Mechanisms underlying REBT in mood disordered patients: Predicting depression from the hybrid model of learning

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A B S T R A C T

Background: Jackson's (2005, 2008a) hybrid model of learning identifies a number of learning mechanisms that lead to the emergence and maintenance of the balance between rationality and irrationality. We test a general hypothesis that Jackson's model will predict depressive symptoms, such that poor learning is related to depression. We draw comparisons between Jackson's model and Ellis' (2004) Rational Emotive Behavior Therapy and Theory (REBT) and thereby provide a set of testable learning mechanisms potentially underlying REBT.

Methods and results: Results from 80 patients diagnosed with depression completed the learning styles profiler (LSP; Jackson, 2005) and two measures of depression. Results provide support for the proposed model of learning and further evidence that low rationality is a key predictor of depression.

Conclusions: We conclude that the hybrid model of learning has the potential to explain some of the learning and cognitive processes related to the development and maintenance of irrational beliefs and depression.

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Keywords:
Hybrid model of learning
Depression
Learning styles profiler
LSP
Rational emotive behavioral therapy
REBT
Numerous studies find a significant correlation between irrational beliefs and emotional disturbance such as anxiety, depression and low self-esteem (e.g., Chang, 1997; Chang and Bridewell, 1998; Daly and Burton, 1983; Goldfried and Sobocinski, 1975; Kassinove and Eckhardt, 1994). In one study, Goldfried and Sobocinski (1975) found that people holding irrational beliefs concerning imagined social rejection reported greater anxiety and hostility than people with more rational beliefs. More generally, Blau and Fuller (2006) reported that irrational beliefs were significantly correlated with many of the scales of the five factor model of personality. While such studies provide support for the core focus of REBT, it needs to be remembered that participants in these kinds of studies tend to be college students tested in artificial situations. Moreover, the five factor model of personality is descriptive and designed from exploratory factor analysis such that it does not explain underlying mechanisms or processes related to depression. Other problems with the five factor model are outlined by Boyle (2008). As far as we know, no research has attempted to identify learning mechanisms underlying the emergence and development of irrationality and the subsequent link to depression.

Jackson's (2005, 2008a) hybrid model of learning provides the opportunity to study these underlying processes. Although developed independently of REBT, it was designed to have clinical and other application and, like REBT, it provides a model of learning beginning with undirected impulses which lead to the development and maintenance of rationality. It aims to provide a model of functional and dysfunctional behavior and suggests that there are numerous pathways from initial impulses to the holding of rational or irrational beliefs. To the best of our knowledge, this is the first application of Jackson's hybrid model of learning to the clinical domain.

In Jackson's (2005, 2008a) hybrid model of learning, the biological basis of personality is sensation seeking. Sensation seeking is widely accepted as an important dimension of personality (Zuckerman, 1978, 1994) with a biological basis related to dopamine and testosterone (Zuckerman, 1994). While sensation seeking has been generally linked to risk taking and negative outcomes (e.g. Zuckerman, 1994), sensation seeking can also have positive outcomes related to learning (Ball and Zuckerman, 1990; Pickering, 2004). Others agree that the dysfunctional consequences of sensation seeking have been over-stated (e.g. Arnett, 1994; Roth et al., 2009). As a result of this emerging consensus, Jackson (2005, 2008a) argued that sensation seeking is more appropriately defined as a general energizing drive associated with being curious and exploratory. Jackson therefore argues that initial impulses for action are neither good nor bad; Ellis (2004) believes the same.

Elliot and Thrash (2002), Humphreys and Revelle (1984), Jackson and Francis (2004) and Izadikah et al. (2009) argue that human behavior is more complex and strategic than other animals, because successful human behavior is largely regulated by higher order cognitive mechanisms that re-express biological drives as complex, functional, and adaptive behavior. In this study, we use the word ‘re-express’ to indicate that sensation seeking influences depression indirectly through a range of cognitive processes. We will also use the word ‘hone’ to signify how cognitive mechanisms improve, sharpen, polish and perfect the general energizing drive of sensation seeking such that rationality and mental wellness develop and are maintained. According to Jackson’s (2005, 2008a) model, appropriate honing of sensation seeking leads to functional outcomes and the direct expression of dysfunctional behavior leads to dysfunctional outcomes.

In Jackson’s (2005, 2008a) hybrid model of learning, the higher-order mechanisms that re-express sensation seeking are represented by well known socio-cognitive variables. Mastery or learning goal orientation is related to allocation of cognitive resources such that cognitive effort is put into a task (Curry et al., 2006; Dweck and Leggett, 1988; VandeWalle, 1997; VandeWalle and Cummings, 1997). Conscientiousness is derived from the five factor model of personality (Costa and McCrae, 1992), and is related to achieving success through social responsibility, hard work and persistence. Rationality is concerned with emotional independence and objectivity. The experiential-cognitive component of the model is captured by deep learning which indicates a proactive interest in acquiring and reflecting deeply on issues and problems (loosely representing a part of Kolb’s, 1984, model of experiential learning).

Jackson’s (2005, 2008a) model is a hybrid as it unites the biological, socio-cognitive and the experiential research foci in personality psychology as discussed by Jackson et al. (2008). Only Jackson’s (2005, 2008a) hybrid model of learning crosses these three research foci. The closest similar model is Cloninger’s which spans biological and socio-cognitive research foci (Cloninger et al., 1993). The basis of Jackson’s (2005, 2008a) model, the key terms it employs and how it overlaps with some of the premises underlying REBT (Ellis, 2004) are presented in Table 1 for reference.

At a general level there is a great deal of overlap between REBT and Jackson’s hybrid model of learning. Both models seek to understand the antecedents of functional versus dysfunctional behavior and both argue that the balance of rationality and irrationality is a crucial element in the model (Ellis, 2005; Jackson, 2005, 2008a).

Of most interest is the potential overlap in meaning between Elli’s and Jackson’s definitions of rationality as this where the two models seem to have most similarity. Irrationality has been defined in many ways in REBT (Ellis, 1987), but it is often linked with demandingness, which is a dogmatic and unreasonable belief that the world has to be a particular way if it is to be acceptable (Bridges and Harnish, 2010). Examples are: “To be happy, I must maintain the approval of all the persons I consider significant” or “I won’t be able to live with myself if I lose this particular job opportunity.” The theory therefore focuses on beliefs that cause emotional distress not on emotional thought processes themselves.

Jackson’s (2005, 2008a) measure of rationality is constructed such that rationality is related to beliefs associated with low demandingness (i.e. emotional independence from the world) and high irrationality is constructed so that it is related to high demandingness (i.e. high emotional dependence). The items concern dogmatic beliefs as opposed to emotional thought processes (e.g., “I believe my personality was shaped by childhood experiences so that there isn’t much I can do to change it”; “I often feel a victim of forces
that I can’t control”) and therefore provide a very similar representation of rationality to that underlying REBT. The full set of items is provided by Jackson (2005).

The most commonly used measures of irrational beliefs thought to underlie REBT include the Rational Behavior Inventory (Shorkey and Whiteman, 1977), Irrational Beliefs Test (IBT, Jones, 1968), Situational Self Statement and Affective State Inventory (Thorpe, Thorpe et al., 2001), Belief Scale (Malouff and Schutte, 1986), Child and Adolescent Scale of Irrationality (Bernard and Laws, 1987), Survey of Personal Beliefs (Demaria et al., 1989), Irrational Beliefs Survey (Watson et al., 1990), Irrational Beliefs Inventory (Koopmans et al., 1994), Perfectionism Cognitions Inventory (Flett et al., 1998), Evaluative Beliefs scale (Chadwick et al., 1999) and the Smith Irrational Beliefs Inventory (Smith, 2002). Early measures have been criticized in not properly measuring beliefs and new measures have yet to be widely used (Bridges and Harnish, 2010). There is therefore no single authoritative alternative measure of irrational beliefs.

We think the other components of Jackson’s (2005, 2008a) hybrid model of learning also has links with REBT. The cognitive effort, cognitive flexibility, precision of thinking and self-efficacy associated with mastery, persistence and hardwork associated with conscientiousness, and the search for knowledge and deeper thinking associated with deep learning, all seem likely related to low demandedness, a desire to orient oneself to the world as opposed to orient the world to oneself and generally facing life’s difficulties. Sensation seeking provides the energizing drive, impulses and goal formation tendencies which are honed by these cognitions leading to the development and maintenance of rationality and emotional wellness; and conversely, low energizing drive influences development and maintenance of failed learning mechanisms and emotional disturbance.

To date, Jackson and colleagues have provided evidence of how cognitive mechanisms re-express high scores of sensation seeking through indirect paths to predict organizational, educational and other outcomes (Jackson, 2008a, 2009, 2011; Jackson et al., 2008; Jackson et al., 2009; O’Connor and Jackson, 2008). This previous research provides support for these paths in terms of how the model predicts functional behavior. We now argue that the similarities between Jackson’s (2005, 2008a) model and REBT suggests that the re-expression of low scores through the cognitive processes will lead to irrationality and depression. This is the first time that outcomes associated with low scores through Jackson’s model (i.e. mechanisms of failed learning) have been investigated and therefore this research identifies a new usage for the hybrid model of learning. The hypotheses which will be tested in this study are shown in Fig. 1.

O’Connor and Jackson (2008), Jackson (2011) and Jackson et al. (2008) find strong evidence of an indirect pathway between sensation seeking and mastery in the prediction of various functional performance outcomes, including maze completion, supervisor and self-rated work performance, self-reported school performance, university performance, and entrepreneurial behavior. That is, individuals hone the energizing drive of sensation seeking by endeavoring to master problems and issues, which leads them to invest effort and allocate cognitive resources to the issue or problem.

Jackson et al. (2009) added to this path by hypothesizing the re-expression of sensation seeking through mastery and rationality, such that high curiosity and exploration is honed successively by high goal focus and cognitive effort (i.e. mastery) and then by high rationality (i.e. emotional independence, autonomy and objectivity) to predict functional outcomes related to rational behavior. They found support for this pathway in the prediction of GPA from university

### Table 1

Principal relationships between Jackson’s (2005, 2008a) hybrid model of learning and personality and its association with some of the premises underlying Ellis’ (2004) REBT.

<table>
<thead>
<tr>
<th>Research focus</th>
<th>Definition</th>
<th>Source</th>
<th>REBT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biological</td>
<td>Sensation seeking: A high approach and low avoidance biologically based, energizing drive which concerns curiosity and exploration.</td>
<td>Sensation seeking (Zuckerman, 1978, 1994)</td>
<td>Initial impulses for action are not necessarily good or bad but can lead to either depression or mental wellness</td>
</tr>
<tr>
<td>Socio-cognitive</td>
<td>Mastery (learning goal oriented) which is related to cognitive effort and long term outcomes through allocation of cognitive resources</td>
<td>Goal orientation (Dweck and Leggett, 1988; VandeWalle, 1997; VandeWalle and Cummings, 1997)</td>
<td>Having practical goals and devoting energy to goals means facing life difficulties.</td>
</tr>
<tr>
<td>Socio-cognitive</td>
<td>Conscientiousness (persistence, social responsibility) which is related to hard work and the need to be responsible</td>
<td>Conscientiousness (e.g. Costa and McCrae, 1992)</td>
<td>Hard work to achieve goals provides happiness</td>
</tr>
<tr>
<td>Socio-cognitive</td>
<td>Rationality (objective; emotionally autonomous, uninfluenced by chance or attachments to people) which provides emotionally detached thinking leading to functional outcomes</td>
<td>Some similarity to low neuroticism (Eysenck, 1967) but different from emotional intelligence (e.g. Petrides and Furnham, 2000)</td>
<td>Irrational beliefs are stable, illogical and at odds with reality whereas rational beliefs lack stability, are logical and are consistent with reality.</td>
</tr>
<tr>
<td>Experiential-cognitive</td>
<td>Deep learning (proactive search for deep knowledge and understanding, systems thinking) which is related to well thought out and well constructed ideas which are low in expedience</td>
<td>Deep knowledge and reflection (Kolb, 1984)</td>
<td>Devoting energy outside ourselves leads to happiness.</td>
</tr>
</tbody>
</table>

Adapted and developed from tables presented in Jackson et al. (2008) and Jackson et al. (2009).
students from Uganda and Australia. Jackson et al. (submitted for publication) found evidence for this pathway in the prediction of transformational leadership in a group of full-time workers. These models argue that high scores in sensation seeking are successively honed through mastery and rationality to predict functional outcomes. We now emotional wellness is found in people who hone exploratory behavior through being goal focused and rational. Conversely, depression is related to low exploratory behavior, low mastery and low rationality. Ellis (1996, 2004) also proposes that irrational beliefs are related to goal attainment, lead to inner conflict, conflict with others and poor mental health.

**H1.** The indirect pathway from sensation seeking, through mastery to rationality will significantly predict depression, such that low scorers in sensation seeking, mastery and rationality will be high in depression.

A further pathway from sensation seeking, through deep learning and conscientiousness to rationality has been proposed and tested by Jackson et al. (2009) and Jackson et al. (submitted for publication). In this pathway, sensation seeking is re-expressed through a series of higher order experiences and cognitions such that curiosity is successively honed by reflecting, sustained hard work and rationality. This indirect pathway to functional learning can be summarized as high exploring → high reflecting → high persisting → high rationality → functionally learned outcome. This pathway loosely resembles the overall content of experiential learning cycles (such as proposed by Kolh, 1984, and later researchers) but differs in that content is developed from prominent and widely known biological, socio-cognitive and socio-experiential research foci and in that it represents a testable mechanism of learning as opposed to a cycle.

We argue that the indirect pathway from sensation seeking to rationality will predict depression. We propose that people who hone exploratory behavior through being reflective, persistent and rational will be low in depression and that low exploratory behavior, low reflection, low persistence and low rationality will predict high depression. Thus, we hypothesize:

**H2.** The indirect pathway from sensation seeking through deep learning, conscientiousness and rationality will significantly predict depression, such that low scorers in sensation seeking, deep learning and rationality will be high in depression.

The most similar personality construct in Jackson’s (2005, 2008a) hybrid model of learning and the five factor model of personality is conscientiousness. There is widespread evidence that conscientiousness predicts many health variables (e.g., Hubicka et al., 2010). Conscientiousness has also been related to depression since low conscientiousness tends to lead to poor performance standards and the discrepancy between high desired and low actual performance is regarded as one possible cause of depression (e.g., Anderson and McLean, 1997). Jackson’s (2005, 2008a) alignment of conscientiousness with responsibility also suggests that it should predict depression because development of responsibility is one of the main intervention foci underlying Choice Theory and Reality Therapy (Townsend and Glasser, 2003). Moreover, we think it likely that a focus on hard work occupies the mind and makes depressive thinking less likely. All this suggests conscientiousness in Jackson’s (2005, 2008a) model will be a direct negative predictor of overall depression. That is, the persistence and social responsibility associated with conscientiousness is likely to ensure that individuals tend not to develop the self-defeating cognitions associated with depression. Therefore, taking into account our reasoning for H2, we hypothesize:

**H3.** The indirect pathway from sensation seeking through deep learning and conscientiousness will significantly predict depression, such that low sensation seeking, low deep learning and low conscientiousness will predict high depression.

Jackson et al. (2009) have also reported evidence of a path from mastery to conscientiousness in the prediction of GPA. This suggests that a further mechanism producing functional learning outcomes is the honing of mastery by persistence.
and social responsibility. That is, goal focus and allocation of cognitive resources from mastery is then honed by choosing to conscientiously pursue the goal with hard work and responsibility. With the exception of deep learning, the indirect path of which this is a part combines components of H1, H2, and H3. Therefore we will not reiterate our explanation for why a whole indirect path is related to depression. Instead, we hypothesize an additional link between the previously argued pathways:

H4. The indirect pathway from mastery to conscientiousness will be positive and significant.

Finally, Jackson et al. (2009) report that the path from sensation seeking to rationality is negative once the positive functional components are redirected through goal orientation and deep learning. What is left is the dysfunctional primitive drive of sensation seeking. This is related to impulsive action lacking goal direction, knowledge and social responsibility (e.g. ‘I want to get rich quick and I don’t care about the long term’) which leads to low rationality. The interesting point about this negative path is that it has the potential to balance the positive effects of the first two paths so that the overall indirect effect of sensation seeking through rationality is not significant (Jackson et al., 2009). By this means, the overall initial impulses from sensation seeking are neither good nor bad. We hypothesize:

H5. The pathway from sensation seeking to rationality will be negative and significant.

We think that Jackson’s (2005, 2008a) hybrid model of learning personality can provide an understanding of vulnerability factors to depression, but we also emphasize that its potential contribution to the literature needs to be understood within the broader context of how other personality models predict depression. Much personality research has reported significant relationships; neuroticism (Barnett and Gotlib, 1988; Gilbert and Reynolds, 1990), coping style (Hewitt and Flett, 1996), perfectionism (Hewitt and Flett, 1993), self consciousness (Ingram et al., 1987), dysfunctional cognitive style (Abramson et al., 1978), locus of control (Benassi et al., 1988), self criticism (Klein et al., 1988) and dysfunctional attitudes (Clark et al., 1989). Jackson’s (2005, 2008a) model is interesting because it provides mechanisms of poor learning for explaining depression, has the potential to provide mechanisms of cognitions underlying REBT, and differs in emphasis from these established views.

2. The current research

We use the hybrid model of learning (Jackson, 2005, 2008a) to predict depression in a clinically depressed sample of people participating in a cognitive behavioral therapy treatment program. This enables us to determine if Jackson’s model predicts depression and determines if depression is predicted through low rationality as proposed by Ellis (2004) REBT. Our use of a clinical sample provides ecological relevance which would not be present in a community or student sample. Moreover, the current research is the first to test how a low energizing drive associated with sensation seeking is related to poor use of higher order cognitive processes and high depression; this is a very different use of the hybrid model of learning (Jackson, 2005, 2008a) which has been previously used to predict functional outcomes (e.g. Jackson, 2011) and delinquent outcomes (e.g. O’Connor and Jackson, 2008).

3. Method

3.1. Participants

Participants were patients (n = 80, 42.1% male, 52.9% female, mean age = 45.22 years, SD = 14.31, min age = 18, max age = 78) diagnosed with Major Depressive Disorder by the treating psychiatrists and referred to the Cognitive Behavioral Therapy (CBT) Unit for CBT treatment (Oei and Browne, 2006; Oei et al., 2010). Most patients were presenting with various co-morbid anxiety disorders such as social phobia and panic disorders. The majority were also receiving medication for the treatment of their Major Depressive Disorder. Before therapy started, participants completed the DASS-42, Beck Depression Inventory (BDI) and the Learning Styles Profiler (LSP) which measures the hybrid model of learning. No external funding or conflicts of interest need be reported.

3.2. Measures and procedure

3.2.1. Depression, anxiety, and stress scales (DASS-42, Lovibond and Lovibond, 1995a, 1995b)

The DASS-42 is a self-report measure assessing the frequency and severity of experiencing negative emotions over the previous week. Frequency/severity ratings are made on a series of 4-point scales (0 = did not apply to me at all, 3 = applied to me very much, or most of the time). Factor analytic studies (Lovibond and Lovibond, 1995a, 1995b) have noted fairly consistent factor structures with the proposed model. The internal consistency of the DASS-42 (Lovibond and Lovibond, 1995a, 1995b) has been estimated to be good to excellent and the validity of the DASS-42 scales has also been consistently demonstrated in terms of its relationship to other depression scales such as the BDI and the BAI (Beck and Steer, 1990). In this study, just the depression scale is used.

3.2.2. Beck depression inventory

The revised BDI (Beck and Steer, 1987) is a 21-item self-report questionnaire in which each item consists of four statements indicating different levels of severity of a particular symptom experienced over the past week. Scores for all 21 items are summed to yield a single depression score. The internal consistency of the BDI, based on a number of clinical samples, is 0.86 (Beck and Steer, 1987). The BDI is an extensively used measure of the somatic, cognitive and affective domains of depression.

The hybrid model of learning (Jackson, 2005, 2008a) measures sensation seeking, mastery, conscientiousness, rationality and deep learning.

Sensation seeking is an exploratory drive characterized by a tendency to be high in approach of reward and novelty and low in avoidance of punishment. An example item is ‘I am excited by what is new in my field.’ The scale is designed to measure undirected sensation seeking (i.e., neither positive nor negative) which is in contrast to Zuckerman’s more negative interpretation of sensation seeking (Zuckerman, 1994). Jackson (2005) reported that sensation seeking was significantly
correlated with Cloninger et al.'s (1993) novelty seeking ($r = 0.34$) and Jackson (2011) reported that it was significantly correlated with Zuckerman's (1994) sensation seeking ($r = -0.37$) which evidences that it is has some similarities to Zuckerman's conceptualization of sensation seeking and some differences.

Mastery (referred to as learning goal achievement in Jackson, 2005, 2008a). High scorers pursue adaptive, challenging response patterns, allocate cognitive resources to problems, and pursue goals. An example item is ‘I achieve specific goals that I set myself’. Jackson (2005) has reported that mastery correlates with VandeWalle (1997) learning goal orientation scale ($r = 0.48$).

Deep learning (referred to as deep learning achiever in Jackson, 2005, 2008a) concerns proactively discovering why things are the way that they are. High scorers reflect and think about the world. An example item is: ‘I enjoy working on a project that involves a great deal of library research’. Jackson (2005) reports that deep learning achievement is correlated with Cloninger et al.'s (1993) scale of self-transcendence ($r = 0.35$). It is important to note that deep learning is proactive learning and this is why a positive relationship with sensation seeking is expected.

Conscientiousness (referred to as conscientious achiever in Jackson, 2005, 2008a) concerns being socially responsible, persistent, and hard working. Jackson (2005) reports that this scale correlates with conscientiousness from the NEO-IPIP ($r = 0.34$). An example item is ‘I usually think carefully before doing things’.

Rationality (referred to as emotionally intelligent achiever in Jackson, 2005, 2008a) concerns being objective, autonomous and emotionally independent. High scorers tend to be rational and have beliefs which are consistent with reality; low scorers tend to be irrational, inconsistent and have beliefs which are inconsistent with reality. This scale captures the balance between rationality and irrationality. Jackson (2005) reports that it is negatively correlated with Eysenck’s (1967) psychoticism ($r = -0.37$). An example item (reverse scored) is: ‘I often feel a lack of control over the direction my life is taking’.

Each scale has 15 items that are answered on a three-point Likert-type scale (2 = True, 0 = False, 1 = Can’t decide). High scores reflect behavior similar to the trait title. Alphas of the scales have been reported as being 0.69 or more on all scales in all studies (Jackson, 2005, 2008a; Jackson et al., 2008; O’Connor and Jackson, 2008).

The hybrid model of learning is specifically designed to have some correlations between the scales and Jackson (2005) therefore chooses an oblique factor analysis over an orthogonal one to justify and evidence the item locations on each of the scales.

### 3.3. Data analysis

Similar indirect pathways through the hybrid model of learning to functional and dysfunctional outcomes have been already tested and confirmed (Jackson, 2008a; Jackson et al., 2009; Jackson et al., submitted for publication; O’Connor and Jackson, 2008). Indirect pathways in the current research were computed using maximum likelihood estimation and significance of indirect pathways was computed by bootstrap. Goodness of fit is reported using multiple indicators. We do not test for mediation since we do not hypothesize a direct relationship between Jackson’s (2005, 2008a) sensation seeking and depression which is Step 1 of Baron and Kenny’s (1986) tests of mediation.

### 4. Results

Means, standard deviations, alphas and correlations are shown in Table 2. Cronbach’s alphas, providing measures of internal consistency, are all above 0.77 and therefore should be considered to be at least reasonable. There is a range of moderate to high correlations between the socio-cognitive scales. In initial support for Ellis’ (2004) REBT, rationality from Jackson’s (2005, 2008a) hybrid model of learning is a significant negative predictor of both the BDI and the DASS-42. In support of the measurement of depression, convergent validity between the DASS-42 and BDI is reported as they are strongly positively and significantly correlated.

Multiple regression was used to provide an initial look at the multivariate predictors of DASS-42 and BDI. None of the five scales of Jackson’s model was a predictor of the criterion variables. As already noted, the scales in Jackson’s (2005, 2008a) hybrid model of learning are correlated as reported in Table 2. This suggests that multiple regression may not be the best way of determining the predictiveness of the model due to known collinearity. This finding is to be expected since all models of indirect effects must contain correlated variables.

Path analysis is better suited to modeling this kind of data and provides a good way of testing hypotheses. The goal of

### Table 2

Means, standard deviations, alphas and correlations of the data ($n = 80$).

<table>
<thead>
<tr>
<th>Scale</th>
<th>Mean</th>
<th>Mean*</th>
<th>SD</th>
<th>Alpha</th>
<th>M</th>
<th>DL</th>
<th>C</th>
<th>RA</th>
<th>DASS</th>
<th>BDI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low sensation seeking (SS)</td>
<td>15.32</td>
<td>14.68</td>
<td>6.03</td>
<td>.77</td>
<td>.71</td>
<td>.42</td>
<td>.27</td>
<td>-.04</td>
<td>-.15</td>
<td>-.02</td>
</tr>
<tr>
<td>Low mastery (M)</td>
<td>16.51</td>
<td>13.49</td>
<td>6.91</td>
<td>.82</td>
<td>.27</td>
<td>.43</td>
<td>.24</td>
<td>.02</td>
<td>.15</td>
<td></td>
</tr>
<tr>
<td>Low deep learning (DL)</td>
<td>14.78</td>
<td>15.22</td>
<td>6.90</td>
<td>.79</td>
<td>.39</td>
<td>.43</td>
<td>-.04</td>
<td>.01</td>
<td>.02</td>
<td></td>
</tr>
<tr>
<td>Low conscientious (C)</td>
<td>10.53</td>
<td>19.47</td>
<td>5.95</td>
<td>.79</td>
<td>.27</td>
<td>.11</td>
<td>.24</td>
<td>.25</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low rationality (R)</td>
<td>13.88</td>
<td>16.12</td>
<td>6.15</td>
<td>.74</td>
<td>.24</td>
<td>.25</td>
<td>.66</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DASS-42 (DASS)</td>
<td>17.97</td>
<td>12.48</td>
<td>.97</td>
<td></td>
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<td></td>
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<tr>
<td>BDI</td>
<td>22.16</td>
<td>10.20</td>
<td>.89</td>
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<td></td>
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</tbody>
</table>

* Means of the scales of Jackson’s (2005, 2008a) hybrid model of learning in personality are presented in the usual manner so such that high scores represent high sensation seeking, high mastery, etc.

** $p<.01$

* $p<.05$
observed path analysis is to test a structural model by estimating theoretically-derived relationships among constructs. In observed path analysis, the measurement model is ignored as an assumption is made that all variables are measured without error. This assumption is satisfied by the requirement that all variables display high levels of internal consistency as assessed using Cronbach’s alpha.

We examined relationships among Jackson’s learning model and the two measures of depression. Age was allowed to covary with all variables and significant relationships were retained within the structural model. As shown in Fig. 2, evidence in favor of Hypothesis 1 is provided by significant parameters along the indirect pathway from sensation seeking, through mastery, rationality to both the DASS-42 and BDI. Evidence in favor of Hypothesis 2 is provided by significant parameters from sensation seeking, through deep learning, conscientiousness and rationality to both measures of depression (although it is important to note the path from conscientiousness to rationality is significant at $p = .107$ in this sample). Evidence in favor of Hypothesis 3 is shown by significant negative parameter from Sensation seeking to high depression; although the evidence in support of H3 is only in the prediction of the BDI and it needs to be noted that the path from conscientiousness to rationality was significant at $p = .107$.

Support for H1 provides evidence in support of an indirect path from sensation seeking through mastery and rationality to depression. The current research therefore provides evidence for the prediction of depression from a “failed” mechanism of functional learning in which low exploration and curiosity is related to low mastery and then low rationality. Evidence supporting H2 and H3 suggests further indirect paths of failed mechanisms of functional learning from low sensation seeking to high depression; although the evidence in support of H3 is only in the prediction of the BDI and it needs to be noted that the path from conscientiousness to rationality was significant at $p = .107$.

Support for H4 suggests that paths from sensation seeking to functional behavior are not interdependent. Evidence in favor of H4 suggested a positive pathway from mastery to conscientiousness which suggests that putting in cognitive processes and dysfunctional outcomes are related to the direct expression of sensation seeking (e.g. Jackson, 2011; O’Connor and Jackson, 2008). Although the model was designed for potential clinical usage (Jackson, 2005), this is the first time that the model has been used in the clinical domain and this is the first time that the model has been used to predict an outcome associated with low sensation seeking. The current research is based on general similarities between Jackson’s (2005, 2008a) model and Ellis’ (2004) REBT. Based on an established model of learning (Jackson, 2005), pre-existing path models (e.g. Jackson, 2008a; Jackson et al., 2009; Jackson et al., submitted for publication) and previous empirical studies that fit parts of the model to functional and dysfunctional learning outcomes in workers, higher education students and school students (Jackson, 2009a, 2009b; Jackson, 2011; Jackson et al., 2008; O’Connor and Jackson, 2008), we tested five hypotheses.

Fig. 2. Significant structural relationships of the theorized structural model with depression. SS = sensation seeking, M = mastery, DL = deep learning, C = conscientiousness, RA= rationality, BDI = Beck Depression Inventory. *** $p < .001$, ** $p < .01$, * $p < .05$, $+ p = .107$.

5. Discussion

Jackson’s (2005, 2008a) presents a new model of personality for understanding learning mechanisms that predict functional and dysfunctional outcomes. Functional outcomes are related to the honing of sensation seeking through
partially. This suggests that this rash impulsivity is low in rationality and provides a further path from sensation seeking to depression.

In our model depression has been predicted from combined effects of various socio-cognitive mechanisms associated with H1, H2, H3, H4 and H5. It suggests that there are relatively complex paths from sensation seeking. We are not surprised by this, as similar effects have been reported (Jackson et al., 2009; Jackson et al., submitted for publication). However, such results provide evidence that researchers need to consider relationships between multiple independent variables in studies of depression rather than simply considering the effects of personality variables in isolation.

We believe these mechanisms of learning are central to understanding how some people are transformational leaders (Jackson et al., submitted for publication), effective workers (Jackson, 2011), delinquent (Jackson, 2011; O’Connor and Jackson, 2008) or, as shown in the present study, depressed. This study adds to the growing evidence that Jackson’s hybrid model of learning has wide general utility across multiple domains. This is not surprising because general models of learning and personality are quite often applied in the prediction of clinical and other outcomes (see, for example, Blau and Fuller, 2006, who predict irrational thinking from the five factor model of personality).

Our results support Ellis’ (2004) ideas underlying REBT and emphasize the importance of irrationality (i.e. low rationality) to depression as well as how initial undirected impulses from sensation seeking are inappropriately honed by cognitive mechanisms concerned with irrationality and conscientiousness. Our model adds to Ellis (2004) work by providing evidence in favor of specific paths from sensation seeking to rationality. Our work confirms Ellis’ (2004) contention that interventions focused on developing rationality are likely to be most effective in treating depression and also suggest that development of conscientiousness may also alleviate depression (at least when measured using the BDI). REBT takes a positive humanistic view in its philosophy of emotion and mind by emphasizing self-actualization, constructivism, lifelong enjoyment of life, unconditional acceptance of self, others and life, and existential choice (Ellis, 1996). Our model is more specific in that it more directly shows how paths from low sensation seeking to low rationality and low conscientiousness are major predictors of depression.

We think that this also emphasizes the usefulness of Jackson’s (2005, 2008) model to the understanding of depression and also shows that no one intervention aimed at a single psychological issue is likely to be successful. In other words, interventions must consider the indirect paths from sensation seeking to depression. Many techniques and tools based on REBT have been developed to foster rational thoughts, explore emotions, and encourage helpful behaviors. Techniques include role play imagery, ladderizing, and shame attacking exercises as they can lead to change in cognitions and behavioral patterns (Ellis and MacLaren, 1998). A comprehensive body of literature spanning 60 years supports the usefulness and value of these techniques (David et al., 2005; Haaga and Davison, 1989). Our research supports the focus on rationality in the treatment of depression but also suggest the importance of treating sensation seeking, mastery, deep learning and conscientiousness. Without attention by the therapist, our model suggests that they will tend to exert an effect on rationality that may counter the effects of intervention. To some extent, this is also recognized by REBT in which, for example, role playing (an energizing activity) is used to develop problem solving skills, develop mastery, deep learning, to take responsibility and avoid self-defeating thinking. However more research is required before more conclusions of this nature can be drawn.

Jackson’s (2005, 2008a) model of functional behavior and rational thinking can also be contrasted with locus of control (Rotter, 1954), attributional style (Abramson et al., 1978) and learned helplessness (Seligman, 1960s and 1970s). A locus of control illustrates what a person believes about the cause of events in their life. It is a belief that whether the outcome and event in everyday’s life result primarily from our own actions and behaviors, or they are the result of fate, chance, circumstances or people. Consequently a locus of control refers to the extent to which people believe they can influence or control events in their lives. Attributional style concerns where success and failure is attributed and learned helplessness is a state of passive response to situations. All of these perspectives are linked to depression and argue that the failure of people to be the ‘captain of their own ship’ and the failure to be able to take control leads to depression and poor mental health (Abramson et al., 1978). Jackson’s (2005, 2008a) hybrid model of learning also argues the importance of directing and controlling cognitive resources toward functional outcomes. Jackson’s model therefore provides an alternative and broader formulation of cognitive mechanisms leading to depression but, similar to these other models, it emphasizes the importance of being in control and suggests that some components of depression are the result of unenergized impulses (low sensation seeking), and unfocussed (low mastery), irresponsible (low conscientiousness), shallow (low deep learning) and irrational thinking which might provide a more formal and interconnected understanding of the self-defeating thinking commonly associated with REBT and depression.

The most important limitation of this research is that causality is not assessed. Indirect pathways capture relationships among proximal variables and the distal variable, but causality is generally not tested in most studies of indirect effects and the same is true of this study. In this study’s defense, it is important to note that the hybrid model of learning is developed from a literature which argues that the socio-cognitive basis of personality is different from the biological basis. On the one hand, there is substantial agreement on these differences in the literature. For example, Cloninger et al. (1993) provide a temperament and character model of personality, Zuckerman (1978, 1994) review the biological basis of sensation seeking. Cury et al. (2006) review the socio-cognitive basis of goal orientation, and Elliot and Thrash (2002) argue that goal orientations mediate biological drives. Elliot and Thrash (2002, p.806) are strong advocates of this perspective and argue goals are channels through which biological drives are directed (i.e. biological drives are energizers whereas goals are specific, cognitive forms of self regulation associated with focus and direction). On the other hand, unambiguous empirical evidence for these distinctions is hard to find. One study, for example, reports similarity in heredity between temperament and character in Cloninger’s model of personality (Gillespie et al., 2003).
Other potential limitations are: that sensation seeking may just be one among several conceptualizations of energizing behavior (see Cyders and Smith, 2008; Cullo et al., 2011) and that we present a simple model of approach which does not take into account that sometimes even avoidant behavior can lead to energizing behavior (see Jackson, 2008b). Moreover, other limitations to this research include the general lack of control regarding our participants who were under different medication and who suffered from a multitude of the psychological and physiological problems. Moreover, it is possible that our reliance on self-report data may have in some way influenced results due to common method variance. Finally, we think we have made a strong case for showing how Jackson's (2005, 2008a) scale of rationality overlaps with the concept of rationality in REBT; nevertheless we have not provided empirical evidence of this overlap.

Overall, these pathways (evidenced by significant beta weights in Fig. 2; good goodness of fit) provide support for Jackson's (2005, 2008a) model of learning in the prediction of depression. In this study, we have provided the first mapping of failed higher order cognitive learning mechanisms in the prediction of two converging measures of depression. Our work is important because we have provided some initial research which provides, within one pre-existing, general and coherent model, why and how important individual differences can predict depression. We believe our research provides a new and different perspective of depression and provides an empirically testable model underlying Ellis' (2004) REBT.

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This is unfunded research.

Conflict of interest
None, but it should be noted that first author is also author of the hybrid model of learning.

References