Variability in Daily Experiences of Mood and its Correlates

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Abstract

This study investigated the characteristics and correlates of Mood variability (MV), defined as atypically frequent fluctuations in mood. MV has been associated in the literature with various forms of psychopathology. For example, MV has shown, however inconsistently, to be elevated in people with depressive symptomatology. This study sought to replicate previous findings of this positive correlation. Due to the well established association of depressive symptoms and stress, this study also examined if MV correlates with stress beyond depressive symptom severity. Other associations explored are those with maladaptive mood regulation abilities, and personality factors. Although MV was not found to be correlated with depressive symptoms through experience sampling methods, a positive correlation was found for self report measures of MV. MV was also found to correlate with both a one-time retrospective measure and daily assessments over one week. Surprisingly, higher levels of MV as measured by experience sampling methods but not through self-report measures were associated with better recovery from a negative mood induction. This study demonstrates the benefit of a multi-method approach to studying mood variability, by means of both experience sampling and survey methods.

Variability in Daily Experiences of Moods and its Correlates

Mood variability (MV) is defined as frequent fluctuations of mood from high to low and vice versa within short periods of time. The same construct has also been referred to in the literature as affective instability (Woyshville, Lackamp, Eisengart, and Gilliland, 1999) and mood lability. It is an important clinical phenomenon, noted for its irregular and hasty pattern, with the capability to lead to much distress (Woyshville et al., 1999). MV has become a subject of renewed interest to researchers since the influential work by Wessman and Ricks in 1966 (Bowen, Baetz, Hawkes, & Bowen, 2006). More recently, associations have been uncovered between MV and various forms of psychopathology.

MV is predominantly measured over a period of time ranging from a few hours to a few days. MV is measured longitudinally due to the fact that retrospective measures of mood and MV are thought to be less accurate compared to experience sampling methodology, which is more sensitive to changes in time, an attribute crucial to assessing MV. In addition, there is disparity in the self-report methodology of assessing MV. The exact questions asked usually vary from study to study (with some consisting of a scale of only 1-2 questions) and there is only limited evidence for the validity of these assessments. Individuals are asked to reply to questions such as: "Do you frequently have ups and downs of your mood since you were young?" or "My mood often changes from happiness to sadness without my knowing why". MV is said to be present if an individual answers positively on all or the majority of analogous self-report questions in the MV scale (Benazzi, 2004). However, retrospective measures for MV have been developed and include measures such as the Affective Lability Scales (Harvey, Greenberg and Serper, 1989).

Experience sampling methodology to assess MV has widely used a visual analog scale (VAS-M) to assess mood on repeated occasions. This scale has been in use for the past 80 years (Ahearn, 2007; Kreindler, Levitt, Woolridge, and Lumsden, 2003).The VAS-M is a linear scale (100mm in most cases) that asks participants to rate their current mood on a scale from 1 to 100. It is anchored on each side by "best I've ever felt" (100) and "worst I've ever felt" (1), with the half way point labeled "neutral mood" (50). The VAS-M has the advantage of ease of administration and exhibits satisfactory evidence of reliability and validity. Validity of self-rated measures such as the VAS-M is usually assessed by comparing it to a clinician rated measure. Little and McPhail (1973) found high correlations ($r_s = .76$ to $r_s = .80$) when they compared clinician VAS ratings and the BDI to VAS-M ratings made by patients. Luria (1975) assessed the test-retest reliability of the VAS-M over a 2 hour period, reporting a correlation of .59. In some recent studies, the VAS-M has been adapted from a paper diary format to an electronic format utilizing palm pilots or other electronic hand held devices. This change to an ecological momentary assessment method leads to collection of data for which quality can be assessed, as it allows ratings to be time-stamped. In addition, this method seems to reduce participant burden and therefore increases compliance. In the majority of studies researching MV, the construct has been operationalized by combining mood scores for each individual taken across different time points and using the standard deviation as a measure of each person's variability in mood (McConville and Cooper, 1997).

As mentioned above, MV has begun to be studied in relation to many clinical disorders. Most notable of these include Bipolar Disorder (Angst, Gamma, and Endrass, 2003; Benazzi, 2004), Major Depressive Disorder (Angst et al., 2003; Benedetti et al., 1996; Cowdry, Gardner, O'Leary, Leibenluft, and Rubinow, 1991), Panic Disorder (Bowen et al., 2006; Katerndahl,

Ferrer, Best, and Wang, 2007), Borderline Personality Disorder (Cowdry et al., 1991),

Premenstrual Syndrome (Cowdry et al., 1991) and Post-Traumatic Stress Disorder (Golier,

Yehuda, Schmeidler, and Siever, 2001). The study by Benedetti et al. (1996) investigated

fluctuations in mood in a clinical sample that included Bipolar Depressive patients and patients

with recurrent Major Depressive Disorder. Through post hoc evaluations, they found that those

in their sample who exhibited higher levels of variability in mood had a longer duration of a

depressive episode, a longer hospital stay and a depressive episode more difficult to treat with

patients needing up to two changes in anti-depressant medication due to failure to show

improvement. These patients also showed signs of relapse more quickly than those without MV.

In addition, Woyshville et al. (1999), studying various psychiatric patients with MV versus

controls assessed affect over a 90 day period in 24 hour increments. They found considerably

greater variability in patients than in controls and thus concluded: "affective instability is seen

prospectively to be a clinically malignant condition evidenced by its association with

comorbidity, treatment resistance, and impairment". Therefore, it can be concluded that

excessive variability in mood is a construct of great clinical relevance that is in need of further

understanding.

<center>Correlates of Mood Variability</center>

Despite the numerous associations with clinical disorders, there are other important

associations for which conflicting findings have been observed in the research literature. I focus

on four characteristics of particular interest: depressive symptoms, stressful life events,

personality traits and mood regulation.

The first correlate of MV where inconsistent associations have been found is the

relationship between depressive symptoms and MV. Angst et al. (2003) were surprised to find

that 'frequent ups and downs of mood' were correlated with depressive symptoms. In their study, they measured "ups and downs" of mood with the question: "Would you say you were one of those people who have frequent ups and downs?" They found that the rate of variability of mood was three times higher among depressive individuals than among controls (2003). They hypothesized that this variability in mood may be an indicator of an immature mood regulation system and as such, suggested further investigation into the area of mood variability and mood regulation. Some older studies, like that of McConville and Cooper (1996) also found strong correlations (r = .61) between MV and depressive symptom severity in a non-clinical sample, based on daily ratings of mood and depressive symptoms over a 30 day period. On the other hand, Cowdry et al. (1991), in their comparison of a clinical sample of patients with Borderline Personality Disorder, Major Depressive Disorder, Premenstrual Syndrome patients (PMS) and controls, found low variability, indeed, relative stability of affect in the major depressive group compared to all other groups. Participants in their study were asked to make self-report mood ratings on a VAS-M twice a day (morning and evening) for two weeks. In another study, Golier et al. (2001) measured variability in moods in three groups, one with Post Traumatic Stress Disorder (PTSD), another with Major Depressive Disorder and the last a control group. Based on these VAS-M ratings taken hourly during one 24 hour period, they found that the MDD group exhibited low variability in mood compared to the PTSD and control group. These studies make apparent the incongruity in methodology used in the study of MV, which may to some degree have lead to the disparate results observed. Consequently, there is a need of further research to better establish the relationship between variability in moods and higher levels of depressive symptoms due to the clinical relevance of such an association.

A second characteristic of MV that is of interest is stress. In comparison to the MV and depressive symptoms relationship, the association between stress and depressive symptoms has been fairly well established in the research literature. Individual vulnerability factors, such as dysfunctional attitudes and negative inferential styles have been found to interact with stressors in predicting depressive symptoms (Cohen, Gunthert, Butler, O'Neill, and Tolpin, 2005). In addition, depression itself has been shown to increase stressful life events, as proposed by the Stress Generation Model (Hammen, 1991). This theory states that individuals experience stressful life events due to maladaptive personality characteristics or disrupted social support networks, which in turn leads to a worsening of depressive symptoms. Thus, depressive symptoms and stress are associated with one another bidirectionally. Given this established relationship, if MV is found to be associated with depressive symptoms, then it may be of interest to examine if MV is associated with stress as well and whether this remains the case when depressive symptoms are controlled for.

A third correlate of MV that is of significance is personality. According to Murrey (2002), there are a few hypotheses for the relationship between MV and personality traits. For example, based on the fact that neuroticism is associated with greater negative affect and extraversion is associated with greater mean positive affect, some have deduced that MV should be high in neurotic extraverts, those individuals who exhibit both of these personality characteristics. Another hypothesis is that MV should associate best with individuals who are high on the neuroticism factor and low on the extraversion factor, on the grounds that MV appears to be related to lower mean levels of happiness. While McConville and Cooper (1992) did not find any correlations between MV and either neuroticism or extraversion, other studies like that of Hepburn & Eysenck (1989) and Williams (1990) were able to do so. Wessman &

Ricks (1966), on the other hand, found that individuals exhibiting highly variable moods showed greater elevations in their level of extraversion but not in neuroticism. In contrast, Murray, Allen, and Trinder (2002) found that neuroticism was the only significant personality predictor of MV in a community sample of 303 individuals. Given this mixed evidence, further investigation is required to conclusively associate the big five personality factors, especially neuroticism and extraversion, with fluctuations in mood.

Mood regulation is the fourth and last focus for the current study as a correlate of MV. According to Silvestrini and Gendolla (2007), mood regulation is the process of either changing or maintaining one's current emotional state and is one part of the broader process of self-regulation that includes controlling one's behaviors and thoughts in addition to one's mood state. Typically, mood regulation strategies are utilized to repair negative mood or to maintain positive ones (Lischetzke and Eid, 2006). A weak mood regulation system and therefore an inability to regulate negative affect has been implicated in the association between MV and depressive symptoms (Angst et al., 2003). In order to examine if this is the case, it may be prudent to first examine if higher levels of MV are in and of themselves characterized by an inability to regulate one's mood. One way to do so would be to see if high MV individuals are able to repair their mood successfully after being induced into a negative mood. If they are in fact unable to do this, so that they report a smaller gain in mood on a mood scale during the recovery in comparison to individuals with lower levels of MV, it may be deduced that MV is indeed correlated with poor or maladaptive mood regulation.

The overall goal of the current study is to investigate the characteristics and correlates of MV. In doing so, I wish to utilize a multi-method approach by examining the performance of two self-report measures assessing MV to an experience sampling measure of MV utilizing the

VAS-M. The first aim of this study is to examine whether these three measures of MV correlate with depressive symptoms. That is, I wish to replicate previous findings that associate higher levels of MV with increased depressive symptoms. I predict that individuals with higher levels of depressive symptoms will indeed exhibit more variability in their moods, measured through both self-report and experience sampling methods. The second aim of the current study seeks to correlate the three MV measures with higher levels of stress, measured both retrospectively and through daily reports of stress levels. Due to the established relationship between depressive symptoms and stress, the study inquires whether variability in moods is correlated with higher levels of stress above and beyond depressive symptom severity. I expected that higher levels of MV will correlate with higher daily and retrospective stress levels. This study also explores correlations between MV and personality traits as well as negative and positive affect. The final aim for this study is to examine whether individuals with greater MV also show greater deficits in regulating negative moods. More specifically, I aim to assess whether these individuals are successfully able to repair negative moods, through both self-report measures and a negative mood induction task. I expect that higher levels of MV will result in reports of lower moods after the negative mood induction and a worse recovery period. In other words, it is predicted that individuals exhibiting higher mood variability will not be able to regulate their mood in order to improve sufficiently in the 5 minute recovery period. I expect that the self-report mood regulation measure will corroborate maladaptive mood regulation abilities in these high MV individuals.

Methods

Participants

Eighty-nine undergraduate students (63 women and 26 men) taking part in the Research

Experience Program in the Department of Psychology at the Ohio State University participated

in the study to earn partial course credit for an introductory Psychology course. The students

ranged in age from 18 to 41 with a mean age of 19.4 years. Seventy-five percent of the students

were Caucasian, 7 percent were Asian, 9 percent were African American and 3 percent were

Hispanic. Seventy percent of the total sample was women.

Measures

Beck Depression Inventory - 2nd Edition (BDI-II). The 21-item BDI-II (Beck, Steer, &

Brown, 1996) is the most current form of the Beck Depression Inventory (BDI). It is used to

assess depressive symptom presence and severity according to the Diagnostic and Statistical

Manual of Mental Disorders- Fourth Edition (DSM-IV; American Psychiatric Association,

1994). Scoring on the 21 item BDI-II is similar to that of the BDI-I, where summary scores range

from 0 (minimal or no depression) to 63 (high depression).

Daily Stress Inventory (DSI). The DSI (Brantley, Cocke, Jones, & Goreczny, 1988) is a

self-report measure that assesses minor daily stressors and the amount of stress caused by each of

the stressors within the previous 24 hours. The measure consists of 58 items. The items include

stressors that are usually not included in major life-event scales and the inventory is thought to

be sensitive to daily fluctuations in stress (Brantley et al., 1988). According to the authors, the

assessment has adequate stability and construct validity. In order to decrease participant burden,

nine lab members were asked to estimate how often each of the stressful events occurred in their

lives during a 24 hour period. According to their responses, the 24 highest rated stress events

were retained. For analyses purposes, scores for each individual from each of the daily ratings were combined to yield one score.

Demographics Questionnaire. We used a brief self-report questionnaire to gather basic demographic information about participants, including age, gender, academic major, and race.

Difficulties in Emotion Regulation Scale (DERS). The DERS (Gratz, 2004) assesses emotion dysregulation along dimensions such as acceptance of emotions and awareness and understanding of emotions. The measure consists of 36 items in six subscales, namely 1) awareness and understanding of emotions (Awareness), 2) acceptance of emotions (non-acceptance), 3) ability to engage in goal-directed behavior (goals), 4) refraining from impulsive behavior (impulse), and 5) access to emotion regulation strategies perceived as effective (strategies). Participants are asked to state how often the items pertain to themselves, on a range from "almost never" (1) to "almost always" (5), The DERS has high internal consistency, with the 5 subscales ranging from $\alpha = .80$ to $\alpha=.89$.

Mood Variability Questionnaire (MVQ). Four self-report questions were used to assess and pre-screen for mood variability. These questions were compiled from commonly used questions that have been used to assess MV in the literature. Examples of these questions include: "Are you a person who has frequent ups and downs in mood?" and "When your mood changes, how often are these changes without an apparent cause?". Responses on the questionnaire range from 0 to 20 with a higher score indicating higher levels of MV.

NEO Five Factor Inventory (NEO-FFI). The NEO-FFI (Costa & McCrae, 1992) is a 60 item questionnaire that is a widely used measure assessing the five basic personality factors, namely Neuroticism, Extraversion, Openness, Conscientiousness, and Agreeableness. Each item has five response options, ranging from "strongly agree" (0) to "strongly disagree" (4). Scores

are divided into five subscales for each of the five personality factors, 12 items per subscale. The authors report that the internal consistency for the inventory ranges from .68 to .86 and that it also shows good validity.

Perceived Stress Scale (PSS). The PSS (Cohen, Kamarck & Mermelstein, 1983) is a 14 item scale that is used to measure participants' experienced levels of stress over the past month (Cohen et al, 1983). Participants are asked how often they have thought or felt a certain way, with answers ranging from 0: "never" to 4: "very often". Scores on the measure range from 0 to 56 with higher scores indicating higher levels of stress. The measure's coefficient alpha reliability in a college sample was found to be .84. The measure also has good concurrent validity and is shown to be correlated with depressive symptomatology.

Personality Assessment Inventory – Borderline Features (PAI-BOR). The PAI-BOR (Morey, 1991) measures personality pathology that is commonly found with Borderline Personality Disorder (BPD). Diagnostic criteria of BPD that are reflected in the measure include affective instability, identity problems, negative relationships, and self-harm. The measure contains 24 items that are rated on a 4-point scale. Of the four subscales, the affective instability subscale of this measure was primarily used as one self-report measure of MV.

Positive and Negative Affectivity Scale (PANAS). The PANAS (Watson, Clark, & Tellegen, 1988) is a self-report questionnaire that consists of 20 items, 10 of which measure positive affect and the other 10 negative affect. Participants are asked to rate the scale from 'very slightly' (1) to 'extremely' (5) based on their current mood. The scale has shown to be internally consistent (PA scale alpha = .87, NA scale alpha = .87) and the authors state that the measure has good convergent validity with lengthier assessments measuring positive and negative affect (r = .76 to r = .92). The measure is also sensitive to mood fluctuations over short periods of time

(Watson, 1988). Scores on each of the scales are calculated separately and range from 10 to 50, with higher scores indicating a higher degree of affect.

Velten Mood Induction Procedure (VMIP). The VMIP (Velten, 1968) is a frequently utilized procedure to induce either a negative, positive or neutral mood. The procedure makes use of 60 self-referent mood-statements that participants read to themselves, first quietly and then out loud. They are asked to attend to the statements and try to feel the moods expressed. Only the negative mood induction statements were used in this study. However, a subset of the positive statements was displayed after the recovery period of the negative mood induction task and participants were given the same instructions as for the negative statements. This was done to remove any lingering negative affect of the negative induction. Examples of statements in the negative induction include: "I'm discouraged and unhappy about myself", "too often I have found myself staring listlessly into the distance, my mind a blank, when I definitely should have been studying", and "the way I feel now, the future looks boring and hopeless" (Martin, 1990).

Visual Analog Scale for Mood (VAS-M). A VAS-M is utilized most commonly to collect mood data in experience sampling methodology. The scale ranges from 0 on the far left denoting "the worst I've ever felt" to 100 on the far right, denoting "the best I've ever felt". Participants were asked to rate their mood three times a day, for one week by responding to the following question: "Please rate your mood on how you feel AT THE CURRENT MOMENT on a scale from 0(negative) to 100(positive) below". For analysis purposes, the standard deviation of the moods reported by each individual across a maximum of 21 time points was used as a measure of the MV for that individual, in concordance with previous studies (e.g., Cowdry et al., 1991; Ahearn et al., 1997; McConville and Chris, 1996).

Measures of MV

In the current study, MV was assessed utilizing three different measures. The primary measure of MV was the standard deviation of the VAS-M that was assessed during the week of mood ratings. In order to prevent confusion with the other MV measures, these standard deviations will henceforth be referred to as MV-ESM (Experience Sampling Method). The second measure of MV was the MVQ that was used for pre-screening. This self-report measure will here forth be referred to as MV-MVQ. The last measure of MV was the affective instability subscale of the Personality Assessment Inventory-Borderline features (PAI-BOR). This measure will hereafter be referred to as MV-PAI. These last two self-report measures measure MV retrospectively.

Procedure

Students in the REP program were pre-screened on the four-item MV measure, the MVQ. Each of the four items was scored on a scale from 1 to 5 with a maximum score of 20. Scores on the pre-screening measure ranged from 4 to 19. Those participants were invited to participate in the study with scores between 12 and 20 (high MV) or between 0 and 8(low MV) on the measure. These individuals were sent recruitment emails explaining the study and requesting their participation. Once participants arrived at the Psychology building at their scheduled time, all portions of the study were explained and they were asked to provide informed consent. Those who gave consent began with session 1 of the study. In this session, participants were asked to complete the following questionnaires: the demographics questionnaire, BDI-II, PSS, ASRM, DERS, PTSM-SR, NEO-FFI, PANAS, and PAI-BOR. Participants were then given instructions to make daily ratings of their mood three times a day for the next 7 days. It was explained that they would make the morning and evening ratings on-line through the survey website

Surveymonkey.com. They would be sent the first of two emails at 6:45am every morning. This email would provide a link to the survey site where they could rate their current mood on the electronic form of the VAS-M. They were also instructed that they should rate their mood between the two hour window of 7am to 9am. For the afternoon mood ratings, they were provided with an afternoon paper packet that consisted of 7 VAS-M scales, one for each day of the week. They were instructed to make their afternoon mood rating between 2pm and 4pm everyday. The afternoon ratings were not made on the survey website as it was more likely that participants would be in class during which time they may not have easy computer or internet access. They would be sent the second email at 8:45pm every night that contained a link to the survey site. They would rate their mood at this time on the electronic VAS-M. In addition, they would also be asked to complete the DSI. The time window for the evening ratings was set from 9pm to 11pm. At the end of Session 1, participants were asked to practice making the mood ratings to familiarize them with the procedure.

When the participants returned to the Psychology building at the end of the week for session 2 of the study, they returned the afternoon packet with the VAS-M mood ratings. They were then asked to complete the PANAS measure assessing their present mood. Next, they were given instructions on a laboratory task. They are asked to pay full attention to the instructions on the computer screen and to try not to think of anything other than the task at hand. The laboratory task was in fact the Velten Mood Induction Procedure (VMIP). Instructions and statements were presented in PowerPoint format. The instructions for the procedure requested the participant to read each of the 60 statements quietly at first, and then out loud. Each statement could be read as many times as needed in order to experience the ideas stated. The instructions further requested participants "to be receptive and responsive to the idea in each

statement, and to allow each idea to act upon [the participant] without interference".

Furthermore, participants were asked not think of contradictory thoughts such as "I'll see if this

works", but instead to concentrate fully without such stray thoughts. The purpose of this

laboratory task, they were told was "to see whether a person can talk himself into a mood" so

that a person may be able to talk himself or herself out of a mood when needed. Participants'

moods were assessed directly before the negative induction and immediately after the induction.

For the next two minutes, they rated their current mood in intervals of 30 seconds. Then, for the

next three minutes, participants rated their mood in intervals of 1 minute. During this five minute

period, they were instructed to try to the best of their ability to attain a positive mood. In order to

remove any lingering negative affect lasting beyond the study, participants read a subset of

elation mood induction statements after the 5 minute recovery period. Lastly, participants were

debriefed about the study.

<div align="center">Results</div>

Descriptive statistics

During the week of mood ratings taken between session 1 and session 2 of the study, the

participants' mean moods reported ranged from 17.5 to 92.2 on the 100 point VAS-M, with a

mean of 60.9 (SD = 2.1). MV-ESM, which, as mentioned before, is scaled in terms of standard

deviations of mood from the week of mood ratings, ranged from 0.44 to 2.83 with a mean of 1.52

(SD = .50). Table 1 shows the means and standard deviations for all primary measures. The

BDI-II scores of the sample ranged from 0 to 44 (maximum possible score = 63) while the PSS

scores ranged from 9 to 43(maximum possible score = 56). Summary scores on the DERS

ranged from 43 to 143 (maximum possible score = 180). Correlations among the MV-ESM, MV-

MVQ and MV-PAI are given in Table 2. Two participants rated their mood less than 50% of the time and therefore were excluded from all analyses.

Correlation between MV and depressive symptoms

Table 3 shows the correlations between the three measures of MV and the BDI-II. I predicted that individuals with higher levels of depressive symptoms would also exhibit more variability in their moods, measured through both self-report and experience sampling methods. Contrary to my hypothesis, depressive symptoms and MV-ESM were not significantly correlated ($r = .10$, $p = .34$). Yet, both MV-MVQ and MV-PAI were each correlated significantly with BDI-II scores (r_s [1]$= .53$, $p < .0001$, and $r = .58$, $p < .0001$, respectively). Thus, two of the three MV measures were found to be associated with the BDI-II. It is interesting to note that these two measures were both self-report measures suggesting some disparity between the self-report and experience sampling methodology.

Correlations between MV and stress

In order to assess the relationship between stress and MV, regression models were formulated to predict retrospective stress (measured by the PSS) as well as daily stress levels (measured by the DSI). I hypothesized that MV-ESM would in fact be a significant predictor of both stressful life events assessed retrospectively (PSS) and stressful life events measured by daily reports (DSI) beyond depressive symptom severity. For the PSS, the overall model was indeed significant ($F (2, 84) = 43.78$, $p < .0001$) (See Table 4). MV-ESM individually predicted stress ($t (84) = 2.04$, $p = .04$), although, the individual beta was small ($\beta = .16$). Together, depressive symptoms and stress accounted for 50 percent of variance in MV-ESM ($R^2 = .50$).

Regression analyses with the DSI as the dependant variable also revealed significant results. All three measure of MV, the MV-ESM, MV-MVQ and MV-PAI predicted daily stress

levels above and beyond depressive symptoms (MV-ESM: $F(2, 83) = 9.73$, $p = .0003$, adjusted

$R^2 = .16$; MV-MVQ^2: $F(2, 66) = 5.65$, $p = .0054$, adjusted $R^2 = .12$; MV-PAI: $F(2, 83) = 7.76$,

$p < .0008$, adjusted $R^2 = .14$; see Table 5). MV-ESM was also an individual predictor of daily

stress levels ($\beta = .25$, $t = 2.46$, $p = .016$). There were no gender effects in either of these

regression models (all p's $> .40$).

Correlations between MV and personality factors

Table 6 shows the correlations between the three MV variables and the five NEO

personality factors. Neither neuroticism nor extraversion correlated with MV-ESM. Nonetheless,

MV-MVQ and MV-PAI associated significantly with all five personality factors. These findings

are consistent with the associations between MV and depressive symptoms in that, again, the two

self-report measures of MV correlated significantly while the experience sampling method did

not. The fact that individual mean moods from the experience sampling data were correlated

with neuroticism ($r = -.33$, $p = .001$) provides some evidence of signal in the repeated mood

ratings participants made.

Mood Regulation

The third goal of the study was to examine the mood regulation abilities of individuals

with higher levels of MV through both a self-report measure, namely the DERS and through the

in-session negative mood induction task. For the latter, I expected that higher levels of MV

would be associated with reports of lower moods after the negative mood induction as well as a

worse recovery period. I further expected the self-report DERS to corroborate maladaptive mood

regulation abilities in these high MV individuals. Together, MV-ESM, MV-MVQ and MV-PAI

accounted for 41% of the variance in the total DERS measure ($F(3, 65) = 16.57$, $p < .0001$,

adjusted $R^2 = .407$) [3]. Of the three MV variables however, only MV-PAI individually predicted

the DERS significantly (standardized $\beta = .57$, t (66) = 4.5, $p = .0001$). Correlations between the

three MV variables and the DERS subscales reveal that, yet again, the self-report MV-MVQ and

MV-PAI correlated significantly with the subscales while MV-ESM did not (see Table 7). One

anomaly of interest was found regarding the DERS Awareness subscale. It was the only subscale

that correlated with MV-ESM ($r = -.26$, $p = .015$) while it was the only subscale that did not

correlate with MV-PAI ($r = .08$, $p = .466$).

For the mood induction task, on average, participants dropped 25.4 points (SD = 1.9)

after the induction on a scale from 0 to 100. The difference between moods reported prior to and

post induction was significant (t (85) = 12.4, $p < .0001$, d = 1.54). As expected, the higher the

level of MV-ESM, the lower the moods that were reported post induction ($r = -.34$, $p = .001$). I

also expected higher levels of MV to correlate with lower amount of recovery. In fact, the

opposite correlation was found. Higher levels of MV-ESM correlated with greater recovery ($r = -.39$, $p = .0002$). Participants gained 27.5 points (SD = 1.9) on average in the recovery period.

This difference between moods reported immediately post induction and after the 5 minute

recovery period was also significant (t (86) = -13.72, $p < .0001$, $d = -1.64$). However, in contrast

to the self-report DERS, neither MV-PAI nor MV-MVQ significantly correlated with either the

mood induction change or the mood induction recovery (see Table 8). Hence, self-report

measures of mood regulation associated more strongly with self-reported MV. This was made

apparent by the association of the DERS measures' with MV-MVQ and MV-PAI but not with

MV-ESM. The negative induction task, on the other hand correlated with experience sampling

methodology of assessing MV.

Correlations between MV and negative and positive affect

Table 9 shows the correlations of MV-ESM, MV-MVQ, and MV-PAI with negative and positive affect. No significant correlations were found between MV-ESM and either of these affect variables. In comparison, MV-MVQ and MV-PAI correlated with both negative and positive affect (assessed through the PANAS). In regard to MV-PAI and MV-MVQ, these findings indicate some concurrence with the correlations between MV and the personality traits neuroticism and extraversion. Recall that MV-PAI and MV-MVQ correlated positively with neuroticism suggesting that more variable individuals exhibit greater negative affect. This is consistent with the positive correlation of the self-report MV measures and negative affect. Similarly, MV-PAI and MV-MVQ had correlated negatively with extraversion, which is conceptually consistent with the findings that MV-PAI and MV-MVQ are negatively associated with and positive affect.

Discussion

The main purpose of this study was to explore the characteristics and correlates of variability in mood. The most consequential among these correlates included depressive symptoms, stressful life events, personality traits, and mood regulation. Correlations between MV and negative and positive affect were also explored. In examining these associations, I wished to utilize both self-report and experience sampling methodology in order to gauge how they performed relative to one another. The association between MV and depressive symptoms was of noteworthy interest due to the discrepancy in the literature regarding this relationship. This may partly have been due to methodological differences among these studies. Although the majority of the studies utilized VAS-M to assess mood over multiple time points in order to gauge variability in mood, the exact questions asked, the frequency with which mood was

assessed, the number of VAS-M used and the total amount of time mood was assessed all varied

considerably. Even the study sample ranged from clinically depressed individuals on medication

to individuals comorbid with other disorders to non-clinical samples. The current study found

differences between the two methodologies in the association between MV and depressive

symptoms. Variability in mood, assessed through the VAS-M from the week of mood ratings

between session 1 and session 2 did not significantly correlate with depressive symptoms

measured by the BDI-II. However, the MVQ and the Affective Instability subscale of the PAI-

BOR both correlated with the BDI-II. In other words, the self-report measures of MV, but not the

experience sampling method associated with depressive symptoms. These findings are

conflicting with those of Cooper and McConville (1996). However, it is possible that this

discrepancy may be due to methodological difference between their study and the current one as

both the frequency and duration in measuring MV were varied.

Although this discrepancy between self report measures of MV and real time data

collected through the VAS-M scales was more pronounced than anticipated, the rest of the

correlations seemed to continue with this pattern of like measures correlating exclusively with

one another.. For example, MV-ESM predicted stressors reported daily through the DSI while

the self-report MV-MVQ and MV-PAI individually did not. MV-ESM also correlated

exclusively with mood regulation assessed through the mood induction task, both change post

induction as well as recovery. MV-PAI and MV-MVQ on the other hand did not correlate with

induction change or recovery but instead correlated with the self-report DERS. Furthermore,

MV-MVQ and MV-PAI correlated significantly with personality traits measured through the

self-report NEO-FFI while MV-ESM did not. To understand these results, it is important to keep

the correlations among the MV variables themselves in mind. The fact that MV-PAI and MV-

MVQ appreciably correlated with one another while MV-ESM did not correlate with the self-report measures (MV-ESM and MV-PAI shared a very small correlation) reveals that MV-ESM is capturing a very small amount of variance in common with the self-report measures of MV. The variability accounted for by MV-ESM seems more apt to correlate with other variables assessed through experience sampling methodology, including stress (DSI) and mood regulation (negative mood induction).

Although not specifically examined in the context of mood variability, other studies have noted this pattern of low correlations between experience sampling and self-report measures as well. For instance, Verkuil, Brosschota, and Thayer (2007) while investigating the frequency and duration of worry in daily life, found that self-report trait measures of worry were not able to predict worry in daily life to a great extent. In fact, they accounted for only 24% of the variance in worry in daily life. As such, they suggested a combination of trait measures and experience sampling measures when applicable in order to account for the greatest variance. This pattern of methodological differences, therefore, is not entirely new and has been evident for at least some other constructs as well. It may be that self-report measures in general have some degree of divergence from experience sampling methods or that the measurement of the VAS-M itself led to this inconsistency. In either case, further replication is required to see which of the possible reasons may be at the root of this difference. In doing so, the VAS-M particularly merits further study. Identifying an optimal frequency and duration for the measurement of MV is needed as this is one aspect that has the potential to lead to much discrepancy in studies assessing MV. It is due to the fact that no standard frequency or duration exists for the measurement of MV that the outcomes of previous studies cannot be compared to one another. The standardization in assessment technique then has the potential to reduce confounding results and lead to a more

reliable measurement of MV so that the outcomes of various studies can be better understood and compared.

However, other possible reasons for this incongruity in results are possible. Common method variance is one important possible explanation for the observed pattern of findings. If systematic error occurred due to the method of measurement, this could have contributed to the divergent results observed between the self-report and experience sampling methods. If this is the case, then the results do not in fact reflect true variance, but simply measurement bias. Another reason for the incongruity in results could be the manner in which the mood ratings were taken during the week, which in turn could have affected the outcome. In particular, the fact that the afternoon mood ratings were made with paper packets containing the VAS while the morning and evening mood ratings were completed online may have led to variation in the data collected, although there is no specific reason to expect a systematic difference. The use of palm pilots or other hand held devices is a possible solution to prevent inconsistencies in data collection. Additionally, if individuals with higher levels of MV tend not to report their moods when the moods are particularly high or low but only report them once they regain a more neutral mood, the VAS-M would not be able to capture variability that actually existed, in which case self-report measures may do a better job of capturing this variability. This is another possible reason for the incongruous outcomes found in this study. Furthermore, the self-report MVQ measure utilized in the study was a compilation of commonly asked questions that assess MV in the literature. Therefore, because the questions themselves have not been used together in the form of a validated questionnaire, it may be that unidentified psychometric problems with this measure could have contributed to the results.

If experience sampling methodologies are in fact hindered by extreme moods, perhaps participants in studies could be made aware of this and could be asked to keep, to the best of their ability to the time windows within which the mood ratings are made. Hand-held electronic devices would help in this situation as well, in that they could provide exact time cues for the mood ratings and increase compliance by being easily accessible. Other improvements that would be beneficial for future studies include the utilization of more than one VAS-M scale to measure daily mood. Some recent literature suggests that based on the current structure of mood, it may be more accurate to partition mood in to negative and positive affect and assess variability in each separately as a measure of MV (Murray, 2002). Lastly, in order to reduce participant burden of completing multiple questionnaires at one time, its may be possible to have the questionnaires completed online. This would allow participants to remain at home and still finish the assessment. In addition, time-stamps on the questionnaires would allow for considering individual differences in when responses are generated (e.g., perhaps some participants would tend to delay reporting when in a bad mood).

Due to the well established association between depressive symptoms and stress, another association of interest was between MV and stress. I wanted to examine if this correlation existed when depressive symptom severity was partialed out so that it would not confound the correlation between MV and stress. As predicted, there was indeed a positive correlation found between these two variables. In fact, MV-ESM associated significantly with both the self report PSS and the DSI measured daily. This was the only case in which the pattern of like measures converging together did not hold. If stress is less prone to the reporting bias mentioned above so that high stress individuals are still able to report stress and are not hindered by it, this would explain why MV-ESM predicted stress assessed by both the PSS and DSI. Nonetheless, the

current study provides initial evidence that even when depressive symptoms are partialled out, variability in moods is associated to stressful life events. This finding is an early step for the prospective future examination of higher levels of variability in mood as a predictor of stress. The Velten Mood Induction Procedure (VMIP) was successful in inducing a negative mood in participants. Although all participants reported low moods after the induction, those participants with higher levels of MV reported lower mood scores as compared to less mood variable individuals. That is, their overall change in mood was greater. This effect is in accordance with our expected hypotheses. However, the pattern of results for recovery from a negative mood yielded unanticipated results. Although it was hypothesized that higher levels of MV would lead to a worse time recovering from the induced negative mood, it was found that the opposite was the case. Individuals with higher MV levels gained more points on the VAS-M in the 5 minute recovery period. This finding may, in actuality, tell us more about the nature of MV. It may be the case that the inherent fluctuations in mood in these individuals allow them to return to a positive state of mind quickly. If recovery from the negative mood induction is indeed occurring largely without participants' conscious efforts, then active mood regulation may not have played a role in this recovery. Furthermore, it seems that individuals high in mood variability may not in fact possess or make use of mood regulation strategies, as observed by the low correlations between MV-ESM and the DERS Strategies subscale. There may be dissimilarity in the type of mood recovery that participants engaged in during the induction task in contrast to how they would normally try to recover from a negative mood, thus leading to the differing results observed. It may be that participants in their daily lives utilize certain approaches to help them improve their mood that they were unable to use in the lab, be it talking to friends or listening to their favorite piece of music. This finding of better recovery from an induction can be construed

as one positive facet of a construct that has until now been thought to be associated with largely

negative outcomes. It appears then, that of all the correlates of MV, MV-ESM in particular is

exclusively able to measure mood regulation that is assessed in real-time. MV-ESM surprisingly

also showed a significant negative correlation with the DERS Awareness subscale. Although

this relationship was unanticipated, it may highlight a potentially important conceptual difference

between mood variability assessed via self-report measures and mood variability assessed via

experience sampling methods. It may be that MV as assessed via self-report reflects

participants' awareness and ability or willingness to report on their mood variability directly.

This may be less true of MV as assessed through the MV-ESM. Indeed, MV-ESM was

associated with low levels of awareness as assessed through the DERS.

In sum, this study examines the utilization of both experience sampling as well as self-

report measures in the study of variability in daily experiences of mood. The benefits of such a

procedure are demonstrated, observed by the fact that experience sampling and self-report

measures each have separate correlates and do not seem to correlate well with one another.

Future studies should take important consideration of the methodologies utilized in the study of

variability in daily experiences of mood as the lack thereof may lead to disparate results.

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Footnote

[1] Due to a non-normal distribution of the Mood Variability Questionnaire (MV-MVQ),

Spearman correlations were used for all associations related to the MVQ instead of Pearson

product moment correlations. Nevertheless, the differences between the Spearman and Pearson

correlations were small. A non-normal MV-MVQ distribution was found as the MVQ was

used as pre-screening measure and participants were selected for the study by over-sampling

extreme responses on the MVQ.

[2,3] The same pattern of results emerged by when the MV-MVQ, due to its non-normal

distribution, was transformed into a categorical variable by dividing scores into low scores

(MVQ = 1-8), medium (MVQ = 9-11) and high (MVQ = 12-20) ranges.

Table 1

Descriptive statistics (sample size, mean and standard deviations) for all primary variables

Variable	N	M	SD
Age	88	19.40 years	2.82 years
MV variables			
MV-ESM	89	1.52	0.50
MV-MVQ	71	10.48	3.04
MV-PAI	89	6.07	3.99
Depressive Symptoms			
BDI-II	89	9.57	8.35
Mood			
PANAS, negative affect	89	14.58	5.04
PANAS, positive affect	89	27.37	7.41
Mood Regulation			
Mood induction change	88	-2.59	1.93
Mood induction recovery	89	2.78	1.88
DERS (sum)	89	76.66	21.06
DERS, awareness	89	14.61	4.53
DERS, clarity	89	10.53	3.44
DERS, goals	89	14.57	5.05
DERS, impulse	89	9.62	4.01
DERS, non-acceptance	89	11.98	5.47
DERS, strategies	89	15.36	6.70
Stress			
PSS	89	24.03	8.23
DSI	87	2.56	1.06
Personality factors			
NEO, agreeableness	89	30.26	5.47
NEO, conscientiousness	89	30.56	7.14
NEO, extraversion	89	30.78	7.26
NEO, neuroticism	89	20.98	9.43
NEO, openness	89	28.53	6.37
Borderline features			
PAI, affective instability	89	6.07	3.99
PAI, identity problems	89	7.33	3.72
PAI, negative relations	89	6.47	3.86
PAI, self harm	89	4.72	3.35

Table 2

Correlations among the three MV variables

	MV-ESM	MV-MVQ	MV-PAI
MV-ESM	--		
MV-MVQ	-.01$^+$	--	
MV-PAI	.22*	.68$^+$*	--

* : significant at p < .05 level
$^+$: Spearman correlations

Table 3

Correlations between MV and the depressive symptoms (BDI-II)

	BDI-II
MV-ESM	.10
MV-MVQ	.53$^+$*
MV-PAI	.58*

*: significant at p < .05 level
$^+$: Spearman correlations

Table 4

Regression model of depressive symptoms and mood variability (experience sampling method) predicting self-report stress.

	t	p	β
BDI-II	8.87	<.0001	.68
MV-ESM	2.04	.04	.16

Table 5

Regression model of depressive symptoms and mood variability (experience sampling method) predicting daily stress levels

	t	p	β
BDI-II	3.22	.002	.32
MV-ESM	2.46	.016	.25

Table 6

Correlations between MV and the NEO personality factors

	MV-ESM	MV-MVQ[+]	MV-PAI
NEO Agreeableness	-.004	-.40*	-.38*
NEO Conscientiousness	-.19	-.33*	-.40*
NEO Extraversion	-.08	-.54*	-.38*
NEO Neuroticism	.11	.51*	.69*
NEO Openness	.13	.28*	.42*

*: significant at p < .05 level
[+] : Spearman correlations

Table 7

Correlations between MV measures and the DERS subscales

	MV-ESM	MV-MVQ[+]	MV-PAI
DERS (total)	.02	.49*	.68*
DERS, awareness	-.26*	.23	.08
DERS, clarity	.11	.33*	.44*
DERS, goals	.10	.29*	.47*
DERS, impulse	.06	.36*	.63*
DERS, non-acceptance	-.05	.34*	.54*
DERS, strategies	.11	.53*	.69*

*: significant at p < .05 level
[+] : Spearman correlations

Table 8

Correlations between MV and the Mood induction variables, change and recovery

	MV-ESM	MV-MVQ[+]	MV-PAI
Mood induction change	.34*	.04	.02
Mood induction recovery	-.39*	-.04	-.01

*: significant at p < .05 level
[+] : Spearman correlations

Table 9

Correlations between Mood Variability and positive and negative affect

	MV-ESM	MV-MVQ[+]	MV-PAI
PANAS, negative affect	.11	.27*	.26*
PANAS, positive affect	-.19	-.46*	-.39*

*: significant at p < .05 level
[+] : Spearman correlations