independent of changes of fit index. Adaptive coping, as implied by a good fit index, may not be applicable to BD with persistent BAS activation (Urosevic et al., 2008). The adaptiveness of emotional sequelae may, in fact, have different dimensions in people with or without disrupted positive emotional functioning (Kang and Gruber, 2013). This finding is therefore consistent with previous findings showing a decrease in adaptive emotion regulation strategies among people with BD (Wolkenstein et al., 2014).

4.4. The significant role of perceived controllability

The additional value of perceived controllability was confirmed in the BD group. When further scrutinized, perceived controllability had a moderating effect on the relationship between BD diagnosis and mood states. Specifically, it did not exert any significant effect on mood states in the healthy control group. However, it made an additional contribution to mood symptoms in the BD group, in which mood states increased markedly with perceived controllability. Essentially, BD is characterized by amplified emotionality (Gruber et al., 2013) with difficulty in emotional regulation (Johnson et al., 2007; Phillips and Vieta, 2007); such individuals' mood symptoms may, therefore, tend to be heightened if they feel a strong sense of perceived controllability after they are presented with BAS-activating life events. In general, perceived controllability over positive emotions is associated with beneficial mental health outcomes (Folkman and Moskowitz, 2000; Gruber et al., 2011). However, people with BD usually have difficulty in controlling intense positive emotions (Gruber, 2011; Johnson et al., 2007), which can be detrimental to their mental health. The failure to control such passions may also easily lead to severe functional impairment, morbidity, and even mortality (Dilsaver, 2011).

4.5. Theoretical extension to a new context

The present study extends the theoretical framework of coping flexibility to a new context—people with severe mental illness (specifically, bipolar disorder). As shown by the results, people with BD show a different profile in coping flexibility than the healthy control group. A good strategy-situation fit and flexibility in coping may imply adaptive psychological well-being (Cheng, 2001; Cheng et al., 2007; Fresco et al., 2006; Gan et al., 2004; Katz et al., 2005; Mino and Kanemitsu, 2005) in

healthy controls, but this is not the case in people with BD. As reflected by the findings, the traditional concept of goodness of fit (Lazarus, 1999) is not applicable to people with BD. Specifically, the inclusion of emotional dysregulation can turn the original matching on the opposite direction. The findings further show that the assumed application of coping strategies in normal controls may not be adaptive in people with BD dealing with fluctuating moods.

In addition, perceived controllability works differently in people with and without BD, especially when the amplified emotionality (Gruber et al., 2013) of BD is taken into account. Perceived control is known to buffer the negative impact of stressors on emotional reactivity (Kunz-Ebrecht et al., 2004; Pressman and Cohen, 2005). As indicated by the present study, lowering perceived controllability greatly helps to regulate mood state when people with BD are presented with BAS-activating stimuli. Thus, findings of the present study support another significant role of perceived control in buffering positive affect.

4.6. Implications for psychosocial interventions and conclusions

Individuals can regulate their mood states by subduing their perceived controllability appraisals when presented with BAS-activating stimuli. Perceived controllability may connote the adoption of an active role or exertion of effort to alter the environment. Therefore, curtailing the perceived controllability of life events seems to connote a sense of "non-striving," which is a core idea in mindfulness (Hayes, 2002; Kabat-Zinn, 1990, 1994). A sense of tranquility and serenity (Cahn and Polich, 2006) and coming to terms with bipolar disorder among middle-aged adults has been shown to calm a heightened mood effectively (Tse et al., 2014b). It is thus not surprising that there has

recently been a steady growth in mindfulness-based therapies, which are an important psychosocial intervention for people with BD or at risk of BD (e.g., Cotton et al., 2016; Murray et al., 2015; Perich et al., 2013; Strawn et al., 2016; Weber et al., 2010). In the past decade, research has established the therapeutic effect of mindfulness on depression (e.g., Barnhofer et al., 2009; Kenny and Williams, 2007; Kingston et al., 2007). Most of these studies focused on reducing depressive symptoms (e.g., Lahera et al., 2014) or improving cognitive function (e.g., Howells et al., 2012). Recently, mindfulness has been shown to be beneficial to the emotion regulation in goal striving among people with BD (Gilbert and Gruber, 2014; Murray et al., 2015). The application of mindfulness-based interventions may also improve emotional processing on BD (Howells et al., 2014).

As emphasized by Baer (2003), the improvement of self-management resulting from mindfulness training in which participants are encouraged to improve their awareness of all cognitive and emotional events can promote the use of a range of coping skills. Mindfulness training allows people to shift their attitude in order to embrace the principle of “letting go” (Frewen et al., 2008; Williams, 2008), which could be a remedy for the upsurge of perceived controllability across time. The present explorative study hopefully represents important groundwork for a shift of focus to regulating manic moods and the harnessing of the perceived controllability of life events through mindfulness.

Table 1 Descriptive statistics of different sociodemographic factors

	BD (*n* = 90) %	Control (*n* = 90) %	Statistics
Gender			
Male	37.7	41.1	X^2 = 0.209
Female	62.2	58.8	
Education			
Secondary level or below	72.3	38.9	X^2 = 23.7**
University or above	27.7	61.1	
Marital status			
Non-married	55.5	35.5	X^2 = 7.257**
Married	44.4	64.4	
Living status			
Alone	20.0	1.1	X^2 = 17.006**
Living with others	80.0	98.8	
Working status			
No paid job	50.0	17.7	X^2 = 20.854**
Paid job	50.0	82.2	
	X(SD)	*X(SD)*	
Age	43.32 (11.264)	39.21 (9.762)	*t = 2.617***

Note. **p < 0.01

Table 2 Descriptive statistics of different measured variables and outcomes

	BD (*n* = 90) *X (SD)*	Control (*n* = 90) *X (SD)*	Statistics (*t*)
Baseline affective symptoms			
MHRSD	1.24 (1.275)	0.89 (1.276)	1.870
BRMS	0.33 (0.793)	0.17 (0.503)	1.684
BAS sensitivity level			
BAS-overall	40.44 (5.277)	38.32 (5.079)	2.749**
Psychosocial functioning level			
FAST-global	11.27 (10.08)	1.23 (1.768)	9.301**
Coping flexibility			
CTR	2.24 (0.832)	2.65 (0.783)	-3.391
VCTR	2.55 (2.088)	2.29 (1.455)	0.970
PF	16.83 (7.165)	13.99 (5.69)	2.950**
EF	10.39 (5.556)	7.64 (3.60)	3.933**
VPF	1.864 (1.830)	2.066 (1.853)	-0.735
VEF	0.940 (0.786)	0.856 (1.36)	0.509
AA	18.26 (7.72)	15.91 (6.13)	2.257**
DD	8.97 (5.23)	5.72 (3.53)	4.877**
VAA	2.11 (2.18)	2.23 (1.81)	-0.362
VDD	1.23 (1.50)	0.908 (1.40)	1.467
Fit index 1	0.517 (0.129)	0.567 (0.129)	-2.610**
Fit index 2	0.527 (0.139)	0.600 (0.157)	-3.325**
Post-event mood states			
ISS-ACT	189.44 (112.2)	155.22 (101.2)	2.149*
ISS-WB	162.78 (76.99)	161.00 (66.28)	0.166

Note. *p < 0.05, **p < 0.01; MHRSD = Modified Hamilton Rating Scale for Depression; BRMS = Bech-Rafaelsen Mania Scale; BAS = Behavioral Approach System; D = Drive; FS = Fun-seeking; RR = Reward responsiveness; BIS = Behavioral Inhibition System; FAST = Functioning Assessment Short Test; CTR = Perceived controllability; VCTR = Variance of perceived controllability; PF = Problem-focused coping; VPF = Variance of problem-focused coping; EF = Emotion-focused coping; VEF = Variance of emotion-focused coping; AA = Behavioral-activation/emotion-amplifying coping; VAA = Variance of behavioral-activation/emotion-amplifying coping; DD = Behavioral-deactivation/emotion-diminishing coping; VDD = Variance of behavioral-deactivation/emotion-diminishing coping; ISS = Internal State Scale; ACT = Activation; WB = Well-being

Table 3 Sequential multiple regression of various variables on mood status (Overall)

		Dependent Variables					
		ISS-activation			ISS-well-being		
Step	Independent Variables	R^2 *total*	ΔR^2	*F*	R^2 *total*	ΔR^2	*F*
1.	Demographic factors	0.02	0.02	0.678	0.08	0.08	2.627*
2.	Group	0.07	0.04	7.664**	0.10	0.01	2.090
3.	BAS sensitivity level	0.12	0.05	10.51***	0.17	0.08	16.271***
4.	Psychosocial functioning level	0.12	0.00	0.384	0.18	0.01	1.014
5.	Coping						
	AA	0.15	0.02	4.839*	0.23	0.05	10.568***
	EF	0.16	0.04	7.976**	0.19	0.01	2.185

Note. ISS = Internal State Scale; BAS = Behavioral Approach System; AA = Behavioral-activation/emotion-amplifying coping; EF = Emotion-focused coping; *p < 0.05, **p < 0.01, ***p < 0.001. *F*-values are for R^2 *total.*

Table 4 Sequential multiple regression of various variables on mood status (Control group)

		Dependent Variables					
		ISS-activation			ISS-well-being		
Step	Independent Variables	R^2 *total*	ΔR^2	*F*	R^2 *total*	ΔR^2	*F*
1.	Demographic factors	0.12	0.12	1.953	0.02	0.02	0.33
2.	BAS sensitivity level	0.17	0.05	5.016*	0.19	0.17	17.207***
3.	Psychosocial functioning level	0.18	0.01	0.650	0.20	0.01	0.52
4.	Coping						
	AA	0.22	0.04	4.308*	0.24	0.04	4.337*
	Fit1	0.19	0.01	1.339	0.26	0.06	6.234*

Note. ISS = Internal State Scale; BAS = Behavioral Approach System; AA = Behavioral-activation/emotion-amplifying coping; Fit1 = Fit Index 1; *p < 0.05, **p < 0.01, ***p < 0.001. *F*-values are for R^2 *total.*

Table 5 Sequential multiple regression of various variables on mood status (BD group)

		Dependent Variables					
		ISS-activation			ISS-well-being		
Step	Independent Variables	R^2 *total*	ΔR^2	*F*	R^2 *total*	ΔR^2	*F*
1.	Demographic factors	0.13	0.13	2.065	0.20	0.20	3.539**
2.	BAS sensitivity level	0.16	0.03	3.004	0.23	0.03	2.675
3.	Psychosocial functioning level	0.18	0.02	1.605	0.23	0.00	0.387
4.	Coping						
	EF	0.25	0.08	8.001**	0.26	0.02	2.429
	CTR	0.18	0.00	0.382	0.31	0.08	9.064**
	AA	0.21	0.03	3.292	0.29	0.06	6.968**

Note. ISS = Internal State Scale; BAS = Behavioral Approach System; EF = Emotion-focused coping; CTR = Perceived controllability; AA = Behavioral-activation/emotion-amplifying coping; Fit1 = Fit Index 1; *p < 0.05, **p < 0.01, ***p < 0.001. *F*-values are for R^2 *total.*

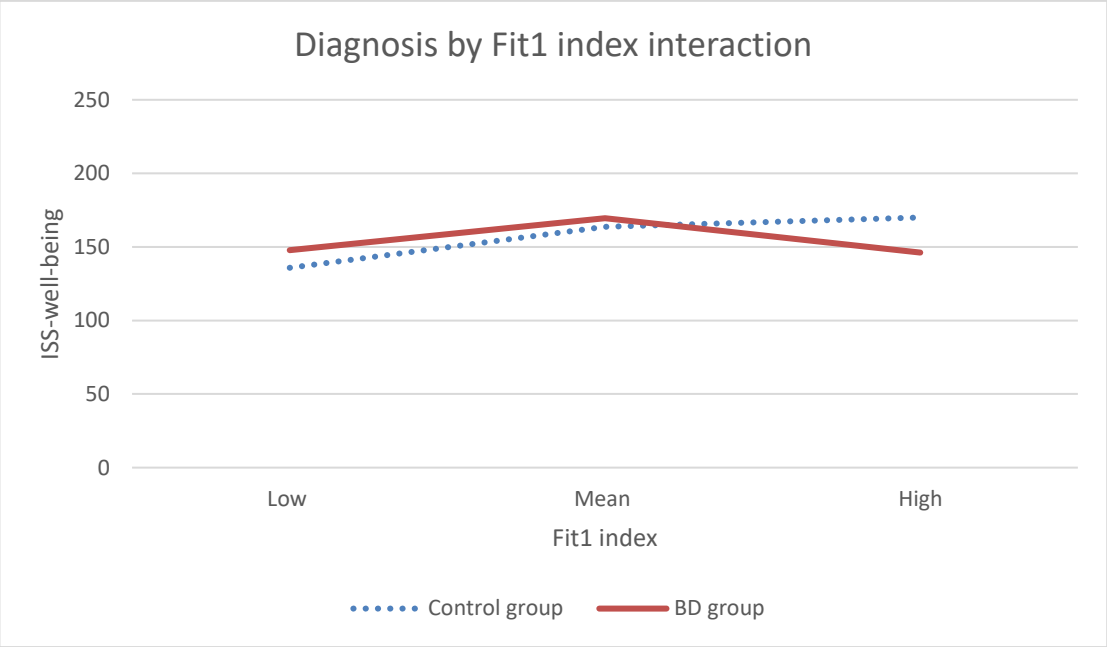

Figure 1 Plot of significant diagnosis by Fit1 index interaction

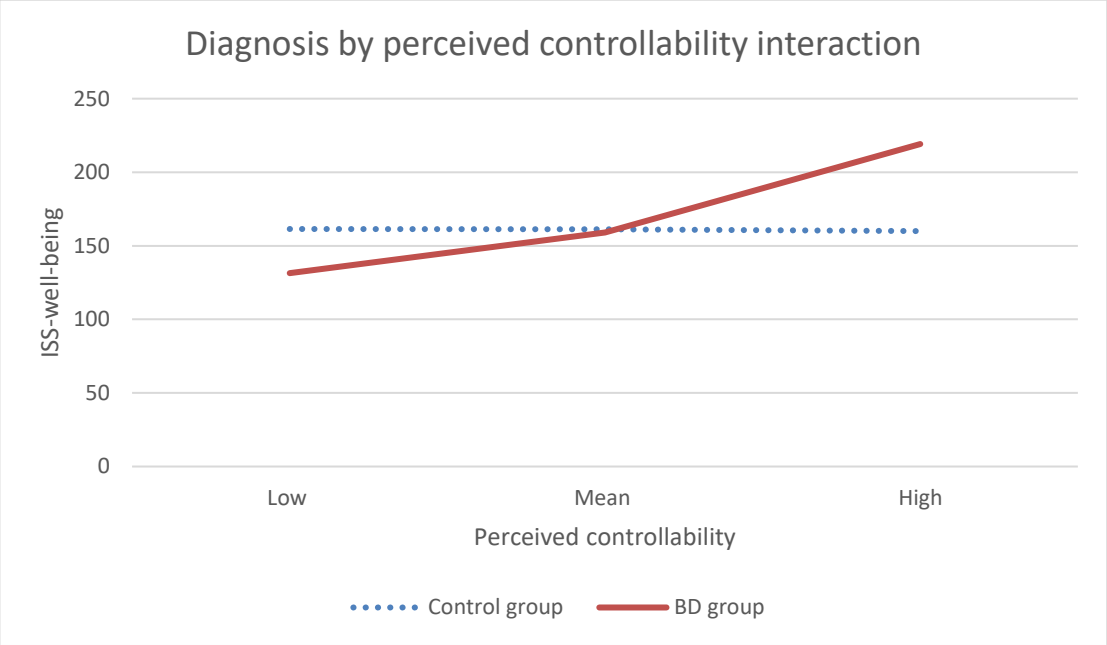

Figure 2 Plot of significant diagnosis by perceived controllability interaction

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