A PROSPECTIVE STUDY OF THE COGNITIVE-STRESS RELATION TO DEPRESSIVE SYMPTOMS IN ADOLESCENTS

By

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CHAPTER I

INTRODUCTION

Cognitive diathesis-stress theories of depression (Abramson, Metalsky, & Alloy, 1989; Abramson, Seligman, & Teasdale, 1978; Beck, 1967, 1976, 1987) assert that individuals with negative cognitive tendencies who are confronted with stressful life events will appraise the stressors and their consequences negatively, thereby contributing to the onset and maintenance of depressive symptoms. Results of studies examining these models in children have been mixed. Abela and Sarin (2002) have suggested that some of the failure to find support for the cognitive-stress models in children has been because researchers have not examined the different types of cognitions in relation to each other rather than separately. Abela and colleagues (Abela & Payne, 2003; Abela & Sarin, 2002) have provided some empirical evidence consistent with this view. The purpose of the present study was to further compare the different ways of combining negative cognitions in interaction with stress to predict depressive symptoms in children

According to Beck (1967; 1976), a cognitive triad of negative views about the self, world, and future, and negative information-processing biases and distortions act as diatheses for depression. In addition, Beck asserted that negative self-schema containing cognitive distortions or dysfunctional attitudes are activated by stressful life events within a domain of personality vulnerability, leading to negative automatic thoughts and depression. The hopelessness theory (Abramson et al., 1989) suggests that three negative inferential styles serve as vulnerability factors to depression. Individuals who attribute the causes of negative events to global and stable factors, who perceive negative events as having disastrous consequences, and who infer negative characteristics about themselves following stressful events are more likely to become depressed than are those who do not have such inferential styles. Explanatory style serves as a distal contributory cause of depressive symptoms that interacts with a negative life event to produce hopelessness, which in turn, is hypothesized to be a proximal sufficient cause of hopelessness depression. Thus, according to cognitive theories of depression, individuals who have more negative beliefs about themselves, the world, and their future (Beck, 1967), and tend to make global, stable, and internal attributions for negative events (Abramson et al., 1989; Abramson et al., 1978) are more likely to become depressed when they experience stressful life events than are individuals who do not have such cognitive styles.

Prospective studies designed to test the extent to which cognitive vulnerability temporally precedes and predicts increases in depressive symptoms and onset of depressive disorder in adolescents and adults have provided support for the diathesis-stress component of the hopelessness theory (Abela, 2002; Abela & Seligman, 2000; Alloy et al., 1999; Alloy & Clements, 1998; Alloy, Just, & Panzarella, 1997; Hankin, Abramson, & Siler, 2001; Metalsky, Halberstadt, & Abramson, 1987; Metalsky & Joiner, 1992, 1997; Metalsky, Joiner, Hardin, & Abramson, 1993). With regard to Beck's (1967, 1976) theory, two prospective studies with adults have found the predicted interaction of dysfunctional attitudes and negative life events (Joiner, Metalsky, Lew, & Klocek, 1999; Kwon & Oei, 1994).

Previous research testing cognitive vulnerability models of depression in child samples has yielded mixed results. Whereas some prospective studies have found that the interaction of negative cognitions and stress predict depressive symptoms (e.g., Dixon & Ahrens, 1992; Hilsman & Garber, 1995; Panak & Garber, 1992), others have provided partial support (Abela, 2001; Conley, Haines, Hilt, & Metalsky, 2001; Lewinsohn, Joiner, & Rohde, 2001; Nolen-Hoeksema, Girgus, & Seligman, 1986, 1992; Robinson, Garber, & Hilsman, 1995; Turner & Cole, 1994), or no support (Abela & Sarin, 2002; Bennett & Bates, 1995; Hammen, Adrian, & Hiroto, 1988). Longitudinal investigations have shown that depressogenic inferential styles about the self or consequences (Abela, 2001), global self-worth (e.g., Allgood-Merton, Lewinsohn, & Hops, 1990; Hammen, 1988; Vitaro, Pelletier, Gagnon, & Baron, 1995), and dysfunctional attitudes (Lewinsohn et al., 2001) predict depressive symptoms (e.g., Allgood-Merton et al., Vitaro et al., 1995) and diagnoses (Hammen, 1988), controlling for prior levels of depression, and often in interaction with negative life events. However, other prospective studies have failed to demonstrate that depressogenic inferential styles about the self or consequences (Abela & Sarin, 2002) or global self-worth (Dubois, Felner, Bran, & George, 1999; Robertson & Simons, 1989) predict depressive symptoms (Bennett & Bates, 1995; Dubois et al., 1999; Robertson & Simons, 1989) and diagnoses (Goodyer, Herbert, Tamplin, & Altham, 2000; Hammen et al., 1988).

Several factors have been suggested to account for inconsistencies in the results of studies testing cognitive vulnerability models of depression in children, including small sample sizes, failure to test the interaction of cognitions and stress, the need to prime negative cognitions with mood or stress inductions, cognitive developmental limitations, and the use of samples receiving treatment (Persons & Miranda, 1992). According to developmental researchers (e.g., Turner & Cole, 1994), studies investigating the etiological component of the hopelessness theory in children have failed to provide consistent support because attributional style emerges as a vulnerability factor to depression once children develop abstract reasoning and formal operational thought during the transition from late childhood to early adolescence. Moreover, Abela and colleagues (Abela & D'Alessandro, 2001; Abela & Gagnon, 2001) suggested that inconsistent support for the hopelessness theory in children may be resolved by specifying hopelessness depression symptoms, rather than depression symptoms in general, as the dependent variable.

Discrepancies in previous research on child samples also may be due, in part, to methodological shortcomings of traditional approaches that examine vulnerability factors in isolation. Although research on adults generally has not distinguished among the highly interrelated inferential styles about causes, consequences, and the self (Abela, 2002; Abela & Seligman, 2000; Metalsky & Joiner, 1992), several studies have found differences among the relation of these styles to depression in children (Abela, 2001; Abela & Sarin, 2002). Abela and Sarin (2002) have argued that children who possess only one negative inferential style and exhibit an increase in depressive symptoms following stressful events will either support or contradict the hopelessness theory, depending on whether or not the study assessed that particular cognitive style. Hence, researchers testing the diathesis-stress component of the hopelessness theory should assess all three inferential styles and consider their interrelations rather than focusing on each separately.

Several ways of defining and combining components of the cognitive vulnerability to depression are possible. First, an "additive" approach examines vulnerability factors in concert by creating a composite score for each individual based on the mean (or sum) of their diatheses. Past research has failed to show that such a composite score interacts with stressful life events to predict depressive symptoms (Abela & Sarin, 2002).

Second, Abela and Sarin (2002) proposed the "weakest link" approach, drawing from the analogy: "A chain is only as strong as its weakest link." According to this perspective, an individuals' degree of vulnerability should be determined by their *most negative* cognitive style. The results of one study examining 79 children in 7th grade over a ten week period showed that although none of the individual depressive inferential styles interacted with negative events to predict increases in hopelessness depression symptoms, children's weakest links interacted with negative events to predict increases in hopelessness depression symptoms (Abela & Sarin, 2002). In another study examining 130 children in 3rd grade and 184 children in 7th grade over a 6 week period, Abela and Payne (2003) again showed that children's weakest links interacted with negative events to predict increases in hopelessness, but not nonhopelessness, depression symptoms. In addition, gender differences were found such that children's weakest links interacted with negative events to predict increases in depressive symptoms in boys with low but not high self-esteem, whereas in girls, children's weakest links interacted with negative events to predict increases in hopelessness depression symptoms among those with high but not low self-esteem.

Finally, the "keystone" approach draws from architectonics and refers to the wedge-shaped stone, positioned at the apex of an arch, which locks the other stones in place and serves as the principal supporting element. According to this perspective, which mirrors the weakest link, an individual's degree of resilience in the face of stress is determined by their *most positive* cognitive style. That is, when confronted with stressful life events, individuals will depend on their strongest cognitions as buffers against the onset and maintenance of depressive symptoms.

The present study builds on existing research on cognitive diathesis-stress models of depression in adolescents in several ways. First, this study attempted to replicate and extend the findings of Abela and colleagues (Abela & Payne, 2003; Abela and Sarin, 2002) regarding the weakest link hypothesis. In particular, we tested the most negative cognitions (i.e., weakest link) as well as the possible buffering role of the most positive cognitions (i.e., keystone). Second, we included a variety of measures of cognitive vulnerability to depression, permitting a broader investigation of diathesis-stress interactions. Third, the current study used an objective, interview-based measure of stressful life events and a clinician interview-based measure of depressive symptoms. Finally. few studies have tested the cognitive vulnerability hypothesis in a sample of adolescents who are particularly at risk for depression (see Conrad & Hammen, 1993). Using a sample of offspring of depressed parents increases the likelihood of including children with a range of negative cognitions, stressful life events, and depressive symptoms.

In summary, the purpose of the current study was to test the cognitive diathesis-stress model of depression in a high-risk sample across three years (i.e., 6th, 7th, and 8th

grades), using traditional, weakest link, and keystone approaches. We hypothesized that the individual, additive, weakest link, and keystone diatheses would interact with stress to predict depressive symptoms one year later and that the weakest link and keystone diatheses would interact with each other and stress to predict increases in depressive symptoms. We also hypothesized that the individual and composite cognitive diatheses would interact with stress to predict hopelessness depression symptoms in particular.

CHAPTER II

METHOD

Participants

The sample consisted of 240 adolescents and their mothers. All children were first assessed in the sixth grade (mean age = 11.87, SD = 0.57). The adolescent sample was 54.2% female and 82% Caucasian, 14.7% African American, and 3.3% Hispanic, Asian, or Native American. The sample was predominantly lower-middle to middle class, with a mean socioeconomic status (Hollingshead, 1975) of 38.84 (SD = 13.27).

Procedure

Parents of 5th grade children from metropolitan public schools were invited to participate in a study about parents and children. A brief health history questionnaire comprised of 24 medical conditions (e.g., diabetes, heart disease, depression) and 34 medications (e.g., Prozac, Elavil, Valium) was sent with a letter describing the project to over 3500 families. Of the 1495 mothers who indicated an interest in participating, the 587 who had endorsed either a history of depression, use of antidepressants, or no history of psychopathology were interviewed further by telephone. The remaining families were excluded because the mother either did not indicate depression or indicated other kinds of serious health problems (e.g., cancer, multiple sclerosis). Based on the screening calls of the 587 families, 349 had mothers who reported either a history of depression or no history of psychiatric problems. The 238 families not further screened were excluded because they did not indicate sufficient symptoms to meet criteria for a depressive disorder (38%), had other psychiatric disorders that did not also include a depressive disorder (19%), they or the target child had a serious medical condition (14%), were no longer interested (21%), the target child either was in the wrong grade or was in special education (6%), or the family had moved out of the area (2%). The Structured Clinical Interview for *DSM* diagnoses (SCID; Spitzer, Williams, Gibbon, & First, 1990), a widely used, semi-structured clinical interview from which *DSM* diagnoses (American Psychiatric Association, 1987, 1994) can be made was then conducted with 349 mothers who indicated during the screening calls that they had had a history of some depression or had had no psychiatric problems. Inter-rater reliability was calculated on a random subset of 25% of these SCID interviews. There was 94% agreement (kappa = .88) for diagnoses of depressive disorders. The final sample of 240 families consisted of 185 mothers who had a history of a mood disorder during the target child's life (high risk group) and 55 mothers who were life-time free of psychopathology (low risk group).

Adolescents were first assessed when they were in 6th grade (Time 1). A research assistant, unaware of the mothers' psychiatric history, administered a battery of questionnaires separately to the mother and adolescent. The present study reports the results of the annual assessments of the adolescents from 6th through 8th grade. Only those measures relevant to the current study are described here.

Measures

Depressive Symptoms were assessed annually with a modified Children's Depression Rating Scale-Revised (CDRS-R; Poznanski, Mokros, Grossman, & Freeman,

1985) and with the Children's Depression Inventory (CDI; Kovacs, 1981). Adolescents were interviewed with the CDRS-R about the extent of their depressive symptoms during the previous two weeks. Twelve depressive symptoms (e.g. anhedonia, insomnia, suicidal ideation) were rated on a 7-point severity scale. Total scores could range from 15 to 105. Coefficient alpha for the CDRS-R was .72 at Time 1.

The CDI is a 27-item questionnaire that measures cognitive, affective, and behavioral symptoms of depression. It is the most widely used self-report measure of depressive symptoms in children, with good internal consistency, test-retest reliability, and convergent validity with other self-report measures (Carey, Faulstich, Gresham, Ruggiero, & Enyart, 1987; Kazdin, French, Unis, & Esveldt-Dawson, 1983; Saylor, Finch, Baskin, Furey, & Kelly, 1984; Saylor, Finch, Spirito, & Bennett, 1984). Each item lists three statements, scored 0 to 2, in order of increasing severity. Children were asked to select the statement that most accurately described how they were thinking and feeling in the past week. Total scores ranged from 0 to 52. Coefficient alpha for the CDI was .81 at Time 1. As set forth in Abela and D'Alessandro (2001), individual symptom measures for hopelessness and nonhopelessness depression were created from the CDI by calculating the mean of relevant items. In the current study, coefficient alpha for the hopelessness depression symptom subscale was .72 at Time 1. Coefficient alpha for the nonhopelessness depression symptom subscale was .40 at Time 1.

Analyses were run on depressive symptoms using a composite measure (Dep-Sxs) derived from both the CDRS-R and the CDI. This variable was created by standardizing both the CDRS-R and the CDI and taking their mean. The CDRS-R and CDI were significantly correlated (r = .37, p < .001) and the composite measure demonstrated a high level of reliability [r_{YY} = .83 (Nunnally & Bernstein, 1994)].

Attributional Style was assessed with the Children's Attributional Style Questionnaire (CASQ; Seligman et al., 1984), which measures attribution dimensions derived from the reformulated learned helplessness model (Abramson et al., 1978). The revised CASQ (Thompson, Kaslow, Weiss, & Nolen-Hoeksema, 1998), containing 12 positive and 12 negative items, was used. Each item varies one causal dimension (locus, stability, globality) while holding the other two dimensions constant. A mean "negative composite" score was created by dividing the number of internal, stable, and global responses to all "bad" events by the total number of negative events. The CASQ given to the latter two-thirds of the sample included an additional 12 negative items from the original CASQ. For these subjects, mean negative composite scores were created by dividing the total number of internal, stable, and global responses by the total number of negative items (i.e., 24). Coefficient alpha for the negative composite score was .48 at Time 1. These results are consistent with what has been found elsewhere in the literature (Gladstone & Kaslow, 1995; Robins & Hinkley, 1989).

Global Perception of Self-Worth was assessed annually with the Self-perception Profile for Children (SPPC; Harter, 1982). The six items of the global self-worth subscale assess the extent to which children are satisfied with themselves, like the way they are leading their lives, like the kind of person they are, and think the way they do things is fine. Each item is presented in a structured alternative format (i.e. "Some kids are often unhappy with themselves BUT other kids are pretty pleased with themselves"). Participants were read both statements and asked to decide if they were more like the kids described in the statement on the left side or on the right side. After selecting the statement that most accurately described them, they were asked to decide whether the chosen statement was "really true" or "sort of true" of them. Responses were scored on a 4-point scale, with lower scores indicating poorer global self-worth. In this sample, coefficient alpha for the global self-worth scale was .82 at Time 1.

Hopelessness was assessed annually with the Children's Hopelessness Scale (CHS; Kazdin, Rodgers, & Colbus, 1986). The 17 True-False items, measuring the extent to which children are pessimistic about their future, are scored either as a *0* for the optimistic direction or a *1* for the pessimistic direction. The CHS demonstrates adequate reliability and construct validity (Kazdin, French, Unis, Esveldt-Dawson, & Sherick, 1983; Kazdin et al., 1986). In this sample internal consistency alpha was .58 at Time 1.

Life Events were assessed annually with the Life Events Interview for Adolescents (LEIA; Garber & Robinson, 1997), which is based on the Life Events and Difficulties Schedule (Brown & Harris, 1989; Williamson et al., 1998) and the Life Stress Interview developed by Hammen et al. (1987). Mothers and adolescents were interviewed separately regarding events that had occurred for the adolescent during the previous year. The LEIA is a semi-structured interview that allows for more precise dating of events and the assessment of objective consequences of events, given the particular context in which they occurred. Such semi-structured interviews have been found to be superior to checklists in overcoming problems of counting, recalling, and dating of events (Duggal et al., 2000).

Interviewers presented to a group of trained raters information about each adolescent's life events. The group then used a 7-point severity scale to rate the event with regard to the degree of objective threat the event had for the person, given the context, ranging from 1 (*none*) to 7 (*severe*). Interviewers and raters were unaware of any information about the mothers' or adolescents' psychopathology. Inter-rater reliability of the objective stress ratings were obtained by having interviewers present the information about the events at the same time to two different groups who made independent ratings of the events. Based on 202 events, agreement among raters was 89.6%, with a kappa of .79. A total level of stress rating and a total event count were derived from the interview for each subject. Because these two stress variables were highly correlated ($r = .92$) at Time 1, analyses were conducted using only one indicator of stress, the total level of stress rating for events that occurred between time points.

CHAPTER III

RESULTS

Descriptive Analyses

Means, standard deviations, and correlations for all variables are reported in Table 1. Boys and girls were significantly different on T1 CASQ (t=1.99, $p < .05$), T2 CHS (t=2.13, $p < .05$), and T3 CDI-NH (t=2.17, $p <$ 05). Males had higher mean scores on each of these measures.

To compute additive, “weakest link,” and “keystone” composite scores, we first standardized scores on the CHS, negative composite subscale of the CASQ, and global self-worth subscale of the SPPC. SPPC scores were multiplied by -1 so that higher scores indicated more negative cognitions, consistent with the other cognitive measures. Each child’s additive composite score was computed by taking the mean of all the cognitive measures at that time point. Each child’s “weakest link” composite score was equal to the highest of all his or her standardized scores at that time point, and the “keystone” composite score was equal to the lowest of all his or her standardized scores at that time point. At Time 1, attributional style was the “weakest link” for 38% of the children, global self-worth for 29%, and hopelessness for 34%. At Time 2, attributional style was the “weakest link” for 38% of the children, global self-worth for 27%, and hopelessness for 35%. At Time 1, attributional style was the “keystone” for 32% of the children, global self-worth for 35%, and hopelessness for 33%. At Time 2, attributional style was the “keystone” for 34%, global self-worth for 31%, and hopelessness for 36%.

Overview of Statistical Analyses: Diathesis-Stress Component

Hierarchical multiple regression analyses (Cohen & Cohen, 1983) were used to test the diathesis-stress interactions. For all analyses, the dependent variable was either Time 2 or Time 3 depressive symptom scores (Dep-Sxs, CDI-H, or CDI-NH). In the first step, gender, risk, and the prior score for the dependent variable (Time 1 or 2 depressive symptoms score) were entered as covariates, and cognitive diatheses and stress scores were entered as main effect variables. In the final step, the cognitive-stress and gender interactions were entered. All variables within each step were entered simultaneously, and were not interpreted unless the step itself was significant (Cohen & Cohen, 1983). Simple slope analyses were conducted on all significant interactions, per Aiken and West (1991). Higher order interactions with risk were tested, but none were found to be significant.

Do Individual Cognitive Diatheses Moderate the Relation between Stress Level and Depressive Symptoms?

Results of regression analyses revealed significant first-order effects for Time 1 Dep-Sxs (β=.306, $p<.001$), Time 1 stress (β=.207, $p<.01$), and Time 1 CHS (β=.188, $p<.01$) predicting Time 2 Dep-Sxs. A significant two-way interaction was found between Time 1 CHS and stress (β=.173, $p<.01$). Finally, the Time 1 CHS x Stress x Gender interaction significantly predicted Time 2 depressive symptoms. Simple slope analysis revealed that among boys, the interaction of hopelessness and stress significantly predicted higher levels of depressive symptoms (β=.300, pr=.251, $p<.001$). Among boys with high levels of hopelessness, stress level significantly predicted increases in depressive symptoms (β=.463, pr=.236, p=.001). Among girls, stress level significantly predicted higher levels of depressive symptoms for those with both low (β=.331, pr=.16, p=.025) and high (β=.352, pr=.218, p=.002) levels of hopelessness.

At Time 2, significant first-order effects were found for Time 2 Dep-Sxs (β=.422, p<.001), Time 2 stress (β=.302, p<.001), and Time 2 CHS (β=.133, p<.05), and a significant two-way interaction was found between Time 2 CHS and stress (β=-.173, p<.01) predicting Time 3 Dep-Sxs. The CHS x Stress x Gender interaction significantly predicted Time 3 depressive symptoms. The nature of this three-way interaction differed from the previous time interval. Simple slope analysis revealed that among boys, higher levels of stress significantly predicted higher levels of depressive symptoms for those with both high (β=.45, pr=.255, p=.001) and low (β=.389, pr=.201, p=.008) levels of hopelessness. Among girls, the interaction of hopelessness and stress levels significantly predicted change in depressive symptoms (β=-.262, pr=-.257, p=.001). For girls with low levels of hopelessness, the relation between stress level and depressive symptoms was significant (β=.44, pr=.323, p<.001).

Also at Time 2, for self-esteem significant first-order effects were found for Time 2 Dep-Sxs (β=.342, p<.001), Time 2 stress (β=.271, p<.001), and Time 2 self-esteem (β=-.255, p<.001), and self-esteem significantly interacted with stress level to predict Time 3 depressive symptoms (Dep-Sxs). Simple slope analyses revealed that the relation between stress levels and depressive symptoms was significant for children with high levels of self-esteem (β=.402, pr=.328, p<.001). This was opposite to the hypothesized direction.

Does the Additive Diathesis Moderate the Relation between Stress Level and Depressive Symptoms?

At Time 1, significant first-order effects were found for Time 1 Dep-Sxs (β=.368, $p<.001$) and Time 1 stress (β=.212, $p<.01$), and A significant two-way interaction was found between Time 1 Additive and gender (β=-.15, $p<.05$) predicting Time 2 depressive symptoms (Dep-Sxs). The Additive x Stress level x Gender interaction significantly predicted increases in Time 2 Dep-Sxs. Simple slope analysis revealed that the interaction of additive diatheses and stress level significantly predicted increases in depressive symptoms for boys (β=.273, pr=.221, p=.002); for boys with high additive (i.e., more negative) cognitions (β=.397, pr=.221, p=.002), higher stress levels significantly predicted higher levels of depressive symptoms. For girls, the interaction of additive diatheses and stress level also was significant (β=-.201, pr=-.173, p=.015); however, the relation between stress level and depressive symptoms was significant for girls with low additive cognitions (β=.551, pr=.286, $p<.001$).

Does the Weakest Link Diathesis Moderate the Relation between Stress Level and Depressive Symptoms?

Results of regression analyses revealed significant first-order effects for Time 1 Dep-Sxs (β=.255, $p<.01$), Time 1 stress (β=.211, $p<.01$), and Time 1 weakest link (β=.201, $p<.01$) predicting Time 2 Dep-Sxs. The Time 1 Weakest Link x Stress Level x Gender interaction significantly predicted increases in depressive symptoms at Time 2. Simple slope analyses revealed that higher levels of stress significantly predicted increases in depressive symptoms among boys with more negative (i.e., higher) weakest links (β=.291, pr=.159, p=.026). Among girls, the relation between stress and depressive symptoms was significant for those with less negative (i.e., lower) weakest links (β=.476, pr=.223, p=.001); this relation was not significant for girls with more negative weakest links, who were already high in depressive symptoms.

At Time 2, significant first-order effects were found for Time 2 Dep-Sxs (β=.382, $p<.001$), Time 2 stress (β=.291, $p<.001$), and Time 2 weakest link (β=.179, $p<.01$) predicting Time 3 depressive symptoms (Dep-Sxs). In addition, weakest link interacted with stress level to predict Dep-Sxs. The relation between stress and depressive symptoms was significant among children with less negative (i.e., lower) weakest links (β=.423, pr=.359, p<.001), whereas this relation was not significant for those with more negative (i.e., higher) weakest links, who already had high levels of depressive symptoms.

Does the Keystone Diathesis Moderate the Relation Between Stress Level and Depressive Symptoms?

The Keystone Diathesis alone did not significantly interact with stress to predict depressive symptoms. There was a significant interaction between the Keystone and Weakest Link, however (see below).

Does the Weakest Link by Keystone Interaction Moderate the Relation between Stress Level and Depressive Symptoms?

At Time 1, significant first-order effects were found for Time 1 Dep-Sxs (β=.23, $p<.01$), Time 1 stress (β=.224, $p<.01$), and Time 1 weakest link (β=.157, $p<.05$) predicting Time 2 Dep-Sxs. Significant two-way interactions were found between Time 1 gender and stress (β=.144, $p<.05$) and between Time 1 keystone and gender (β=-.16, $p<.05$). The Time 1 weakest link x keystone x stress interaction was significant (β=.225, p<.05) and the Weakest Link x Keystone x Stress x Gender interaction significantly predicted change in depressive symptoms (Dep-Sxs). Simple slope analyses revealed that the Keystone x Stress interaction was significant for girls with more positive weakest links (β=-.403, pr=-.174, p=.017) and for boys with more negative weakest links (β=-.221, pr=-.153, p=.035). Higher stress levels significantly predicted change in depressive symptoms for girls with more negative (i.e., low) keystone diatheses regardless of whether they had positive (i.e., low) (β=1.000, pr=.247, p=.001) or negative (i.e., high) (β=.384, pr=.186, p=.011) weakest links (Figure 1a). The relation between stress levels and depressive symptoms was significant for girls with more positive keystone diatheses and negative weakest links (β=.543, pr=.18, p=.013). For boys, higher stress levels significantly predicted higher levels of depressive symptoms among those with more negative (i.e., low) keystone diatheses and negative (i.e., high) weakest links (β=.468, pr=.223, p=.002) (Figure 1b).

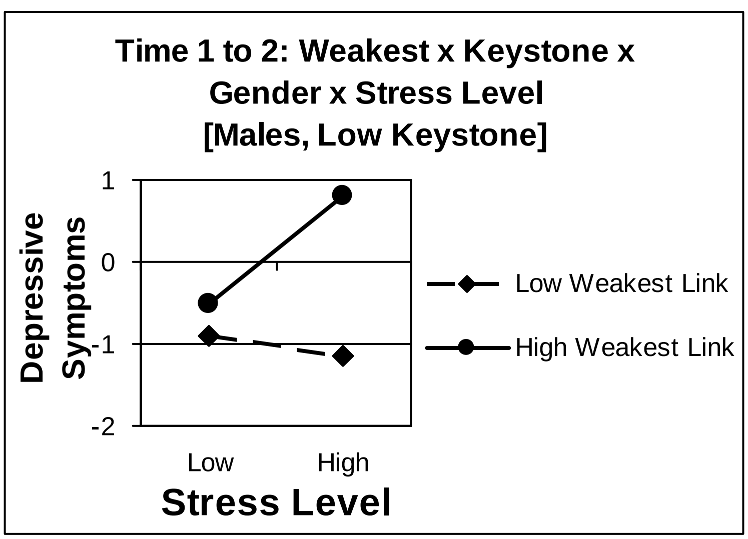


Figure 1a.

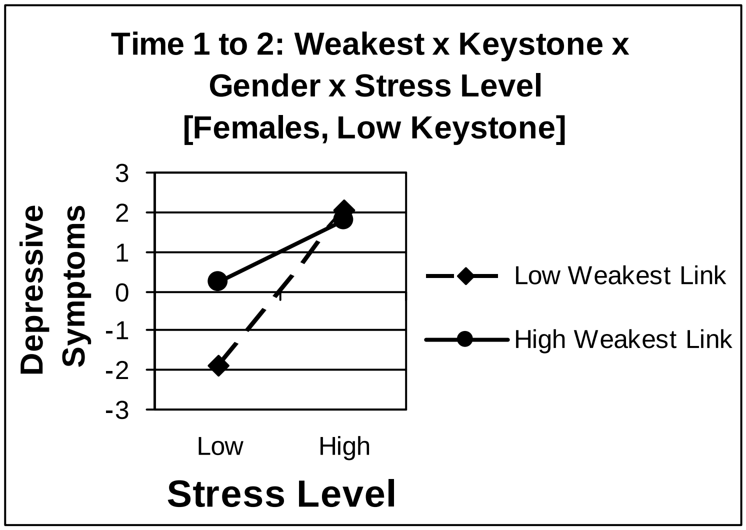


Figure 1b.

At Time 2, significant first-order effects were found for Time 2 Dep-Sxs (β=.29, p<.001), Time 2 stress (β=.302, p<.001), and Time 2 keystone (β=-.309, p<.001) predicting Time 3 Dep-Sxs. A significant two-way interaction was found between Time 2 weakest link and keystone (β=-.141, p<.05). Simple slope analyses revealed that higher stress levels significantly predicted change in depressive symptoms for boys with negative (i.e., low) keystones diatheses with either positive (β=.562, pr=.175, p=.023) or negative (β=.359, pr=.189, p=.014) weakest links. Higher stress levels also significantly predicted change in depressive symptoms for boys with more positive (i.e., high) keystone diatheses and negative (i.e., high) weakest links (β=.68, pr=.218, p=.005). Higher stress levels significantly predicted change in depressive symptoms for girls with more positive (i.e., high) keystone diatheses and positive (i.e., low) weakest links (β=.608, pr=.316, p<.001).

Hopelessness Depression: Do the Individual and Composite Cognitive Diatheses Moderate the Relation Between Stress Level and Hopelessness Depression Symptoms?

Results of regression analyses revealed that significant first-order effects were found for Time 1 CDI-H (β=.416, p<.001), Time 1 stress (β=.17, p<.05), and Time 1 hopelessness (CHS; β=.198, p<.01) predicting Time 2 hopelessness depression symptoms (CDI-H). The Time 1 CHS x Stress x Gender interaction significantly predicted Time 2 CDI-H. Simple slope analyses revealed that for boys, the interaction of hopelessness and stress levels significantly predicted change in depressive symptoms (β=.225, pr=.191, p=.007). Among boys with high levels of hopelessness, stress level significantly predicted high levels of hopelessness depressive symptoms (β=.42, pr=.213, p=.002). Among girls with low levels of hopelessness, the relation between stress levels and hopelessness depressive symptoms was significant (β=.291, pr=.142, p=.045).

Regarding the additive composite cognitive measures, at Time 1, significant first-order effects were found for Time 1 CDI-H (β=.474, p<.001) and Time 1 stress (β=.192, p<.01) predicting changes in hopelessness depression symptoms (CDI-H).. A significant two-way interaction was found between Time 1 additive and gender (β=-.217, p<.001), and the Additive x Stress level x Gender interaction significantly predicted changes in CDI-H. Simple slope analyses revealed that among boys, the interaction of additive diathesis and stress levels significantly predicted change in depressive symptoms (β=.257, pr=.211, p=.003). Higher levels of stress significantly predicted high levels of depressive symptoms for boys with higher additive (β=.45, pr=.25, p<.001) and for girls with lower additive (β=.274, pr=.151, p=.033) negative cognitions.

Regarding the weakest link hypothesis, significant first-order effects were found for Time 1 CDI-H (β=.342, p<.001), Time 1 stress (β=.166, p<.05), and Time 1 weakest link (β=.223, p<.01) predicting hopelessness depressive symptoms (CDI-H) at Time 2. In addition, the Time 1 Weakest Link x Stress Level x Gender interaction significantly predicted Time 2 CDI-H. Simple slope analyses indicated that the interaction of weakest link diatheses and stress level significantly predicted change in depressive symptoms for boys (β=.358, pr=.216, p=.002). Higher levels of stress significantly predicted higher levels of depressive symptoms among boys with more negative (i.e., higher) weakest links (β=.436, pr=.239, p=.001). For girls, the relation between stress and depressive symptoms was significant for girls with more positive (i.e., lower) weakest links (β=.34, pr=.173, p=.014), but not for those with more negative (i.e., higher) weakest links, who were already high on depressive symptoms.

Regarding the keystone hypothesis at Time 1, significant first-order effects were found for Time 1 CDI-H (β=.364, p<.001), Time 1 stress (β=.197, p<.01), and Time 1 keystone (β=-.249, p<.001) predicting Time 2 hopelessness depression symptoms (CDI-H). The Keystone x Stress Level x Gender interaction also significantly predicted Time 2 CDI-H. Simple slope analyses revealed that among boys, the Keystone x Stress Level interaction significantly predicted change in depressive symptoms (β=-.244, pr=-.196, p=.006). The relation between stress levels and hopelessness depressive symptoms was significant among boys with more negative (i.e., lower) keystone diatheses (β=.461, pr=.231, p=.001) (Figure 2a). For girls, the relation between stress and hopelessness depressive symptoms was significant for those with more positive (i.e., higher) keystone diatheses (β=.359, pr=.215, p=.002), whereas this relation was not significant for girls with more negative (i.e., lower) keystone diatheses, who were already high on depressive symptoms (Figures 2b).

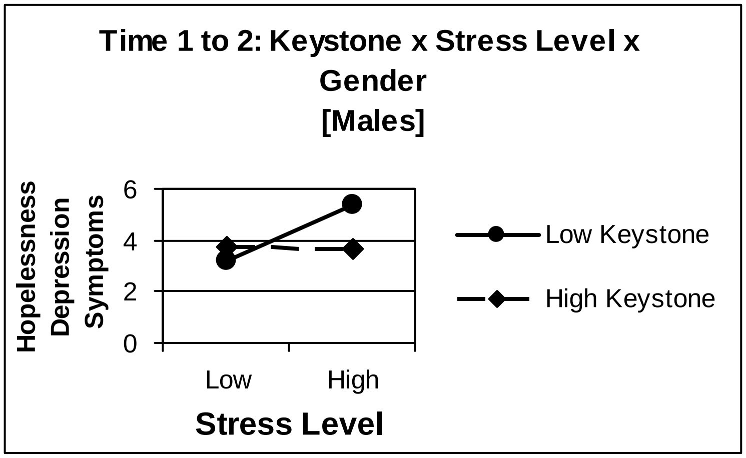


Figure 2a.

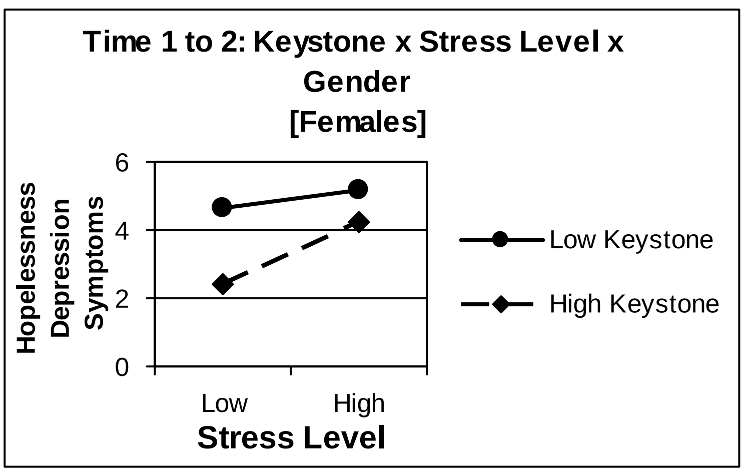


Figure 2b.

At Time 2, the Weakest Link x Keystone x Stress x Gender interaction significantly predicted Time 3 hopelessness depressive symptoms (CDI-H) (Table 2). The Weakest Link x Keystone x Stress Level interaction significantly predicted change in depressive symptoms for boys (β=.308, pr=.189, p=.013). For boys with less negative (i.e., lower) weakest links, the interaction of keystone diatheses and stress level significantly predicted change in depressive symptoms (β=-.411, pr=-.212, *p*=.005). Higher stress levels significantly predicted higher levels of depressive symptoms for boys with less positive (i.e., lower) keystone diatheses and less negative (i.e., lower) weakest links (β=.918, pr=.282, p<.001), whereas for boys with more negative (i.e., higher) weakest links the relation between stress and depressive symptoms, which were already high, was not significant.

Table 1. Regression analysis predicting Time 3 depressive symptoms (CDI-H) from weakest link, diatheses, keystone diatheses, gender, and stress**,** beyond the effects of risk and prior depression level

Step	Predictor	B	β	*pr*	$R^2\Delta$
Predicting Time 3 child hopelessness depressive symptoms					
1					.451***
	Gender	.079	.014	.018	
	Risk	.272	.041	.05	
	T2 CDI-H	.483	.413	.377***	
	T2 Stress Level	.017	.081	.096	
	T2 Weakest Link	.155	.051	.052	
	T2 Keystone	-1.065	-.253	-.248***	
2					.089***
	T2 Gender x Stress Level	-.069	-.167	-.227**	
	T2 Weakest Link x Stress Level	-.011	-.051	-.06	
	T2 Weakest Link x Gender	-.029	-.005	-.005	
	T2 Keystone x Stress Level	.011	.035	.044	
	T2 Keystone x Gender	-.817	-.097	-.107	
	T2 Weakest Link x Keystone	-1.03	-.266	-.314***	
3					.021
	T2 Weakest Link x Gender x Stress Level	.032	.077	.083	
	T2 Keystone x Gender x Stress Level	.080	.126	.151*	
	T2 Weakest Link x Keystone x Gender	-.933	-.133	-.145	
	T2 Weakest Link x Keystone x Stress Level	.012	.05	.052	
4					.017*
	T2 Weakest Link x Keystone x Stress Level x Gender	-.096	-.189	-.196*	

*p<.05; **p<.01; ***p<.001

With regard to nonhopelessness depressive symptoms (CDI-NH), at Time 1 the significant first-order effects were found for Time 1 CDI-NH (β=.252, $p<.001$), Time 1 stress (β=.168, $p<.05$), and Time 1 weakest link (β=.233, $p<.01$) predicting Time 2 CDI-NH, and the Gender x Stress interaction was significant (β=.191, $p<.01$). A significant three-way interaction was found among weakest link, keystone, and stress (β=.282, $p<.05$). The Weakest Link x Keystone x Stress x Gender interaction also significantly predicted Time 2 CDI-NH. Simple slope analyses revealed that the Weakest Link x Keystone x Stress interaction significantly predicted change in nonhopelessness depressive symptoms for girls (β=.438, pr=.236, p=.001). For girls with less negative (i.e., low) weakest links, the Keystone x Stress interaction predicted change in nonhopelessness depressive symptoms (β=-.432, pr=-.187, p=.009). For girls with more negative (i.e., lower) keystone diatheses, higher stress levels significantly predicted higher depressive symptoms for those with either positive (β=.786, pr=.198, p=.006) or negative (β=.527, pr=.247, p=.001) weakest links. For girls with more positive (i.e., higher) keystone diatheses and more negative (i.e., high) weakest links, stress levels significantly predicted nonhopelessness depressive symptoms (β=.756, pr=.246, p=.001).

CHAPTER IV

DISCUSSION

The purpose of the present study was to test the cognitive-stress model of depression using different operationalizations of the cognitive diathesis. Overall there was some evidence consistent with the model for each way negative cognitions were defined. With regard to the individual cognitions, hopelessness interacted with stress and gender to predict increases in 7^{th} and 8^{th} grade depressive symptoms, and self-worth interacted with stress to predict increases in 8^{th} grade depressive symptoms. Some support also was found for the diathesis-stress models using additive vulnerability composites, which interacted with stress and gender to predict increases in 7^{th} grade depressive symptoms. Regarding the weakest link, children's weakest link interacted with stress and gender to predict increases in 7^{th} grade depressive symptoms. The form of this interaction was consistent with the model for boys but not girls. Finally, for the keystone hypothesis, the four-way interaction between the weakest link, keystone, stress and gender predicted changes in depressive symptoms in both 7^{th} and 8^{th} grade. Thus, the current study showed that the relations among the different measures of cognitive vulnerability, stress levels, and depressive symptoms often were moderated by gender.

Examining the interaction plots revealed two distinct patterns tied to gender. According to the typical diathesis-stress model, higher levels of depressive symptoms will be found for individuals who have more negative cognitive styles and have experienced higher levels of stress. This pattern held for boys (e.g., Figures 1a, 2a). In contrast, for girls higher levels of depressive symptoms were found for all except those girls with more positive cognitive styles who experienced lower levels of stress. This alternative pattern is displayed in Figures 1b and 2b.

These distinct interaction patterns suggest possible gender differences in mechanisms of vulnerability. For girls, it appears that cognitive vulnerability may constitute a sufficient, but not necessary, cause of depressive symptoms, whereas for boys, the cognitive vulnerability may constitute a necessary, but not sufficient, cause of depressive symptoms. The dual vulnerability in girls may be partly responsible for the higher rates of depression in females that emerge during early adolescence.

The present study also found evidence consistent with the symptom component of the hopelessness theory (Abramson et al., 1989). Increases in hopelessness depression symptoms in 7th grade were predicted by the interaction of stress level and gender with the individual measure of hopelessness, the additive vulnerability composites, children's weakest link, and the keystone diatheses. The form of these interactions basically paralleled the pattern of results found for the composite measures of depression. Again, the typical diathesis-stress model was characteristic of males, whereas females showed the alternative pattern. Finally, the four-way interaction among the weakest link, keystone, gender, and stress predicted change in both hopelessness and nonhopelessness depression symptoms.

The present study contributed in several ways to the existing literature on cognitive diathesis-stress models of adolescent depression. First, this study attempted to replicate the findings of past research on the weakest link hypothesis and the symptom component of the hopelessness theory (Abela & Payne, 2003; Abela & Sarin, 2002) in a sample particularly at risk for depression. Second, the measures of cognitive style used in this study differed from those examined by Abela and colleagues in their original formulation of the weakest link (Abela & Sarin, 2002). This represents a step toward assessing the generalizability of this approach to other conceptualizations and measures of cognitive vulnerability. Third, the cognitive diathesis –stress model was examined using a variety of cognitive measures both individually and combined. In addition, resilience to depression in the context of stress was tested using the keystone approach. Finally, this study tested cognitive-stress model using an objective, interview-based measure of stressful life events and both a self-report and a clinician interview-based measure of depressive symptoms.

Inconsistent findings regarding the individual and composite diatheses may have been due to several factors. First, detecting reliable moderator effects has proven difficult for researchers engaged in field studies (e.g., Jaccard, Helbig, Wan, Gutman, & Kritz-Silverstein, 1990; Morris et al., 1986; Zedeck, 1971). Factors accounting for reduced statistical power in nonexperimental field studies include, but are not limited to, exacerbation of measurement error in predictor variables when they are multiplied to form product variables (Busemeyer & Jones, 1983; Aiken & West, 1991), and reduction of the residual variance of the product due to the properties of joint distributions of predictor variables (McClelland & Judd, 1993). Though the squared semi-partial correlations associated with interaction terms are typically very small, even moderator effects explaining 1% of the variance should be considered important due to difficulties of detection (Evans, 1985). Second, the subtle interplay among cognitions, stressors, and depressive symptoms may be better captured with a more time-sensitive design than the annual assessment schedule adopted in the present study. Third, more consistent support for the cognitive diathesis-stress model may have been found if we had attempted to match specific classes of stressors with specific types of cognitive vulnerability. In particular, an individual's weakest link may interact exclusively with a subtype of environmental adversity to predict depressive symptoms (Abramson, Metalsky, & Alloy, 1989). Finally, stronger evidence of the cognitive-stress model might have been found if we had primed children's negative affect before assessing their cognitive vulnerability (Persons & Miranda, 1992).

Other limitations of the present study should be mentioned because they have implications for future work in this area. First, the measure of hopelessness depression adopted from Abela and D'Alessandro (2001) assessed only four of the nine hypothesized hopelessness symptoms included in the original formulation of hopelessness theory (Abramson et al., 1989). Second, the construct of nonhopelessness depression has questionable validity. Given that this collection of symptoms is not hypothesized to constitute a syndrome, caution should be used when interpreting discrepancies between results obtained with the hopelessness versus nonhopelessness depression subscales of the CDI. Furthermore, the internal consistency of the nonhopelessness depression symptom subscale was poor (.40 at Time 1). A more rigorous and meaningful test of the symptom component of hopelessness theory might be achieved by comparing the hopelessness depression subscale scores with the overall composite scores of the depression measure from which the subscale was derived. Finally, although low levels of internal consistency of the CASQ are well documented (e.g., Thompson et al., 1998), measurement error in predictor variables can be exacerbated when they are multiplied to form interaction terms. As previously discussed, this can reduce statistical power and reduce the interpretability of the findings.

In conclusion, results from the current study highlight the utility of composite measures of cognitive vulnerability in conjunction with stress in predicting depressive symptoms. Future studies should examine the developmental trajectory of the weakest link and keystone diatheses. Understanding why cognitive styles emerge as vulnerability or resilience factors at different developmental stages, along with what accounts for between-individual differences, may allow clinicians to better identify children at greatest risk for depression. This, in turn, will facilitate the development of more effective prevention programs that target an individual's weakest link and bolster idiosyncratic resilience factors. Intervening before children experience their first major depressive episode is central to prevention according to the kindling hypothesis, which proposes that the pattern of depressive episode onsets becomes increasingly autonomous and less linked to stressful life events (Post, 1992). Results from the present study also suggest that additive diatheses, weakest links, and keystone diatheses may operate differently in boys and girls. Examination of the interaction plots revealed two distinct prototypes associated with gender. Future research should investigate links between gender and the typical diathesis-stress versus alternative models to illuminate the vulnerability and resilience mechanisms that may contribute to gender differences in rates of depression.

Table 2 Means, Standard Deviations, and Correlations

	Mean	SD	1	2	3	4	5	6	7	8	9	10	11
1. Gender	1.54	0.5											
2. Risk	0.77	0.42	.04										
3. T1 CASQ	0.27	0.13	-.13*	.07									
4. T1 SPPC	3.37	0.58	.01	-.19**	-.30***								
5. T1 CHS	2.29	1.97	-.04	.04	.20**	-.36***							
6. T1 Add	0.00	0.48	-.11	-.06	.62***	.24***	.58***						
7. T1 Weak	0.00	0.97	-.11	.09	.59***	-.69***	.65***	.37***					
8. T1 Key	0.00	0.71	-.03	-.12	-.63***	.59***	-.60***	-.45***	-.55***				
9. T1 Stress	26.52	14.98	-.05	.44***	.01	-.16*	.12	-.03	.13	-.06			
10. T1 Dep-Sxs	-0.01	0.82	-.03	.12	.39***	-.55***	.36***	.14*	.56***	-.47***	.23***		
11. T1 CDI-h	2.92	2.73	-.05	.17*	.41***	-.60***	.33***	.10	.59***	-.48***	.11	.78***	
12. T1 CDI-nh	1.55	1.48	-.10	.15*	.37***	-.46***	.23***	.10	.44***	-.39***	.18**	.58***	.59***
13. T2 CASQ	0.26	0.13	.05	.06	.44***	-.29***	.15*	.21**	.33***	-.35***	.06	.16*	.31***
14. T2 SPPC	3.38	0.53	.02	-.17*	-.22**	.50***	-.21**	.05	-.38***	.34***	-.20**	-.43***	-.43***
15. T2 CHS	2.48	1.96	-.15*	.21**	.12	-.29***	.41***	.17*	.31***	-.32***	.13	.25***	.30***
16. T2 Add	-0.00	0.47	-.07	.07	.25***	-.07	.25***	.31***	.20**	-.24**	-.01	-.02	.13
17. T2 Weak	0.00	0.94	-.02	.22**	.28***	-.43***	.30***	.10	.43***	-.33***	.19**	.38***	.44***
18. T2 Key	0.00	0.68	.09	-.11	-.37***	.40***	-.30***	-.19**	-.39***	.44***	-.08	-.28***	-.38***
19. T2 Stress	20.25	13.98	.03	.34***	.03	-.22**	.13	-.05	.15*	-.13*	.45***	.18**	.19**
20. T2 Dep-Sxs	.0031	0.88	.05	.25***	.14*	-.45***	.31***	.00	.37***	-.30***	.34***	.42***	.40***
21. T2 CDI-h	2.49	2.40	-.02	.17*	.27***	-.49***	.34***	.09	.45***	-.41***	.24***	.44***	.50***
22. T2 CDI-nh	1.08	1.34	-.03	.16*	.29***	-.38***	.22**	.09	.41***	-.30***	.25***	.39***	.35***
23. T3 Dep-Sxs	-0.02	0.81	.02	.29***	.24**	-.29***	.23**	.13	.30***	-.31***	.35***	.33***	.36***
24. T3 CDI-h	2.62	2.84	-.01	.20**	.24**	-.28***	.29***	.19**	.29***	-.36***	.19**	.29***	.40***
25. T3 CDI-nh	1.06	1.40	-.15*	.18*	.26***	-.31***	.25***	.14*	.33***	-.32***	.18*	.32***	.30***

Table 2 Continued

	12	13	14	15	16	17	18	19	20	21	22	23	24
1. Gender													
2. Risk													
3. T1 CASQ													
4. T1 SPPC													
5. T1 CHS													
6. T1 Add													
7. T1 Weak													
8. T1 Key													
9. T1 Stress													
10. T1 Dep-Sxs													
11. T1 CDI-h													
12. T1 CDI-nh													
13. T2 CASQ	.33***												
14. T2 SPPC	-.36***	-.30***											
15. T2 CHS	.11	.15*	-.37***										
16. T2 Add	.05	.61***	.24***	.56***									
17. T2 Weak	.32***	.58***	-.71***	.66***	.38***								
18. T2 Key	-.28***	-.66***	.58***	-.54***	-.45***	-.56***							
19. T2 Stress	.18**	.09	-.25***	.11	-.03	.21**	-.14*						
20. T2 Dep-Sxs	.30***	.26***	-.55***	.42***	.09	.51***	-.48***	.35***					
21. T2 CDI-h	.34***	.37***	-.61***	.38***	.09	.54***	-.57***	.29***	.83***				
22. T2 CDI-nh	.40***	.29***	-.48***	.29***	.08	.42***	-.43***	.26***	.70***	.64***			
23. T3 Dep-Sxs	.28***	.33***	-.52***	.33***	.09	.45***	-.52***	.49***	.60***	.61***	.46***		
24. T3 CDI-h	.21**	.33***	-.53***	.37***	.11	.46***	-.54***	.27***	.53***	.63***	.40***	.82***	
25. T3 CDI-nh	.26***	.23**	-.48***	.25**	-.01	.39***	-.37***	.24**	.39***	.44***	.49***	.59***	.62***

Appendix

Table 1. Regression analysis predicting Time 2 depressive symptoms (Dep-Sxs) from hopelessness, gender, and stress**,** beyond the effects of risk, and prior depression level

Step	Predictor	B	β	*pr*	$R^2\Delta$
Predicting Time 2 depressive symptoms (Dep-Sxs)					
1					.288***
	Gender	.276	.077	.091	
	Risk	.426	.102	.106	
	T1 Dep-Sxs	.33	.306	.318***	
	T1 Stress Level	.025	.207	.208**	
	T1 Hopelessness	.169	.188	.206**	
2					.043**
	T1 Gender x Stress Level	.021	.087	.101	
	T1 Hopelessness x Stress Level	.010	.173	.193**	
	T1 Hopelessness x Gender	-.008	-.005	-.006	
3					.018*
	T1 Hopelessness x Gender x Stress Level	-.017	-.147	-.163*	

*p<.05; **p<.01; ***p<.001

Table 2. Regression analysis predicting Time 3 depressive symptoms (Dep-Sxs) from hopelessness, gender, and stress**,** beyond the effects of risk, and prior depression level

Step	Predictor	B	β	*pr*	$R^2\Delta$
Predicting Time 3 depressive symptoms (Dep-Sxs)					
1					.452***
	Gender	.004	.001	.002	
	Risk	.073	.019	.023	
	T2 Dep-Sxs	.385	.422	.43***	
	T2 Stress Level	.035	.302	.333***	
	T2 Hopelessness	.112	.133	.158*	
2					.033*
	T2 Gender x Stress Level	-.026	-.11	-.148	
	T2 Hopelessness x Stress Level	-.009	-.173	-.202**	
	T2 Hopelessness x Gender	.024	.014	.018	
3					.014*
	T2 Hopelessness x Gender x Stress Level	-.016	-.143	-.165*	

*p<.05; **p<.01; ***p<.001

Table 3. Regression analysis predicting Time 3 depressive symptoms (Dep-Sxs) from self-esteem and stress**,** beyond the effects of gender, risk, and prior depression level

Step	Predictor	B	β	*pr*	$R^2\Delta$
Predicting Time 3 depressive symptoms (Dep-Sxs)					
1					.485***
	Gender	-.060	-.018	-.025	
	Risk	.148	.04	.05	
	T2 Dep-Sxs	.311	.342	.348***	
	T2 Stress Level	.031	.271	.311***	
	T2 Self-Esteem	-.785	-.255	-.28***	
2					.013*
	T2 Self-Esteem x Stress Level	.027	.12	.158*	

*p<.05; **p<.01; ***p<.001

Table 4. Regression analysis predicting Time 2 depressive symptoms (Dep-Sxs) from additive diatheses, gender, and stress**,** beyond the effects of risk, and prior depression level

Step	Predictor	B	β	*pr*	$R^2\Delta$
Predicting Time 2 depressive symptoms (Dep-Sxs)					
1					.257***
	Gender	.249	.07	.08	
	Risk	.429	.103	.104	
	T1 Dep-Sxs	.396	.368	.382***	
	T1 Stress Level	.025	.212	.208**	
	T1 Additive	-.048	-.013	-.014	
2					.034*
	T1 Gender x Stress Level	.025	.104	.12	
	T1 Additive x Stress Level	.006	.024	.028	
	T1 Additive x Gender	-1.14	-.15	-.172*	
3					.053***
	T1 Additive x Gender x Stress Level	-.121	-.236	-.274***	

*p<.05; **p<.01; ***p<.001

Table 5. Regression analysis predicting Time 2 depressive symptoms (Dep-Sxs) from weakest link diatheses, gender, and stress**,** beyond the effects of risk, and prior depression level

Step	Predictor	B	β	*pr*	$R^2\Delta$
Predicting Time 2 depressive symptoms (Dep-Sxs)					
1					.284***
	Gender	.311	.087	.102	
	Risk	.411	.098	.102	
	T1 Dep-Sxs	.274	.255	.238**	
	T1 Stress Level	.025	.211	.212**	
	T1 Weakest Link	.368	.201	.191**	
2					.014
	T1 Gender x Stress Level	.028	.117	.136	
	T1 Weakest Link x Stress Level	.003	.033	.028	
	T1 Weakest Link x Gender	-.093	-.025	-.029	
3	T1 Weakest Link x Gender x Stress Level	-.040	-.195	-.165*	.019*

*p<.05; **p<.01; ***p<.001

Table 6. Regression analysis predicting Time 3 depressive symptoms (Dep-Sxs) from weakest link diatheses and stress**,** beyond the effects of gender, risk, and prior depression level

Step	Predictor	B	β	*pr*	$R^2\Delta$
Predicting Time 3 depressive symptoms (Dep-Sxs)					
1					.462***
	Gender	-.054	-.016	-.022	
	Risk	.117	.031	.039	
	T2 Dep-Sxs	.347	.382	.383***	
	T2 Stress Level	.034	.291	.326***	
	T2 Weakest Link	.311	.179	.202**	
2					.017*
	T2 Weakest Link x Stress Level	-.016	-.14	-.18*	

*p<.05; **p<.01; ***p<.001

Table 7. Regression analysis predicting Time 2 depressive symptoms (Dep-Sxs) from weakest link diatheses, keystone diatheses, gender, and stress**,** beyond the effects of risk and prior depression level

Step	Predictor	B	β	*pr*	$R^2\Delta$
Predicting Time 2 depressive symptoms (Dep-Sxs)					
1					.291***
	Gender	.296	.083	.097	
	Risk	.36	.086	.089	
	T1 Dep-Sxs	.248	.23	.211**	
	T1 Stress	.027	.224	.223**	
	T1 Weakest Link	.288	.157	.139*	
	T1 Keystone	-.255	-.103	-.098	
2					.041
	T1 Gender x Stress Level	.034	.144	.167*	
	T1 Weakest Link x Stress Level	.001	.007	.005	
	T1 Weakest Link x Gender	-.418	-.114	-.105	
	T1 Keystone x Stress Level	-.017	-.099	-.095	
	T1 Keystone x Gender	-.785	-.16	-.151*	
	T1 Weakest Link x Keystone	.099	.062	.058	
3					.036*
	T1 Weakest Link x Gender x Stress Level	-.016	-.078	-.056	
	T1 Keystone x Gender x Stress Level	.035	.101	.099	
	T1 Weakest Link x Keystone x Gender	-.116	-.038	-.03	
	T1 Weakest Link x Keystone x Stress Level	.025	.225	.143*	
4					.017*
	T1 Weakest Link x Keystone x Stress Level x Gender	.060	.263	.166*	

*p<.05; **p<.01; ***p<.001

Table 8. Regression analysis predicting Time 3 depressive symptoms (Dep-Sxs) from weakest link diatheses, keystone diatheses, gender, and stress**,** beyond the effects of risk and prior depression level

Step	Predictor	B	β	*pr*	$R^2\Delta$
Predicting Time 3 depressive symptoms (Dep-Sxs)					
1					.52***
	Gender	.032	.01	.014	
	Risk	.163	.044	.057	
	T2 Dep-Sxs	.263	.29	.304***	
	T2 Stress	.035	.302	.355***	
	T2 Weakest Link	.081	.047	.052	
	T2 Keystone	-.735	-.309	-.329***	
2					.035*
	T2 Gender x Stress Level	-.018	-.075	-.105	
	T2 Weakest Link x Stress Level	-.011	-.096	-.113	
	T2 Weakest Link x Gender	-.147	-.042	-.045	
	T2 Keystone x Stress Level	.008	.045	.056	
	T2 Keystone x Gender	-.369	-.077	-.086	
	T2 Weakest Link x Keystone	-.308	-.141	-.175*	
3					.007
	T2 Weakest Link x Gender x Stress Level	-.020	-.083	-.091	
	T2 Keystone x Gender x Stress Level	.005	.013	.016	
	T2 Weakest Link x Keystone x Gender	-.277	-.07	-.077	
	T2 Weakest Link x Keystone x Stress Level	-.004	-.031	-.032	
4					.015*
	T2 Weakest Link x Keystone x Stress Level x Gender	-.050	-.176	-.182*	

*p<.05; **p<.01; ***p<.001

Table 9. Regression analysis predicting Time 2 depressive symptoms (CDI-H) from hopelessness, gender, and stress**,** beyond the effects of risk and prior depression level

Step	Predictor	B	β	*pr*	$R^2\Delta$
Predicting Time 2 depressive symptoms (CDI-H)					
1					.319***
	Gender	.061	.013	.015	
	Risk	.059	.01	.011	
	T1 CDI-H	.352	.416	.424***	
	T1 Stress Level	.028	.17	.178*	
	T1 Hopelessness	.242	.198	.22**	
2					.011
	T1 Gender x Stress Level	.005	.016	.019	
	T1 Hopelessness x Stress Level	.008	.099	.112	
	T1 Hopelessness x Gender	-.104	-.043	-.051	
3					.018*
	T1 Hopelessness x Gender x Stress Level	-.023	-.147	-.163*	

*p<.05; **p<.01; ***p<.001

Table 10. Regression analysis predicting Time 2 depressive symptoms (CDI-H) from additive diatheses, gender, and stress, beyond the effects of risk and prior depression level

Step	Predictor	B	β	*pr*	$R^2\Delta$
Predicting Time 2 hopelessness depressive symptoms (CDI-H)					
1					.289***
	Gender	.072	.015	.017	
	Risk	.017	.003	.003	
	T1 CDI-H	.402	.474	.482***	
	T1 Stress Level	.031	.192	.197**	
	T1 Additive	.338	.065	.077	
2					.048**
	T1 Gender x Stress Level	.002	.005	.006	
	T1 Additive x Stress Level	.030	.086	.103	
	T1 Additive x Gender	-2.241	-.217	-.251***	
3					.025**
	T1 Additive x Gender x Stress Level	-.112	-.16	-.193**	

*p<.05; **p<.01; ***p<.001

Table 11. Regression analysis predicting Time 2 depressive symptoms (CDI-H) from weakest link diatheses, gender, and stress, beyond the effects of risk and prior depression level

Step	Predictor	B	β	*pr*	$R^2\Delta$
Predicting Time 2 hopelessness depressive symptoms (CDI-H)					
1					.315***
	Gender	.107	.022	.026	
	Risk	.094	.017	.017	
	T1 CDI-H	.289	.342	.305***	
	T1 Stress Level	.027	.166	.173*	
	T1 Weakest Link	.559	.223	.206**	
2					.006
	T1 Gender x Stress Level	.008	.025	.029	
	T1 Weakest Link x Stress Level	.013	.091	.078	
	T1 Weakest Link x Gender	-.252	-.05	-.057	
3					.034**
	T1 Weakest Link x Gender x Stress Level	-.073	-.262	-.225**	

*p<.05; **p<.01; ***p<.001

Table 12. Regression analysis predicting Time 2 depressive symptoms (CDI-H) from keystone diatheses, gender, and stress**,** beyond the effects of risk and prior depression level

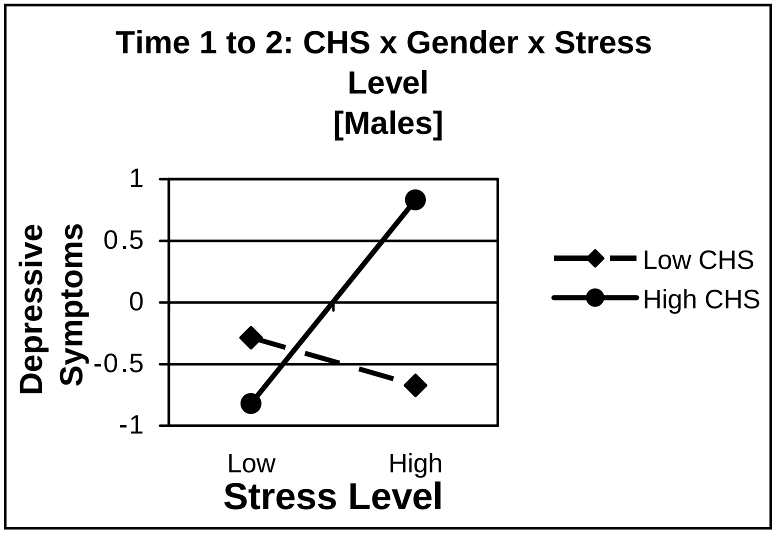
Step	Predictor	B	β	*pr*	$R^2Δ$
Predicting Time 2 hopelessness depressive symptoms (CDI-H)					
1					.332***
	Gender	.023	.005	.006	
	Risk	-.077	-.014	-.014	
	T1 CDI-H	.308	.364	.361***	
	T1 Stress Level	.032	.197	.208**	
	T1 Keystone	-.839	-.249	-.259***	
2					.008
	T1 Gender x Stress Level	.015	.047	.056	
	T1 Keystone x Stress Level	-.013	-.055	-.064	
	T1 Keystone x Gender	-.4	-.06	-.071	
3					.029**
	T1 Keystone x Gender x Stress Level	.085	.181	.209**	

*p<.05; **p<.01; ***p<.001

Table 13. Regression analysis predicting Time 2 depressive symptoms (CDI-NH) from weakest link, diatheses, keystone diatheses, gender, and stress**,** beyond the effects of risk and prior depression level

Step	Predictor	B	β	*pr*	$R^2Δ$
Predicting Time 2 nonhopelessness depressive symptoms (CDI-NH)					
1					.264***
	Gender	.073	.027	.031	
	Risk	.015	.005	.005	
	T1 CDI-NH	.224	.252	.245***	
	T1 Stress Level	.015	.168	.168*	
	T1 Weakest Link	.324	.233	.209**	
	T1 Keystone	-.137	-.073	-.069	
2					.05*
	T1 Gender x Stress Level	.034	.191	.218**	
	T1 Weakest Link x Stress Level	.004	.049	.034	
	T1 Weakest Link x Gender	-.286	-.103	-.094	
	T1 Keystone x Stress Level	-.009	-.068	-.065	
	T1 Keystone x Gender	-.118	-.032	-.03	
	T1 Weakest Link x Keystone	.157	.129	.12	
3					.029
	T1 Weakest Link x Gender x Stress Level	.020	.132	.094	
	T1 Keystone x Gender x Stress Level	.021	.081	.078	
	T1 Weakest Link x Keystone x Gender	-.037	-.016	-.013	
	T1 Weakest Link x Keystone x Stress Level	.024	.282	.179*	
4					.017*
	T1 Weakest Link x Keystone x Stress Level x Gender	.045	.258	.16*	

*p<.05; **p<.01; ***p<.001



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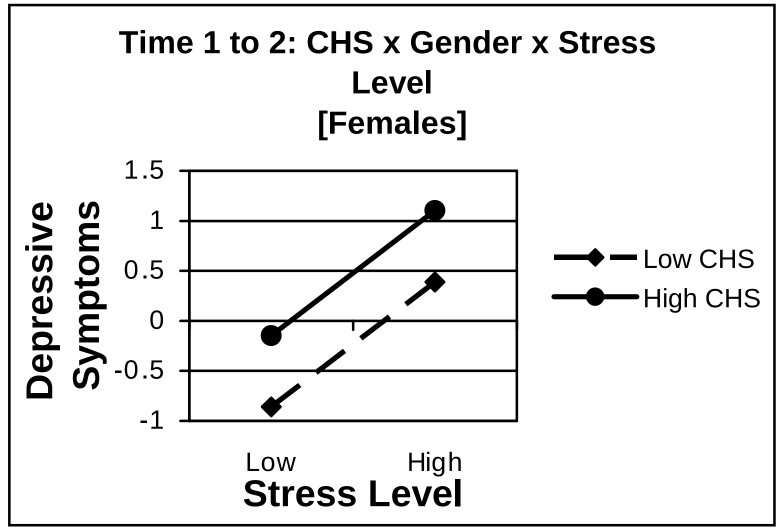

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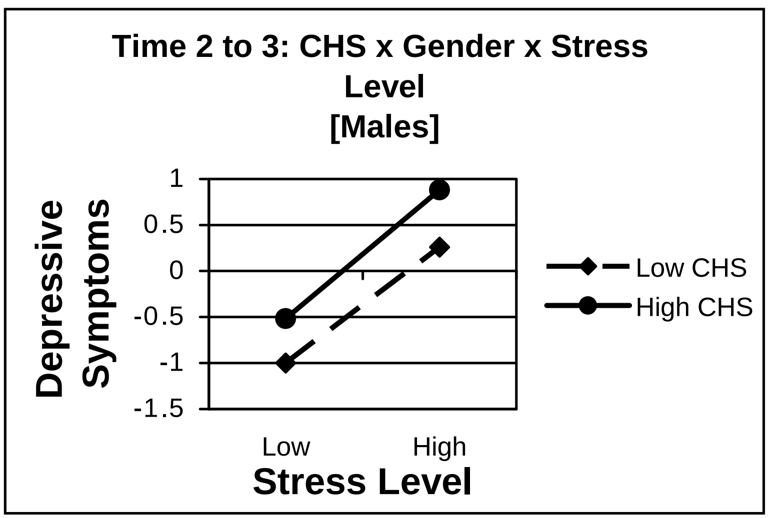

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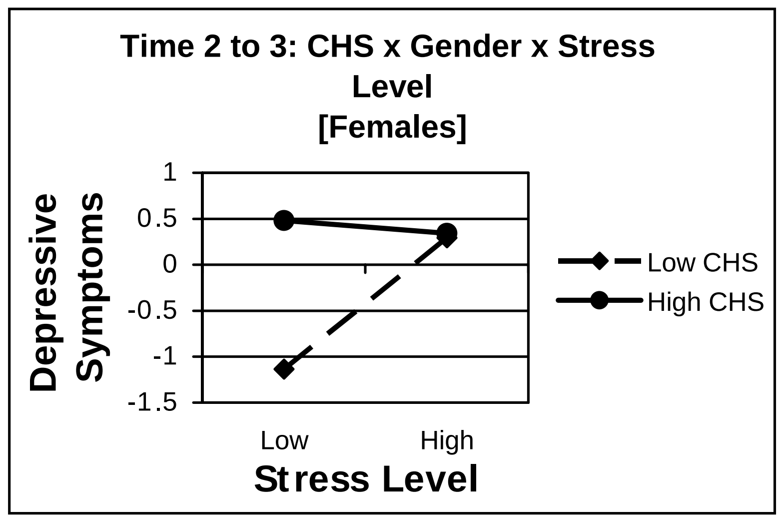

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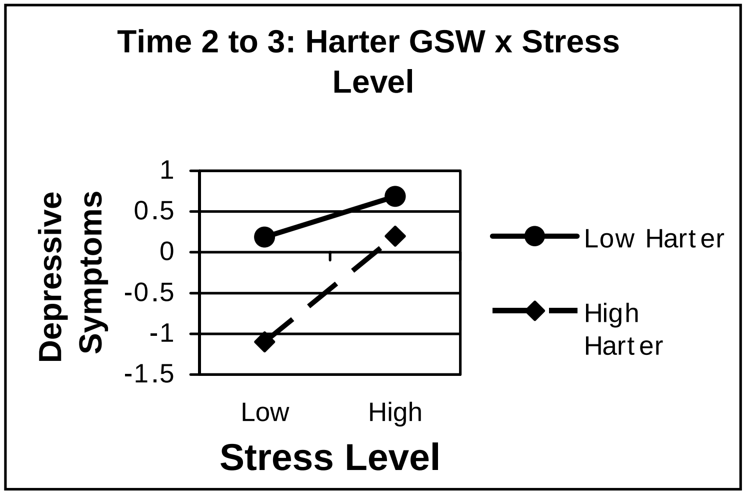

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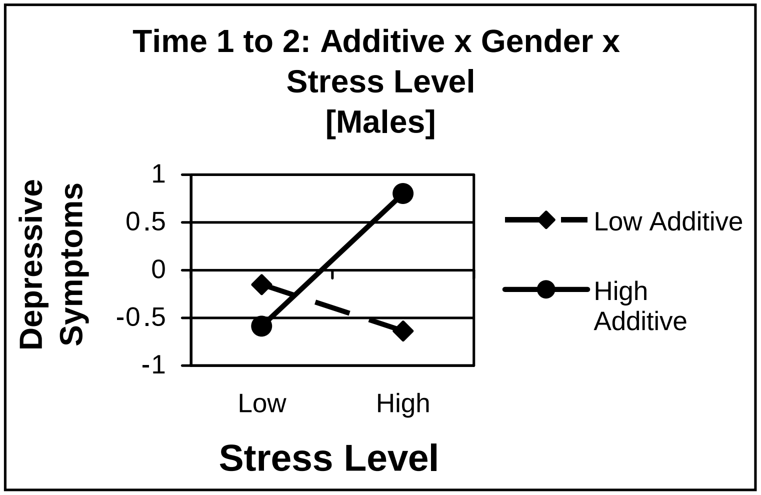

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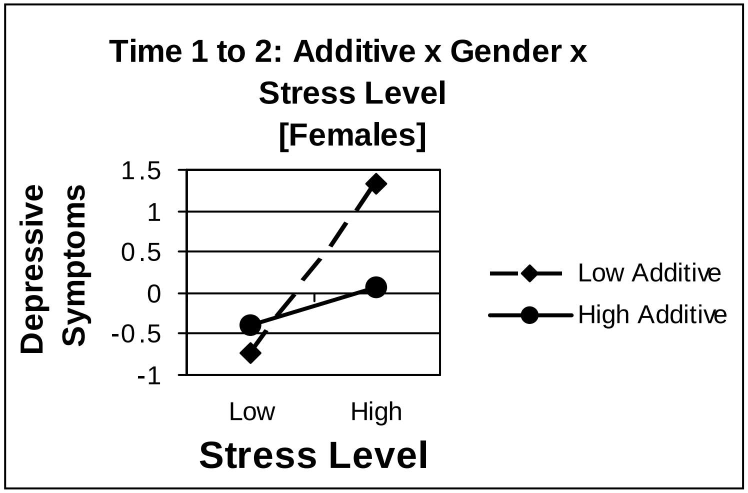

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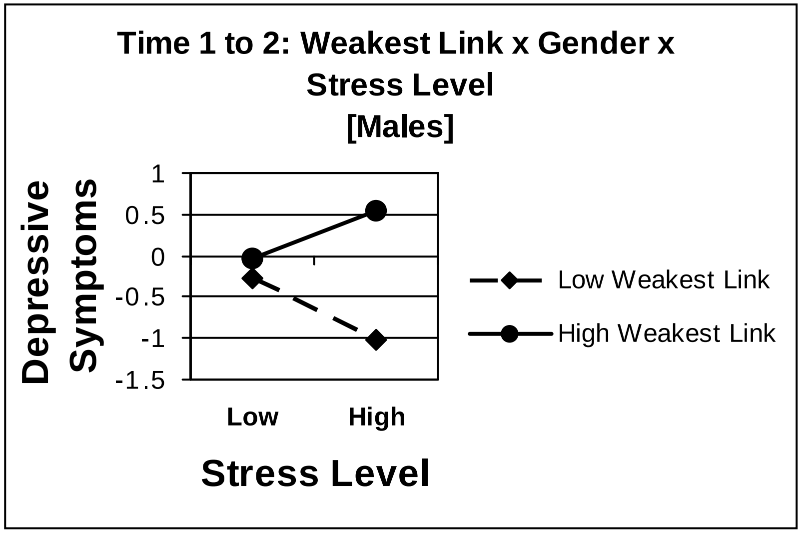

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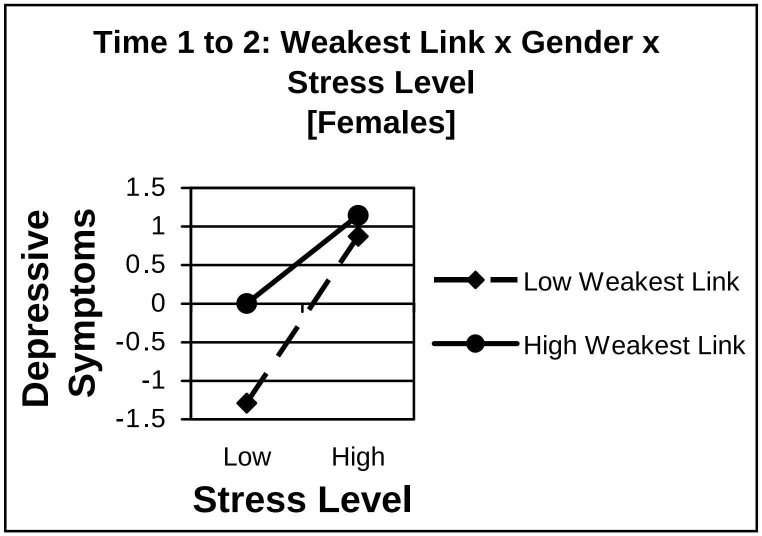

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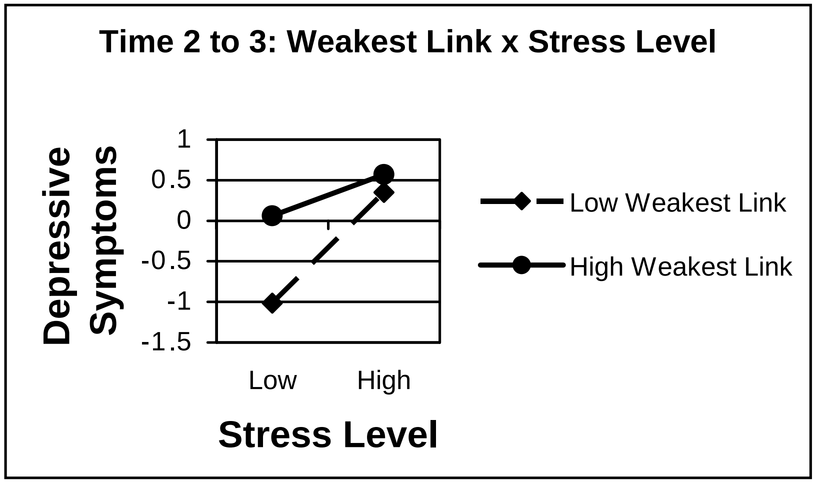

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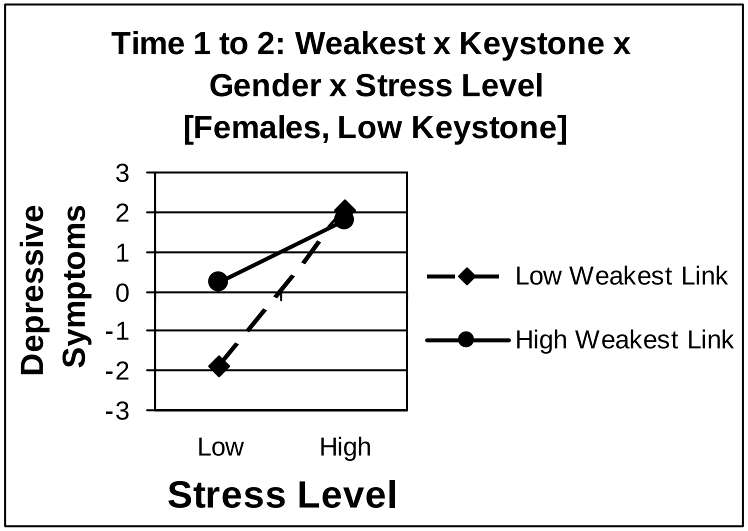

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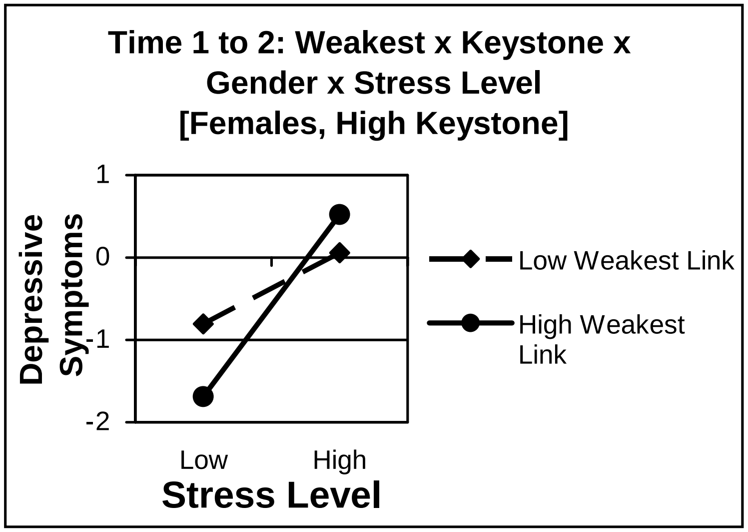

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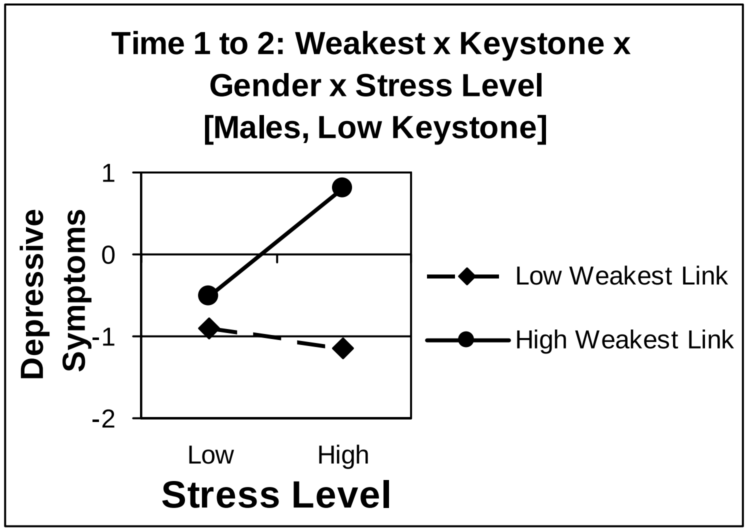

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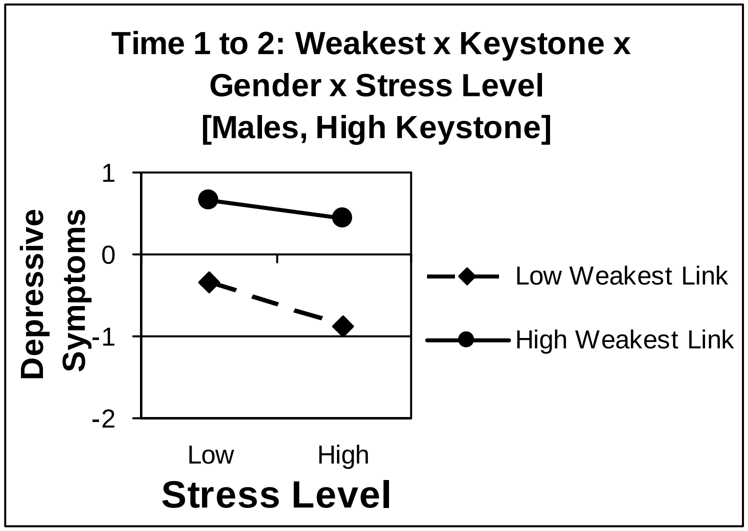

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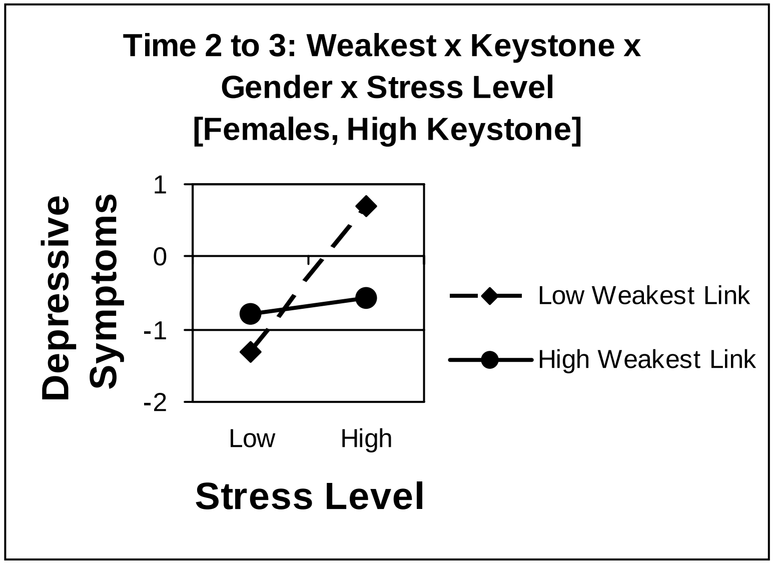

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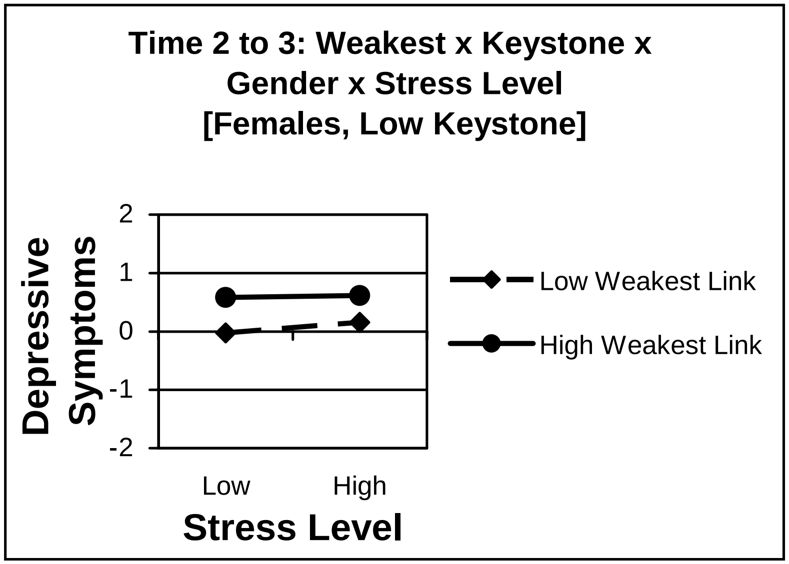

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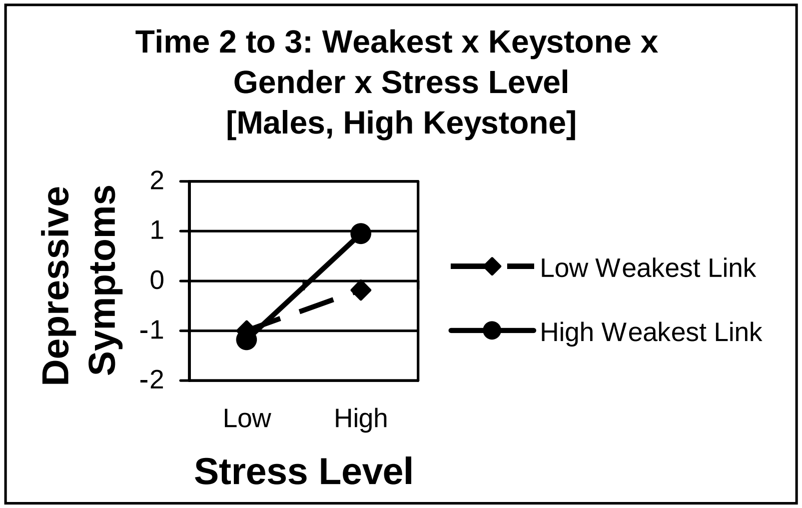

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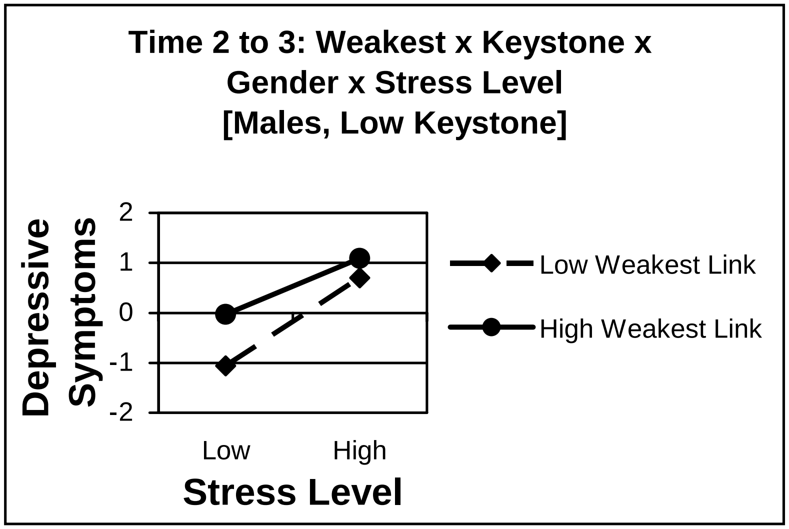

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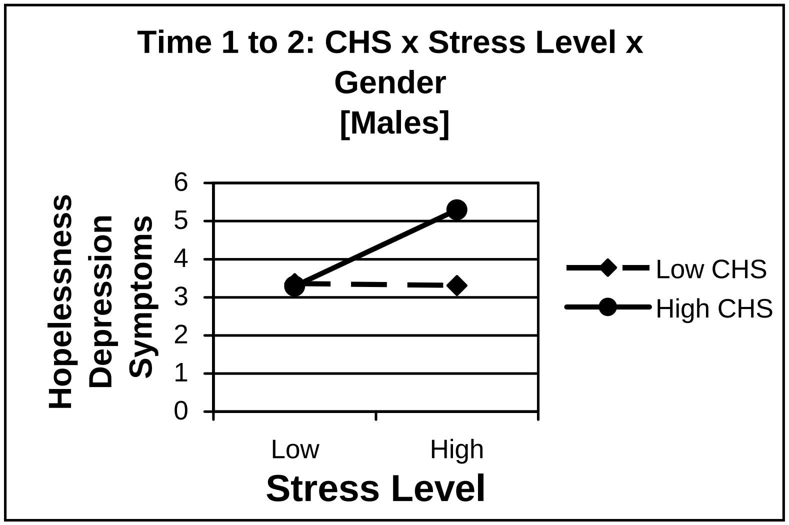

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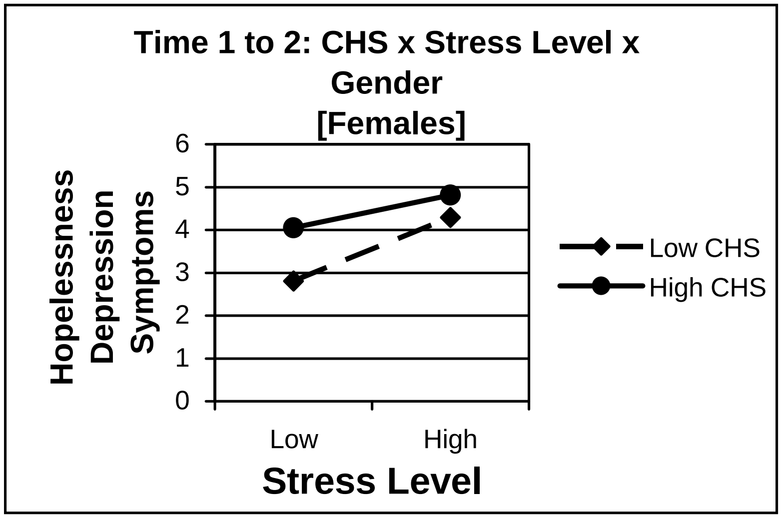

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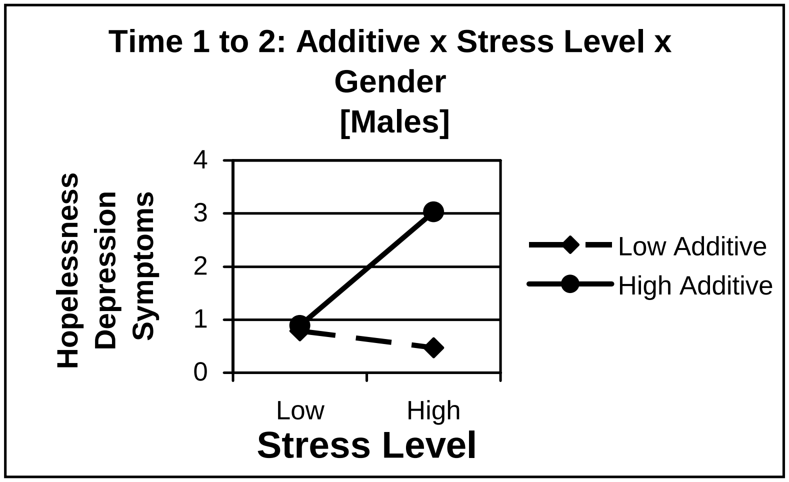

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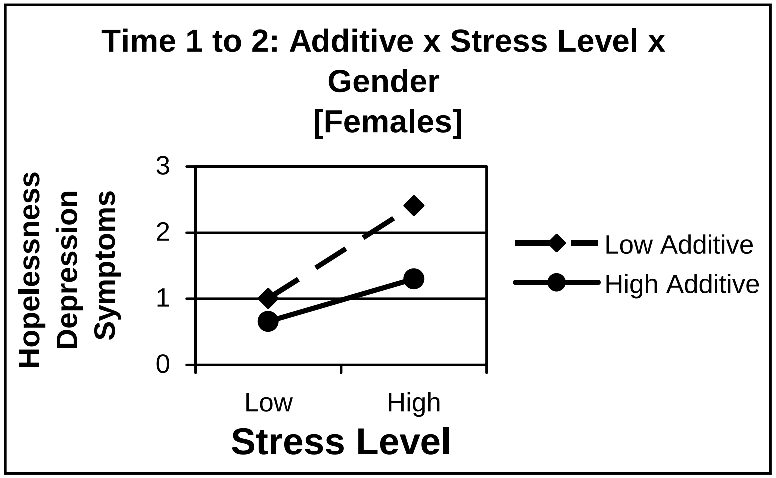

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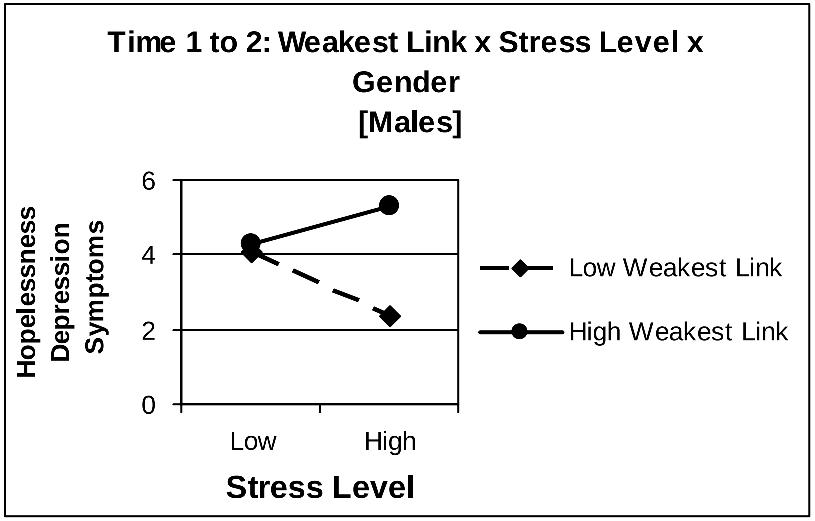

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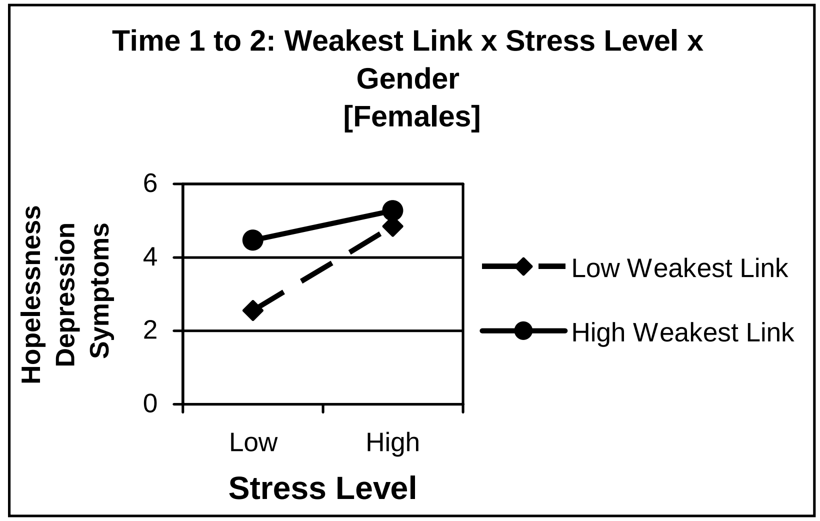

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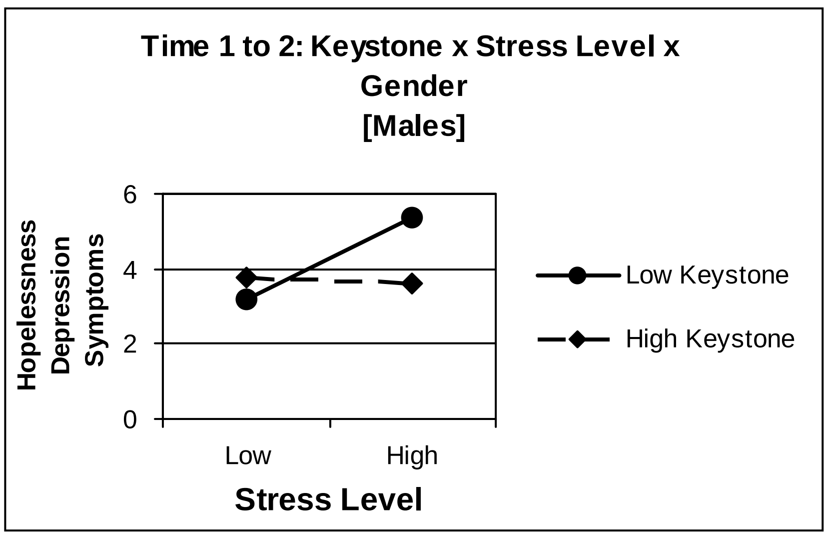

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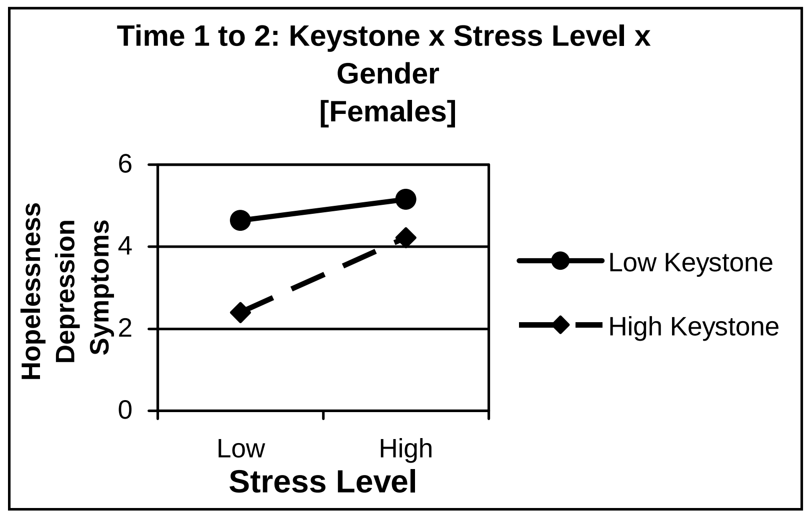

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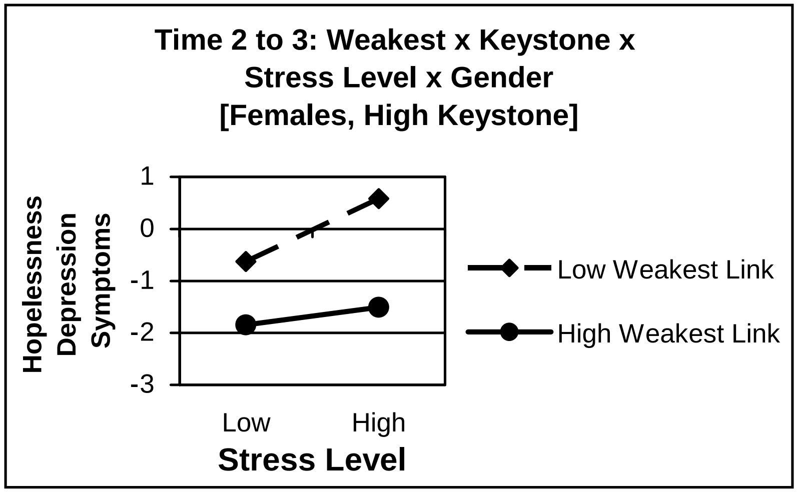

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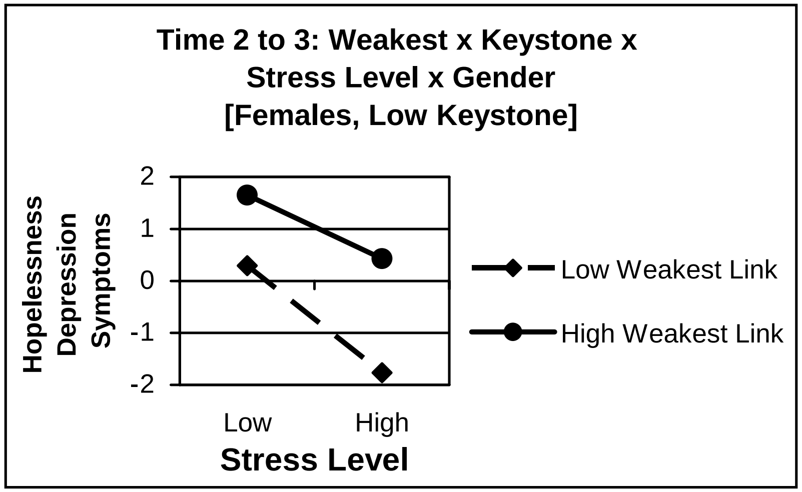

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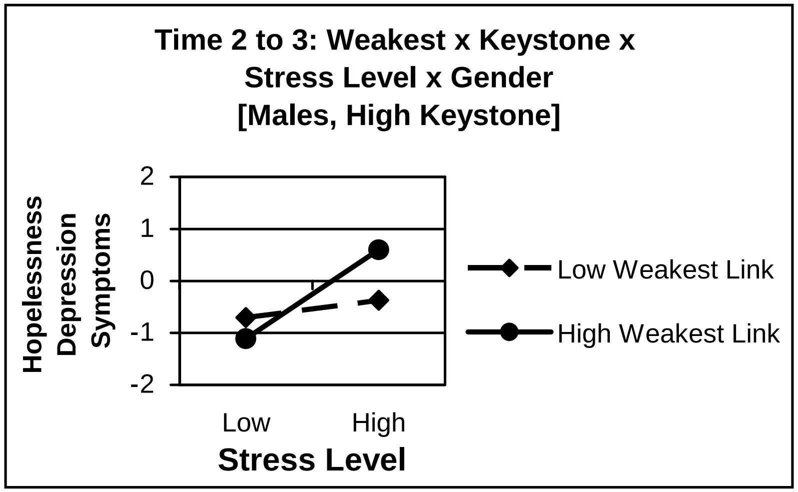
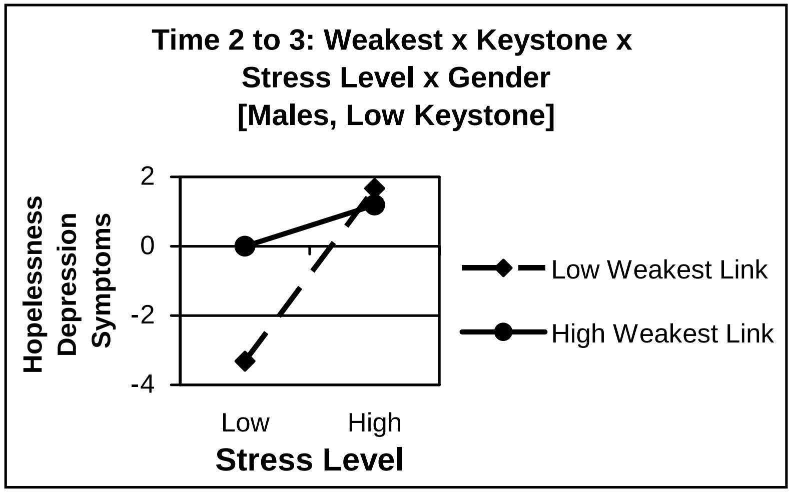


Figure 13c.



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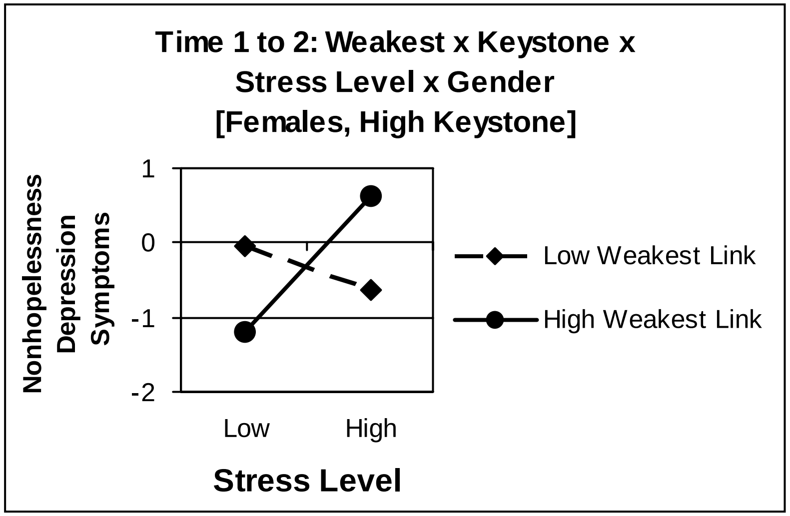

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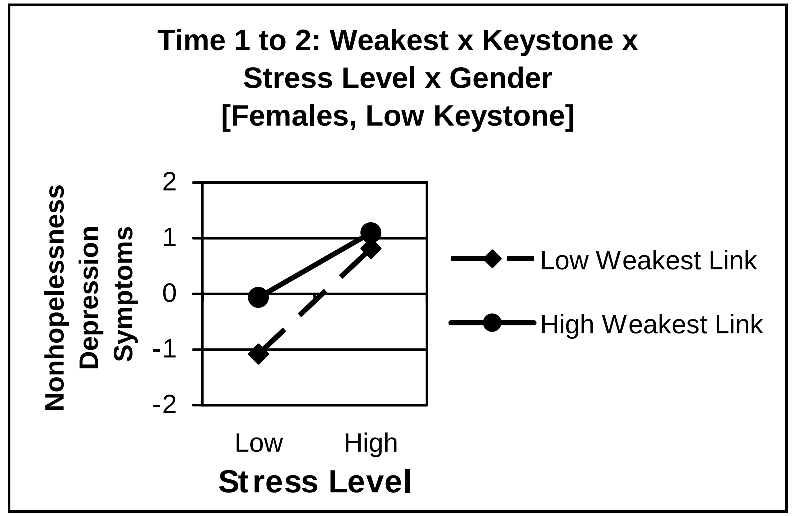

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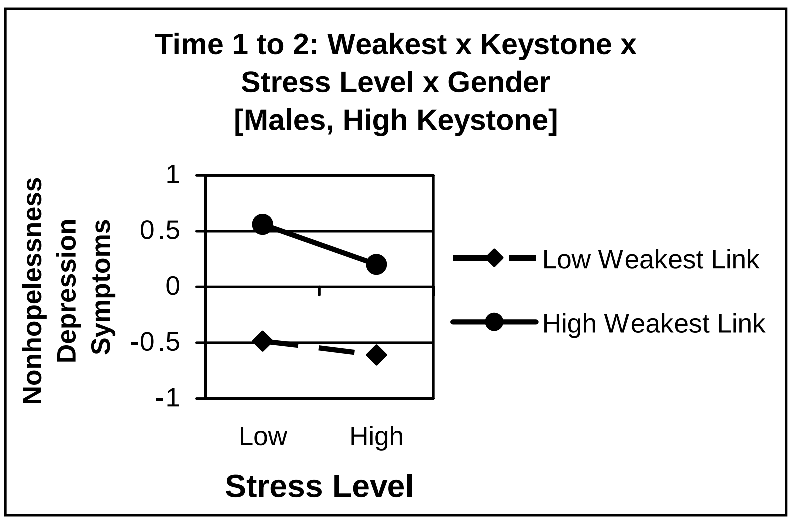

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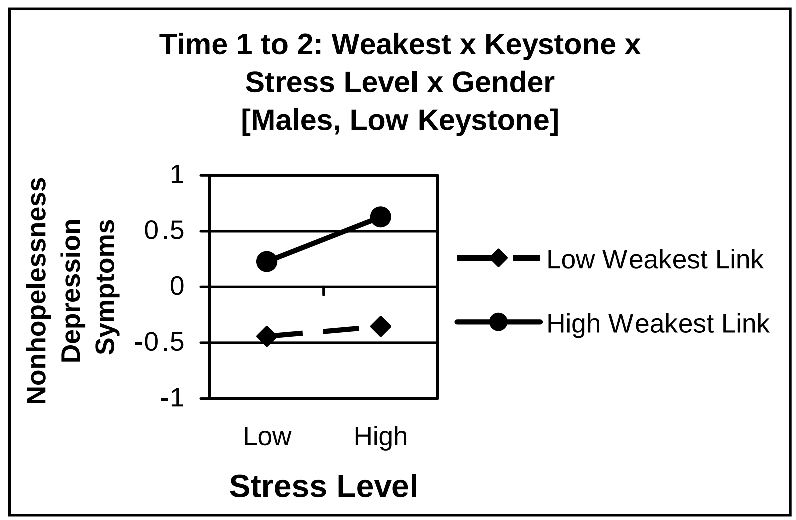

Figure 14d.

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