

DEPRESSION, DAILY STRESS, AND INTERPERSONAL BEHAVIOR

by

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Bachelor of Philosophy, University of Pittsburgh, 2019

Submitted to the Undergraduate and Graduate Faculty of

The Kenneth P. Dietrich School of Arts & Sciences in partial fulfillment

of the requirements for the degree of

Bachelor of Philosophy

University of Pittsburgh

2019

UNIVERSITY OF PITTSBURGH
THE DIETRICH SCHOOL OF ARTS & SCIENCES

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Depression is not just about low; it has personal and social costs as well. According to the stress generation theory, individuals suffering from depression tend to generate life stressors. Given how common both stress and depression are and how they play a large role in many different domains in an individual's life, this study examined how these two variables play a role in interpersonal interactions. Participants ($N = 396$) completed six surveys per day for seven consecutive days, on a smartphone application, to report on their social interactions. Participants with elevated depressivity scores experienced more stress, consistent with the stress generation effect. Participants who experienced momentary stress self-reported their interpersonal behavior as cold towards their interaction partner(s). Individuals higher in depressivity also self-reported submissive behavior on average. Depression also amplified the link between stress and submissive behavior. The results of the current study shed further light on the complex interplay between depression, stress, and an individual's behavior in social situations.

Keywords: Depression, Stress, Interpersonal Behavior, Stress Generation, Ecological Momentary Assessment

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ACKNOWLEDGEMENTS

Thank you to Lauren Hallion, Jay Fournier, and Kevin King for serving as members of my committee.

Thank you to Will Woods for serving on my committee and always providing help and guidance whenever I needed it.

Thank you to my friends and family for supporting me as I worked through this project.

Finally, a tremendous thank you to my thesis advisor, Aidan Wright. His encouragement and guidance allowed me to pursue much more than I ever thought I could.

1.0 INTRODUCTION

Depression is a common mental disorder with large personal and social costs. In the United States alone, approximately 6.7% of adults experienced a major depressive episode in 2016 (National Institute of Mental Health, 2017). In order to develop better interventions for depression, a good understanding of the processes that lead to the development and maintenance of depression are needed. Several theories have been developed that discuss vulnerabilities and consequences of the disorder that each emphasize distinct aspects of depressive phenomenology. For instance, a behaviorist perspective on depression argues for the role of lack of positive reinforcement and stress (Lewinsohn, 1974). Lewinsohn's theory states that due to increased stress and decreased positive reinforcement, individuals who struggle with depression do not know how to cope with interpersonal conflicts (McLeod, 2015). Alternatively, a cognitive account of depression prioritizes the role of negative thoughts about self, the future, and the world in general (Beck, 1967). And, although this perspective emphasizes cognitions, Beck has also argued that interpersonal dispositions place individuals at risk for depression (Beiling & Alden, 2001). Further, in the context of the cognitive behavioral approach, Meichenbaum (1985) posited and demonstrated with his stress inoculation therapy that an individual can be prepared for and protected against stress before it even occurs (Meichenbaum, 1985). Despite differences in emphasis (e.g., behavioral reinforcement, cognition, mental schemas), prominent theories of depression converge on the importance of the experience of stressors and social and

interpersonal functioning in the development and maintenance of the pathology. The current study investigates how depression, daily stress, and interpersonal behavior are associated with each other in order to better understand the potentially complex interplay among these theoretically relevant components.

It has been well-established that stress can contribute to the deterioration of an individual's mental health, and particularly contribute to the development and exacerbation of depression (e.g., Caspi et al., 2003; Kasl, 1984; Price, Choi, & Vinokur, 2002). However, it is now increasingly understood that depression also has an influence on an individual's experience of stress. In what has been termed "stress generation" (Hammen, 1991, 2006), individuals with depression may engage in behaviors that are likely to lead to greater stress, resulting in a reciprocal relationship between stress and depression (Alloy & Liu, 2010; Hammen, 1991, 2006). In other words, individuals are not only prone to depression due to life stressors, but when depressed, they then tend to generate more of the stressors that increase their risk for the disorder (Chun, Cronkite, & Moos, 2004; Levinson, 2006).

The stress generation hypothesis (Hammen, 1991) states that depressive mood can lead to stressors, which can add to an individual's cognitive vulnerability, leading to an even further increased experience of depression (Calvete, Orue, & Hankin, 2012). Compared to individuals with no history of depression, those who are vulnerable to the disorder encounter a higher rate of stressful events that to some degree are dependent on their own actions (Conway, Hammen, & Brennan, 2012). Indeed, psychopathology generally, and depression more specifically, leads to impaired functioning in a number of psychosocial domains, such as work and relationships due to their associated symptoms (Hammen, 1991). By extension, it can be assumed that these psychosocial impairments and their sequelae can contribute to chronic stress. Thus, this

potentially leads to a cyclical process, such that mental disorders by definition include functional impairment and that is likely a source of stress in and of itself, which in turn place the individual at higher risk to perpetuating the psychopathology (Hammen, 1991).

The impacts of depression are not limited to low mood; it has strong effects in the interpersonal domain as well, while also increasing the experience of stress (e.g., Davila et al., 1997). Consistent with the stress generation model described above, Interpersonal Theory states that individuals experiencing depression may cause or maintain their mood disorders, in part through the way their symptoms and behavior impact their social environments (Bieling & Alden, 2001). Compared to a healthy sample, depressed individuals rate interpersonal problems as more distressing (Barrett & Barber, 2007). In addition, individuals suffering from depression also tend to enjoy their social interactions less (Nezlek et al., 2000). Moreover, this association presumably goes both ways; depressed individuals also report that a loss and deficit of social interactions exacerbates their depression and low mood (Gladstone, Parker, Malhi, & Wilhelm, 2007).

Stressors such as divorce, societal or family demands are interpersonal in nature. However, it is important to note that people diagnosed with depression also tend to lack skills necessary for regular conversation and general conflict resolution (Hammen, 1991), which can cause negative responses in an interaction (Coyne et al., 1987). This could further lead to fewer pleasant and more unpleasant interactions with others, which serve as a predictor of depression (Lewinsohn, 1974). Although relatively little research has investigated the effect stress has on a person's social behavior, the limited research that does exist suggests that daily stress is associated with higher dominance and lower warmth in social situations (i.e., hostile behavior; Wright, Hopwood, & Simms, 2015). However, this finding is limited in that it is derived from a

single sample of data collected from psychiatric patients, potentially limiting generalizability. Ultimately, these research findings suggest that the link between stress and social behavior is likely important, but how it plays out hour-to-hour and day-to-day is not well understood.

According to the transactional model of stress, the stress response is based on the individual's appraisal of their environment (Lazarus, 1999). During a social interaction, for example, an individual may evaluate a situation as a threat. Based on that evaluation, the person's stress response may be activated, which would then lead the individual to find ways to cope with the perceived threat. Consequently, it is important to study different ways a person perceives social interactions, and indicate what factors are playing a role in such a setting. By definition, an individual's stable characteristics remain consistent across social interactions (Costa & McCrae, 1992), suggesting that there might be similarities in how they cope with a stressful social interaction. For instance, there is a positive correlation between neurotic hostility and depression, and a negative correlation between neurotic hostility and warmth; these correlations help in understanding the relationship between neuroticism, hostility, and depression (Felsten, 1996). Similarly, stress is associated with hostile behavior in daily life (Wright et al., 2015). If an interpersonal interaction is perceived as stressful, the hostile feelings and behaviors may be experienced and projected onto others.

Due to the nature of depression and its symptoms, people may seek reassurance from others around them; however, the reassurance-seeking behavior could become excessive, causing others to reject the individual (Shahar, Joiner, Zuroff & Blatt, 2004). Similarly, the stress generation model argues that depression can cause people to behave in ways that may induce stress, which can negatively impact their interpersonal relationships, which can further amplify the depression (Hammen, 1991). By tying these two ideas together, Pothoff et al. (1995)

suggested that high amounts of reassurance-seeking behavior predicted high levels of interpersonal stress, which led to an increased experience of depression (Shahar, Joiner, Zuroff & Blatt, 2004).

Some consistent individual difference variables that have been theorized to have a relationship with depression are two personality elements proposed by Beck and Blatt (Beiling & Alden, 2001). Each of their theories suggest that an individual's preference or investment in relationships can play a role in their perception of the social interaction. For instance, the diathesis-stress model posits that sociotropic individuals (those highly invested in interpersonal relationships), are more prone to depression if the interaction is not perceived as social acceptance or personal attractiveness (Clark & Brown, 1992). On the other hand, an autonomous person (one who values independence) has a higher chance of developing depression if events or interactions are limiting their independence and control (Clark, Beck & Brown, 1989). "Degree of upset, outcome expectations, perceived uncertainty and uncontrollability, amount of change resulting from the event, [and] perceived lack of social support" all have been shown to have significant associations with depression (Clark & Brown, 1992, p. 637-638). Therefore, a person's experience of life events as well as social interactions may play a critical role in the development of depression.

Research provides initial support for these hypotheses. For instance, a study conducted by Clark and Beck (1992) showed that the interaction between sociotropy and negative social events had an association with dysphoria. Further, individuals high on sociotropy experiencing a negative social event are more likely to manifest a depressive state (Clark & Beck, 1992). A study that was conducted by Bieling and Alden (2001) to test the associations between depression and social behavior found that depressed individuals expressed negative social

behavior, which led to rejection. Furthermore, depressed individuals also seemed more withdrawn in their interactions due to low amounts of conversations and high levels of negative non-verbal behavior. As predicted and previously mentioned, individuals suffering with depression were rejected by others in the social interaction (Bieling & Alden, 2001).

When discussing stress, it is important to note the difference between stressful life events and daily stress. While these two kinds of stressors are related, they are not the same. Stressful life events refer to major stressors, including divorce, death of an intimate partner, or loss of a job. These life stressors can then translate into daily stress. For instance, a death of an intimate partner could lead to daily stressors like loss of income or more responsibility for the children. Research supporting this idea indicates that stressful life events are strongly related to the onset of depression (Sroufe, Duggal, & Weinfield, 2000). Specifically, prior studies have shown that individuals who develop depression are 3-6 times more likely to have experienced a severely threatening event such as marital breakup or financially devastating job loss (Harkness, Bruce, & Lumley, 2006). However, one of the most novel findings within life stress research is the role of stress in changes across recurrent episodes of (Monroe & Harkness, 2005). “Stress sensitization” is the process by which individuals become more sensitive to the unfortunate events that instigate depression, such that lower amounts of stress are required subsequent episodes of depression (Harkness, Bruce, & Lumley, 2006). This then plays a role in an individual’s everyday life experience of stress and depression and this study aims to report on that fine-grained day-to-day behavior and social interactions.

1.1 CURRENT STUDY

The aims of this study were to investigate the effect of depression on stress (A), social behavior (B), and the relationship between stress and social behavior in daily life (D; Figure 1). In addition, the relationship between stress and interpersonal behavior during social situations was examined (C). Interpersonal behavior and stress in social situations was sampled in the moment using ecological momentary assessment (EMA; Stone & Shiffman, 1994) while depressive characteristics were measured at baseline and treated as an individual difference (i.e., the personality trait of Depressivity). I hypothesized based on previous findings (Wright et al, 2015), as well as the broader theoretical literature on depression, individuals higher in depressivity would, on average, behave more distant and withdrawn (i.e., colder) during social interactions. As evidenced by previous research that such behavior leads to rejection (Bieling & Alden, 2001), the depressed individual would experience their own behavior as cold on average, and possibly as more dominant. Consequentially, the low participation or the withdrawal from the interaction would be associated with lower warmth (i.e., colder) and lower dominance (i.e., higher submissiveness). Furthermore, in stressful interactions, depression would amplify the link between stress and interpersonal functioning as shown by the stress-generation theory.

2.0 METHOD

2.1 PARTICIPANTS

Participants in the current study were drawn from a larger sample of undergraduates ($N = 836$), recruited during the Fall 2016 semester to complete the baseline questionnaire for course credit. As a part of this larger study, participants were given the additional opportunity to participate in ambulatory assessment (AA) for the chance to win one of a variety of prizes (e.g. \$75 gift card). Chances of winning increased with the number of surveys answered. In order to participate in the study, participants had to be 18 years of age or older and have a smartphone with iOS or Android software. No other exclusionary criteria were used. Course credit and entry into a prize drawing was awarded for participation compensation.

The sample used in the current study consisted of individuals who completed an additional ambulatory assessment protocol ($n = 396$). The sample was 56.3% female with an age range from 18 to 34 ($M = 18.74$; $SD = 1.35$). There were 80.3% of participants who identified as White (12.1% Asian; 6.6% Black; 0.3% American Indian/Alaskan Native). Three participants in this sample did not answer this item. Additionally, 27.8% indicated a lifetime history of mental health treatment, out of which 50.9% had received treatment during the prior year.

2.2 PROCEDURE

Upon arrival to the lab, participants completed initial baseline questionnaires that was followed by a week-long AA protocol. The baseline questionnaire was completed at the lab on the first day of the study and collected information such as demographics, personality, and personality pathology. Following the survey, participants were provided with instructions for completing the study. Participants then downloaded the MetricWire application on their smartphones to use for reporting on their interactions. The AA surveys completed on MetricWire obtained information on affect, interpersonal behavior, and narcissism (as a part of a larger study).

The MetricWire application pushed a notification to the participants' smartphones on a random schedule to complete the AA surveys. Starting the day after the initial session in the lab, participants completed up to six surveys each day for seven days straight. Surveys were sent out with a minimum of 90-minute interval between each survey. Each survey began with asking the participants if they had participated in an interpersonal interaction. If the participants answered yes to that question, they were required to answer more questions regarding that interaction. Participants were asked about who the interaction was with as well as the amount of time that had passed since the interaction. Following those questions, participants were asked to self-rate their behavior and the behavior of their partner(s) during the interaction on a variety of scales. Some participants may not have received the full number of surveys (up to 42) due to a

technological error in the third-party software. The mean number of responses was 22.14 ($SD = 14.16$).

2.3 MEASURES

2.3.1 DEPRESSIVE PERSONALITY TRAITS

The Computerized Adaptive Test of Personality Disorder – Static Form (CAT-PD-SF; Simms, 2013) includes 216 items from the much larger CAT-PD project item pool (Simms et al., 2011). The CAT-PD-SF is designed for administration in a static format with all questions presented to all participants. It assesses 33 maladaptive personality traits with self-report items rated on a five-point Likert scale (0 – Very Untrue of Me; 1 – Moderately Untrue of Me; 2 – Neither True nor Untrue of Me; 3 – Moderately True of Me; 4 – Very True of Me). In the current study, depressive personality traits were assessed with the Depressivity scale; this subscale consists of six items, two of which are reverse coded. An example item is “I tend to feel very hopeless.”

2.3.2 INTERPERSONAL BEHAVIORS

Participants were asked the degree to which they expressed dominant (“Accommodating/Submissive Timid” to “Assertive/Dominant/Controlling”) and affiliative (“Cold/Distant/Hostile” to “Warm/Friendly/Caring”) behaviors during their social interactions.

Behaviors were rated using a visual analogue sliding scale ranging from 0 to 100 (Woods et al., in preparation).

2.3.3 STRESS

Participants were asked about the stress they experienced during their social interactions using a single item developed for a larger study. Participants rated their stress using a visual analogue scale ranging from 0 (“Not at all”) to 100 (“Extremely”).

2.4 ANALYTIC PLAN

I estimated the associations between depression, daily stress, and social interactions, using multilevel structural equation modeling (MSEM; Figure 1). In MSEM, each momentary variable is decomposed into within-person and between-person variance components. Associations involving within-person variables (e.g., stress) were estimated in my model using random effects, meaning that each participant has their own unique estimate of the association, and the average of these individualized associations (also known as the fixed effect) is presented. Because each person has their own estimated association, these random effects become between person variables that can then be associated with other between-person variables, such as depression. My model estimated the effects of depression on average tendencies to report feeling stress (Path A) and behaving warmly or dominantly (Path B). It also tested the relationship between momentary stress and the participant’s social behavior (Path C) across the

domains of warmth and dominance and the effect of depression on this relationship in order to see if depression amplified or dampened the link between stress and social behavior (Path D).

3.0 RESULTS

When individuals reported experiencing stress, they also tended to report less warm (i.e., colder) behavior towards their interaction partner(s) ($\beta = -.39, p < .05$). There was no association between momentary experience of stress and expressed dominance or submissiveness ($\beta = .01, n.s.$).

When examining associations between depression and stress, individuals who reported a higher level of depression also tended to report more momentary stress on average ($\beta = .30, p < .05$). While there was no association between the expression of warm behavior and depression ($\beta = -.09, n.s.$), participants did report expressing higher submissiveness on average ($\beta = -.16, p < .05$). Additionally, depression amplified the link between stress and social behavior. Participants who reported greater depression showed a stronger link between stress and less dominant behavior ($\beta = -.18, p < .05$), although depression did not influence the association between stress and warmth ($\beta = -.02, p > .05$).

4.0 DISCUSSION

I examined the impact of momentary stress on momentary social behavior, as well as the effect of dispositional depression on stress, social behavior, and their momentary association. On average, depressed individuals expressed submissive behavior. This is also consistent with the cross-sectional association of depression and elevated submissive interpersonal problems (e.g., Barrat & Barber, 2007). Furthermore, depressed individuals also tend to be more withdrawn and express high levels of negative non-verbal behavior (Bieling & Alden 2001). In line with my hypothesis, when participants had an interaction with another individual while experiencing stress, the participant reported on their own behavior as cold. Contrary to my other hypothesis, there was no association between an individual's experience of momentary stress and expressed dominance. Based on the stress generation effect (Hammen, 1991), it was hypothesized that high experience of stress would be associated with high levels of depression. In line with this previous work (e.g., Alloy & Liu, 2010; Hammen, 1991, 2006), participants who reported higher levels of depression also reported greater experience of momentary stress.

Prior work suggests that interactions that are perceived as stressful may be associated with hostile feelings and behaviors (i.e., higher cold and dominant behavior; Wright et al., 2015). In line with these findings, I found that the experience of stress was associated with self-rated cold behavior. Since the limited research on the relationship between momentary stress and social behavior was conducted in a psychiatric sample, this replication supports the

generalization of this finding. While this study found a clear relationship between cold behavior and stress, there was no significant relationship with the expression of dominance. This could be due to the specific cues the participants were receiving or giving, depending on the nature of the relationship. In social interactions, an individual presents a particular problem with a certain expectation from the other people involved in the interaction (e.g., to receive consolation or advice). Depending on the context cues, individuals react accordingly (Horowitz et al, 2001).

Also, supporting prior work on the stress generation effect (Hammen, 1991), participants who reported experiencing higher momentary stress also reported higher levels of depression. While depression was evaluated first in this study and the measure of stress was obtained after that, we know that psychosocial impairments that are as result of depression can constitute chronic stress, which leads to a cyclical process; these disorders include functional impairment and that in and of itself can create stress. Similar to what has been seen in previous studies (e.g., Calvete, Orue, & Hankin, 2012; Conway, Hammen, & Brennan, 2012), individuals who are vulnerable to depression encounter more stressful events, which are often dependent on their own actions. The link between depression and average reported daily stress is consistent with this model. This may be one of the proximal etiological and maintenance mechanisms of the disorder.

In addition, participants with high levels of depression also expressed higher submissiveness during social interactions on average. Given that individuals with depression tend to enjoy their social interactions less on average (Nezlek et al., 2000), submissive behavior and more passivity is understandable due to the relative lack of investment in the interaction. This further supports the idea behind stress generation: stating that depressed individuals also report that a loss and deficit of social interactions exacerbates their depression and low mood

(Gladstone, Parker, Malhi, & Wilhelm, 2007). Although Lewinsohn's theory might predict that submissiveness pulls for helping behavior from others, and thereby reinforces depression, in fact it may paradoxically elicit frustration and colder behavior from others, which in turn perpetuates the depression due to reduced interpersonal rewards.

The results of the current study shed further light on an individual's behavior across a range of emotions. This can be very beneficial to know in a clinical setting; with the increasing occurrences of depression in student samples (Aselton, 2012), it is also important to understand the disorder from a different perspective in terms of interpersonal relationships. It has been previously demonstrated that depression can lead to augmented stress (Hammen, 1991); the current study develops our understanding of how depression effects an individual's social behavior. During a social interaction, individuals higher in depression are likely to behave more submissively and when stressed they express greater cold behavior. However, the more depressed an individual is, the more likely they are to respond to stress with submissiveness. This helps in terms of seeking interventions in a clinical setting for individuals experiencing depression and interpersonal conflicts. Knowing the kind of behavior a person on average expresses and experiences under stressful circumstances, a clinician can have a better insight into their client's actions and perceptions of the interaction.

The strengths of this study include the sampling of participants' behavior in their natural environment, in real-time as it is lived in daily life; this was done through the use of EMA. Using EMA strengthened this study in multiple ways: 1) it enhanced the ecological validity of the results, sampling from behaviors in real-life situations; 2) it captured thoughts, feelings, and behavior immediately or shortly after they had occurred thereby reducing the retrospective biases; and 3) it captured the dynamics of processes as they unfolded over time (i.e., how stress

and interpersonal behavior fluctuate together across situations over time). Additionally, using participants' personal cell phones to collect data aided in collecting data from a relatively large sample, which provided me with more reliable results.

Assessing the participants' depression using a Depressivity scale is one notable limitation because it is limited to self-report and asks about dispositional tendencies to experience low mood, not clinical depression; performing clinical interviews or using self-report scale of depression symptoms like the Beck Depression Inventory to obtain that data may have given a better insight into clinical levels of depression. Therefore, all results should be interpreted in light of this limitation. Similarly, stress was self-reported and there was no objective measure of stressful events. Therefore, the construct is best characterized as perceived stress, not objective stress.

This study looked at the relationship between depression, daily stress, and interpersonal behavior through the use of EMA. Based on the participants' report on their own behavior, I found that the stress generation theory held through in this study. Under stress, participants rated their own behavior as cold. If participants were experiencing high levels of depression, they also rated their behavior as more submissive. Given these results, the relationship between depression, stress, and interpersonal interactions should be further investigated in different contexts to give more insight on people's behavior under certain conditions. As discussed previously, psychopathology leads to impaired functioning in multiple psychosocial domains; it is important to study these relationships in terms of social behavior due to the commonality of maladaptive behavior that is associated with stress and depression.

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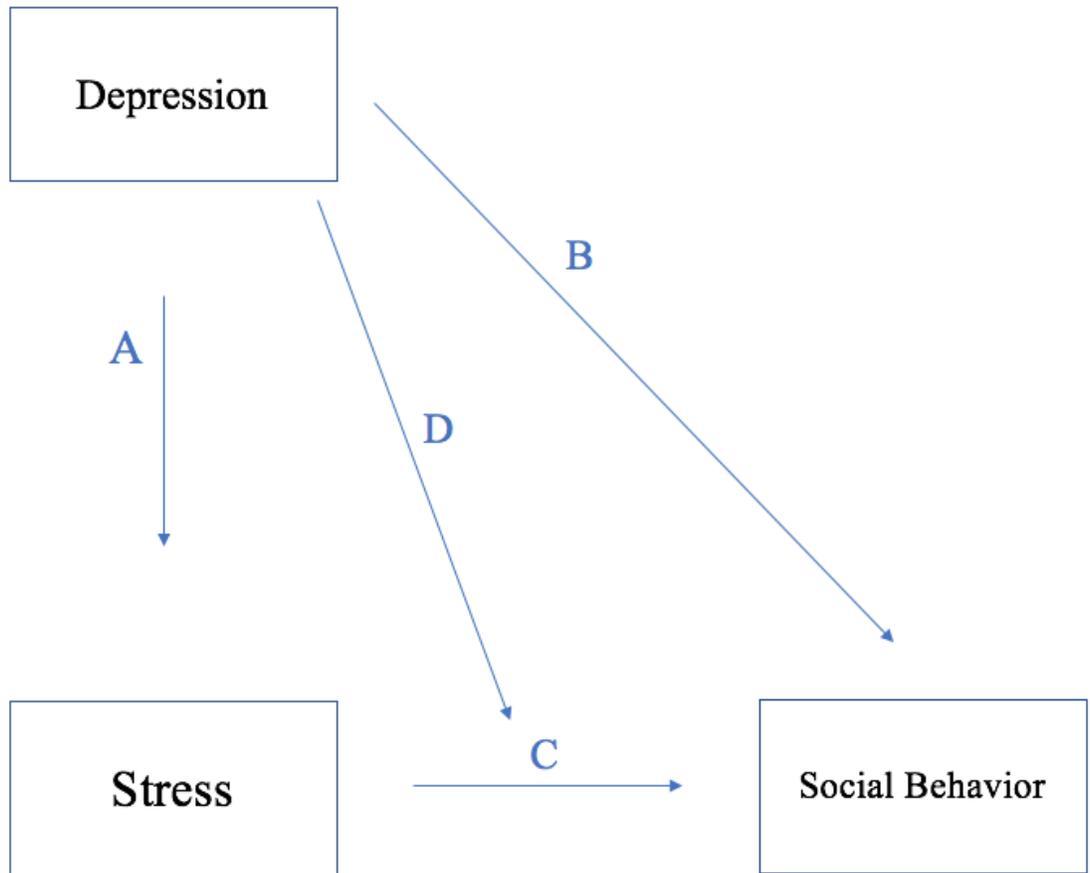


Figure 1 A diagram of the pathways of interest in the current study.