Understanding the role of coping in the development of depressive symptoms: Symptom specificity, gender differences, and cross-cultural applicability

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Objectives. The primary aim examined whether coping deficits, a greater tendency to utilize maladaptive as opposed to adaptive coping strategies, was associated with increases in depressive symptoms following negative events. The secondary goals examined: the common vulnerability hypothesis, sex differences, and the cross-cultural generalizability.

Design. Following the initial assessment, Canadian adolescents completed three follow-up assessments every 6 weeks. The Chinese adolescents completed an initial assessment and six follow-up assessments occurring monthly.

Methods. At Time 1, 150 Canadian and 397 Chinese adolescents completed self-report measures assessing depressive symptoms, anxious symptoms, negative events, and coping. During each of the follow-up assessments, participants completed self-report measures assessing depressive symptoms, anxious symptoms, and negative events.

Results. In both samples, higher levels of coping deficits were associated with increases in depressive, but not anxious, symptoms following negative events. Gender differences did not emerge.

Conclusions. The present study provides a theoretically driven model to examine the impact of broad-based coping on the development of depressive symptoms.

Research examining the prevalence of major depressive disorder suggests that it is reaching near epidemic proportions as approximately 20% of adolescents will experience an episode by age 18 (Hankin *et al.*, 1998). Such episodes run a chronic

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course with up to 66% relapsing within a 5-year period (Kovacs, 1996) and 84% relapsing by adulthood (Harrington, Rutter, & Frombonne, 1996). Despite such alarming statistics, researchers have only recently begun to examine theories regarding the aetiology of adolescent depression.

While there are a number of factors that contribute to the aetiology of depression in youth, one of the most robust predictors is stress (Grant, Compas, Thurm, McMahon, & Gipson, 2004). Stress includes but is not limited to acute traumatic events, chronic strain and adversity, and the accumulation of negative life-events and daily hassles (Grant *et al.*, 2000). Stress is a pervasive risk factor for the development of psychopathology during adolescence, and in a review of 60 longitudinal studies examining the relationship between stress and psychopathology, Grant *et al.* (2004) found that in 88% of these studies, stress prospectively predicted increases in depressive and anxious symptoms.

Given the strong association between stress and depressive symptoms, researchers have examined individual differences in how adolescents respond to stress. Specifically, the ways in which 'adolescents cope with stress are potentially important mediators and moderators of the impact of stress on current and future adjustment' (Compas, Connor-Smith, Saltzman, Thomsen, & Wadsworth, 2001, p. 87). As research has indicated that patterns of coping during adolescence play a central role in both preventing and contributing to the development of psychopathology, such patterns likely have a profound impact on one's developmental course (Connor-Smith & Compas, 2004). One prominent model of coping developed by Connor-Smith, Compas, Wadsworth, Thomsen, and Saltzman (2000) divides coping into five theoretically distinct categories: (1) primary control engagement (altering objective conditions), (2) secondary control engagement (changing oneself in order to adapt to a stressful situation), (3) disengagement (responses oriented away from the stressor), (4) involuntary engagement (responses directed towards a stressor but outside of an individual's control), and (5) involuntary disengagement (responses directed away from a stressor but outside of an individual's control). The subscales are assessed using the Responses to Stress Questionnaire (RSQ; Connor-Smith *et al.*, 2000).

To date, the RSQ has been used to examine the concurrent relationship between stress and negative affect. In research with three independent samples of adolescents, results indicated that whereas higher levels of primary and secondary control engagement were associated with lower levels of internalizing symptoms, higher levels of disengagement, involuntary engagement, and involuntary disengagement were associated with higher levels of such symptoms (Connor-Smith *et al.*, 2000). Similarly, in a cross-sectional study, results found that individuals who endorsed higher levels of primary and secondary control engagement reported lower levels of depressive and anxious symptoms (Wadsworth & Compas, 2002). In contrast, individuals who indicated higher levels disengagement responses were associated with higher levels of such symptoms. Only one study has examined whether RSQ subscales have moderated the relationship between negative events and depressive symptoms prospectively. Wadsworth and Berger (2006) found that higher levels of primary control engagement interacted with Time 1 negative events to predict higher levels of Time 2 depressive and anxious symptoms. Nevertheless, such events did not interact with secondary control engagement or disengagement to prospectively predict change in symptomology. Given these findings and the paucity of prospective data examining this relationship, further research is warranted.

As most individuals completing the RSQ tend to report using 'many coping responses of all types or very few responses overall' (Wadsworth, Riekmann, Benson, & Compas, 2004, p. 401), the majority of researchers have calculated scores for each of the

subscales by dividing the sum of the items on each subscale by the sum of all items on the measure. Such proportional scores create an index of the degree to which each subscale was endorsed in comparison to the other subscales (Connor-Smith & Compas, 2004). A shortcoming of this approach is that it can lead to contradictory predictions for the same individual. Consider the following example. An adolescent receives high proportional scores, relative to the other subscales, on the primary control engagement and the disengagement subscales. Past cross-sectional studies have indicated that (1) higher levels of primary and secondary control engagement are associated with lower levels of negative affect (i.e., adaptive subscales) and (2) disengagement, involuntary engagement, and involuntary disengagement are associated with higher levels of such states (i.e., maladaptive subscales; Connor-Smith *et al.*, 2000). Consequently, when examining the primary control engagement proportional score, one would predict that the adolescent will exhibit decreases in depressive symptoms. In contrast, when examining the disengagement proportional score, one would predict that the same adolescent will show increases in depressive symptoms. Given that the traditional way of scoring the RSQ can lead to contradictory predictions, an individuals' degree of vulnerability to depression may be better captured by using a data analytic approach that simultaneously takes into account levels on each of the five subscales.

One potential approach to resolving this conflict is to create a ratio score for each participant in which the sum of an individual's maladaptive coping strategies are divided by the sum of both his/her adaptive and maladaptive coping strategies. Amsel and Fichten (1990) posit that such an approach is preferred as it creates a ratio with a definitive numerical range (i.e., 0–1), and the range may be utilized to create a metric delineating vulnerability. When utilizing the maladaptive ratio, higher ratio scores would indicate a greater tendency to utilize maladaptive as opposed to adaptive coping strategies. Thus, high ratio scores should predict increases in depressive symptoms. In utilizing a ratio, it accounts for the likelihood that individuals utilize a number of coping strategies, both adaptive and maladaptive, in response to different negative events, and further, resolves the problem of predicting contradictory outcomes.

Secondary objectives

While the primary objective was to examine a new theoretical approach towards conceptualizing coping in adolescents, we also examined secondary objectives including (a) the common vulnerability hypothesis, (b) sex differences in coping deficits, and (c) the cross-cultural generalizability. First, there is a high rate of comorbidity between anxious and depressive disorders in youth (Costello, Foley, & Angold, 2006). Seligman and Ollendick (1998) hypothesize that the comorbidity of anxiety and depressive disorders may be explained by common aetiological factors that increase the probability that both disorders will occur. As past research has found that maladaptive coping strategies are associated with elevations in both depressive (Hampel & Petermann, 2005) and anxious symptoms (Suveg & Zeman, 2004), we would predict non-specificity.

Second, past research has found that females experience a higher prevalence of depressive episodes during adolescence as compared to males (Hankin, Mermelstein, & Roesch, 2007). In examining gender differences, researchers have focused on both stress exposure (mediation) and stress reactivity (moderation) models (e.g., Hankin *et al.*, 2007). Stress exposure models propose that girls are exposed to a greater number of dependent interpersonal stressors as compared to boys which may result in higher

levels of depressive symptoms. Nolen-Hoeksema and Girgus (1994) posit that prior to adolescence girls possess a greater number of risk factors, and consequently gender differences may also emerge as a result of differences in coping deficits. In contrast, stress reactivity models posit that even when girls and boys experience comparable levels of stress, girls may be more likely to experience elevated levels of depressive symptoms in response to such stress. As past research has found support for both stress exposure and stress mediation models (Hankin *et al.*, 2007), both models were explored.

Last, in an effort to better understand the cross-cultural generalizability, we examined adolescents from China. Research examining depression amongst Chinese adolescents indicated that the lifetime prevalence is comparable to Western samples (Liu *et al.*, 1999). As research within Mainland China has found that negative events is both concurrently associated with depression as well as prospectively predicts depression (e.g., Fong, 2006; Liu *et al.*, 1999; Liu, Tein, Zhao, & Sandler, 2005), researchers have begun to examine factors that may moderate the relationship between the occurrence of negative events and depressive symptoms. One such factor that has received recent attention has been maladaptive coping strategies (Chen & Zheng, 2002; Liu, Tein, & Zhongtang, 2004). While the proposed model may play a different role in Chinese youth as compared to Western youth, the applicability is interesting to consider given the (a) high rates of depression amongst adolescents, (b) association between stress and depression, and (c) present focus on understanding coping in the development of depression amongst Chinese adolescents.

Method

Participants
Participants were recruited from high schools in Montreal, Quebec (Canada) and Yue Yang, Hunan (China). The Canadian sample included 150 high school students (46% male) whose ages ranged from 12 to 18 (mean = 15.17; $SD = 1.22$). The sample was 78.9% Caucasian, 5.6% Asian, 4.3% Black, 3.1% East-Indian, 2.5% Native American, 1.2% Hispanic, and 3.1% reported other as their ethnicity. With regards to the Chinese sample, the final sample consisted of 397 high school students (49.8% male) whose ages ranged from 14 to 19 (mean = 16.18; $SD = 0.95$). The sample was 97.1% Han and 3.9% ethnic minorities.

Procedure
Prior to the initial assessment, letters of informed consent were sent home to parents requesting consent for their child to participate. All students who received parental consent chose to give personal consent. During the initial assessment, students completed a demographics form and the following questionnaires: (1) Center for Epidemiologic Studies Depression Scale (CES-D; Radloff, 1977), (2) Multidimensional Anxiety Scale for Children (MASC; March, 1997; Yao *et al.*, 2007), (3) Adolescent Life-Events Questionnaire (ALEQ; Hankin & Abramson, 2002), and (4) RSQ (Connor-Smith *et al.*, 2000; Yao *et al.*, 2010). Follow-up assessments occurred every 6 weeks (Times 2–4) for Canadian adolescents and once a month for 6 months (Times 2–7) for Chinese adolescents. At each follow-up, participants completed the following questionnaires: (1) CES-D, (2), MASC, and (3) ALEQ.

Measures

The Chinese version of all self-report measures was developed using the back-translation method. First, the original version was translated into Chinese by one bilingual translator from the psychology department at Central South University. Next, the Chinese version was back-translated into English by another bilingual translator from the Psychology Department at McGill University. If discrepancies arose in the back-translation, translators worked cooperatively to make corrections to the Chinese version.

Center for Epidemiologic Studies Depression Scale

The CES-D (Radloff, 1977) is a 20-item self-report measure that assesses levels of depressive symptoms. Items on the scale range from 0 to 3 and higher scores reflect greater depressive symptomology. Across administrations the Cronbach's alpha ranged from .89–.94 with Canadian adolescents to .89–.95 with Chinese adolescents.

Multidimensional Anxiety Scale for Children

The MASC (March, 1997; Yao *et al.*, 2007) is a 39-item measure that assesses severity of anxious symptoms in the past week. Youth rate each item on a four-point Likert scale ranging from 0 to 3 and higher scores reflect greater anxious symptomology. The Cronbach's alpha ranged from .90–.93 for Canadian adolescents to .91–.96 for Chinese adolescents.

Adolescent Life-Events Questionnaire

The ALEQ (Hankin & Abramson, 2002) is a self-report questionnaire that was developed to assess a broad range of negative life-events occurring in the past month. Participants were asked to indicate how often such events occurred on a Likert scale ranging from 0 to 4 with higher scores reflecting a greater number of negative life-events. The Cronbach's alpha ranged from .92 to .93 for Canadian adolescents and .92–.96 for Chinese adolescents.

Responses to Stress Questionnaire

The RSQ (Connor-Smith, Compas, Wadsworth, Thomsen, & Saltzman, 2000; Yao *et al.*, 2010) was designed to measure specific voluntary/controlled and involuntary/automatic coping strategies. Theoretically, the RSQ contains five distinct subscales and each subscale is composed of no less than three unique coping strategies. Item scores on the RSQ range from 1 to 4 and higher scores indicated a greater propensity to employ a given subscale.

In order to examine the frequency with which an individual utilizes maladaptive versus adaptive coping strategies, a ratio of maladaptive to total strategies was created (RATIO) whereby higher scores indicated a greater tendency to utilize maladaptive, as opposed to adaptive, coping strategies in response to stressors. The following steps were followed to create the RATIO. First, maladaptive (RSQ Maladaptive) and adaptive (RSQ Adaptive) subscales were created by summing relevant subscales. RSQ maladaptive contained the disengagement coping, involuntary engagement coping, and involuntary disengagement coping subscales, and RSQ Adaptive included the primary and secondary control engagement coping subscales. Second, to account for the different number of items falling on each of the two subscales, the RSQ maladaptive and RSQ adaptive were

divided by their item totals. Last, RSQ maladaptive was divided by the sum of RSQ adaptive and RSQ maladaptive. The Cronbach's alpha for RSQ adaptive and RSQ maladaptive was .85–.93 for Canadian adolescents and .83–.91 for Chinese adolescents.

Overview of data analytic approach

Multi-level modelling analyses were completed using SAS (version 9.1) mixed procedure and maximum-likelihood estimation. With regards to our primary hypothesis, our dependent variable was within-subject fluctuations in depressive symptoms (WI_CES-D). As WI_CES-D, a level 1 variable, is a within-subject variable, scores were centred at each participant's mean such that WI_CES-D reflects upwards/downwards fluctuations in an individual's level of depressive symptoms compared to his or her mean level of symptoms. Our primary predictors of WI_CES-D were RATIO and fluctuations in negative events (WI_ALEQ) during the follow-up interval. As RATIO, a level 2 variable, is a between subject variable, RATIO scores were standardized prior to analyses. As WI_ALEQ, a level 1 variable, is a within-subject predictor, scores were centred at each participant's mean prior to analyses such that WI_ALEQ reflects upwards/downwards fluctuations in an individual's level of negative events compared to his/her average level of negative events.

Our multi-level models nested individuals over time allowing us to utilize an idiographic approach. One advantage an idiographic approach is that by obtaining repeated assessments of symptoms as well as negative events within individuals over an extended period of time, we are able to gather a reliable estimate of each individual's symptom level following the increased occurrence of negative events. A second advantage of an idiographic approach is that for each individual, high levels of negative events can be operationalized in reference to his/her own mean level of negative events. Such an approach towards minimizes the impact of individual differences in the reporting of negative events.

Results

Descriptive data

The means, standard deviations, and intercorrelations between all Time 1 measures are presented in Table 1 and descriptive statistics for symptoms are included in Table 2.

Canadian adolescents: Depressive symptoms in response to negative events

Four additional effects were included when examining whether RATIO × WI_ALEQ to predict WI_CES-D. First, to control for individual differences in baseline levels of depressive symptoms, participant's initial depressive symptoms were included. Second, as model specificity was examined, initial and follow-up anxiety were included as covariates. Third, given that participants are likely to exhibit different levels of depressive symptom when experiencing their own average level of negative events, a random effect for intercept was included. Last, given that WI_ALEQ is a within-subject predictor whose effect is expected to vary from participant to participant, a random effect for slope was included. Preliminary analyses indicated that none of the reported associations were moderated by age, and thus, analyses are presented for the entire sample as a whole.

The autoregressive parameter (AR) and random intercept were significant and were retained in the model. The random slope was not significant and was removed from the

Table 1. Means, standard deviations, and intercorrelations amongst initial CES-D, initial MASC, initial ALEQ, adaptive RSQ, maladaptive RSQ, and maladaptive RSQ ratio

	1	2	3	4	5	6
Canadian adolescents						
1. Initial CES-D	13.84 (10.44)					
2. Initial MASC	.57**	38.58 (15.97)				
3. Initial ALEQ	.66***	.42***	104.30 (25.35)			
4. Adaptive RSQ	−.16*	.11	−.06	49.48 (10.37)		
5. Maladaptive RSQ	.54***	.59***	.55***	.14	68.49 (17.76)	
6. RATIO	.58***	.41***	.50***	−.56***	.73***	0.58 (0.07)
Chinese adolescents						
1. Initial CES-D	12.16 (8.84)					
2. Initial MASC	.60***	44.35 (16.84)				
3. Initial ALEQ	.56***	.50***	104.21 (21.62)			
4. Adaptive RSQ	−.05	.11*	.05	54.44 (8.94)		
5. Maladaptive RSQ	.47***	.55***	.47***	.34***	77.72 (15.40)	
6. RATIO	.47***	.43***	.41***	−.46***	.68***	0.59 (0.05)

Note. Means and SD on the diagonal; CES-D, Center for Epidemiologic Studies Depression Scale; MASC, Multidimensional Anxiety Scale for Children; ALEQ, Adolescent Life-Events Questionnaire; RSQ, Responses to Stress Questionnaire; *$p \leq .05$; **$p < .01$; ***$p < .001$.

Table 2. Means, standard deviations, and range for depressive and anxious symptoms during the follow-up period

	Canadian adolescents		Chinese adolescents	
	Mean	SD	Mean	SD
Depressive symptoms				
Follow-up #1	12.95	10.26	12.36	9.22
Follow-up #2	11.37	10.99	12.02	9.53
Follow-up #3	9.96	10.57	11.35	9.70
Follow-up #4	12.83	11.10	10.32	9.99
Follow-up #5	–	–	8.96	9.10
Follow-up #6	–	–	10.00	9.56
Anxious symptoms				
Follow-up #1	36.01	18.18	40.44	18.15
Follow-up #2	36.20	18.89	37.00	19.72
Follow-up #3	32.45	18.14	32.76	20.93
Follow-up #4	36.33	18.43	29.06	20.97
Follow-up #5	–	–	26.01	21.26
Follow-up #6	–	–	27.72	21.65

Note. Depressive symptoms, Center for Epidemiologic Studies Depression Scale; Anxious symptoms, Multidimensional Anxiety Scale for Children.

model. A significant two-way, cross-level interaction emerged between RATIO and WI_ALEQ. Predicted WI_CES-D scores for individuals with low or high RATIO scores (± 1.5 *SD*) who were experiencing a low or high negative events (± 1.5 *SD*) were estimated using the fixed effects model (see Table 3; Figure 1a). Analyses were conducted for each RATIO condition examining whether the slope of the relationship between

Table 3. Estimates for the fixed effects component of the simultaneous and reverse models for Canadian adolescents

Predictor	Parameter estimate (*b*)	SE	*t* value	*df*
Simultaneous model				
Time 1 CES-D	6.59	.49	13.53***	145
Time 1 MASC	−0.11	.04	−3.13***	145
WI_MASC	0.22	.03	8.51***	395
WI_ALEQ	0.16	.02	7.25***	395
RATIO	0.84	.44	1.91	145
RATIO × WI_ALEQ	0.05	.02	2.20*	395
Reverse model				
Time 1 ALEQ	19.39	.90	21.58***	146
Time 1 MASC	−0.15	.07	−2.18*	146
WI_MASC	0.13	.05	2.55*	397
WI_CES-D	0.81	.13	6.44***	397
RATIO	2.21	.89	2.49*	146
RATIO × WI_CES-D	−0.01	.12	−0.05	397

Note. CES-D, Center for Epidemiologic Studies Depression Scale; MASC, Multidimensional Anxiety Scale for Children; ALEQ, Adolescent Life-Events Questionnaire; RATIO, a ratio of maladaptive to total strategies; *p* ≤ .05; **p* < .01; ***p* < .001.
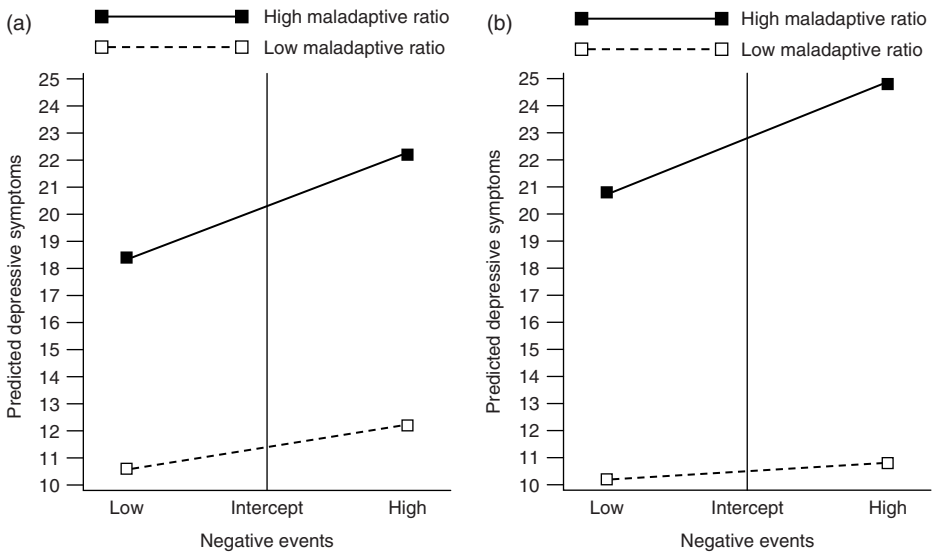
Figure 1. (a) Predicted CES-D scores as a function of RSQ ratio and occurrence of negative events amongst Canadian adolescents. (b) Predicted CES-D scores as a function of RSQ ratio and occurrence of negative events amongst Chinese adolescents.

WI_CES-D and RATIO significantly differed from 0. Although WI_ALEQ was associated with increases in WI_CES-D for individuals possessing both high ($b = 0.23$; $t(395) = 7.25$, $p < .0001$) and low ($b = 0.09$; $t(395) = 2.01$, $p < .05$) levels of RATIO, the slope of this relationship is 2.6 times greater in individuals possessing a high RATIO. Further, the slope for these two groups significantly differed ($b = 0.14$; $t(395) = 2.20, p < .05$).

Canadian adolescents: Negative events in response to depressive symptoms
We conducted analyses examining the reverse model. When examining the effects of RATIO and WI_CES-D on an individual's WI_ALEQ, the AR, and random slope were significant and were retained. The random intercept was not significant and was removed from the model. When examining the fixed effects component of the reverse model, the two-way, cross-level interaction between RATIO × WI_CES-D was not significant ($b = -0.01$, $SE = .12$; $t(397) = -0.05$, $p = .86$; see Table 3).

Canadian adolescents: Anxious symptoms in response to negative events
When examining the effects of RATIO and ALEQ on WI_MASC, the AR, and random slope were significant and were retained in the model. The random intercept was not significant and was removed. When examining the fixed effects component of the model, the two-way, cross-level interaction between RATIO × WI_ALEQ was not significant ($b = -0.03$, $SE = .04$; $t(384) = -0.67$, $p = .51$). Further, neither WI_ALEQ ($b = 0.06$, $SE = .04$; $t(384) = 1.64$, $p = .10$) nor RATIO ($b = 0.80$, $SE = .64$; $t(145) = 1.27, p = .21$) emerged as a main effect of anxious symptoms.

Examining gender differences in Canadian adolescents

In order to determine whether gender acted as a moderator of depressive symptoms, we examined GENDER × RATIO × WI_ALEQ. When examining the effects on an individual's CES-D scores, the AR, and random intercept were significant and were retained. The random slope was not significant and was removed prior to re-estimation. With regards to the fixed effects component of the model, the three-way, cross-level interaction between GENDER × RATIO × WI_ALEQ was not significant ($b = 0.002$, $SE = .05$; $t(393) = 0.04$, $p = .97$).

In order to examine our gender mediation hypothesis, we followed Baron and Kenny's (1986) guidelines: (1) girls would report greater depressive symptoms as compared to boys, (2) girls would report a higher maladaptive ratio, (3) average depressive symptoms scores during the follow-up period would be associated with a maladaptive coping ratio, and (4) after controlling for the proportion of the variance in depressive symptoms accounted for by a maladaptive ratio, the effect of gender would be significantly reduced or eliminated. When examining our first criteria, girls reported significantly greater depressive symptoms during the follow-up period ($t(156) = -2.69$, $p < .001$). Specifically, girls reported significantly greater depressive symptoms at the first ($t(149) = -2.32$, $p < .05$), second ($t(132) = -1.95$, $p \leq .05$), and final ($t(139) = -2.52$, $p < .05$) follow-up, however, at the initial assessment there was not a significant statistical difference ($t(158) = -1.60$, $p = .11$). With regards to our second criteria, there was not a significant difference between boys' and girls' scores for the maladaptive ratio ($t(149) = -0.70$, $p = .49$). As our second criterion is not satisfied, gender did not act as a mediator.

Chinese adolescents: Depressive symptoms in response to negative events

The AR, random slope, and random intercept were significant and were retained. A significant two-way, cross-level interaction emerged between RATIO and WI_ALEQ (see Table 4). Analyses were conducted for each RATIO condition examining whether

Table 4. Estimates for the fixed effects component of the simultaneous and reverse models for Chinese adolescents

Predictor	Parameter estimate (b)	SE	t value	df
Simultaneous model				
Time 1 CES-D	3.79	.31	12.33***	393
Time 1 MASC	−1.41	.32	−4.46***	393
WI_MASC	0.22	.01	22.93***	1,845
WI_ALEQ	0.05	.01	4.23***	1,845
RATIO	0.84	.27	3.11**	393
RATIO × WI_ALEQ	0.02	.01	2.26*	1,845
Reverse model				
Time 1 ALEQ	11.09	.65	16.97***	392
Time 1 MASC	−4.66	.72	−6.46***	392
WI_MASC	0.59	.02	25.61***	1,839
WI_CES-D	0.31	.06	4.93***	1,839
RATIO	1.06	.62	1.70	392
RATIO × WI_CES-D	0.08	.05	1.55	1,839

Note. CES-D, Center for Epidemiologic Studies Depression Scale; ALEQ, Adolescent Life-Events Questionnaire; RATIO, a ratio of maladaptive to total strategies; *$p \leq .05$; **$p < .01$; ***$p < .001$.

the slope of the relationship between WI_CES-D and RATIO significantly differed from 0. WI_ALEQ was associated with increases in depressive symptoms for individuals possessing high ($b = 0.08$, $SE = .02$; $t(1,845) = 4.45$, $p < .0001$) but not low ($b = 0.01$; $t(1,845) = 0.48$, $p = .63$) RATIO scores, and the slope for these two groups significantly differed ($b = 0.07$; $t(1,845) = 2.26$, $p < .05$; see Figure 1b).

Chinese adolescents: Negative events in response to depressive symptoms

We examined whether RATIO scores interacted with WI_CES-D to predict WI_ALEQ. The AR, random intercept, and random slope were significant and were retained. When examining the fixed effects component of the reverse model, the two-way, cross-level interaction between RATIO × WI_CES-D was not significant ($b = 0.08$, $SE = .05$; $t(1,839) = 1.55$, $p = .12$; see Table 4).

Chinese adolescents: Anxious symptoms in response to negative events

When examining the effects of RATIO scores and ALEQ on WI_MASC, the AR, random slope, and random intercept were significant and were retained. When examining the fixed effects component of the model, the two-way, cross-level interaction between RATIO × WI_ALEQ was not significant ($b = -0.01$, $SE = .02$; $t(1,845) = -0.27$, $p = .79$). While WI_ALEQ emerged as a main effect of WI_MASC ($b = 0.35$, $SE = .02$; $t(1,845) = 15.85$, $p < .0001$), RATIO did not ($b = 0.07$, $SE = .59$; $t(393) = 0.12$, $p = .91$).

Examining gender differences in Chinese adolescents

In order to determine whether gender acted as a moderator of subsequent depressive symptoms (i.e., WI_CES-D), we examined GENDER × RATIO × WI_ALEQ. When examining the effects on an individual's CES-D scores, the AR, random intercept, and random slope were significant and were retained in the model. With regards to the fixed effects component of the model, the three-way, cross-level interaction between GENDER × RATIO × WI_ALEQ was not significant ($b = -0.004$, $SE = .02$; $t(1,828) = -0.22$, $p = .83$).

When examining our gender mediation hypothesis, we utilized causal steps approach. When examining average level of depressive symptoms over the follow-up period, girls reported higher levels of depressive symptoms ($t(399) = 2.71$, $p < .001$). Specifically, girls reported greater depressive symptoms at the first ($t(401) = 2.60$, $p < .001$), fourth ($t(379) = 2.18$, $p < .05$), sixth ($t(376) = 2.82$, $p < .01$), and seventh ($t(356) = 3.57$, $p < 0.001$) assessment, however, while approaching significance, there were not significant statistical differences at the second ($t(393) = 1.83$, $p = .07$), third ($t(384) = 1.76$, $p = .08$), and fifth assessments ($t(378) = 1.93$, $p = .06$). As there was not a significant difference between boys' and girls' maladaptive ratio scores ($t(398) = 0.35$, $p = .73$), the findings suggest that gender did not act as a mediator.

Discussion

Several findings emerged from the current study. First, higher levels of a maladaptive coping ratio were associated with greater increases in depressive symptoms following negative events. These findings suggest that individuals who utilize a greater proportion

of maladaptive strategies, as opposed to adaptive strategies, in response to negative events may experience increased depressive symptoms. While past research has typically utilized proportional scores to examine the relationship between stressors and depressive symptoms (e.g., Connor-Smith & Compas, 2004), proportional scores may lead to contradictory outcomes. A ratio approach resolves this issue and thus, is a viable alternative to examine the prospective relationship between depressive symptoms and negative events. While there are a number of strengths to the ratio approach, future research would also benefit from examining the stability of the construct over time. More specifically, adolescence is a period when individuals are learning *how* to cope, and thus, coping strategies may vary as a function of life's problems. Such exploration may result in ratio lability, and consequently, it may be that the maladaptive ratio is associated with specific triggers for an individual.

Second, a maladaptive coping ratio did not interact with negative events to predict change in anxious symptoms. Although the occurrence of negative events emerged as a main effect of anxious symptoms, a maladaptive coping ratio did not significantly predict anxious symptoms. While Seligman and Ollendick (1998) posit that there are common aetiological factors that result in both depression and anxiety, the developmental unfolding of such symptomology may vary. More specifically, research has found that anxiety precedes depression (e.g., Woodward & Fergusson, 2001). As anxious symptoms may negatively impact the type of coping strategies that individuals utilize to reduce the stress associated with negative events, it may consequently heighten vulnerability to depression. Therefore, future research would benefit from examining the developmental unfolding of depressive and anxious symptoms in order to determine (a) the effect that anxious symptoms have on increasing the use of maladaptive coping strategies and (b) the subsequent role such strategies play in the development of depression.

Third, gender models examining stress exposure and stress reactivity were not significant. Past research suggests that gender differences in adolescence may emerge as a result of sensitivity to dependent interpersonal stressors (Rudolph, 2002). However, in the current study, we utilized a self-report measure which does not assess contextual factors, and thus, we may not be able to effectively examine whether stressors were dependent or independent in nature. Thus, future studies should examine our proposed coping model in conjunction with a clinical interview which is better able to categorize stressors and in doing so, determine whether maladaptive coping ratio plays a role in the development of gender differences during adolescence.

Additionally, Nolen-Hoeksema and Girgus (1994) posit gender differences may emerge from differences in the level of vulnerability factors. However, there were not significant gender differences in the mean level of the maladaptive coping ratio in either sample. Such a finding is in contrast with past studies that have examined individual coping strategies. For example, Nolen-Hoeksema (2001) reported that adolescent girls are more likely than boys to respond to stressors with a ruminative response style, and such a gender difference persists through adulthood. At the same time, it is important to distinguish between individual versus broad-based use of coping strategies as they address separate research questions. The examination of individual coping strategies makes the implicit assumption that individuals use a given strategy at the exclusion of all others. In contrast, by examining the interplay of coping strategies, it accounts for the likelihood that individuals utilize multiple coping strategies, both adaptive and maladaptive, in response to negative events. Given that research has found gender differences when exploring individual coping strategies, a potential drawback to utilizing a ratio approach is that composite scores may not be able to detect such differences.

Last, despite cultural differences between Mainland China and Canada, the present findings indicate the robustness of the model. Chinese adolescents who reported a high maladaptive coping ratio reported greater levels of depressive symptoms, but not anxious symptoms, following negative events as compared to individuals who reported a low maladaptive coping ratio. While it appears that the vulnerability–stress model likely applies to both cultures, the specifics which constitute stress may vary. For Western youth, primary stressors include conflicts with parents and peer relationships (Grant *et al.*, 2006). In contrast, research with Chinese adolescents suggests that academic and cultural factors play an important role (Fong, 2006). As education is thought to be a means to rise from poverty to prosperity, escalating social pressures are being placed on Chinese youth to excel in school, resulting in increased stress and decreased leisure time (Fong, 2006). Additionally, China is undergoing large scale modernization which has disrupted traditional family roles and social support networks that were long believed to have buffered Chinese individuals from the effects of stress (Chun, Moos, & Cronkite, 2006). While past research has found that Chinese individuals historically endorse collectivistic coping strategies that reflect the interconnectedness with Chinese culture as well as an interdependent sense of self (Yeh & Inose, 2002; Yeh & Wang, 2000), younger generations have begun to embrace more individualistic values (Wang, 2006). As Chinese youth continue to utilize more individualistic coping strategies, models of coping developed in Western cultural contexts are becoming increasingly relevant to Chinese adolescents.

Several limitations should be noted. First, the current study utilized self-report measures which may be prone to response bias. Future research would benefit from utilizing more sophisticated assessment techniques such as peer or parent ratings and semi-structured interviews. Second, while every effort was made to conduct parallel studies in Canada and China, scheduling difficulties emerged which resulted in a different number of waves as well as different time intervals between assessments. Despite these differences, each participant completed a sufficient number of assessments in order to determine a participant's reliable mean level of stress at his/her own mean level of symptomology. Therefore, it is not believed that the difference in number of waves adversely affected the results. Last, the self-report measures utilized with Chinese adolescents were translated from existing measures developed primarily for Western samples. Future research examining samples from China would benefit from using and developing indigenous measures.

The study provides a theoretically driven model examining the impact of broad-based coping on the development of depressive symptoms. Presently, there is a preponderance of resources being channelled to develop universal prevention programmes. Such programmes are designed for individuals who are vulnerable to depression, and thus, they are in need of clinical tools that reliably identify at-risk individuals.

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