Personality Facets in Patients with Major Depressive Disorder: Differential Change across Treatment and Association with Relapse and Recurrence

By

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Abstract

Personality assessed at a higher-order, “domain” level has shown to be predictive of the treatment response and course of major depressive disorder (MDD). Personality domains have also shown mean-level change (i.e., absolute change) and rank-order stability (i.e., relative stability) across treatment. The nature and prognostic significance of personality change at a lower-order, “facet” level has yet to be evaluated. The present study investigated absolute and relative change of personality facets across cognitive-behavioural therapy (CBT), interpersonal psychotherapy (IPT), and antidepressant medication (ADM) for MDD, and the effect of personality change and pre-treatment personality traits on relapse/recurrence. A total of 150 outpatients with the MDD were randomized to receive either CBT, IPT, or ADM. Remitted patients \((n = 92)\) were assessed on a weekly basis for a maximum of 18 months following treatment. Findings support absolute change and relative stability of personality facets, indicating that both components of personality have prognostic significance.
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Table of Contents

Personality and Depression ........................................................................................................... 1
  Conceptual Overview .................................................................................................................. 1
  The Five-Factor Model of Personality ....................................................................................... 3
  Major Depressive Disorder ........................................................................................................ 4
  Relationships between Personality Domains and Major Depressive Disorder ....................... 5
  Absolute vs. Relative Change and the “State-Trait” Issue ....................................................... 12
  Merits of Considering Facets vs. Domains ................................................................................ 13
  Relationships between Personality Facets and Major Depressive Disorder ............................ 15
  The Present Study .................................................................................................................... 19

Method ........................................................................................................................................ 21
  Overview ................................................................................................................................... 21
  Participants ................................................................................................................................. 22
  Measures .................................................................................................................................... 23
  Procedure .................................................................................................................................... 25
  Treatment of Missing Data ........................................................................................................ 29

Results ......................................................................................................................................... 29
  Study Goal 1: Personality Stability and Change across Treatment ......................................... 29
  Study Goal 2: The Predictive Utility of Personality Change Over 18-Month Follow-up .......... 32
  Study Goal 3: The Predictive Utility of Pre-Treatment Personality Traits Over 18-Month Follow-up .................................................................................................................. 33

Discussion .................................................................................................................................. 34
  Study Goal 1: Personality Stability and Change across Treatment ......................................... 35
  Study Goal 2: The Predictive Utility of Personality Change Over 18-Month Follow-up .......... 40
  Study Goal 3: The Predictive Utility of Pre-Treatment Personality Traits Over 18-Month Follow-up .................................................................................................................. 43
  Limitations and Strengths ......................................................................................................... 44
  Future Directions ....................................................................................................................... 45
  Conclusions ............................................................................................................................... 45

References ..................................................................................................................................... 47
List of Figures

Figure 1. Paired samples t-tests reflecting differential change in Depression according to treatment condition .................................................................69

Figure 2. Paired samples t-tests reflecting differential change in Impulsiveness according to treatment condition ..........................................................70

Figure 3. Paired samples t-tests reflecting differential change in Angry Hostility according to treatment condition .........................................................71

Figure 4. Paired samples t-tests reflecting differential change in Excitement-seeking according to treatment condition ......................................................72

Figure 5. Paired samples t-tests reflecting differential change in Trust according to treatment condition ...........................................................................73

Figure 6. Paired samples t-tests reflecting differential change in Modesty according to treatment condition .......................................................................74

Figure 7. Paired samples t-tests reflecting differential change in Values according to treatment condition .......................................................................75
List of Tables

Table 1. Summary of the personality depression relationship in the literature..........................63

Table 2. Demographic and Clinical Characteristics by Treatment Type and Relapse/Recurrence Status..........................................................................................................................65

Table 3. Descriptives, Reliability Estimates, Correlations, and Difference Scores of Facets at Pre and Post-Treatment........................................................................................................66

Table 4. ANCOVAs Predicting Personality Change across Treatment when Controlling for Depression Severity .............................................................................................................68
Personality and Depression

Conceptual Overview

In the 19th century, poet Henry Longfellow noted that “often times we call a man cold when he is only sad” (Thompson, 1938). In contemporary psychological and psychiatric research, the terms introverted and depressed have replaced cold and sad, but views about the personality-depression relationship that have been the subject of literary work for centuries persist. Personality and psychopathology are similar in that they both, by definition, have a marked influence on human functioning. They differ in that personality refers to an individual's “characteristic patterns of cognition, emotion, and behaviour” (Funder, 2007, p. 5), whereas psychopathology refers to a “clinically significant disturbance in an individual's cognition, emotion regulation, or behaviour” (American Psychiatric Association [APA], 2013, p. 20). Although the personality-depression relationship might reflect different conceptual models (e.g., Bagby, Quilty, & Ryder, 2008a), efforts to elucidate the role of personality in the development and symptom expression of depression are of clinical interest, carrying the potential to inform diagnosis, prognosis, and treatment (Klein, Kotov, & Bufferd, 2011).

Five principal conceptual models have been proposed to characterize the personality-depression relationship: the vulnerability model, the common-cause model, the pathoplasty model, the complication/scar model, and the spectrum model (Bagby et al., 2008a; Klein et al., 2011; Klein, Wonderlich, & Shea, 1993). The vulnerability model posits that personality predisposes individuals to develop depression. This model is typically supported by findings demonstrating that personality predicts onset of depression in never-depressed populations. The common cause model posits that a shared diathesis predisposes individuals to certain personality traits and to depression. This model is typically supported by evidence suggesting that the same
etiological factor is associated with personality traits and with depression. The pathoplasty model posits that personality influences the expression of depression. This model is typically supported by evidence demonstrating that personality predicts the course and prognosis of depression. Whereas vulnerability, common-cause, and pathoplasty models suggest that personality affects depression, the complication/scar model posits that depression affects personality (with the complication model suggesting that personality restores to premorbid levels following remission and the scar model suggesting that depression effects lasting personality change). The complication/scar model is typically supported by findings demonstrating that personality changes in conjunction with depression. The spectrum model posits that certain personality traits reflect a subclinical manifestation of depression. It differs from aforementioned four conceptual models in that it suggests that personality is qualitatively indistinguishable from depression, with both constructs differing only in degree (Bagby et al., 2008a; Klein et al., 2011).

The present investigation is based on principals outlined in two conceptual models: the pathoplasty model and the complication/scar model. Extant literature utilizing prospective designs has supported the pathoplasty model by demonstrating that personality predicts treatment outcomes, relapse, and recurrence of depression (e.g., Bagby et al., 2008b, Hees, Koeter, and Schene, 2013; Ormel, Oldehinkel, & Vollebergh, 2004). As such, these findings suggest that personality influences the course and prognosis of depression. A body of research also supports the complication/scar model by demonstrating that personality changes in conjunction with depression (e.g., Karsten et al., 2012). Given that personality has shown to influence the course of depression and to change in concomitance with the disorder (e.g., Bagby et al., 2008b, Hees, et al. 2013, Karsten et al., 2012), personality traits and their changes across treatment may serve to predict long-term outcomes. As such, the present study investigated: (1) the stability and
differential change of personality across various treatments for depression, (2) the effect of personality change on relapse and recurrence, and (3) the effect of pre-treatment personality on relapse and recurrence. In light of evidence demonstrating an increased predictive utility of lower-order personality facets compared to higher-order domains (Paunonen & Ashton, 2001), this investigation focused on personality at the facet-level.

The introduction will begin with a description of the Five-Factor Model (FFM) of Personality and of Major Depressive Disorder (MDD). Given that the majority of research in the area has focused on personality domains as opposed to facets, literature examining the relationship between personality domains and MDD will first be reviewed. The introduction will conclude with a review of findings at the facet level-of-resolution and a description of the present investigation.

**The Five-Factor Model of Personality**

The FFM is a comprehensive classification of universal traits that is currently the most widely used and accepted dimensional model of personality (McCrae & Costa, 2008). Although there are various measures of the FFM (e.g., Goldberg, 1999, John & Srivastava, 1999), the current description focuses on the FFM as conceptualized and operationalized by Costa and McCrae’s family of NEO Inventories (including the *NEO Personality Inventory* [NEO-PI], the *Revised NEO Personality Inventory* [NEO PI-R], the *NEO Five-Factor Inventory* [NEO-FFI], and the *NEO Personality Inventory 3* [NEO PI-3]; Costa & McCrae, 1988; Costa & McCrae, 1992; McCrae, 1992, McCrae & Costa, 2005). This class of measures operationalizes personality dimensions as hierarchical constructs, with broad, higher-order traits (known as domains) situated at the top of the hierarchy, and narrower, lower-order traits (known as facets) situated at the bottom (Costa & McCrae, 1992). The five personality domains of the model (as
conceptualized using the NEO Inventories) include: neuroticism (characterized by anxiety, angry hostility, depression, self-consciousness, impulsiveness, and vulnerability), extraversion (characterized by warmth, gregariousness, assertiveness, activity, excitement-seeking, and positive emotions), conscientiousness (characterized by competence, order, dutifulness, achievement striving, self-discipline, and deliberation), agreeableness (characterized by trust, straightforwardness, altruism, compliance, modesty, and tender-mindedness), and openness (characterized by fantasy, aesthetics, feelings, actions, ideas, and values; Costa & McCrae, 1992).

Derived from factor analyses of questionnaire items (Costa & McCrae, 1992), the five domains have been replicated across participants of different ages, languages, and cultural backgrounds (McCrae & Allik, 2002). Personality traits in the model have been found to be heritable (e.g., all 5 domains and 26 of 30 facets; Jang, Livesley, Angleitner, Reimann, & Vernon, 2002) and physiologically-rooted (Canli, 2008; Laceulle, Ormel, Aggen, Neale, & Kendler, 2013), and have also shown to be present in clinical contexts (Costa, Bagby, Herbst, & McCrae, 2005). There is not a consensus among FFM instruments regarding the nature of the facets within each domain, with only certain facets shared across instruments (Costa, McCrae, 1992; Goldberg, 1999).

**Major Depressive Disorder**

Major depressive disorder is a pressing public health concern, affecting approximately 3.2 million Canadians, and costing the Canadian economy approximately $14.4 billion each year (Statistics Canada, 2012; Stephens & Joubert, 2001). The Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5) defines MDD by either a manifest low mood or a diminished enjoyment in most activities for a period of at least two weeks, which is accompanied
by somatic and cognitive symptoms (APA, 2013). The core features of the disorder have remained unchanged since the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, Text Revision (DSM IV-TR; APA, 2000). Despite the development of empirically validated treatments (e.g., cognitive behavioural therapy [CBT]; interpersonal psychotherapy [IPT]; antidepressant medication [ADM]), up to 80% of remitted patients experience a recurrent depressive episode within two years (Beshai, Dobson, Bockting, & Quigley, 2011; Dobson et al., 2008). Efforts to elucidate factors contributing to cycles that maintain the disorder following treatment are therefore of critical importance.

**Relationships between Personality Domains and Major Depressive Disorder**

**Cross-Sectional Associations**

An extensive literature has accumulated examining the association between FFM personality domains and MDD (see Table 1 for a review of findings). Kotov, Gamez, Schmidt, and Watson’s (2010) meta-analysis indicated that individuals with the disorder possess heightened levels of neuroticism and decreased levels of conscientiousness compared to healthy controls. Because extraversion demonstrated inconsistent associations with MDD across studies, it was not highly related to the disorder in the context of the meta-analysis. Moreover, results did not support consistent relationships between MDD status and agreeableness or openness (Kotov et al., 2010). It is of note that although high neuroticism, low conscientiousness and low extraversion are common features of many psychological disorders (Kotov et al., 2010), high neuroticism and low extraversion have been associated with MDD irrespective of comorbid diagnoses (Spinhoven, Vad Der Does, Ormen, Zitman, & Penninx, 2013). Although such findings contribute to a preliminary understanding of the personality-MDD relationship, their cross-sectional designs do not allow for the causal basis of associations to be inferred.
The sections that follow review literature that examines the relationship between FFM personality traits and depression using prospective designs (e.g., least two time points). A comprehensive approach to the review was taken, despite the fact that much of the relevant literature is dated. In incidences in which prospective investigations using FFM measures were not available, relevant investigations conceptualizing FFM domains utilizing other personality models were reported, with the models included specified.

**Personality in the Treatment of Major Depressive Disorder**

A general evaluation of the literature supports all five factors as having predictive utility in the context of treatment for MDD (Bagby et al., 1995; Canuto et al., 2009; Du, Bakish, Ravindran, & Hrdina; Quilty et al., 2008), though the specific domains related to treatment responsiveness have shown to vary across studies. One investigation (Blom et al., 2007) did not support the predictive utility of any of the FFM domains following ADM as well as psychotherapy in patients with MDD, with only severity of depressive episode, duration of depressive episode, and use of medical services predictive of treatment outcomes.

**Neuroticism**

Neuroticism has most consistently been found to predict treatment responsiveness (Bagby et al., 2008b; Canuto et al., 2009; Quilty et al., 2008). Canuto et al. (2009) investigated the role of FFM personality traits in predicting response to day hospital treatment (consisting of a combination of group therapy, individual therapy, ADM, as well as family and network meetings) in older adults with either MDD or a depressive episode of bipolar disorder. Neuroticism was the only dimension predictive of treatment outcomes, with this domain associated with reduced or slower improvement in depressive symptoms over the course of treatment. Quilty et al. (2008) examined the association between FFM personality domains and
treatment response following a combined ADM and psychotherapy regimen for MDD. Patients were randomly assigned to ADM condition, and designated to receive either supportive, cognitive-behavioural, or psychodynamic interventions. Analyses that accounted for common variance across personality dimensions indicated that low neuroticism was uniquely predictive of treatment response. In a related study, Bagby et al. (2008b) examined the role FFM personality traits in the differential treatment response to either CBT or ADM for MDD. Patients with high levels of neuroticism showed an improved response to ADM compared to CBT. The authors suggested that patients with high levels of neuroticism may be too emotionally dysregulated to effectively engage in CBT; as such, they may be more responsive to ADM because this treatment targets affective symptoms associated with MDD without relying on the patient’s regulative capacity (Knutson et al., 1998). Results of this investigation highlight the importance of considering differential influences of treatment types when examining associations between personality and treatment response (Bagby et al., 2008b).

Extraversion

Findings supporting the role of extraversion in treatment contexts are mixed. Bagby et al. (1995) found low extraversion to predict poor responsiveness to ADM after controlling for baseline depression severity. Although the authors acknowledged that their inferences were limited by the fact that other treatment conditions were not included in their investigation, they suggested that their findings in combination with previous research (e.g., Miller, 1991) may indicate that extraversion reflects a nonspecific predictor of treatment response. Conversely, in an examination of the relationship between FFM domains and ADM adherence in patients with MDD, high extraversion predicted reduced treatment compliance (Cohen et al., 2004).
authors opined that patients high in extraversion may be too engaged in other activities to prioritize their medication. 

Conscientiousness

In Quilty et al.’s (2008) aforementioned investigation (examining the association between FFM personality domains and treatment response following a combined ADM and psychotherapy regimen for MDD), analyses that accounted for common variance across personality dimensions indicated that high conscientiousness was uniquely predictive of treatment response. Additional analyses in both treatment-completer and intent-to-treat samples indicated that conscientiousness consistently interacted with extraversion in the prediction of treatment response, with patients high in conscientiousness more likely to respond to treatment when they were also high in extraversion. The authors suggested that high conscientiousness and extraversion may reflect a particularly useful combination of characteristics required for treatment gains, perhaps facilitating the ease with which patients foster a therapeutic relationship, maintain involvement in therapy sessions, and/or fulfill treatment requirements (Quilty et al., 2008).

Agreeableness

Du et al. (2002) found agreeableness to be exclusively predictive of response to ADM, with high agreeableness positively related to treatment outcomes. The authors suggested that agreeable patients may have a tendency to believe in the possibility of improvement, which may increase their responsiveness (Du et al., 2002). Others have speculated that agreeableness may enhance treatment outcomes by improving the therapeutic relationship (Feeley, De Rubeis, & Gelfand, 1999; Klein et al., 2003).

Openness
Bagby et al. (2008b) found that patients with high levels of openness showed an improved response across both CBT and ADM. The authors suggested that openness, reflecting a need to contemplate experience and a tendency to maintain a flexible position towards novel ideas (McCrae & Costa, 1997), may interfere with receptivity to treatment (Bagby et al., 2008b).

**Summary**

Overall, studies examining the predictive value of personality domains in the context of treatment for MDD support the prognostic utility of FFM domains, though mixed findings suggest that the relationship may be largely determined by the research design and statistical analyses employed. Despite divergences in research design and statistical analyses across investigations, consideration to these features (e.g., type of treatment, recruitment procedures, and sample size) does not appear to reveal a distinct pattern of domains predictive of treatment outcomes. Such findings therefore underscore the complex nature of the relationship between personality and treatment for MDD, suggesting that considering domains in isolation may be insufficient. It is also of note that whereas all reported studies have utilized prospective designs, none have included a follow-up phase; as such, little is known regarding the role of personality on sustained treatment outcomes.

**Personality in the Course of Major Depressive Disorder**

To our knowledge, one study to date has prospectively examined the relationship between FFM personality traits and sustained treatment outcomes. Hees et al. (2013) investigated predictors of symptom remission (defined by a Hamilton Depression Rating Scale Score [HDRS] < 8) and return to work in patients who have taken time off work due to MDD. Patients completed either treatment as usual or a combination of treatment as usual and occupational therapy, and were assessed at 18-month follow-up. None of the FFM personality domains
predicted symptom remission following both treatments. Higher levels of conscientiousness, however, predicted an increased likelihood of follow-up return to work.

A number of investigations have utilized prospective designs in order to examine the relationship between personality and MDD relapse or recurrence using models other than the FFM. To this end, treatment studies (Berlanga, Heinze, Torres, Apiquian, & Cabellero, 1999; Duggan, Lee, & Murray, 1990; Faravelli, Ambonetti, Pallanti, & Pazzagli, 1986; Surtees & Wainwright, 1996) and longitudinal studies (Ormel et al., 2004) that have operationalized personality using Eysenck’s Three Factor Model of personality (Eysenck, 1967, 1982) have indicated that high levels of neuroticism were associated with an increased risk of MDD relapse or recurrence. Although neuroticism as operationalized by the FFM and by Eysenck’s Three Factor Model have been found to capture similar constructs, differences between both constructs have been identified (e.g., impulsivity is captured in FFM neuroticism but not in Three Factor Model neuroticism; Zuckerman, Kuhlman, Joireman, Teta, & Kraft, 1993). It is of note that the paucity of FFM research examining the role of personality in the long-term course of MDD may be explained by the fact that personality has shown to change in conjunction with MDD (e.g., Karsten et al., 2012), complicating the explanatory value of personality in the prediction of MDD at any given time point.

**Personality Change in Conjunction with Depression**

While findings reviewed up until this point have supported the presumed causal influence of personality on the expression and course of MDD, evidence also suggests that MDD changes personality (Klein et al., 2011). Although personality traits were originally described as remaining stable in adulthood (McCrae & Costa, 1999), they have later shown to be amenable to gradual change over time (Srivastava, John, Gosling, & Potter, 2003; Roberts, Walton, &
Viechtbauer, 2006) and to acute change in the advent of depressive episodes (with effect sizes for changes generally between 1 and 1.5 standard deviations in magnitude; e.g., Costa et al., 2005; De Fruyt, van Leeuwen, Bagby, Rolland, & Rouillon, 2006; Santor, Bagby, & Joffe, 1997; Zinbarg, Uliaszek, and Adler, 2008). Such findings counter the commonly held misconception that after the age of 30 personality ‘‘has set like plaster and will never soften again’’ (James, cited in Costa & McCrae, 1994, p. 21).

**Personality Change across Time**

A number of prospective longitudinal investigations to date have suggested that neuroticism changes in conjunction with MDD. Karsten et al (2012) examined the effect of depression and anxiety on FFM personality traits over a two-year time span. Recovery from a depressive episode was found to predict decreases in neuroticism and onset of a depressive episode was found to predict increases in neuroticism. In Weber et al.’s (2012) study examining the stability of personality traits, cognitive processes, and brain volumes in older adults with and without early-onset MDD across a two-year time period, heightened neuroticism scores observed in this group at baseline showed to decrease to levels comparable to healthy controls at follow-up. Chow and Roberts (2014) similarly found depressive symptoms to be prospectively related to decreases in neuroticism scores in older adults, with levels of life satisfaction and stress found to partially mediate this relationship.

One prospective longitudinal investigation to date has suggested that FFM domains other than neuroticism change in concomitance with MDD. In Karsten et al.’s (2012) investigation of the effect of depression and anxiety on personality traits over a two-year time span, recovery from depression predicted increases in extraversion and in conscientiousness (with onset of depression also predicting decreases in these domains). While both depressive and anxiety
disorders (corrected for one another) have shown associations with changes in neuroticism, depressive symptoms demonstrated stronger associations with changes in extraversion and conscientiousness, compared to anxiety symptoms (Karsten et al., 2012).

**Personality Change in Treatment**

Treatment studies have consistently indicated that FFM neuroticism decreases and FFM extraversion increases in response to ADM for MDD (Bagby et al., 1995; Costa et al., 2005; Du et al., 2002; De Fruyt et al., 2006; Santor et al., 1997; Tang et al., 2009). In addition, changes in neuroticism and extraversion have been observed following a treatment involving ADM alone, psychotherapy alone, or a combination of both in patients with depressive disorders (Griens, Jonker, Spinhoven & Blomb, 2002; Quilty et al., 2008). Whereas most studies have not included a placebo control group, Tang et al. (2009) found greater personality change associated with ADM compared to those patients in the placebo condition. Increases in conscientiousness (Costa et al., 2005; De Fruyt et al., 2006; Quilty et al., 2008) agreeableness (De Fruyt et al., 2006; Quilty et al., 2008), and openness (Costa et al., 2005; De Fruyt et al., 2006; Quilty et al., 2008) have also been observed across treatments, however changes in these domains are less consistent compared to changes in neuroticism and extraversion.

**Absolute vs. Relative Change and the “State-Trait” Issue**

When interpreting findings relevant to personality change, it is necessary to consider the distinction between absolute and relative change (De Fruyt et al., 2006; Santor et al., 1997). To this end, evidence suggests that personality scores change at the mean-level across treatment (i.e., absolute change), but the rank-order of personality scores are maintained (i.e., relative stability; De Fruyt et al. 2006). Zinbarg et al., (2008) interpreted absolute changes of personality as reflecting a component of personality variance that is alterable and interpreted the relative
stability of personality as reflecting a component of personality variance that persists throughout adulthood.

It is also of consideration that many researchers have asserted that personality is systematically confounded by depressive symptoms and therefore has no meaning when assessed in the presence of depression (Hirschfeld, Klerman, Clayton, & Keller, 1983; Joffe & Regan, 1988; Liebowitz, Stallone, Dunner, & Fieve, 1979; Wetzler, Kahn, Cahn, Van Praag, & Asnis, 1990). In fact, this “state trait issue” (Costa et al., 2005, p. 46) has been the subject of contentious debate in the field. Costa et al. (2005) empirically addressed this issue by comparing trait scores on the NEO PI-R (Costa & McCrae, 1992) when administered to patients prior to and following 14 to 26 weeks of ADM. Although trait scores showed to change at the mean-level, the reliability, validity, and factor structure of the NEO PI-R were maintained following successful ADM. Findings suggested that personality levels assessed during the active phases of MDD should be regarded as accurate assessments of an individual’s existing condition instead of as distortions exclusively due to state effects of the disorder. In support of these findings, Quilty et al. (2008) found that changes in the five FFM domains following a combined ADM and psychotherapy regimen for MDD were only modestly associated with changes in depressive symptoms (with effects either small or non-significant), indicating that they reflect changes in personality rather than proxies to state effects.

**Merits of Considering Facets vs. Domains**

Given that personality domains have shown to predict onset, treatment responsiveness, and recurrence of MDD, personality dimensions at pre-treatment as well as personality changes across treatment may reflect trait vulnerabilities that contribute to the high rates of relapse and recurrence (Harkness, Bagby, Joffe, & Levitt, 2002). It is important, however, to consider the
resolution of personality that is likely to most effectively predict relapse and recurrence. In this regard, while there are psychometric benefits in examining the association between personality and MDD at the domain-level (e.g., improved scale reliability; Cronbach & Gleser, 1965), such investigations are limited in two critical respects: (1) they do not allow for precise explanations of the personality-MDD relationship to be provided (e.g., Ashton, 1998), and (2) their broad nature risks masking or tempering the influence of relevant specific personality dimensions (e.g., Chmielewski & Watson, 2009; Paunonen & Ashton, 2001; Reynolds & Clark, 2001).

To this end, the improved reliability of broad trait scales does not necessarily indicate that they demonstrate improved predictive power (Ashton, 1998; Ones & Viswesvaran, 1996; Paunonen & Ashton, 2001). In particular, although it is commonly believed that the reliability of a scale places an inflexible limit on its maximum capacity for validity (Anastasi & Urbina, 1997), Ashton et al. (1998) challenged this notion by suggesting that “the question to be asked is whether or not the improved reliability derived by aggregating the subscales provides a gain in validity that outweighs the loss in validity due to the dilution of variance specific to certain subscales which (sic) relate to the criterion of interest” (p. 289).

In accordance with this assertion, several researchers have called for the identification of facets that may be responsible for relations between personality and psychopathology at the domain-level (Klein et al., 2011; Kotov et al., 2010; Naragon-Gainey, Watson, & Markon, 2009; Rector, Bagby, Huta, & Ayearst, 2012; Zinbarg et al., 2008), having also demonstrated the predictive and explanatory benefits of conducting personality research at the facet-level (Paunonen, Rothstein, & Jackson; Paunonen & Nicol, 2001; Quilty, Pelletier, DeYoung, & Bagby, 2013; Reynolds & Clark, 2001). As examples, Weiss and Costa (2005) found that the relationship between conscientiousness and longevity is primarily due to increases in the self-
discipline facet, enhancing our understanding of this domain-outcome relationship. In addition, positive emotionality was found to primarily responsible for the association between extraversion and depression (Naragon-Gainey et al., 2009), suggesting that observed inconsistencies in the relationship between extraversion and MDD (e.g., Kotov et al., 2010) may be due to the fact that various FFM instruments differentially emphasize the influence of this facet (Naragon-Gainey & Watson, 2014).

**Relationships between Personality Facets and Major Depressive Disorder**

**Cross-Sectional Associations**

Compared to research at the domain-level, few studies have examined the relationship between FFM facets and MDD. With that said, cross-sectional investigations have indicated that all neuroticism facets are elevated in patients with a diagnosis of MDD and in remission (Bagby et al., 1995; Bagby et al., 1996; Bagby et al., 1997; Bienvenu et al., 2004; Chopra et al., 2005; Harkness et al., 2002; Rector et al., 2012; Hayward, Taylor, Smoski, Steffens, & Payne, 2013; Hood, Richter, & Bagby, 2002). Such findings are consistent with evidence revealing heightened levels of this domain in individuals with MDD (e.g., Kotov et al., 2010). Moreover, depression, anxiety, and angry hostility facets of neuroticism have demonstrated unique associations with MDD (i.e., associations while controlling for other FFM facets; Chioqueta & Stiles, 2005; Costa et al., 2005). Importantly, depression is the only facet of neuroticism that has found to overlap in content with state depression (Uljaszek et al., 2009).

For extraversion facets, decreased levels of positive emotions, assertiveness, and warmth have been observed in patients with a current and remitted diagnosis of MDD (Bagby et al., 1995; Bagby et al., 1997; Bienvenu et al., 2004; Chioqueta & Stiles, 2005; Chopra et al., 2005; Costa et al., 2005; Harkness et al., 2002; Hayward et al., 2013; Rector et al., 2002; Rector et al.,
2012). Whereas a majority of facets within conscientiousness, agreeableness and openness have not been consistently related to MDD, low levels self-discipline (facet of conscientiousness) and actions (facet of openness) have demonstrated associations with depression across several studies (Bagby et al., 1995; Bienvenu et al., 2004; Chioqueta & Stiles, 2005; Costa et al., 2005; Rector et al., 2012; Hayward et al., 2013).

**Personality in the Treatment of Major Depressive Disorder**

One treatment investigation to date has found a facet of neuroticism to be predictive of treatment outcomes. In Canuto et al.’s (2009) investigation of the role of FFM personality traits on response to day hospital treatment in older adults experiencing a major depressive episode, vulnerability was found to predict decreased treatment responsiveness. This finding may indicate that a difficulty coping with stress serves as a negative prognostic indictor. With respect to extraversion, Bagby et al. (1995) found that gregariousness was associated with responsiveness to ADM, suggesting that “specific alterations in behavior [were] associated with recovery from depression” (p.231). In terms of agreeableness, Bagby et al. (2008b) found that patients with low trust, low straightforwardness, and high tendermindedness were more likely to respond to ADM, compared to CBT. Such findings indicate that patients’ characteristic interpersonal receptivity may influence the psychotherapy process. Given that agreeableness was not associated with treatment outcomes, such findings also support Paunonen & Ashton’s (2001) contention that limiting investigations to the domain level of analysis can mask findings driven by narrowly acting mechanisms. For openness, Bagby et al. (2008b) found that heightened levels of fantasy, aesthetics, actions and values predicted increased responsiveness across both CBT and ADM. Such findings suggest that introspective and flexible dispositions may improve outcomes across
treatment types (Bagby et al., 2008b). No treatment investigation to date has found facets of FFM conscientiousness to predict treatment outcomes.

**Personality in the Course of Major Depressive Disorder**

One study to date investigated the relationship between FFM facets and depression using a prospective design. Naragon-Gainey and Watson (2014) examined if personality facets predicted levels of depression in a community sample over a five-year time span. Facets were selected from a factor analyses of six facet scales (e.g., the NEO PI-R, Multidimensional Personality Questionnaire, Sixteen Personality Factor Questionnaire, Six Factor Personality Questionnaire, Jackson Personality Inventory–Revised, and the Hogan Personality Inventory; Conn & Rieke, 1994; Costa & McCrae, 1992; Hogan & Hogan, 1995; Jackson,1994; Jackson, Paunonen, & Tremblay, 2000; Tellegen, in press) in order to broadly capture each FFM domain. High anger (facet of neuroticism similar to FFM angry hostility), low positive emotionality (facet of extraversion similar to FFM positive emotions), low conventionality (facet of conscientiousness similar to dutifulness), and low culture (facet of openness similar to ideas) predicted depressive symptoms after controlling for baseline levels of depression. Findings suggest that personality facets at baseline may influence to the prognosis and course of MDD.

**Personality Change**

Costa et al. (2005) conducted the only investigation to date examining FFM facet-level changes across treatment for MDD. With regard to neuroticism, patients were found to decrease in anxiety, depression, self-consciousness, and vulnerability in response to ADM; for extraversion, patients were found to increase in warmth, assertiveness, and positive emotions in response to ADM; with respect to conscientiousness, patients were found to increase in competence, achievement striving and self-discipline in response to ADM; for agreeableness,
patients were found to decrease in modesty in response to ADM; no facets of openness were found to change following response to ADM.

Although many facets that have changed in response to ADM in Costa et al.’s (2005) investigation were also found to be associated with MDD in cross-sectional investigations (e.g., anxiety [facet of neuroticism], depression [facet of neuroticism], self-consciousness [facet of neuroticism], vulnerability [facet of neuroticism], warmth [facet of extraversion], assertiveness [facet of extraversion], positive emotions [facet of extraversion], and self-discipline [facet of conscientiousness]), some facets that have demonstrated consistent associations with the disorder in cross-sectional investigations were not found to change (e.g., impulsiveness [facet of neuroticism], angry hostility [facet of neuroticism], actions [facet of extraversion]). Furthermore, some facets that have not consistently exhibited cross-sectional relations with MDD were found to change in response to ADM in Costa et al.’s (2005) investigation (e.g., competence [facet of conscientiousness], achievement striving [facet of conscientiousness], and modesty [facet of agreeableness]). This suggests that changes in personality facets in conjunction with MDD are likely due to factors other than state effects.

In light of findings supporting pathoplastic and complication/scar effects at domain- and facet- levels, it is reasonable to question if personality facets that persist or change following treatment are implicated in cycles that maintain MDD following treatment. Given evidence supporting the relative stability of personality across treatment for the disorder (De Fruyt et al., 2006), pre-treatment personality traits may also predict sustained treatment effects.
The Present Study

Study Goal 1

The first goal of the present study is to investigate relative and absolute changes in personality facets in patients receiving either CBT, IPT, or ADM for MDD. In light of research supporting the relative stability of personality (e.g., De Fruyt et al., 2006), it is hypothesized that all facets at pre-treatment will correlate with their respective facets at post-treatment. Given that mean-level changes in personality have been observed across treatments (e.g., Bagby et al., 2008b) and personality measured during the active phases of MDD is conceptualized as partially reflecting trait effects (Costa et al., 2005), it is expected that certain personality facets will change independent of changes in depression severity. It is also expected that certain personality facets will differentially change by treatment type, with each therapeutic modality targeting MDD using different techniques. In this regard, CBT aims to alter dysfunctional cognitions and behaviours (Greenberger & Padesky, 1995), IPT aims to promote a healthy interpersonal environment (Weissman, Markowitz, Klerman, 2000), and ADM aims to alter biological processes associated with MDD (Rothschild, 2012).

Specifically, it is hypothesized that all six facets of neuroticism will decrease across all treatment types, reflecting change in different components of the neuroticism domain. With respect to extraversion, it is hypothesized that positive emotions will increase across all treatment types, reflecting an increased tendency to experience emotions such as joy, happiness, love, and excitement; it is also hypothesized that activity and excitement-seeking will increase across CBT and IPT, as these treatments often aim to foster an active lifestyle (Greenberger & Padesky, 1995; Weissman, 2000). For conscientiousness, it is hypothesized that self-discipline will increase across all treatment types, reflecting an enhanced motivation and capacity to carry out
tasks; it is also hypothesized that competence will increase across psychotherapy (both CBT and IPT), reflecting an improved confidence in one’s capabilities. In terms of agreeableness, it is hypothesized that modesty will decrease across all treatment types, reflecting an improved sense of confidence in oneself; it is also hypothesized that trust will increase across psychotherapy, reflecting an enhanced perception of others’ positive or neutral intentions (resulting from a positive therapeutic relationship). For openness, it is hypothesized that actions and ideas will increase across CBT, as this treatment modality may foster a sense of intellectual curiosity and a willingness to consider novel activities.

Study Goal 2

The second goal of the present study is to examine if changes in personality facets across treatment predict relapse/recurrence of MDD over an 18-month period following treatment (above and beyond post-treatment depression severity). Given that high levels of neuroticism have been found to predict relapse and recurrence of MDD (e.g., Ormel et al., 2004), it is hypothesized that the absence of (or minimal) decreases of all six of its facets will be associated with an increased risk of relapse/recurrence. For extraversion, it is hypothesized that increases in warmth, gregariousness, activity, excitement-seeking, and positive emotions will be associated with a decreased risk of relapse/recurrence by facilitating interpersonal intimacy and accessibility to pleasurable experiences. With respect to conscientiousness, it is hypothesized that increases in competence and achievement striving will be associated with a decreased risk of relapse/recurrence by promoting a sense of self-efficacy and purpose. In terms of agreeableness, it is hypothesized that decreases in modesty will be associated with a decreased risk of relapse/recurrence by promoting an improved confidence in oneself. For openness, it is
hypothesized that increases in actions and ideas will be associated with a decreased risk of relapse/recurrence by promoting an ongoing receptivity to experiential and intellectual learning.

**Study Goal 3**

The third goal of the present study is to extend findings supporting the predictive utility of pre-treatment personality dimensions on treatment response for MDD (e.g., Bagby et al., 2008b, Quilty et al., 2008) by examining the sustained prognostic value of pre-treatment personality facets over an 18-month period following treatment (above and beyond post-treatment depression severity). As such, all facets that are expected to predict relapse/recurrence by way of change across treatment (as described in the second study goal) are hypothesized to predict relapse/recurrence when assessed at pre-treatment. Specifically, with respect to neuroticism, is hypothesized that heightened levels of all six facets will increase risk of relapse/recurrence. For extraversion, it is hypothesized that heightened levels of warmth, gregariousness, activity, excitement-seeking, and positive emotions will reduce risk of a relapse/recurrence. In terms of conscientiousness, it is hypothesized that heightened levels of competence and achievement striving will reduce risk of relapse/recurrence. With respect to agreeableness, it is hypothesized that heightened levels of modesty will reduce the risk of relapse/recurrence. For openness, it is hypothesized that increases in actions and ideas will reduce risk of relapse/recurrence.

**Method**

**Overview**

This study consists of two components or phases – a treatment phase and a follow-up phase. All participants in the follow-up phase required an adequate “dose” treatment resulting in successful remission for each of the three interventions delivered. As not all participants in the
treatment phase received an adequate dose of intervention and not all who did remitted, the characteristics of the participants are reported separately for the treatment and follow-up phase as they “flowed” through the study.

Participants

The sample was composed of 150 outpatients (95 [63.3%] women, 55 [36.6%] men) with a current primary diagnosis of MDD and who had consented to participate in a randomized controlled trial (RCT) conducted at an university-affiliated, tertiary care addiction and mental health hospital in a large, predominantly English-speaking metropolis (population = 5.6 million) in Canada. All participants took part in the trial between July, 2001 and March, 2004. At the treatment phase of the study, a total of 2460 participants were assessed for eligibility; 2251 were excluded at this phase of the trial for various reasons – some ($n = 1252; 56.6\%$) were excluded because they did not meet the eligibility criteria (see study inclusion/exclusion criteria below); others ($n = 534; 23.7\%$) did not agree to participate following the description of the trial provided during the consent process; still others ($n = 306; 13.6\%$) fell out of contact with the study coordinators; and some ($n = 159; 7.1\%$) did not, or otherwise could not participate for other unspecified reasons. The remaining 209 participants were randomized to receive either CBT ($n = 74$), IPT ($n = 65$), or ADM ($n = 70$), with 150 (71.8%) participants completing at least eight weeks of treatment: $n = 38$ [51.4%]) for CBT; $n = 44$ [67.7%] for IPT; $n = 37$ [52.9%] for ADM.

Of the 150 participants who received at least eight weeks of treatment, 92 (34 [37%, men and 58 [63%] women) or a total of 61.3% met criteria for a sustained response (i.e., remission) after treatment and agreed to take part in the follow-up phase of the study. The mean age of the follow-up sample was 41.45 years ($SD = 12.12$). The mean years of education was 16.24 ($SD =$
2.42). The mean Blishen Index score (a standard and valid measure of socio-demographic status for Canada) was 41.21 ($SD = 20.78$), indicating that the sample is best characterized as “middle class” by Canadian standards (Blishen, Carroll, & Moore, 1987). The mean number of previous depressive episodes was 1.81 ($SD = 2.70$).

**Inclusion/Exclusion Criteria**

Participants were eligible for study inclusion if they: (1) met DSM-IV diagnostic criteria for MDD, as determined by the *Structured Clinical Interview for DSM-IV, Axis I Disorders – Patient Version* (SCID-I/P; First, Spitzer, Gibbon, & William, 1995), (2) were between 18-60 years of age, (3) had not taken antidepressant medication for at least four weeks, and (4) were fluent in English, with a minimum of eight years of education. Patients were not eligible for study inclusion if they: (1) met DSM-IV diagnostic criteria for bipolar disorder (past or current), psychotic disorders, substance abuse or dependence disorders (over the past six months), or organic brain syndrome; (2) met DSM-IV criteria for either borderline or antisocial personality disorder as assessed by the *Structured Clinical Interview for DSM-IV-Axis II Personality Disorders* (SCID–II; First, Spitzer, Gibbon, Williams, & Benjamin, 1997); (3) had been administered electroconvulsive therapy over the past six months; or (4) had an active medical illness.

**Measures**

The *SCID-I/P* (First et al., 1995) is a semi-structured interview that can be used to diagnose MDD and other psychiatric disorders based on DSM-IV criteria. The SCID-I/P has demonstrated strong psychometric properties in psychiatric patient samples (including adequate to good interrater reliability, good retest reliability and adequate convergent and discriminant
diagnostic validity; Kranzler, Kadden, Babor, Tennen, Rounsaville, 1996; Zanarini &
Frankenburg, 2001).

The *SCID-II* (First et al., 1997) is designed to assess systemically for the 10 personality
disorder in the DSM-IV. The SCID-II has demonstrated adequate to good psychometric
properties in psychiatric patient samples (including adequate convergent validity and good retest
reliability; Maffei et al., 1997; Skodol, Rosnick, Kellman, Oldham, 1988).

The *Beck Depression Inventory - Second Edition* (BDI-II; Beck, Steer, & Brown, 1996) is
a 21-item self-report measure of depression severity. The items on this instrument are rated on a
4-point scale ranging from 0 to 3, with some items comprising of differently worded “anchors.”
The total score is the sum of item ratings and yielding scores ranging from 0 to 63 (0-13
reflecting “normal” mood; 14-20 reflecting mild depression; 21-30 reflecting moderate
depression; 30-63 reflecting severe depression). The BDI–II has strong psychometric properties
(including excellent internal consistency, test-retest reliability, construct, convergent, and
discriminant validity) in undergraduate student, community, and psychiatric patient samples
(Beck et al., 1996; Whisman, Perez, & Ramel, 2000; Wang & Gorenstein, 2013).

The 17-item *HRSD* (Hamilton, 1967) is an interview-rated measure of depression
severity. This HRSD is the most commonly and frequently used measure of depression in
clinical trials (Bagby, Ryder, Schuller, & Marshall, 2004). This 17-item semi-structured
interview is rated on a 3- or 5-point scale (depending on the item). The total score is the sum of
item ratings, yielding scores ranging from 0 to 52 (0-7 reflecting normal mood; 8-16 reflecting
mild depression; 17-23 reflecting moderate depression; 24-52 reflecting severe depression;
Zimmerman, Martinez, Young, Chelminski, & Dalrymple, 2013). The HRSD has demonstrated
strong psychometric properties (including good internal consistency, retest reliability, content
validity, convergent validity, and discriminant validity) in undergraduate, community, and psychiatric patient samples (Bagby et al., 2004; López-Pina, Sánchez-Meca, & Rosa-Alcázar, 2009).

**Personality**

The revised NEO Personality Inventory (NEO PI-R; Costa & McCrae, 1992) was used to assess the personality facets in the FFM. It is the most widely and frequently used instrument to assess the FFM. Each item on this 240-item self-report measure (8 items for each of the 30 facets) are rated on a 5-point scale ranging from 0 (strongly disagree) to 4 (strongly agree). The total facet score is the sum of item ratings, yielding raw scores ranging from 0 to 32. The NEO PI-R has demonstrated strong psychometric properties, including good-to-excellent internal consistencies, retest reliability, content, convergent, and discriminant validity among undergraduate, community, and clinical samples (Costa & McCrae, 1992; Costa et al., 2005; De Fruyt et al., 2006). In the current sample, coefficient alphas for facets ranged from .54 (dutifulness) to .86 (straightforwardness) at pre-treatment and .51 (dutifulness) to .83 (straightforwardness) at post-treatment; the mean inter-item correlations (MICs) ranged from .13 (post-treatment dutifulness and actions) to .36 (pre-treatment aesthetics and post-treatment anxiety; see Table 3).

**Procedure**

**Participant Recruitment**

Participants were primarily recruited through advertisements in local newspapers. Information about the treatment study was also disseminated to community mental health professionals and general practitioners, who were asked to convey information about the treatment study to their patients. The recruitment process was coordinated via a clinical research
laboratory at the hospital. Participants who contacted the laboratory were informed of the study protocol (including randomization into treatment conditions and the duration of treatment) and were administered a preliminary telephone interview to assess for eligibility criteria. Those who passed the initial screening were asked to attend an in-person screening appointment, where they were administered the SCID–I/P and the SCID–II. Doctoral students in clinical psychology administered the SCID–I/P under the supervision of a licensed clinical psychologist, and were trained to obtain “gold-standard” reliability status concerning diagnoses. Following this, a team meeting involving the doctoral student who administered the interviews and two licensed psychologists took place to determine eligibility (consensus between the two psychologists was required for study entry).

_Treatment Phase_

Participants who were eligible and who provided written consent were then randomly assigned to receive 16 weeks of CBT, IPT, or ADM. No significant differences were found between patients in each treatment condition at pre-treatment for the sample’s demographic and clinical characteristics (all \( ps > .19 \); see Table 2). For patients assigned to a psychotherapy condition, treatment was extended to a maximum of 20 sessions if patients did not respond by the 16\(^{th}\) week. Patients in each treatment condition who were retained in the present study did not significantly differ in the amount of weeks for which they remained in treatment (for CBT: \( M = 15.75, SD = 3.35 \); for IPT: \( M = 16.48, SD = 2.45 \); for ADM: \( M = 15.82, SD = 1.21 \)). The BDI-II, the HRSD, and the NEO PI-R were administered at intake and within one week of the final treatment consultation.

Cognitive-behavioural therapy was based on Greenberger and Padesky’s (1995)
manual, IPT was based on Weissman et al.’s (2000) manual, and ADM was based on the Canadian Network for Mood and Anxiety Treatment guidelines (Kennedy & Lam, 2001). The medication provided consisted of one or more of several medications and dosages—bupropion (100–450 mg), citalopram (20–300 mg), fluoxetine (20–60 mg), paroxetine (20–40 mg), phenelizine (60–90 mg), venlafaxine (37.5–150 mg), or sertraline (50–200 mg). Patients in the ADM condition consulted with a psychiatrist every two weeks, who monitored their symptoms and adjusted medication as needed.

All therapists administering CBT and IPT were found to be adherent to their respective treatment protocols, as assessed by a Ph.D.-level psychologist who used the Study Psychotherapy Rating Scale (Hollon et al., 1988) to evaluate treatment fidelity in each session. In the CBT condition, 8 different therapists administered treatment (1 Ph.D.-level clinical psychologist and 7 graduate trainees in clinical psychology), in the IPT condition, 11 different therapists administered treatment (3 medical doctors, 2 social workers, 3 graduate trainees in clinical psychology, and 3 graduate trainees in disciplines other than clinical psychology), and in the ADM condition, 4 different psychiatrists managed medication (all with experience treating patients with MDD). Within the CBT condition, post-treatment BDI-II scores did not significantly differ by treatment provider after controlling for pre-treatment BDI-II scores. Within the IPT and ADM conditions, however, post-treatment BDI-II scores significantly differed by treatment provider after controlling for pre-treatment BDI-II scores [for IPT: $F(10, 42) = 2.31, p = .03$, partial $\eta^2 = .35$; for ADM: $F(3, 39) = 12.55, p < .01$, partial $\eta^2 = .49$]. Such findings are likely accounted for by high discrepancies in the number of patients that each health care practitioner treated. For IPT, 1 therapist treated 26 patients, 1 therapist treated 11 patients, 3 therapists treated 3 patients, 2 therapists treated 2 patients, and 4 therapists treated 1 patient. For
ADM, 1 psychiatrist treated 26 patients, 1 psychiatrist treated 14 patients, 1 psychiatrist treated 3 patients, and 1 psychiatrist treated 1 patient.

**Follow-up Phase**

Patients who exhibited a sustained response to treatment were recruited to participate in the follow-up phase of the study. Based on current standards (e.g., Frank et al., 1991; Rush et al., 2006), treatment response was considered to occur when (1) patients experienced $\geq 50\%$ reduction in HRSD scores from pre- to post- treatment, (2) patients’ post-treatment HRSD scores were $< 8$, and (3) patients’ post-treatment HRSD scores $< 8$ were maintained for $\geq 3$ weeks.

The follow-up phase did not include any further psychotherapy, although patients in the ADM condition were free to continue their medication regimen if they chose to do so. The 92 patients who agreed to take part in this phase were administered the HRSD on a weekly basis via telephone for a maximum of 72 weeks following the treatment phase. If HRSD scores were indicative of a relapse (i.e., a score $> 8$ occurring during the 4 month period from the start of the follow-up phase) or a recurrence (i.e., a score $> 8$ occurring 4 months after the start of the follow-up phase), patients discontinued study participation. A total of 21 patients experienced a relapse/recurrence over the follow up phase. The mean time to relapse/recurrence for patients in was 56.53 weeks ($SD = 14.31$), with a minimum number of weeks to relapse/recurrence of 5 and a maximum number of weeks to relapse/recurrence of 62. In Table 2 the demographic and clinical descriptives are displayed separately for the group of patients who experienced a relapse/recurrence and the group of patients who did not. No significant differences for any pre-treatment demographic or clinical characteristics were found between patients who experienced a relapse/recurrence and patients who did not (all $ps > .07$).
Treatment of Missing Data

In the treatment phase sample, a total of 5.55% of observations were missing, with 31/150 (20.67%) patients who completed at least eight weeks of treatment containing missing observations. Eight weeks was selected (DeRubeis et al., 2005) as this is consistent with previous investigations of the role of personality in treatment outcomes for MDD (Vittengl, Clark, Thase, & Jarrett, 2013). Missing HRSD data in the follow-up period was expected in all patients following a relapse/recurrence. No observations were missing from pre-treatment BDI-II scores, 2.67% of observations were missing from pre-treatment NEO PI-R scores, .67% of observations were missing from post-treatment BDI-II scores, and 18.0% of observations were missing from post-treatment NEO-PI-R scores. The data was not found to be missing completely at random \(\chi^2(9) = 21.00, p = .03\). Because excluding patients with missing values would therefore likely bias results and reduce statistical power, a multiple imputation procedure was used when analyzing treatment phase data. In accordance with imputation guidelines (e.g., Schafer & Graham, 2002), 10 datasets were imputed via the automatic method using IBM SPSS Statistics version 20 software (IBM SPSS, 2013).

Results

Study Goal 1: Personality Stability and Change across Treatment

To address the first study goal, correlations between facets at pre- and post- treatment across treatment conditions were calculated. All facets at pre-treatment were significantly correlated with their respective facet at post-treatment (see Table 3 for means, standard deviations, reliability estimates, correlations, and difference scores of facets at pre- and post-treatment). Repeated measures analyses of covariance (ANCOVAs) were conducted separately for each personality facet controlling for BDI-II pre-treatment scores. Personality facets served
as the dependent variable, and treatment condition served as the independent variable. These analyses computed a main effect of time (indicating whether the facet changed over the course of treatment beyond changes in depression) and an interaction with treatment group (indicating whether changes in the facet differed across treatment condition).

Results for ANCOVAs are presented in Table 4. As outlined by Field (2013) and Pallant (2007), large effects were defined by a partial $\eta^2 \geq .14$, medium effects were defined by a partial $\eta^2 \geq .06$ and < .14, and small effects were defined by a partial $\eta^2 < .06$. For neuroticism, main effects were large for decreases in Angry Hostility [$F(1, 147) = 49.67, p < .01, partial \eta^2 = .25$] and Vulnerability [$F(1, 147) = 54.54, p < .01, partial \eta^2 = .27$], main effects were medium for decreases in Impulsiveness [$F(1, 147) = 14.08, p < .01, partial \eta^2 = .09$], and main effects were small for decreases in Depression [$F(1, 147) = 5.53 , p = .02, partial \eta^2 = .04$] and Self-consciousness [$F(1, 147) = 7.09, p < .01, partial \eta^2 = .05$]. Two medium effects were observed for time x treatment type interactions [Depression: $F = 4.35(2, 147), p = .02, partial \eta^2 = .06$; Impulsiveness: $F(2, 147) = 5.00, p < .01, partial \eta^2 = .06$], and one small effect was observed for a time x treatment type interaction [Angry Hostility: $F = 3.26 (2, 147), p = .04, partial \eta^2 = .04$].

Independent samples $t$-tests were conducted to delineate significant facet x treatment type interactions. All follow-up $t$-tests were conducted without controlling for depression severity in order to preserve the ecological validity of personality constructs. Patients receiving ADM demonstrated greater decreases in Impulsiveness compared to patients receiving CBT or IPT ($t = 2.16, p = .03, d = .42$). No significant between group differences were observed for Depression or Angry Hostility. As exhibited in Figures 1, 2, and 3, paired samples $t$-tests indicated that Depression significantly decreased in patients receiving CBT ($t = 4.65, p < .01, d = .66$), IPT ($t = 5.78, p < .01, d = .93$), and ADM ($t = 4.83, p < .01, d = .79$). Impulsiveness significantly
decreased in patients receiving ADM \((t = 3.33, p < .01, d = .27)\), and Angry Hostility significantly decreased in patients receiving CBT \((t = 2.98, p < .01, d = .35)\) and IPT \((t = 2.53, p = .02, d = .33)\).

For extraversion, main effects were large for increases in Gregariousness \([F (1, 147) = 53.85, p < .01, \text{partial } \eta^2 = .27]\), Assertiveness \([F (1, 147) = 92.23, p < .01, \text{partial } \eta^2 = .39]\), Activity \([F (1, 147) = 66.03, p < .01, \text{partial } \eta^2 = .31]\), Excitement-seeking \([F (1, 147) = 5.34, p < .01, \text{partial } \eta^2 = .26]\), and Positive Emotions \([F (1, 147) = 49.74, p < .01, \text{partial } \eta^2 = .25]\). One small effect was observed for a time x treatment type interaction [Excitement-seeking: \(F = 3.21 (2, 147), p = .04, \text{partial } \eta^2 = .04\)]. Independent samples t-tests indicated that patients receiving IPT demonstrated greater increases in Excitement-seeking compared to patients receiving ADM \((t = 2.04, p = .04, d = .28)\). As exhibited in Figure 4, paired samples t-tests indicated that Excitement-seeking significantly decreased in patients receiving IPT \((t = 2.41, p = .02, d = .25)\).

For conscientiousness, main effects were large for increases in Order \([F (1, 147) = 47.61, p < .01, \text{partial } \eta^2 = .25]\), Achievement Striving \([F (1, 147) = 46.98, p < .01, \text{partial } \eta^2 = .24]\), Self-discipline \([F (1, 147) = 61.87, p < .01, \text{partial } \eta^2 = .30]\), and Deliberation \([F (1, 147) = 32.73, p < .01, \text{partial } \eta^2 = .18]\). The main effect was medium for increases in Competence \([F (1, 147) = 9.35, p < .01, \text{partial } \eta^2 = .06]\).

For agreeableness, main effects were medium for increases in Trust \([F (1, 147) = 12.49, p < .01, \text{partial } \eta^2 = .08]\) and Compliance \([F (1, 147) = 16.29, p < .01, \text{partial } \eta^2 = .10]\), and main effects were small for increases in Altruism \([F (1, 147) = 4.68, p = .03, \text{partial } \eta^2 = .03]\). Two small effects were observed for time x treatment type interactions [Trust: \(F = 3.19 (2, 147), p = .04, \text{partial } \eta^2 = .04\); Modesty: \(F = 4.10 (2, 147), p = .02, \text{partial } \eta^2 = .05\)]. Independent samples t-tests were conducted to delineate significant time x treatment type interactions. No significant
between group differences were observed for Trust or Modesty. As exhibited in Figures 5 and 6, paired samples t-tests indicated that Trust significantly increased in patients receiving CBT ($t = 3.22, p < .01, d = .32$) and IPT ($t = 3.07, p < .01, d = .28$; see Figure 5) and Modesty significantly increased in patients receiving CBT ($t = 2.43, p = .02, d = .24$).

For openness, main effects were large for increases in Actions [$F (1, 147) = 35.08, p < .01$, partial $\eta^2 = .19$], main effects were medium for increases in Values [$F (1, 147) = 1.21, p < .01$, partial $\eta^2 = .07$], and main effects were small for increases in Fantasy [$F (1, 147) = 7.32, p < .01$, partial $\eta^2 = .05$] and Aesthetics [$F (1, 147) = 5.30, p < .01$, partial $\eta^2 = .04$]. A small effect was observed for time x treatment type interaction [Values: $F = 3.91 (2, 147), p = .02$, partial $\eta^2 = .05$]. Independent samples $t$-tests were conducted to delineate the significant facet x treatment type interactions. No significant between group differences were observed for Values. As exhibited in Figure 7, paired samples $t$-tests indicated that Values significantly increased in patients receiving CBT ($t = 2.01, p = .05, d = .25$).

**Study Goal 2: The Predictive Utility of Personality Change Over 18-Month Follow-up**

There were no differences in relapse/recurrence rates across CBT ($n = 4/28, 14.29\%$), IPT ($n = 11/34, 32.35\%$), or ADM ($n = 6/30, 20.00\%$; $\chi^2 (2) = 3.05, p = .22$). Because such rates did not significantly differ by treatment condition, study goal 2 was tested by conducting Cox regression survival analyses predicting time to relapse/recurrence from residualized change facet scores, with analyses collapsed across treatment conditions. Residualized change scores were utilized as they describe the direction and magnitude of change while ensuring that changes are not accounted for by heightened baseline values (Robins, Fraley, & Krueger, 2009). After controlling for BDI-II scores, three models were significant. The first [$\chi^2 (1, N = 80) = 4.12, p = .05$] pertained to gregariousness (facet of extraversion), with the estimate for the hazard ratio
indicating that patients who demonstrated increases in Gregariousness were .61 times less at risk of experiencing a relapse/recurrence than those who did not (95% CI [.37, 1.00]). The second \( \chi^2 (1, N = 80) = 8.85, p < .01 \) pertained to Dutifulness (facet of conscientiousness), with the estimate for the hazard ratio indicating that patients who demonstrated increases in Dutifulness were 1.74 times more at risk of experiencing a relapse/recurrence than those who did not (95% CI [1.22, 2.49]). The third \( \chi^2 (1, N = 80) = 3.94, p = .05 \) pertained to Fantasy (facet of openness), with the estimate for the hazard ratio indicating that patients who demonstrated increases in Fantasy were .67 times less at risk of experiencing a relapse/recurrence than those who did not (95% CI [.45, .99]). Such effects are considered to be small in magnitude by current standards (Chen, Cohen, & Chen, 2010).

**Study Goal 3: The Predictive Utility of Pre-Treatment Personality Traits Over 18-Month Follow-up**

Study goal 3 was tested by conducting Cox regression survival analyses predicting time to relapse/recurrence from pre-treatment facet scores, with analyses collapsed across treatment conditions. After controlling for BDI-II scores, two models were significant. The first \( \chi^2 (1, N = 92) = 4.46, p = .04 \) pertained to Straightforwardness (facet of agreeableness), with the estimate for the hazard ratio indicating that patients with heightened levels of Straightforwardness were 1.12 times more at risk of experiencing a relapse/recurrence than those without (95% CI [1.01, 1.25]). The second \( \chi^2 (1, N = 92) = 6.89, p < .01 \) pertained to Aesthetics (facet of openness), with the estimate for the hazard ratio indicating that patients with heightened levels of Aesthetics were 1.11 times more at risk of experiencing a relapse/recurrence than those without (95% CI [1.02, 1.21]). Such effects are considered to be small in magnitude by current standards (Chen et al., 2010).
Discussion

Summary of Findings

The present study investigated (1) absolute and relative stability of FFM personality traits across three treatments for MDD (CBT, IPT, and ADM), (2) the effect of personality changes on relapse/recurrence following treatment, (3) and the effect of pre-treatment personality traits on relapse/recurrence following treatment. Findings indicated that all pre-treatment facets correlated with their respective facets at post-treatment. Personality facets spanning the five domains were also found to change across treatment independent of depression severity, with certain facets found to change differentially by treatment type. Specifically, five neuroticism facets decreased (angry hostility, depression, self-consciousness, impulsiveness and vulnerability), five extraversion facets increased (gregariousness, assertiveness, activity, excitement-seeking, and positive emotions), five conscientiousness facets increased (competence, order, achievement striving, self-discipline, and deliberation), three agreeableness facets increased (trust, altruism, and compliance), and four openness facets increased (fantasy, aesthetics, actions, and values) across all treatments. In addition, three neuroticism facets (angry hostility, depression, and impulsiveness), one extraversion facet (excitement-seeking), two agreeableness facets (trust and modesty) and one openness facet (values) differentially changed by treatment type. Personality changes and pre-treatment personality traits were also found to predict risk of relapse/recurrence after controlling for the influence of post-treatment depression severity. Specifically, increases in gregariousness and fantasy were associated with an increased risk for relapse/recurrence, and increases in dutifulness were associated with a reduced risk for relapse/recurrence. Further, heightened levels of pre-treatment straightforwardness and aesthetics were associated with an increased risk of relapse/recurrence. Findings support the relative stability as well as absolute
change of personality across treatments, indicating that both components of personality have pathoplastic effects.

**Study Goal 1: Personality Stability and Change across Treatment**

*Relative-Stability Across Treatments*

It was hypothesized that all facets at pre-treatment would correlate with their respective facets at post-treatment. This hypothesis was supported, validating the relative stability of personality across treatments for MDD (e.g., De Fruyt et al. 2006). Given that treatment contexts have been described as reflecting circumstances most likely to yield personality change (Piedmont, 1998), such findings support views suggesting that a component of personality variance remains stable over time (Zinbarg et al., 2008).

*Absolute Change Across Treatments*

**Neuroticism**

It was hypothesized that all six facets of neuroticism would decrease across treatments. This hypothesis was largely supported, with five of the six neuroticism facets decreasing significantly across treatments (large effects found for decreases in angry hostility and vulnerability, medium effects found for decreases in impulsiveness, and small effects found for decreases in depression). Findings are generally in line with research indicating that neuroticism changes in conjunction with MDD (e.g., Karsten et al., 2012; Bagby et al., 1995; Costa et al., 2005; Du et al., 2002; De Fruyt et al., 2006; Quity et al., 2008; Santor et al., 1997; Tang et al., 2009; Weber et al., 2012), but differ from Costa et al.’s (2005) investigation which found facet anxiety to decrease following successful ADM. Treating MDD appears to improve a number of specific features of neuroticism, with facet anxiety possibly more resistant to change without direct targeting in treatment. It is also possible that anxiety did not show to change across
treatment because of minimal variance of this facet at pre-treatment (in light of high levels of co-occurrence between anxiety and depression; e.g., Barlow, Allen, Choate, 2004). In this regard, the mean T-score \((M = 62.39, SD = 9.99)\) of this facet in the present investigation was higher than that observed in the normative sample (by definition, \(M = 50, SD = 10\)), but comparable to mean neuroticism T-scores in psychiatric patient samples (e.g., \(M = 65.87; SD =14.72\); Bagby et al., 1999).

In addition, impulsiveness, angry hostility, and depression were found to differentially change by treatment type (effects were medium for impulsiveness and depression and small for angry hostility). Specifically, patients receiving ADM demonstrated greater decreases in impulsiveness compared to patients receiving CBT or IPT. This finding is in line with research indicating that ADM directly targets neurobiological mechanisms associated with impulsiveness (Prado-Lima, 2009), but differ from Costa et al. (2005) who did not find impulsiveness to change across ADM. This discrepancy may be due to the fact that medications differed across study designs, with some medications administered in the present study not administered in Costa’s et al.’s (2005) investigation (e.g., Citalopram), and vice versa (e.g., Desipramine, Moclobemide, and Nefazodone).

Angry hostility was found to significantly decrease in patients receiving CBT and IPT, but not in patients receiving ADM. This finding is consistent with Costa et al. (2005), who did not find angry hostility to change across ADM. It may be that psychotherapy skill development has the capacity to impact neuroticism facets. Specifically, CBT may challenge cognitive distortions underlying anger (e.g., perceptions of injustice; Greenberger & Padesky, 1995) and IPT may promote tempered and effective communication skills (Weissman et al., 2000). It is of note that facet depression was found to significantly decrease following all three treatment types.
This finding, however, was observed when marginal means (controlling for depression severity) were taken into account. In light of research demonstrating content overlap between state and facet depression (e.g., Uliaszek et al., 2009), this finding may reflect a statistical artifact due to the inclusion of state depression as a covariate in analyses.

**Extraversion**

It was hypothesized that positive emotions would increase across all treatment types, and activity and excitement-seeking would increase across CBT. This hypothesis was partially supported. Gregariousness, assertiveness, activity, excitement-seeking, and positive emotions increased across all treatment types (effects were large for all facets). These findings are generally consistent with research indicating that extraversion changes in conjunction with MDD (e.g., Karsten et al., 2012; Bagby et al., 1995; Costa et al., 2005; Du et al., 2002; De Fruyt et al., 2006; Quity et al., 2008; Santor et al., 1997; Tang et al., 2009). It is possible that treating MDD may indirectly serve to increase dispositional features of sociability and sensation seeking, in addition to positive emotions. Further, excitement-seeking showed to differentially change by treatment type (effect was small), with patients receiving IPT demonstrating greater increases in excitement-seeking compared to patients receiving ADM. Although in need of further exploration, patients treated with IPT may gain an enhanced sense of social activation by increasing their satisfaction from interpersonal exchanges.

**Conscientiousness**

It was hypothesized that self-discipline would increase across all treatment types, and competence would increase across both CBT and IPT. This hypothesis was partially supported. Competence, order, achievement striving, self-discipline, and deliberation increased across all treatment types (effect sizes were large for order, achievement striving, self-discipline, and
deliberation and medium for competence). Findings are generally in line with research indicating that conscientiousness changes in conjunction with MDD (Costa et al., 2005; De Fruyt et al., 2006; Karsten et al., 2012, Quilty et al., 2008). One explanation for this finding is that treating MDD may have the effect of increasing a dispositional capacity to carry out tasks and to actively control impulses.

**Agreeableness**

It was hypothesized that modesty would decrease across all treatment types, and trust would increase across CBT and IPT. This hypothesis was largely supported. Modesty showed to differentially change by treatment type (effect was small), with this facet significantly decreasing in patients receiving CBT, but not in patients receiving IPT or ADM. Findings counter Costa et al. (2005), who found modesty to decrease across ADM. Given that NEO PI-R modesty items appear to reflect low self-esteem ("I have a very high opinion of myself", reverse scored), it may be that CBT techniques (e.g., cognitive restructuring and behavioural experiments) serve to promote a balanced opinion of the self (Greenberger & Padesky, 1995).

In addition, trust, altruism, and compliance decreased across all treatment types (effects were medium for trust and compliance and small for altruism). Findings are generally in line with research indicating that agreeableness increases across treatment for MDD (De Fruyt et al., 2006; Quilty et al., 2008). Treating MDD may have the effect of enhancing a tendency to cooperate and empathize with others. As hypothesized, trust also significantly increased in patients receiving CBT and IPT, but not in patients receiving ADM. Although further exploration is needed, findings may support perspectives suggesting that aspects of the therapeutic relationship operate to repair primary attachment styles (Bowlby, 1977; Daniel, 2006).
Openness

It was hypothesized that ideas would increase across CBT. This hypothesis was not supported. Instead, fantasy, aesthetics, actions, and values increased across all treatment types (effects were large for actions, medium for values, and small for fantasy and aesthetics). Findings are generally in line with research indicating that openness increases across treatment for MDD (Costa et al., 2005; De Fruyt et al., 2006; Quilty et al., 2008). Treating MDD may have the effect of promoting a dispositional flexibility towards activities, beliefs, and emotions, rather than promoting an intellectual curiosity. It is of note that previous research has found that patients in RCTs exhibit heightened pre-treatment levels of actions compared to patients receiving treatment in clinics (Kushner, Quilty, McBride, & Bagby, 2009). In light of such discrepancies, further research is needed supporting the generalizability of findings concerning this facet to clinical settings.

In addition, values showed to differentially change by treatment type (effect was small), with this trait significantly increasing in patients receiving CBT, but not in patients receiving IPT or ADM. One explanation for this is that CBT may serve to promote an open-minded attitude towards social, political, and religious beliefs by targeting “black and white” thinking styles (Greenberger & Padesky, 1995).

Additional Considerations

It is of note that depression severity was not controlled for in our descriptive account of raw difference scores and in analyses conducted to follow up on significant time x treatment type interactions. As such, the directionality of change observed in raw-difference scores differed from that observed in ANCOVAs for certain facets (e.g., for order, deliberation, and fantasy).
It was decided, however, to conduct follow-up *t*-tests using raw difference scores instead of using marginal mean difference scores in order to preserve the unconfounded nature of personality constructs (for enhanced utility of findings beyond the present investigation). In addition, follow-up *t*-tests for significant time x treatment type interactions did not demonstrate significant differences in personality change between treatment groups for all facets (e.g., significant between treatment group differences were not found for angry hostility, trust, modesty, or values). With that said, within treatment group *t*-tests served to explain significant time x treatment type interactions for all facets, with the exception of facet depression. Discrepancies between follow-up *t*-tests and ANCOVAs may be accounted for by a reduction of power in *t*-tests (e.g., Borm, Fransen, Lemmens, & 2007) in addition to the discrepant influence of depression severity.

Taken together, findings addressing the first study goal support both the stability and differential change of personality facets across treatment, possibly suggesting that treating MDD serves to alter patients’ personalities within the confines of a limited range (e.g., Piedmont, 1998). As such, findings suggest that a patient who enters treatment for MDD with low levels of gregariousness is likely to experience increases in their levels of gregariousness following treatment (in support of absolute change). However, this patient is likely to exhibit lower levels of gregariousness following treatment compared to a patient who entered treatment with higher levels of gregariousness (in support of relative stability).

**Study Goal 2: The Predictive Utility of Personality Change Over 18-Month Follow-up**

It was hypothesized that changes in personality facets across treatment would predict relapse/recurrence in the 18-month follow-up phase. Specifically, the absence of (or minimal) decreases of all six neuroticism facets were expected to predict an increased risk of
relapse/recurrence, increases in five extraversion facets (warmth, gregariousness, activity, excitement-seeking, and positive emotions) were expected predict a decreased risk of relapse/recurrence, increases in two conscientiousness facets (competence and achievement striving) were expected predict a decreased risk of relapse/recurrence, decreases in one agreeableness facet (modesty) was expected to predict a decreased risk of relapse/recurrence, and increases in two openness facets (actions and ideas) were expected to predict a decreased risk relapse/recurrence. Hypotheses were minimally supported, with changes in a total of three facets found to predict risk of relapse/recurrence above and beyond depression severity (effects were small for all relationships): gregariousness, dutifulness, and fantasy.

Specifically, patients who increased in gregariousness across treatment were found to have a reduced risk of experiencing a relapse/recurrence in the follow-up phase. Gregariousness reflects a tendency to enjoy spending time with others and to actively pursue social stimulation (Costa & McCrae, 1992). This finding therefore supports and extends Bagby et al.’s (1995) results by suggesting that depressed patients who successfully develop an appreciation for the company of others over the course of treatment are likely to experience prolonged treatment effects. This finding also appears to be line with research demonstrating the protective influence of social support in individuals with MDD (Lin, Dean, & Ensel, 2013).

Patients who increased in dutifulness across treatment were found to have a reduced risk of experiencing a relapse/recurrence in the follow-up phase. Dutifulness reflects a strict and careful adherence to one’s obligations and principals (Costa & McCrae, 1992). As such, it may approximate perfectionism, which involves a rigid, relentless, and counter-productive form of over-striving (Hewitt, & Flett, 1991). This finding appears to therefore be consistent with a body of literature indicating that perfectionism serves as a negative short- and long-term prognostic
indicator for patients receiving treatment for MDD (e.g., Blatt, Zuroff, Hawley, Auerbach, 2010; Enns, Cox, & Pidlubny, 2002).

Patients who increased in fantasy across treatment were found to have a reduced risk of experiencing a relapse/recurrence in the follow-up phase. Individuals high on fantasy tend to enjoy imagining and to have a rich inner world (Costa & McCrae, 1992). As such, it appears to approximate self-reflection, which is a form of self-focussed attention that is driven by an epistemic curiosity in the self (Takano & Tanno, 2009). Self-reflection has been found to have both adaptive and maladaptive effects on psychological functioning. In the absence of negative emotions, it is commonly associated increases in self-awareness, problem solving, and the promotion of psychological functioning. In the context of depression, however, it has been associated with self-rumination and negative outcomes (see Watkins, 2008 for a review). As such, it is particularly noteworthy that depression severity at post-treatment was controlled for in analyses. Consistent with the reflection literature, the present investigation suggests that an inclination to introspect serves as a positive prognostic indicator following treatment for MDD in the absence of depressive symptoms.

Although precise hypotheses were minimally supported for the second study goal, findings suggest that personality changes in the context of treatment predict relapse/recurrence of MDD. Given that gregariousness and fantasy have been found to increase across treatment (as assessed by the first study goal), such increases may serve to protect against relapse/recurrence following treatment. With dutifulness not having been found to significantly change across treatment for MDD, decreasing (or minimizing increases) in dutifulness across treatment may have the effect of improving long-term treatment outcomes.
Study Goal 3: The Predictive Utility of Pre-Treatment Personality Traits Over 18-Month Follow-up

All personality facets that were expected to predict relapse/recurrence by way of change across treatment were also hypothesized to predict relapse/recurrence when considered at pre-treatment. Such hypotheses were minimally supported, with changes in a total of two facets found to predict risk of relapse/recurrence above and beyond depression severity (effects were small for all relationships): straightforwardness and aesthetics. Such findings extend the personality and treatment outcome literature (e.g., Bagby et al., 2008b, Quilty et al., 2008) by suggesting that pre-treatment personality may have long-term prognostic influence.

Specifically, heightened levels of straightforwardness at pre-treatment were found to predict risk of relapse/recurrence in the follow-up phase. Straightforwardness reflects a tendency to be sincere and ingenuous, with individuals low in this trait described as having manipulative tendencies (Costa & McCrae, 1992). Although labelled “straightforwardness”, this facet appears to more fittingly reflect a construct denoting naiveté vs. shrewdness. In this regard, seven of the eight items in the scale reflect a tendency to trick or deceive others (e.g., “if necessary, I am willing to manipulate people to get what I want”, reverse scored; Costa & McCrae, 1992). As such, it may be that individuals high in this trait are emotionally reactive to negative life events due to their credulous nature.

Heightened levels of aesthetics at pre-treatment were also found to predict risk of relapse/recurrence in the follow-up phase. Aesthetics reflects a sensitivity to art and beauty, with individuals high in this trait described as likely to be moved by poetry, captivated by music, and affected by art (Costa & McCrae, 1992). This finding may appear inconsistent with Bagby et al. (2008b), who found that heightened levels of aesthetics predicted increased responsiveness to
both CBT and ADM. It is possible, however, that this trait may reflect an inherent tendency to attach emotional valance to experiences, perhaps denoting a vulnerability towards negative mood states over time (Desseilles, Chang, Piguet, Bertschy, Dayer, 2012).

**Limitations and Strengths**

The current results should be interpreted in the context of the following limitations. The first limitation is that I did not control for multiple comparisons. Given the preliminary nature of the investigation, our analyses were designed with the intention of minimizing Type II error (i.e., the error of accepting a null hypothesis that is false) at the expense of Type I error (i.e., the error of rejecting a null hypothesis that is true). Second, in light of the many analyses conducted, the sample size, and the anticipation of small effects, the current investigation may have lacked sufficient power to detect effects. Third, a relatively low frequency of patients experienced a relapse/recurrence following treatment (30%), which may not have allowed for sufficient power in follow-up analyses. Fourth, the patient sample in the current investigation may have been biased by attrition due to the fact that 43% of patients who met eligibility criteria did not participate in the treatment phase of the investigation. Fifth, it is questionable to what extent findings are generalizable to real-world patients who may not have met inclusion/exclusion criteria. Sixth, given that the study design did not include a control group, it cannot be guaranteed that facet-level changes across treatments were a function of the interventions, as opposed to a function of life events over time. In this regard, personality changes have been found to occur over time following career and relationship changes (e.g., Scollon & Diener, 2006). Finally, our investigation relied on a single measure of universal personality traits. Although many facets of the NEO PI-R are regarded as maladaptive at their extreme ends (e.g., angry/hostility, positive emotionality; Costa & McCrae, 1992), a measure designed to capture the
full range of pathological personality facets (e.g., the Personality Inventory for DSM-5; Krueger, Derringer, Markon, Watson, & Skodol, 2012) or the use of multiple measures of personality (e.g., Naragon-Gainey & Watson, 2014) may have been optimal for our purposes. In light of aforementioned limitations, replication of results is necessary.

Methodological Strengths of the present investigation include: (1) the use of a clinical sample that was randomly assigned to receive a range of empirically supported treatments for MDD; (2) a multi-method approach to the assessment of depression (including interviews and self-reports), and (3) the assessment of personality at the facet-level (Paunonen & Ashton, 2001).

**Future Directions**

It was beyond the scope of the current study to explore the causal basis of personality changes across treatment. There are likely two potential explanations for observed changes in personality: (1) reductions of MDD symptoms may have caused changes in personality following treatment; (2) features of treatment may have caused changes in personality. Delineating mechanisms of personality change and their effects on relapse/recurrence remains an important area of future research.

**Conclusions**

Results support the relative stability and absolute change of personality facets across treatments, indicating that both components of personality predict relapse/recurrence. Findings are consistent with the complication/scar model by indicating that personality traits change in conjunction with MDD; findings are also consistent with the pathoplasty model by suggesting that pre-treatment personality traits predict the course of MDD following treatment. Further, with changes in personality traits found to predict relapse/recurrence, findings suggest that complication/scar effects likely also have pathoplastic effects. It is hoped that findings have shed
light unto the complex interplay between personality and psychopathology in the context of treatment for MDD, and encourage therapists to broaden desired treatment goals to include changes in personality facets.
References


Table 1. Summary of the Personality Depression Relationship in the Literature. Blank Boxes Indicate No Research or Null Findings.

<table>
<thead>
<tr>
<th>Cross-sectional Associations of the personality-depression relationship</th>
<th>Personality in the prediction of treatment outcomes for depression across treatment types</th>
<th>Personality in the prediction of the course of depression</th>
<th>Personality change in conjunction with depression</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Domains</strong></td>
<td>Positively associated with neuroticism</td>
<td>Positively associated neuroticism</td>
<td>Positively associated neuroticism</td>
</tr>
<tr>
<td></td>
<td>Negatively associated with extraversion</td>
<td>Negatively associated with extraversion</td>
<td>Negatively associated with extraversion</td>
</tr>
<tr>
<td></td>
<td>Negatively associated with conscientiousness</td>
<td>Negatively associated with conscientiousness</td>
<td>Negatively associated with conscientiousness</td>
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<tr>
<td><strong>Facets of neuroticism</strong></td>
<td>Positively associated with anxiety</td>
<td>Positively associated with anxiety</td>
<td>Positively associated with anger (facet of neuroticism similar to FFM angry hostility)</td>
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<td></td>
<td>Positively associated with angry hostility</td>
<td>Positively associated with angry hostility</td>
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</tr>
<tr>
<td></td>
<td>Positively associated with depression</td>
<td>Positively associated with depression</td>
<td></td>
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<tr>
<td></td>
<td>Positively associated with self-consciousness</td>
<td>Positively associated with self-consciousness</td>
<td></td>
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<tr>
<td></td>
<td>Positively associated with impulsiveness</td>
<td>Positively associated with impulsiveness</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Positively associated with vulnerability</td>
<td>Positively associated with vulnerability</td>
<td></td>
</tr>
</tbody>
</table>
| Facets of extraversion | • Negatively associated with positive emotions  
• Negatively associated with assertiveness  
• Negatively associated with warmth  
• Negatively associated with gregariousness  
• Negatively associated with positive emotionality (facet of extraversion similar to FFM positive emotions)  
• Negatively associated with changes in warmth  
• Negatively associated with changes in assertiveness  
| Facets of conscientiousness | • Negatively associated with self-discipline  
• Negatively associated with conventionality (facet of conscientiousness similar to dutifulness)  
• Negatively associated with changes in competence  
• Negatively associated with changes in achievement striving  
• Negatively associated with changes in self-discipline  
| Facets of agreeableness | • Negatively associated with actions  
• Positively associated with changes in modesty  
| Facets of openness | • Negatively associated with fantasy  
• Negatively associated with aesthetics  
• Negatively associated with actions  
• Negatively associated with values  
• Negatively associated with culture (facet of openness similar to ideas)
Table 2
Demographic and Clinical Characteristics by Treatment Type and Relapse/Recurrence Status

<table>
<thead>
<tr>
<th>Variable</th>
<th>Treatment phase (n = 150)</th>
<th>Follow-up phase (n = 92)</th>
<th>F</th>
<th>t/χ²</th>
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<tr>
<td></td>
<td>CBT (n = 52)</td>
<td>IPT (n = 54)</td>
<td>ADM (n = 44)</td>
<td>No relapse/recurrence (n = 71)</td>
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<tr>
<td>Female sex, n (%)</td>
<td>38 (73.10)</td>
<td>32 (59.26)</td>
<td>25 (56.82)</td>
<td>1.66</td>
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<td>Age, M (SD)</td>
<td>41.46 (11.84)</td>
<td>40.63 (13.04)</td>
<td>42.41 (11.51)</td>
<td>.25</td>
</tr>
<tr>
<td>Years of education, M (SD)</td>
<td>16.29 (2.48)</td>
<td>16.33 (2.32)</td>
<td>16.07 (2.52)</td>
<td>.15</td>
</tr>
<tr>
<td>Blishen index, M (SD)</td>
<td>40.44 (21.29)</td>
<td>41.91 (20.21)</td>
<td>41.23 (21.33)</td>
<td>.06</td>
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<tr>
<td># of previous depressive episodes, M (SD)</td>
<td>1.43 (1.88)</td>
<td>1.82 (2.04)</td>
<td>2.22 (3.93)</td>
<td>.91</td>
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<td>Pre-treatment BDI-II score, M (SD)</td>
<td>28.80 (8.13)</td>
<td>31.63 (8.00)</td>
<td>29.88 (8.06)</td>
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<tr>
<td>Pre-treatment HDRS score, M (SD)</td>
<td>17.94 (3.56)</td>
<td>18.19 (3.93)</td>
<td>17.75 (3.53)</td>
<td>.17</td>
</tr>
</tbody>
</table>
Table 3

Descriptives, Reliability Estimates, Correlations, and Difference Scores of Facets at Pre- and Post-Treatment

<table>
<thead>
<tr>
<th>Facet</th>
<th>Pre-treatment</th>
<th>Post-treatment</th>
<th>r</th>
<th>Difference scorea</th>
</tr>
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<tr>
<td></td>
<td>M (SD)</td>
<td>a</td>
<td>MIC</td>
<td>M (SD)</td>
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<tr>
<td>Neuroticism</td>
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<tr>
<td>Anxiety</td>
<td>21.06 (5.10)</td>
<td>.80</td>
<td>.34</td>
<td>19.03 (5.49)</td>
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<td>Angry Hostility</td>
<td>16.75 (5.09)</td>
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<td>.30</td>
<td>15.73 (4.89)</td>
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<td>.20</td>
<td>19.84 (5.33)</td>
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<td>Self-consciousness</td>
<td>19.96 (4.95)</td>
<td>.71</td>
<td>.23</td>
<td>17.80 (5.10)</td>
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<td>18.49 (5.14)</td>
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<td>.24</td>
<td>17.74 (5.09)</td>
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<td>Vulnerability</td>
<td>17.02 (4.48)</td>
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<td>.23</td>
<td>14.74 (4.71)</td>
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<td>Extraversion</td>
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<tr>
<td>Warmth</td>
<td>18.68 (5.21)</td>
<td>.78</td>
<td>.32</td>
<td>20.07 (5.02)</td>
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<td>Gregariousness</td>
<td>14.66 (5.69)</td>
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<td>15.59 (5.45)</td>
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<td>Assertiveness</td>
<td>13.07 (5.13)</td>
<td>.78</td>
<td>.30</td>
<td>14.36 (5.50)</td>
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<td>Activity</td>
<td>14.51 (4.27)</td>
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<td>.21</td>
<td>15.43 (4.08)</td>
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<td>Excitement-seeking</td>
<td>14.91 (4.75)</td>
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<td>.17</td>
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<td>Competence</td>
<td>17.79 (4.29)</td>
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<td>Order</td>
<td>15.74 (4.79)</td>
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<td>15.72 (4.81)</td>
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<td>.26</td>
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<td>Self-discipline</td>
<td>13.73 (5.39)</td>
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<td>.35</td>
<td>15.37 (5.25)</td>
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<td>16.28 (4.46)</td>
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<td>Agreeableness</td>
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Note. ** p < .01, * p < .05.

a Difference score = post-treatment facet score - pre-treatment facet score.
Table 4
**ANCOVAs Predicting Personality Change across Treatment when Controlling for Depression Severity**

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<thead>
<tr>
<th>Factor</th>
<th>Time</th>
<th>Time × Treatment Condition</th>
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*Note.** $p < .01$, *$p < .05$. Medium and large effects ($\eta^2 \geq .06$) are in boldface.*
Figure 1. Paired samples $t$-tests reflecting differential change in Depression according to treatment condition. Standard errors are represented in the figure by the error bars attached to each column.
Figure 2. Paired samples $t$-tests reflecting differential change in Impulsiveness according to treatment condition. Standard errors are represented in the figure by the error bars attached to each column.
Figure 3. Paired samples $t$-tests reflecting differential change in Angry Hostility according to treatment condition. Standard errors are represented in the figure by the error bars attached to each column.
Figure 4. Paired samples $t$-tests reflecting differential change in Excitement-seeking according to treatment condition. Standard errors are represented in the figure by the error bars attached to each column.
Figure 5. Paired samples $t$-tests reflecting differential change in Trust according to treatment condition. Standard errors are represented in the figure by the error bars attached to each column.
Figure 6. Paired samples *t*-tests reflecting differential change in Modesty according to treatment condition. Standard errors are represented in the figure by the error bars attached to each column.
Figure 7. Paired samples $t$-tests reflecting differential change in Values according to treatment condition. Standard errors are represented in the figure by the error bars attached to each column.