



Benchmarking: An International Journal

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Article information:

To cite this document:

Sushanta K. Mishra, Amitabh Deo Kodwani, Kunal Kamal Kumar, Kamal K Jain, "Linking Loneliness to depression: a dynamic perspective", Benchmarking: An International Journal, <https://doi.org/10.1108/BIJ-10-2016-0158>

Permanent link to this document:

<https://doi.org/10.1108/BIJ-10-2016-0158>

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Linking loneliness to depression: a dynamic perspective

Key words: Depression, Loneliness, Personality.

Article classification: Research paper

Introduction

Depression may lead to devastating effects on people's lives (Gotlib & Hammen, 1992). According to World Health Organization (WHO) estimates, depression will be the second leading contributor to the global disease burden by 2020. In addition, depression is considered as a risk factor for suicide, one of the top ten causes of death globally (Murray & Lopez, 1996). The emotional state of persistent abjection ranging from relatively mild discouragement to feelings of extreme despondency and despair is conceptualized as depression (Goldenson, 1984: 212-213). Though depression is argued to impact at all age groups, some age groups are prone to depression than others. In fact, studies reported that incidence of depression among the college students far exceeds that among the general population. This is because of the following reasons. One, college adults pursuing undergraduate education are argued to face stress-arousing and anxiety-provoking situations (Arnett, 2000; Meadows, Brown, & Elder, 2006; Zirkel, 1992) which may lead to the experience of depression. Two, College years are characterized by unprecedented transitions (Arnett, 2000) such as moving away from family support (Kenyon & Koerner, 2009), for many may be the first time in life (Mahmoud, Staten, Hall, & Lennie, 2012). Three, at this age the need to create life goals and the search for personal existence triggers depression in young adulthood (Dezutter, et al., 2013).

Depression among the students has negative association with their self-efficacy, interpersonal harmony (Chen et al., 2006), leisure experience and academic performance (Eisenberg, Gollust, Golberstein, & Hefner, 2007). On the other hand depression might lead to enhanced experience of anxiety (Anson, Bernstein, Hobfoll, 1984), stress (Dusselier et al., 2005), breakdown of relationships (Ali, Rahbar, Naeem, Tareen, Gui, Samad, 2002), substance abuse (Teter, Falone, Cranford, Boyd, & McCabe, 2010), adoption of dangerous practices such as unsafe sex (Weitzman, 2004) and suicide (Eisenberg et al., 2007). Given the deleterious effect of depression, studies have explored its correlates. These factors are classified as individual factors, situational factors and organizational factors. A comprehensive list of these factors is provided in Table 1. Though studies have explored the correlates of depression, there is a felt need to explore the factors that lead to depression (McTernan et al., 2013). Similarly, considerable research has linked loneliness to depression (Anderson, 1999), yet, the present literature suffers from two major limitations. First, even though several theories suggest longitudinal relationships between loneliness and depression, extant theories have not sufficiently explained *why and when* changes in loneliness exert unique influences on depression. Second, most of the studies have captured both loneliness and depression as cross-sectional data and hence, assumed them as to be static concepts (Anderson et al., 1994; Lau et al., 1999; Theeke et al., 2012). However, the present literature argued in favour of dynamic conceptualization of loneliness and depression. Based on past studies, our study argued in favour of dynamic conceptualization as it assumes change in the respective variables overtime and establishes the linkage between change in loneliness and change in depression. Based on a longitudinal study spanning over six months, we examine the dynamic relationship between loneliness and the experience of depression among the undergraduate college students in a business school in India. In addition, we explored the role

of personality on the above relationship. The study attempts to explain why and when of the relationship between change in loneliness and change in depression.

Insert Table 1 about here

Theory and Hypotheses

Loneliness is an unpleasant emotional condition where a person feels estranged from others and lacks security and closeness in his or her social relationships (Cramer & Barry, 1999). Loneliness is considered as a state, thus, is similar to other human states such as hunger, thirst, and pain (Cacioppo & Patrick, 2008). We focus on loneliness as an antecedent of depression for two reasons. One, loneliness is agreed to be a prominent emotion leading to depression (Gotlib & Hammen, 1992). Second, experience of loneliness is a commonly occurring phenomenon prevalent among student population. For example, studies have highlighted that around 30 percent of the college students experience loneliness as a problem during their college years (McWhirter, 1990). However, the present literature suffers from two limitations. One, most of the studies on loneliness and depression are conducted in the Western world and very less is known about the linkage in non-Western populations, especially in the Asian context. Second, previous research studies have considered the static nature of loneliness and depression. In the present study we aim to address these limitations by conceptualizing dynamic nature of the relationship and testing it in a non-Western context. Loneliness is a discrete emotion (Cacioppo & Patrick, 2008; Hawkey & Cacioppo, 2007) and is defined as “the exceedingly unpleasant and driving experience connected with inadequate discharge of the need for human intimacy (Sullivan, 1953: 290). One of the major psychological tensions inherent in loneliness is that although feeling lonely triggers a person’s need to seek building interpersonal relationships (Cacioppo & Patrick, 2008), it also increases his or her vigilance about the cues received from others in interpersonal

relationships and tendency to interpret these cues from a negative and defensive lens (Goswick & Jones, 1981; Leary, Cottrell, & Phillips, 2001). Research has suggested that being lonely is considered a sign of social failure and people are likely to perceive a lonely individual as someone who is generally undesirable (Duck, Pond, & Leatham, 1994).

Past theories have tried to explain the relationship between loneliness and depression. For example, ‘stress-as-offense to-self’ theory has been used in past research (Semmer, Jacobshagen, Meier, & Elfering, 2007) to explain the linkage. According to this theory loneliness is considered as stressful because it threatens the self-concept of an individual and hence might lead to an experience of depression. Extant studies have demonstrated that loneliness and depression are distinct constructs and loneliness is related to depression (Perlman, Gerson, & Spinner, 1978). However, most of the studies have taken a static view of these constructs while checking the relationships (Hagerty & Williams, 1999). Mitchell and James (2001: 532) argued for considering the role of time in management research otherwise the theories may get impoverished. Dunford et al. (2012) argued that knowing the pattern of change may lead to a realistic dynamic view of human experience and it will provide a better managerial implication to address stress. The following example highlights the importance of studying the dynamic nature of the relationship.

Consider two individuals in the same context who are experiencing same level of loneliness (a rating of 4 in a scale which captures loneliness in a scale ranging from 1 to 7). Most of the past research that looked at loneliness as a static phenomenon, would consider the two individuals to experience same level of depression. But the case may be different for both the individuals. For example, consider one individual’s loneliness level has increased from 1 to 4, and the other individual’s loneliness level has decreased from 7 to 4. The question then becomes whether the increase or decrease in the level of loneliness over time makes any difference in the experience of depression compared to assuming loneliness as a

static phenomenon. To understand this dynamic nature of depression, we borrowed from prospect theory.

Prospect theory helps in explaining decision making under uncertainty (Kahneman & Tversky, 1984). According to it, decision making particularly in uncertain situations is largely determined by the framing of the situation (such as gains or losses) by the decision makers. Framing captures the internal standards against which individuals evaluate options or current situation. Hence frame of reference is considered as an important factor (Chen et al., 2011) as the stressors may not be experienced in similar manner by different individuals; hence the outcome might be different. The subjective value function captures gains or losses in comparison to one's reference point. Prospect theory further suggests that the same level of discrepancy is valued more if it reflects loss as opposed to gain relative to a reference point respectively. For example, the subjective value employees attach to earning Rupees 100,000 in a month would differ depending on their earning in the previous month (i.e. Rupees 80,000 or Rupees 120,000). Prospect theory claims that individuals value a salary cut of Rupees 20,000 in a more negative manner compared to their positive experience in a salary increase of Rupees 20,000.

Kahneman (1999) argued that the above logic can explain individual behaviors especially the differences in related behaviours such as task engagement or disengagement. In other words, improvement or decrement in a relative term will change the subjective value one assigns to that state as well as their subjective experiences in a given context. Extending this argument it can be argued that change in loneliness is likely to be related to change in depression. This is because according to Prospect theory, improvements/ decrements in work experiences are more salient to individuals. One important reason for this assertion is that at a given time, individuals might attach different meanings to an absolute level of loneliness, depending on increase or decrease in their depression levels up to that point.

Hypothesis 1: Change in loneliness is related to change in depression scores.

Even though prospect theory provides an explanation for the relationship between loneliness change and changes in depression, it fails to explain when loneliness change is likely to influence individual experience of depression. We build on individual differences and argue that it might influence the outcome of loneliness. Studies have focused on individual differences with regard to depression (Brown, 2003). Individual differences (personality traits) describe the way people are different from each other psychologically. Trait approach has attempted to decode individual differences and has gained prominence in the study of personality. Personality has been conceptualized differently by different researchers. However, there is a general agreement that personality is the organized set of characteristics of an individual that uniquely influences his/ her cognitions, motivations, and behaviors across situations (Ryckman, 1999: 05). The Big-5 traits namely openness to experience, conscientiousness, extraversion, agreeableness, and neuroticism have emerged from decades of research and have demonstrated effective and simplified representation of overwhelming number of traits (McCrae & Costa, 2006).

These five traits have been found useful in their applicability (McCrae & Costa, 2006), and their ability to predict behavioral outcomes. In the present study, big-five personality traits have been taken as the study variables. We specifically focused on two factors (a) neuroticism and (b) extraversion as they have been shown to correlate with aspects of occupational wellbeing including psychological distress (Hart et al., 1995). Neuroticism is found to be related to emotional instability, negative affect, and reduced ability to cope with pressure. On the other hand, high extroversion is related to sociability, optimism, and positive affect (Costa and McCrae, 1992). Consistent to past studies (Bakker et al., 2010; Evans et al., 2016), we have taken these two dimensions of personality in the present study.

Neuroticism

Neuroticism is considered similar to negative affectivity (Watson & Clark, 1992). High negative affectivity signifies impulsive behavior, anger and use of ineffective coping techniques to stressful situations (O'Brien, Terry, & Jimmieson, 2008). Neuroticism thus is considered to be associated with increased stress vulnerability and the tendency to experience distress (Armstrong & Rimes, 2016). Neuroticism is the tendency to experience negative emotions such as sadness or anxiety, as well as mood swings (McCrae & Costa, 2006). Those scoring high on neuroticism tend to worry or ruminate a great deal and are prone to having their feelings easily hurt. Studies have shown that the effect of organizational constraints lead to negative work outcomes but the relationship is weaker for employees having low negative affectivity (Penney & Spector, 2005). In contrast high neurotic individuals experience greater job dissatisfaction (Judge et al., 1998). In a longitudinal study spanning 50 years, Staw et al. (1986) found that neuroticism is a significant predictor of job dissatisfaction, even after controlling for other factors such as work conditions. In addition neurotic individuals are found to be prone to having their feelings easily hurt and poor emotional adjustment to stressors (Judge & Ilies, 2002) such as loneliness. As a result individuals having high neurotic personality will experience more depression than others given the same level of change in loneliness.

Hypothesis 2: The linkage between change in loneliness and change in depression is moderated by neuroticism such that the relationship is stronger for individuals having higher levels of neuroticism.

Extraversion

Propensity to be sociable, gregarious, and assertive is called as extraversion (Barrick & Mount, 1991). Thus, extraversion concerns “differences in preference for social interaction and lively activity (McCrae & Costa, 2006: 46). Individuals with high levels of extraversion are good at building effective interpersonal relations with people, and generating energy and

cohesion (Tett & Burnett, 2003). Across 48 studies included in the meta-analyses Borman et al. (2001) found that extraversion is positively related to teamwork. Extraversion has been conceptualized having two broad components: ambition and sociability (Hogan, 1982). Sociability component of extraversion indicates that extraverts seek support from colleagues when they encounter complex tasks (Ting-Toomey & Chung, 1996). They are effective in developing interpersonal contacts (King & Broyles, 1997) and hence it is easy for them to become an in-group member (Taylor & Moghaddam, 1994). To explain the moderation effect of extraversion, we drew from the need for attachment work of Bowlby (1973). Bowlby described that like kids, adults also have some need for intimate relationships or a confidant. People are anxious about breaking attachments and failure to achieve need for attachment will lead to loneliness (Murphy & Kupshik, 1992). Loneliness is considered as an absence of attachment figure and influences the quality of life negatively. Studies have found evidence of a negative relationship between extraversion and avoidance attachment (Carver, 1997). Since loneliness is the absence of attachment, we argue that the relationship between change in loneliness and change in depression will be stronger for individuals having high extraversion. This is because the impact of loneliness will be more as the need for attachment is high for individuals having higher extraversion.

Hypothesis 3: The linkage between change in loneliness and change in depression will be moderated by extraversion such that the relationship is stronger for individuals having higher extraversion.

Methods

The present study is part of a bigger study that employed a longitudinal survey design. Data were collected in two phases with a 6-month time lag between the phases. Data were initially collected in July 2014, and again with all measures repeated in January, 2015. Data were collected from two sections from the undergraduate program participants at one of the

reputed institutions in India. We used mean substitution to impute the missing values as the number of missing values were very less (less than 1 percent) and were randomly distributed. Our study focused on temporal changes in loneliness and depression. Analytically, temporal change could be quantified in a variety of ways. In the present study we subtracted the time 1 score from the time 2 score to calculate the change score. One advantage in temporal change studies is that the test controls for most of the extraneous factors. For example, most of the studies (see Chen et al., 2011) using temporal design argue that controlling for the effect of other factors in time 1 how much increase in the DV (dependent variable) is explained by the change in IV (independent variable). However, consistent to past studies (Lau et al., 1999; Theeke et al., 2012; in the present study, we controlled the effect of demographic variables such as gender, number of siblings, family type (nuclear family or joint family), age and qualification due to their probable interference with the proposed theoretical model.

We captured Loneliness using the 20-item UCLA Loneliness Scale (version 3; Russell, 1996). Participants responded using a 4-point Likert-type scale (Never to Always). The reversed scored items were coded in the direction of higher loneliness before computing the scale composite scores. Depression was measured using the Center for Epidemiologic Studies Depression Scale (CES-D; Radloff, 1977). The CES-D is a self-report 20-item scale designed to measure depression. Neuroticism and expression were measured by using the respective items from the 44 item-scale (John & Srivastava, 1999). All the scales demonstrated adequate reliability. Before testing the hypotheses we checked the convergent and discriminant validity of the studied constructs. A common measure to establish convergent validity at the construct level is the average variance extracted (AVE). This criterion is defined as the sum of the squared loadings divided by the number of the indicators. The value of AVE for each construct was more than 0.50 indicating convergent validity (Bagozzi & Yi, 1988). All the scales demonstrated convergent validity (Table 2). We used Fornell and Larcker (1981) criterion to check discriminant validity. It compares the square root of the AVE values with the latent variable correlations. We found that the square

root of each construct's AVE is greater than its highest correlation with any other construct indicating discriminant validity of all the scales used in the study (Table 2).

To minimize common method variance (CMV) we used both the procedural and statistical measures (Podsakoff et al., 2012). In this regard, we used different anchoring labels for each scale, pretested the questionnaire and ensuring the respondents anonymity of their responses (Podsakoff et al., 2012). In addition, we conducted post-hoc Harman's one-factor test to check any possibility of common method variance. The unrotated principal component factor analysis revealed the presence of four distinct factors (loneliness, depression, neuroticism and extraversion) with eigenvalues greater than 1.0, rather than a single factor. Out of the total 50.04% variance explained, the first (largest) factor accounted for 21.55% variance which is less than the threshold of 50%. Results from this test indicate that common method effect is not an issue in this study.

Results

The means, standard deviations, correlations, average variance extracted scores and scale reliabilities of the variables are reported in Table 2. We conducted multicollinearity diagnosis for the sample. The respective variance inflation factor (VIF) scores were well below the commonly agreed threshold value ($VIF < 10$).

Insert Table 2 about here

Before running the regression analysis, we checked the normality, linearity and homoscedasticity scores for the variables and found the data suitable for regression analysis. We mean-centred the variable scores before running the regression (Aiken & West, 1991). We proposed a positive linkage between change in loneliness and depression (Hypothesis 1). Our data indicated a positive relationship between the two ($\beta = .59, p < .001; \Delta R^2 = .33, p < .001$). Thus hypothesis 1 is supported.

Insert Table 3 about here

We conducted hierarchical multiple regression and followed the steps prescribed by Baron and Kenny (1986) to test the hypotheses. In this analysis, the control variables were entered in step 1, independent variable was entered in step 2, and personality factors (neuroticism and extraversion) were entered in step 3. The interaction term (independent variable X personality factors) was entered in step 4 to test our hypotheses. As can be seen in Step 4 of Table 3, the regression coefficient for the two-way interaction term (between change in loneliness and neuroticism) was found to non-significant in explaining change in depression. Hence Hypothesis 2 was not supported.

We followed the same method to test Hypothesis 3. The regression coefficient for the two-way interaction term (between change in loneliness and extraversion) was found to explain an additional variance of 3 percent at a significant level of .05 ($p < 0.05$), after controlling for the effect of control variables, change in loneliness and extraversion. In addition we plotted the simple regression lines for high and low levels of extraversion (Aliken & West, 1991; see Figure 1). The graph indicates that the relationship between change in loneliness and change in depression is stronger for individuals high in extraversion. Hence hypothesis 3 was supported.

Insert Figure 1 about here

Discussion

Both loneliness and depression represent important and interrelated problems (Allen & Sheeber, 2009). Previous empirical studies highlighted that people who say they are lonely also say they feel depressed (Perlman et al., 1978; Russell et al., 1978). Researchers also find a strong relationship between loneliness and depression (Weeks et al., 1980). The result of

our study is also in line with the previous studies. However, based on the inputs borrowed from prospect theory we argued that both the loneliness and depression are dynamic concepts. Hence unlike the extant literature which predominantly captured both loneliness and depression as static phenomena, we went one step forward and looked at the dynamic relationship between loneliness and depression.

Contribution to theory

Our study revealed that both loneliness and depression changes over the period of time and hence are dynamic in nature. This is important as it is not the loneliness that matters rather the change in loneliness that has deleterious effects. Further we explored the moderating effect of personality factors on relationship between loneliness and depression. However, the information on the role of personality factors on the relationship between loneliness and depression is limited and inconsistent, despite strong concurrent associations between the two constructs and personality traits (Asendorpf & van Aken, 2003; Kotov et al., 2010). Personality is suggested to be a major risk factor for depression (Hakulinen et al., 2015). Previous research also indicated that the five-factor model of personality can account for many of the individual differences in personality (McCrae & Costa, 2006). We included two personality factors, neuroticism and extraversion in our study for two reasons. One, extraverted individuals are usually less likely to experience depressive symptoms and loneliness. Two, neurotic individuals are more likely to experience depressive symptoms (Vanhalst et al., 2012).

As hypothesised, the linkage between change in loneliness and change in depression was found higher among those people who were high on extraversion. This may imply that extraversion not only relates to higher levels of loneliness and depression, but also exacerbates those outcomes. This clearly indicates that the impact of loneliness will be more for individuals having higher extraversion. This finding is in line with the definition of

extraversion, i.e. they are effective in developing interpersonal contacts (King & Broyles, 1997) and possess higher levels of need for attachment (McCrae & Costa, 2006). However, contrary to our assertion, neuroticism was not found to moderate the relationship between change in loneliness and change in depression. Further research may explore the role of neuroticism in explaining the linkage between change in loneliness and change in depression.

Contribution to practice

Findings of this longitudinal study demonstrate that change in loneliness is important in increased level of depression. Hence, institutions play an active role in reducing the change in loneliness. Previous studies have clearly highlighted various consequences of depression among the students (Eisenberg et al., 2007; Weitzman, 2004). Depression often acts as a gateway for more serious health risks and unproductive behaviour. Hence, it is important for students as well as college authorities to understand the dynamic nature and relationship of loneliness and depression, as well as the role of personality factors on this relationship. Routine monitoring as well as various educational programs may be included as regular components of campus culture. This would help authorities to identify and provide counselling services to them. Even curriculum can also support to encourage various group activities in the campus to reduce some amount of loneliness among the students.

Various programs can be designed with an objective to improve interpersonal skills, cognitive understanding, and resolution of aversive emotions, as these college going students or budding managers are more receptive to intervention programs, focusing the importance of friendships during this crucial time (Dickens & Perlman, 1981). College authorities can help these budding managers to learn and adopt effective self-control strategies to help them to cope with internal stress cues, and develop problem-solving skills, before problems actually starts (Rosenbaum, 1990). Since the lonely students lack confidence in social situations and are less assertive (Goswick & Jones, 1981), they may show less interest in

friendship and relationships. Thus, the above strategies, if organised properly by the college authorities involving the peer group, would help gain their confidence and would positively influence their personality leading to decrease in depression.

Not only among the students, depression been identified as a serious concern among working professionals. Depression is argued to represent a disease that puts financial burden not only on workers, their families, and the healthcare systems but also on the businesses worldwide (McTernan et al., 2013). In the work context, depression is argued to have deleterious effect. For example, Greenberg and colleagues (1993) found that compared to their normal conditions, individuals in depressed conditions contribute less in terms of productivity. Depression interferes directly as well as indirectly with work performance. For example, Berndt et al. (1998, p. 513) argued that individual's inability to concentrate, low energy, susceptibility to fatigability, exaggerated self-doubts, and indecisiveness might impair work performance. Martin, Blum, Beach, and Roman (1996) found that depression reduces individual's occupational functioning and has negative effects on their job performance. We focus on loneliness as an important antecedent of depression. We focus on loneliness because loneliness is agreed to be a prominent workplace emotion that has the potential to affect both the employees and the organizations. Unfortunately, it has received scant attention within the field of management (Ozcelik & Barsade, 2011). Future studies may explore the model among the working professionals for wider applicability. In the present study we have used survey research method. Survey method has its limitations. Future studies may use the multi-method approach for better generalizability.

Conclusion

Our study asserts that change in loneliness is important for the experience of depression. Same level of loneliness might have different effect on individuals depending on their

personality, especially extraversion. Steps need to be taken as extraversion people are susceptible towards experience depression if they feel lonely.

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Table 1: Correlates of Depression/ Symptoms of Depression

| Authors | Factors | Relationship with Depression |
|---------------------------------|---|-------------------------------------|
| Situational Factors | | |
| Clay, Anderson, & Dixon (1993) | Stressful situations | Positive |
| Cole & Milstead (1989) | Social support | Negative |
| Begley (1994) | Social anxiety | Positive |
| Slavich & Irwin (2014) | Social threat | Positive |
| Paterniti et al. (2002) | hostility | Positive |
| Permuy et al. (2009) | Attachment styles (Fearful and Preoccupied) | Positive |
| La Greca & Harrison (2005) | Victimization | Positive |
| Hokanson et al. (1989) | Social contact | Negative |
| | Enjoyability of social contacts | Negative |
| | Life-event stress | Positive |
| Lee & Hankin (2009) | Insecure Attachment | Positive |
| | Dysfunctional Attitudes | Positive |
| Anderson (1994) | Cultural differences | Related |
| Individual Factors | | |
| Begley (1994) | Anger | Positive |
| Clay, Anderson, & Dixon (1993) | | |
| Cole & Milstead (1989) | Hopelessness | Positive |
| Barnett & Gotlib (1988) | Neuroticism | Positive |
| | Extraversion | Negative |
| Lee & Hankin 2009 | Self-esteem | Negative |
| Sowislo & Orth (2013) | | |
| Soysa & Wilcomb (2013) | Mindfulness | Negative |
| | Self-compassion self- efficacy | Negative |
| Anderson (1999) | Loneliness | Positive |
| Semmer et al. (2007) | | |
| Nangle et al. (2003) | Friendship | Negative |
| La Greca & Harrison (2005) | | |
| Organizational Factors | | |
| Shani & Pizam (2009) | Job satisfaction | Negative |
| | Job Stress | Positive |
| | Burnout | Positive |
| Schermuly & Meyer (2015) | Leader-member exchange | Negative |
| | Empowerment | Negative |
| | Meaning, | Negative |
| | Competence | Negative |
| | Self-determination | Negative |
| Shudo, Yamamoto, & Sakai (2017) | Techniques for activating rewarding behavior | Negative |
| | Techniques for reduction of avoidance behavior | Positive |

Table 2: Mean, standard deviation, and zero-order correlation among variables

| Sl. No | Variables | Mean | SD | Alpha | CR | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|--------|----------------------|------|-----|-------|-----|------|-------|-------|--------|--------|---------|--------|---------|--------|--------|
| 1. | Gender | .35 | .48 | | | | | | | | | | | | |
| 2. | Siblings | .85 | .36 | | | .17 | | | | | | | | | |
| 3. | Family Type | 1.77 | .42 | | | -.01 | -.23* | | | | | | | | |
| 4. | Neuroticism | 2.89 | .82 | .87 | .88 | -.06 | .14 | -.09 | (.71) | | | | | | |
| 5. | Extraversion | 2.99 | .91 | .85 | .86 | .09 | -.13 | .18† | -.14* | (.75) | | | | | |
| 6. | Loneliness (Phase-1) | 1.95 | .63 | .93 | .94 | -.16 | .26* | -.19† | .38*** | -.37** | (.69) | | | | |
| 7. | Loneliness (Phase-2) | 2.04 | .70 | .95 | .95 | -.15 | .02 | -.12 | .20† | -.25* | .44*** | | | | |
| 8. | Depression (Phase-1) | 2.08 | .56 | .86 | .89 | .09 | .25* | -.06 | .35** | -.29** | .63*** | .23† | (.67) | | |
| 9. | Depression (Phase-2) | 2.21 | .60 | .87 | .88 | -.03 | -.08 | -.14† | .28** | -.05 | .18 | .65*** | .23* | | |
| 10. | Change in Loneliness | .09 | .71 | - | - | -.01 | -.21* | .06 | -.14 | .08 | -.47*** | .59*** | -.34** | .45*** | |
| 11. | Change in Depression | .24 | .65 | - | - | -.03 | -.24* | -.07 | -.01 | .12 | -.14 | .50*** | -.40*** | .78*** | .61*** |

Note: N = 87

† p < .1, * p < .05 ** p < .01, *** p < .001

Alpha: Cronbach alpha; CR: Composite reliability.

Numbers in the parenthesis indicate AVE scores.

Table 3: Interaction effect of neuroticism and extraversion on the relationship between change in loneliness and change in depression

| | Step 1 | | Step 2 | | Step 3 | | Step 4 | | Model F Change | Overall R2 | R2 Change | |
|-------------------------------------|---------|-----|---------|-----|---------|-----|---------|-----|-------------------|------------|-----------|--|
| | β | se | β | se | β | se | β | se | | | | |
| Step 1: Control variables | | | | | | | | | | | | |
| Gender | .01 | .15 | -.01 | .12 | | | | | 2.18 [†] | .07 | .07 | |
| Siblings | -.27* | .20 | -.14 | .17 | | | | | | | | |
| Family type | -.13 | .17 | -.13 | .14 | | | | | | | | |
| Step 2: Independent Variable | | | | | | | | | | | | |
| Change in Loneliness | | | .59*** | .08 | | | | | 45.18*** | .40 | .33 | |
| Step 3: Personality Variable | | | | | | | | | | | | |
| Neuroticism | | | | | .08 | .07 | | | .90 | .41 | .01 | |
| Extraversion | | | | | .08 | .06 | | | .92 | .41 | .01 | |
| Step 4: Interaction Effect | | | | | | | | | | | | |
| Change in Loneliness X Neuroticism | | | | | | | .23 | .03 | 2.01 | .42 | .02 (ns.) | |
| Change in Loneliness X Extraversion | | | | | | | .27 | .04 | 4.84 | .44 | .03* | |

Note: N = 87

† p < .1, * p < .05 ** p < .01, *** p < .001

Step 3 and step 4 are repeated for neuroticism and extraversion respectively.

Figure 1: Interaction effect

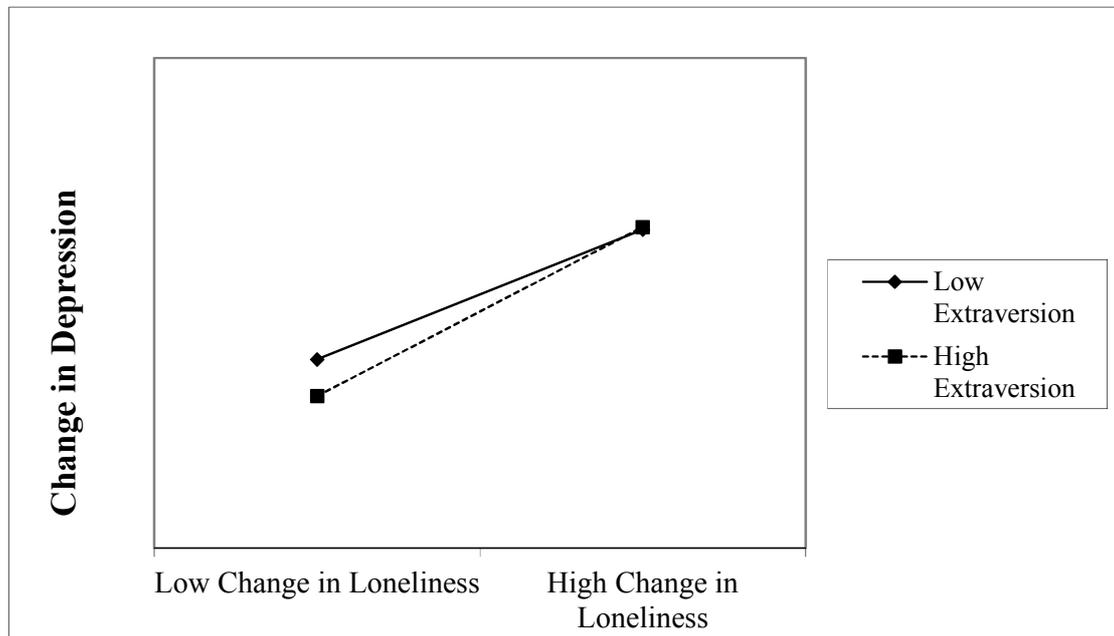


Table 1: Correlates of Depression/ Symptoms of Depression

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| Begley (1994) | Social anxiety | Positive |
| Slavich & Irwin (2014) | Social threat | Positive |
| Paterniti et al. (2002) | hostility | Positive |
| Permuy et al. (2009) | Attachment styles (Fearful and Preoccupied) | Positive |
| Greca & Harrison (2010) | Victimization | Positive |
| Hokanson et al. (1989) | Social contact | Negative |
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| | Life-event stress | Positive |
| Lee & Hankin (2009) | Insecure Attachment | Positive |
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| Begley (1994) | Anger | Positive |
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| Barnett & Gotlib (1988) | Neuroticism | Positive |
| | Extraversion | Negative |
| Lee & Hankin 2009 | Self-esteem | Negative |
| Sowislo & Orth (2013) | | |
| Soysa & Wilcomb (2013) | Mindfulness | Negative |
| | Self-compassion self-efficacy | Negative |
| Anderson (1999) | Loneliness | Positive |
| Semmer et al. (2007) | | |
| Nangle et al. (2003) | Friendship | Negative |
| Greca & Harrison (2010) | | |
| Organizational Factors | | |
| Shani & Pizam (2009) | Job satisfaction | Negative |
| | Job Stress | Positive |
| | Burnout | Positive |
| Schermuly & Meyer (2015) | Leader-member exchange | Negative |
| | Empowerment | Negative |
| | Meaning, | Negative |
| | Competence | Negative |
| | Self-determination | Negative |
| Shudo, Yamamoto, & Sakai (2017) | Techniques for activating rewarding behavior | Negative |
| | Techniques for reduction of avoidance behavior | Positive |

Table 2: Mean, standard deviation, and zero-order correlation among variables

| Sl. No | Variables | Mean | SD | Alpha | CR | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|--------|----------------------|------|-----|-------|-----|------|-------|-------|--------|--------|---------|--------|---------|--------|--------|
| 1. | Gender | .35 | .48 | | | | | | | | | | | | |
| 2. | Siblings | .85 | .36 | | | .17 | | | | | | | | | |
| 3. | Family Type | 1.77 | .42 | | | -.01 | -.23* | | | | | | | | |
| 4. | Neuroticism | 2.89 | .82 | .87 | .88 | -.06 | .14 | -.09 | (.71) | | | | | | |
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| 6. | Loneliness (Phase-1) | 1.95 | .63 | .93 | .94 | -.16 | .26* | -.19† | .38*** | -.37** | (.69) | | | | |
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| 10. | Change in Loneliness | .09 | .71 | - | - | -.01 | -.21* | .06 | -.14 | .08 | -.47*** | .59*** | -.34** | .45*** | |
| 11. | Change in Depression | .24 | .65 | - | - | -.03 | -.24* | -.07 | -.01 | .12 | -.14 | .50*** | -.40*** | .78*** | .61*** |

Note: N = 87

† $p < .1$, * $p < .05$ ** $p < .01$, *** $p < .001$

Alpha: Cronbach alpha; CR: Composite reliability.

Numbers in the parenthesis indicate AVE scores.

Table 3: Interaction effect of neuroticism and extraversion on the relationship between change in loneliness and change in depression

| | Step 1 | | Step 2 | | Step 3 | | Step 4 | | Model F | | Overall R2 | |
|-------------------------------------|---------|-----|---------|-----|---------|-----|---------|-----|-------------------|-----|------------|-----------|
| | β | se | β | se | β | se | β | se | Change | R2 | Change | R2 |
| Step 1: Control variables | | | | | | | | | | | | |
| Gender | .01 | .15 | -.01 | .12 | | | | | 2.18 [†] | .07 | | .07 |
| Siblings | -.27* | .20 | -.14 | .17 | | | | | | | | |
| Family type | -.13 | .17 | -.13 | .14 | | | | | | | | |
| Step 2: Independent Variable | | | | | | | | | | | | |
| Change in Loneliness | | | .59*** | .08 | | | | | 45.18*** | .40 | | .33 |
| Step 3: Personality Variable | | | | | | | | | | | | |
| Neuroticism | | | | | .08 | .07 | | | .90 | .41 | | .01 |
| Extraversion | | | | | .08 | .06 | | | .92 | .41 | | .01 |
| Step 4: Interaction Effect | | | | | | | | | | | | |
| Change in Loneliness X | | | | | | | .23 | .03 | 2.01 | .42 | | .02 (ns.) |
| Neuroticism | | | | | | | | | | | | |
| Change in Loneliness X | | | | | | | .27 | .04 | 4.84 | .44 | | .03* |
| Extraversion | | | | | | | | | | | | |

Note: N = 87

[†] $p < .1$, * $p < .05$ ** $p < .01$, *** $p < .001$

Step 3 and step 4 are repeated for neuroticism and extraversion respectively.

Figure 1 : Interaction effect

