

Does Brooding Rumination Moderate the Stress to Depression Relationship Similarly for Chinese and New Zealand Adolescents?

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Abstract

The present cross-sectional, cross-national study was conducted to determine whether adolescents in China and New Zealand use brooding rumination to respond to stress similarly or differently. Self-reported everyday stress intensity, brooding rumination, and depressive symptoms were compared between 1624 New Zealand (NZ) and 914 Chinese early adolescents, aged 10-15 years of age. Chinese adolescents reported higher levels of brooding rumination and depression than NZ youth, and females reported higher levels of both variables than males as well. In contrast, NZ adolescents reported higher overall everyday stress intensity compared to Chinese adolescents. An examination at the stress item level showed that Chinese adolescents reported higher stress intensity for issues such as low grades and lack of free time, whereas NZ adolescents were more concerned with physical appearance and conflict with family members. Examination of the moderation hypothesis showed that brooding rumination was found to exacerbate the stress to depression relationship for younger (10-13 yrs) NZ adolescents and older (14-15 yrs) Chinese adolescents, and to a lesser extent older (14-15 yrs) NZ adolescents. Thus, it seems that this exacerbating dynamic occurred at an earlier age in New Zealand than in China. In addition, gender moderated this exacerbation relationship in that females of both countries exhibited the relationship, but males of both countries did not. Females, compared to males, and Chinese adolescents, compared to New Zealand adolescents, may report higher brooding rumination due to their stronger collectivist orientation in interpersonal relationships.

Keywords: adolescence, brooding rumination, everyday stress, depressive symptoms, China, New Zealand

1. Introduction

1.1 Cross-Cultural Comparisons of Adolescent Ruminative Coping Are Lacking

The literature concerning experiences of stress and coping efforts by adolescents has identified numerous stressors that impinge upon well-being and a wide range of different coping strategies that are used to blunt the effects of stress (e.g., Skinner & Zimmer-Gembeck, 2007; Wolchik & Sandler, 1997; Zimmer-Gembeck & Skinner, 2008). Most of the research on adolescent coping has been based on studies with American, or more broadly Western, samples. Markus and Kitayama (1991) have suggested that cultural forces significantly shape stress appraisals and coping attempts, and cross-cultural comparisons of these are needed. To answer the question as to whether Western and Asian adolescents cope with problems similarly or not, the present study reports comparisons of levels and types of stress, use of brooding rumination (i.e., repetitive self-denigrating thoughts about one's ability to cope with distress), and the outcome variable of self-reported depressive symptoms between Chinese and New Zealand adolescents. Beyond examining mean group differences between Chinese and New Zealand youth on these variables, the question of whether brooding rumination would moderate the effects of stress on depressive symptoms similarly between the two groups was empirically examined.

Lazarus and Folkman's (1984) contextual model of stress delineates definitions of stress and coping used widely within the field. Lazarus and his colleagues claim that a person initially evaluates an event's relevance through primary appraisal, i.e., does this event affect my well-being? If primary appraisal suggests that harm or loss is imminent, then the person engages in secondary appraisal, in which he or she determines whether resources at

hand are adequate to meet the danger posed by the stressful event. A coping effort, then, is defined by Lazarus (1991) as “cognitive or behavioral efforts to manage specific external or internal demands (and conflicts between them) that are appraised as taxing or exceeding the resources of the person” (p. 112). The research reported here follows Lazarus’s model in that we asked adolescents whether a set of particular events was judged to be stressful, whether they used brooding ruminative coping to deal with this set of stressful events, and whether coping was successful or not by measuring depressive symptoms. Based on several cross-cultural comparisons of the coping process (see literature described in section 1.2 below), we thought it possible that mean levels of stressful events, brooding rumination, and depressive symptoms would vary between the two national groups.

However, going beyond the basic outline of Lazarus and Folkman’s model, the chief goal of this research was to examine the *relationships* among stress, brooding rumination, and depressive symptoms within the context of Cohen and Wills’ (1985) stress buffering model. The essential notion of their model is that a coping effort (social support in their case, rumination in the present case) functions as a third variable that can moderate the strength of the basic relationship (i.e., stress predicting depression). In their case, social support functioned as a buffer, but in the present case, we expected to obtain an exacerbating effect of rumination upon our outcome measure of depressive symptoms. We chose depression as the outcome measure in our model because it is a frequently used variable to reflect how well individuals negotiate stressful events (Wolchik & Sandler, 1997).

Ample empirical evidence exists that the influence of coping strategies upon the stress to adjustment relationship can be usefully illuminated through the use of moderation analyses. The first author of this article pioneered this technique in the 1990s (Jose, Cafasso, & D’Anna, 1994; Jose et al., 1998), but subsequently other researchers have adopted this approach to good effect as well (e.g., Marks, Sobanski, & Hine, 2010; Nolen-Hoeksema, Wisco, & Lyubomirsky, 2008; Tsai, Chang, Sanna, & Herringshaw, 2011). Statistical moderation is now considered to be a basic tool for examining how a third variable, e.g., coping, affects the strength of the relationship between two other variables, e.g., stress and adjustment (Hayes, 2013; Jose, 2013).

1.2 Cultural Differences

Individuals of different personalities and contextual backgrounds have been found to differ in their use of coping strategies, and this general interest in exploring individual differences in stress and coping has been extended to investigating whether cultural backgrounds of adolescents are predictive of reliable differences (Wong & Wong, 2006). An early example of this type of cross-cultural work is a study by Seiffge-Krenke and Shulman (1990), who compared adolescent coping in Israeli and German youth. Subsequent cross-cultural comparisons have been performed between American and Russian adolescents (Jose et al., 1998), among several European nations (Gelhaar, Seiffge-Krenke, Borge, Cicognani, Cunha et al., 2007), and among other countries (Crystal et al., 1994; Loxton, 2009). Differences have been attributed to differences in appraisal (e.g., self-appraisals, Markus & Kitayama, 1991) and contextual forces (e.g., socialistic vs. capitalistic societies, Jose et al., 1998). The present research program was enacted in order to compare two representative countries from the collectivist and individualist traditions: China (P.R.C.) and New Zealand respectively. Theory and research in cross-cultural psychology suggests that China and New Zealand are good exemplars of these two distinct cultural groups (Triandis, 1995). New Zealand has been identified as the sixth highest-ranking individualist nation, behind the United States, Australia, Great Britain, Canada, and the Netherlands (Hofstede, 1984), whereas China is frequently held up as a good example of a collectivist society (Triandis, 1995).

We have found no study that has explicitly compared Asian and Western adolescents on the three key variables of stress, brooding rumination, and depressive symptoms in the fashion proposed here. Some research has been conducted on adolescent adjustment within China and within New Zealand, but no systematic cross-cultural comparison has been conducted with regards to the stress and coping process. The chief value in doing so would be to identify ways in which adolescents of these two countries similarly or differently experience stressful events, brood about these problems, and manifest depressive symptoms.

A number of studies have examined the nature of stressful events faced by New Zealand and Australian youth. For example, McGee and Stanton (1992) found that stress was generated most strongly in the areas of self-image, independence, academic and physical competence, parental conflict, and changes in residence and school. Youth who reported high levels of stress reported poorer mental health outcomes, but potential moderators were not investigated. Given that these youth live in individualistic societies, it is understandable that concerns about independence, self-image, materialistic concerns, overt conflict, and sexuality were expressed.

Lacking are studies that examine the nature of coping strategies and their impact on psychological adaptation. It is likely that New Zealand youth use similar methods of coping as other Western adolescents (Jose & Ratcliffe, 2004). In the U.S., Nolen-Hoeksema and colleagues (Nolen-Hoeksema, Morrow, & Fredrickson, 1993) have

shown that rumination deepens and lengthens episodes of depressive symptoms, i.e., exacerbates negative moods, chiefly among young adults. Nolen-Hoeksema (1991; Nolen-Hoeksema, Wisco, & Lyubomirsky, 2008) has defined rumination as repetitively thinking about the causes, consequences, and symptoms of one's negative affect (i.e., depressive symptoms), and that definition is utilized in the present study. In Canadian and American samples, Abela (2001; Abela & Hankin, 2011) have demonstrated similar processes with adolescents.

The sample of adolescents used in the present report has previously been examined, and several papers have resulted from these within-culture analyses (i.e., Jose & Brown, 2008; Jose & Ratcliffe, 2004; Jose & Schurer, 2010). Jose and Brown (2008) investigated whether ruminative coping moderated the stress to depressive symptoms relationship in this sample of adolescents, but they did not find significant moderation. However, they used a general construct of rumination based on a measure by Nolen-Hoeksema et al. (1993), which conflates three subtypes of rumination. In the present set of analyses, we examined the impact of a specific subtype of rumination termed "brooding rumination" by Treynor, Gonzalez, and Nolen-Hoeksema (2003; see also Nolen-Hoeksema et al., 2008) that has been deemed to be the pernicious factor in the broader construct of rumination. They have defined brooding rumination as moody pondering involving self-critical thoughts; an example item would be "I think, Why do I have problems other people don't have?"

1.3 Chinese Literature

A nascent literature on stress, coping, and adjustment in Chinese youth is accumulating. As in Western countries, early work focused on a single component of this process, for example, on various indices of psychological maladjustment (Crystal et al., 1994). Subsequently, researchers began to study associations between components of the stress-coping-adjustment process, and a number of studies have examined all three elements in a single data collection. The study of rumination as a coping construct is in its infancy in Chinese research, but research with Chinese samples has involved measures of rumination in various ways (Abela, Stolorow, Mineka, Yao, Zhu, & Hankin, 2011; Hong et al., 2010; Xiao, Huang, Ling, Liu, Zhu, & Yao, 2009). The most relevant study, by Yang, Zhang, and Yao (2010), has examined the moderating role of brooding rumination on the stress to depression relationship in Chinese high schoolers, but they failed to find evidence of a significant moderating result. However, they did not examine this phenomenon over the age span from early to middle adolescence, as the current study does. Just as with Western samples, significant questions remain.

1.4 Gender Differences

At the same time that we investigated cultural differences, we sought to examine gender differences as well. The original basis for studying rumination by Nolen-Hoeksema (Nolen-Hoeksema & Girgus, 1994) was to explain the universal finding that women report higher depressive levels than men. Her subsequent research (Nolen-Hoeksema, Larson, & Grayson, 1999) as well as related work by others (Broderick, 1998; Broderick & Korteland, 2004) has shown that females report higher levels of rumination, particularly brooding rumination, and rates of stress intensity and depressive symptomatology are also elevated relative to males. Jose and Brown (2008) has shown that the gender difference in rumination begins to occur at about age 13 in New Zealand. Commensurate research on the same variables in Asian countries is lacking, but it reasonable to surmise that a similar gender difference for rumination (and perhaps for stress intensity and depression as well) would be evidenced in collectivist countries.

1.5 Predictions

We expected differences in two areas: 1) mean group comparisons; and 2) differential moderation of the stress to adjustment relationship by ruminative coping across demographic groups. In the last several decades, numerous studies have investigated cultural differences in adjustment, and a general consensus has emerged that individualists report higher subjective well-being and adjustment than collectivists (Diener, Diener, & Diener, 2009; Hofstede, 1984; Triandis, 1995). On this basis, we expected that the Chinese adolescents would report higher levels of stress intensity, brooding rumination, and depressive symptoms compared to New Zealand adolescents. Also, with regard to specific stressors, we expected that Chinese participants would report higher levels of stress intensity for matters related to schoolwork, relationships with others, and physical living conditions, whereas New Zealand participants would report concerns related to self-image, money and possessions, family conflict and break-up, and boredom. Gender differences are commonly found across this age range for these three variables (Broderick, 1998; Jose & Brown, 2008), so we predicted that girls would report higher stress, brooding rumination, and depressive symptoms than boys. And last, age differences in these variables (Jose & Brown, 2008) have been found, so we predicted that older adolescents (14-15 yrs) would report higher levels of all three variables than younger adolescents (10-13 yrs).

The second set of hypotheses was based on Cohen and Wills' (1985) stress buffering model. Since brooding rumination is thought to worsen adjustment (Nolen-Hoeksema et al., 2008), we predicted that brooding rumination would function as an exacerbator rather than a buffer. The baseline assumption was that brooding rumination would exacerbate the everyday stress intensity to depressive symptoms relationship, and this prediction is referred to in this paper as the "focal relationship". Further, we expected that country, gender, and age might moderate this focal relationship. In particular, since cultural norms in Asian cultures treat males and females more equally relative to Western cultures (Hofstede, 1984; Triandis, 1995), we predicted that females would evidence a stronger focal relationship than males in New Zealand compared to China, and given that autonomy and independence are encouraged earlier and more pervasively in Western societies (Kagitcibasi, 2005), we predicted that the focal relationship would be evidenced in New Zealand at a younger age than in China. Thus, we predicted we would find significant multi-way interactions involving country, age, and gender on the focal stress by brooding rumination relationship.

2. Method

2.1 Participants

2.1.1 New Zealand (NZ) Participants

Previous reports on this dataset have been made (Jose & Brown, 2008; Jose & Schurer, 2010), but the present sample differs in some small degree with these previous reports because in the present case we selected on the basis of age to obtain early and middle adolescents, leaving out older adolescents. The reason for this selection was that research typically finds more change and development during early and middle adolescence than late adolescence. Data were collected in 17 educational institutions ranging from primary to secondary schools, and these schools were randomly selected from urban, suburban, and rural areas. This sample consisted of 1624 adolescents, and participants were 937 females and 687 males ranging about evenly across the age span from ten to fifteen years. Information about parental occupation was used to determine the adolescent's socio-economic status (SES). The SES was based on the New Zealand Socio-Economic Index of Occupational Status (NZSEI) that uses NZ norms (Davis, McLeod, Ransom, & Ongley, 1997). In this sample the maternal NZSEI was $M = 45.34$, $SD = 16.34$ and paternal NZSEI was $M = 52.06$, $SD = 18.80$, suggesting that participants came from middle-class families on average. Most participants (72%) lived with both biological parents, another 10% lived with a parent and a step-parent, and about 17% of adolescents lived in a single-parent family.

2.1.2 Chinese Participants

Data were collected in nine different schools located in the urban setting of Beijing in order to match the age-range represented by the New Zealand sample. The sample of 914 participants consisted of 448 female and 466 male adolescents aged ten to fifteen years. Parental occupation was used to determine the participant's SES. In the absence of a standardized Chinese SES instrument, SES was rated in this study on an ordinal scale that ranged from 1 = labourer to 14 = professional. In this sample the maternal SES was $M = 8.32$, $SD = 3.59$ and the paternal SES was $M = 10.07$, $SD = 3.67$, suggesting that most of the families could be considered to be of average or high average socio-economic status as well. The majority of young people (93%) lived with two biological parents, 2% lived with a parent and a step-parent, and 4% lived in a single-parent household.

2.2 Measures

All participants completed a booklet including demographic details and self-report measures of stress, rumination, and depressive symptoms. Measures for the Chinese sample were translated from English into Chinese and then back translated by different translators to ensure comprehensibility and comparability.

2.2.1 Everyday Stress Intensity

The measure of stress was the Everyday Life Events Scale for Children (Jose et al., 1994; Jose et al., 1998). This scale assesses stress intensity of 50 everyday life events based on Lazarus and Folkman's (1984) Transactional Stress Model. The scale contains items such as "arguing with mother or father". The scale was originally developed within the North American context, but variations of it have been used in many other countries. Several culture-specific items were changed in the Chinese questionnaire to guarantee contextual comparability, for example, "a family member had trouble getting N.Z. citizenship papers" was changed to "a family member had trouble getting provincial papers". Items were selected to allow for coverage of both individualist and collectivist concerns.

According to the appraisal process described in Lazarus and Folkman's model, each item was completed in two discrete steps. In the first instance, participants chose "yes" or "no" depending on whether the stressful event had occurred within the last month (frequency). The next step involved appraisal of problem intensity: participants

were asked to answer the question “how much of a problem was the event?” with one of four options: 0 = “none”, 1 = “a little”, 2 = “some”, or 3 = “a lot”. According to Jose et al. (1998), stress intensity, as opposed to frequency, reveals the strongest and most illuminating relationships with outcome measures, so it was used in the present study. Stress intensity scores can range from 0-150. Higher scores indicated that many stressful events had happened in the last month and that they were considered to be serious problems. Jose et al. (1998) have reported Cronbach’s alphas greater than .84 for these scales. In this study, the internal reliability was found to be $\alpha = .88$ in the New Zealand sample, and $\alpha = .87$ in the Chinese sample.

2.2.2 Brooding Rumination

The maladaptive emotion-focused coping strategy of brooding rumination was taken from the 17-item self-report rumination measure used in Nolen-Hoeksema et al.’s study (1993). Participants rated how often they reacted to the stressful events they had reported on the stress scale on a five-point Likert scale ranging from 1 = “never” to 5 = “always”. Following advice taken from Treynor et al. (2003), the subscale of brooding rumination (e.g., “I think ‘why can’t I handle things better?’”) was derived from this broader measure of rumination. In this study, for the New Zealand sample, the reliability was $\alpha = .76$, and for the Chinese sample, $\alpha = .70$.

2.2.3 Depressive Symptoms

Self-reported depressive symptoms were assessed with the Children’s Depression Inventory (CDI; Kovacs, 1985). Each of 27 items is answered by ticking one of three alternative options that represent different levels of severity of depressive symptoms over the last two weeks (e.g., “I am sad once in a while” (0), “I am sad many times” (1), or “I am sad all the time” (2)). Scores range from 0 to 54 with higher scores indicating a higher number of depressive symptoms. Researchers have obtained Cronbach’s alphas of $\alpha > .80$, and the scale has been confirmed to be a reliable and valid measure for depression in children and adolescents (Kovacs, 1985; Jose et al., 1994; 1998). In this study, the internal reliability was $\alpha = .89$ for the New Zealand sample and $\alpha = .79$ for the Chinese sample.

2.3 Cultural Invariance of Continuous Variables

When comparing constructs in cross-cultural research, it is important to demonstrate configural and metric invariance. An examination of the measurement models of the continuous variables across the two countries was performed using confirmatory factor analysis (CFA). Following Byrne (2010), the CFA was constructed in the usual manner (i.e., three indicators for each construct, no multiple loadings were allowed, and no second order constructs were created). As recommended by Cheung and Rensvold (2002), we sought to determine whether the CFI model fit index deteriorated by more than .01 once equality constraints were placed on the model. Using the automated multiple-group approach in AMOS advocated by Byrne, a baseline model was compared to two subsequent models, focusing on: a) factor loadings for each item on each latent construct (item-level metric invariance) and b) covariances between latent constructs (i.e., configural invariance). The analysis showed that the CFI deteriorated from .994 (baseline) to .991 for configural invariance and to .984 for item-level metric invariance. These results suggest that both configural and item-level metric invariance were obtained for the continuous measures.

2.4 Procedure

In New Zealand, a letter was sent, followed by a telephone call, from researchers who initially contacted all schools with students in the aforementioned age groups. Once the school agreed to participate, the school was sent information sheets and consent forms for the students and their parents. By New Zealand ethics guidelines, for students younger than 16 years of age, parental consent was required. Completion of the paper-and-pencil questionnaire took between 30 to 60 minutes depending on age of participant.

One to two researchers led each data collection session accompanied by a teacher. Participants aged 12 years or younger completed the questionnaire in two sessions. At the end of each session, students were given a debriefing sheet to inform them of the study and thank them for their participation. Additionally, they were given contact numbers of their school, an external agency, and the researchers so that they could approach someone if they had any concerns about issues mentioned in the questionnaire.

In China, data were collected by the third author assisted by research assistants. The experimenter obtained permission from nine schools, and data were collected in a similar manner as described above.

3. Results

3.1 Descriptive Statistics

Table 1 reports the means, standard deviations, and correlations of the key variables for the two country groups separately. Gender differences on the three continuous variables for the NZ sample were larger than for the Chinese sample. Also, it was decided to dichotomize age into two groups to facilitate ANOVA analyses and depiction of moderation results, despite the loss of some mathematical information. Examination of the distributions suggested that dichotomization was a fair way to simplify this variable. In addition, the literature often makes a distinction between early adolescents and middle adolescents at age 13 (e.g., Jose & Brown, 2008), so the present usage makes sense with regard to typical adolescent phases.

Table 1. Descriptive statistics for the variables used with the NZ and the Chinese samples

Variable	1	2	3	4	5
1. Everyday life stress		.441**	.491**	.088**	.194**
2. Brooding rumination	.311**		.451**	.138**	.203**
3. Depressive symptoms	.353**	.301**		.096**	.129**
4. Age (dichotomized)	.120**	.236**	.138**		.039 ^{NS}
5. Gender	-.002 ^{ns}	.050 ^{NS}	.066*	-.054 ^{ns}	
New Zealand					
M	0.35	2.39	10.73		
SD	0.31	0.85	7.80		
Chinese					
M	0.22	2.41	13.68		
SD	0.25	0.79	5.82		

Note. Correlations for the NZ sample are tabled above the diagonal, and those for the Chinese sample are tabled below the diagonal. N = 1624 for the New Zealand sample and N = 914 for the Chinese sample. Gender was coded 0 = males and 1 = females. Age was coded 1 = 10 to 13 year-olds and 2 = 14 to 15 year-olds. * $p < .05$; ** $p < .001$; ^{ns}Non-significant.

3.2 Mean Differences in Continuous Variables

A three-way (country by age by gender) multivariate analysis of variance (MANOVA) on the three continuous variables of average intensities of everyday life events, brooding rumination, and depressive symptoms yielded a significant multivariate main effect for country, Wilks' $\lambda = .842$, $F(3, 1908) = 119.51$, $p < .001$, $\eta_p^2 = .16$; for age (dichotomized into "younger", 10 to 13 yrs, and "older", 14 to 15 yrs), Wilks' $\lambda = .983$, $F(3, 1908) = 11.11$, $p < .001$, $\eta_p^2 = .02$; and for gender, Wilks' $\lambda = .980$, $F(3, 1908) = 13.14$, $p < .001$, $\eta_p^2 = .02$. Significant multivariate interactions were also obtained for country by gender and for age by gender, Wilks' λ s = .99 and .99, F s(3, 1908) = 5.76 and .3.17, p s < .001 and .05, η_p^2 s = .01 and .01 respectively.

The univariate results yielded country differences for everyday life events, $F(1, 1910) = 113.32$, $p < .001$, $\eta_p^2 = .06$, brooding rumination, $F(1, 1910) = 23.11$, $p < .01$, $\eta_p^2 = .02$, and depressive symptoms, $F(1, 1910) = 90.26$, $p < .001$, $\eta_p^2 = .05$. NZ adolescents reported higher levels of everyday life event problem intensity ($M = .35$, $SD = .31$) than Chinese adolescents ($M = .22$, $SD = .25$). On the other hand, Chinese adolescents reported higher levels of depressive symptoms ($M = 13.68$, $SD = 5.82$) and brooding rumination ($M = 2.41$, $SD = .79$) than NZ adolescents (M s = 10.73 and 2.39, SD s = 7.80 and .85). These results did not uniformly support the first prediction in that Chinese youth did not report higher levels of everyday stress, but they did report higher brooding rumination and depression as expected.

Significant univariate results were obtained for age for brooding rumination, $F(1, 1910) = 27.52$, $p < .001$, $\eta_p^2 = .02$, and depressive symptoms, $F(1, 1910) = 13.98$, $p < .001$, $\eta_p^2 = .01$. Older adolescents (14-15 yrs) reported

higher levels of brooding rumination ($M = 2.52$, $SD = .81$) than younger adolescents (10-13 yrs) ($M = 2.24$, $SD = .83$). Similarly, older adolescents reported higher levels of depressive symptoms ($M = 12.36$, $SD = 7.23$) than younger adolescents ($M = 11.04$, $SD = 7.29$). These two results supported the age prediction, but contrary to expectation no significant difference in everyday stress was found between the two age groups, $p = .21$.

Significant univariate results were obtained for gender for all three outcome measures, $F_s(1, 1910) = 16.35$ to 32.76 , $ps < .001$, $\eta^2 = .01$ to $.02$. As predicted, females reported higher levels of everyday stress ($M = .34$, $SD = .31$) than males ($M = .26$, $SD = .27$); higher levels of brooding rumination ($M = 2.51$, $SD = .85$) than males ($M = 2.26$, $SD = .79$); and higher levels of depressive symptoms ($M = 12.39$, $SD = 7.70$) than males ($M = 11.07$, $SD = 6.68$).

In addition, two significant univariate interactions between country and gender were obtained: for everyday stress and for brooding rumination. In both cases, male and female Chinese adolescents reported similar levels, but female NZ adolescents reported distinctly higher levels than male NZ adolescents, which is consistent with the predictions for country and gender. A single significant univariate interaction between age and gender was found for brooding rumination. As predicted, little difference in brooding rumination was noted between males and females in the younger group ($M = 2.17$, $SD = .79$; $F = 2.29$, $SD = .86$), but a greater difference was noted in the older group ($M = 2.34$, $SD = .77$; $F = 2.67$, $SD = .80$), which is consistent with the two univariate predictions for gender and age.

3.3 Examination of Everyday Life Stress Differences by Country

Forty-one of the 50 everyday life events yielded significant national group differences (at the $p < .01$ level). On 26 out of the 41 everyday life events, NZ adolescents reported higher stress intensity than Chinese adolescents. Researchers have recommended the use of the ipsative standardization technique within individuals or groups before submitting data to ANOVA procedures. We adopted this recommendation within the present cross-cultural context because the possibility exists that national group scores may be inflated or deflated by a response set (see Jose et al., 1998). Consequently the overall means and standard deviations reported above for the everyday life events for the two national groups were ipsatized. (Please see Note 1 below.) In this way, significant univariate findings would highlight *relative* stressfulness of particular events between the two groups.

After ipsatization, a one-way MANOVA was performed on the 50 everyday life events, and it yielded a significant multivariate effect for national group, Wilks' $\lambda = .458$, $F(100, 1901) = 36.90$, $p < .001$, $\eta_p^2 = .54$. Thirty-five differences were obtained for the everyday life events (the 6 most extreme differences for each country are reported in Table 2). For 21 everyday life event items, NZ youth reported relatively higher intensity than Chinese youth, and for 14 items the reverse was obtained. Notable differences, consistent with predictions, were that NZ adolescents reported relatively higher intensity stress concerning their appearance, arguments with siblings or parents, being rushed, being punished, presence of sad or angry family members, and not being able to talk about their feelings with someone, whereas Chinese adolescents reported relatively higher stress intensity for issues such as difficulty speaking English, concerns about grades, conflicts with classmates, concerns about health, travel to school, and crowded living conditions.

Table 2. Ipsatively standardised mean rated problem intensity of everyday life events by country

Stressful event	National group	
	NZ	Chinese
NZ > Chinese		
Not liking the way you look	1.28	-0.46***
Arguing with your brother(s) or sister(s)	0.24	-0.67***
You were rushed, you couldn't relax or take it easy	1.18	0.19***
Arguing with your parents	0.25	-0.47***
You were punished for something that you did or didn't do	0.30	-0.41***
Someone in your family was angry or cried a lot	-0.18	-0.72***
Chinese > NZ		
You had trouble speaking English well	-0.96	2.80***

You received lower grades than you expected	0.58	2.44***
Trying to get along with other people in your class	-0.35	0.55***
You dealt with someone from another culture who didn't understand your culture	-0.93	-0.53***
You were not able to watch TV or play video games	-0.66	-0.17***
You took the bus or train to school	-0.77	-0.40***

Note. The six largest differences for each country are reported.

** $p < .01$; *** $p < .001$.

3.4 Relationships among Everyday Stress, Brooding Rumination, and Depressive Symptoms: Test of the Exacerbation Hypothesis

A hierarchical regression was computed to test the hypothesis that brooding rumination would exacerbate the relationship of everyday stress on depressive symptoms. Country, age (younger vs. older), and gender were constituted as dichotomous categorical moderating variables, and everyday stress and brooding rumination were retained in their continuous form. All interactions were generated by multiplying the relevant main effects with each other. Despite widespread practice to the contrary, continuous variables in this case were not centered before multiplication as there are no advantages in doing so (Jose, 2013). The regression equation was computed by entering predictor terms in five discrete steps: 1) the main effects of stress, brooding rumination, country, age, and gender; 2) all possible two-way interactions; 3) all possible three-way interactions; 4) all possible four-way interactions; and 5) the five-way interaction. This equation included 29 terms, which, using conventional values in a power analysis, meant that it was possible to identify a medium to large effect size with the current sample size.

The chief purpose of this analysis was to determine whether gender, age, and country jointly moderated the focal relationship (i.e., brooding rumination was expected to exacerbate the relationship between stress and depression). This prediction was tested with the five-way interaction term. However, the analysis yielded a non-significant interaction term, $p = .63$, so we concluded that there were no significant country differences in how gender and age together moderated this focal relationship.

However, one four-way interaction yielded statistical significance, i.e., country by age by stress by brooding rumination, $\beta = .73$, $p = .007$, which suggested that there was a country difference in how age alone (leaving aside gender) moderated the focal relationship. This term was probed by examining the focal relationship separately in the four demographic groups: younger vs. older adolescents in China and in New Zealand. The results showed that significant exacerbation was found for two groups: younger NZ adolescents and older Chinese adolescents, $\beta_s = .23$ and $.59$, $p_s = .03$ and $.006$ respectively, and older New Zealand adolescents also exhibited a marginally significant relationship, $\beta = .19$, $p = .08$. Younger Chinese adolescents did not yield a significant moderation result, $\beta = -.15$, $p = .26$. Figure 1 depicts the relationship exhibited by the younger New Zealand adolescents. Notably the other two groups with a significant result showed the same pattern as well: namely, adolescents who reported high levels of brooding rumination evidenced the strongest relationship between everyday stress intensity and depressive symptoms. Simple slope analyses using ModGraph (Jose, 2008) revealed that high and medium levels of brooding rumination yielded statistically significant positive slopes, but the low level group did not ($p = .52$). This result supports the focal prediction, namely that adolescents who reported higher levels of brooding rumination would manifest a strong association between everyday stress and depressive symptoms, but adolescents who reported lower levels of brooding rumination would not.

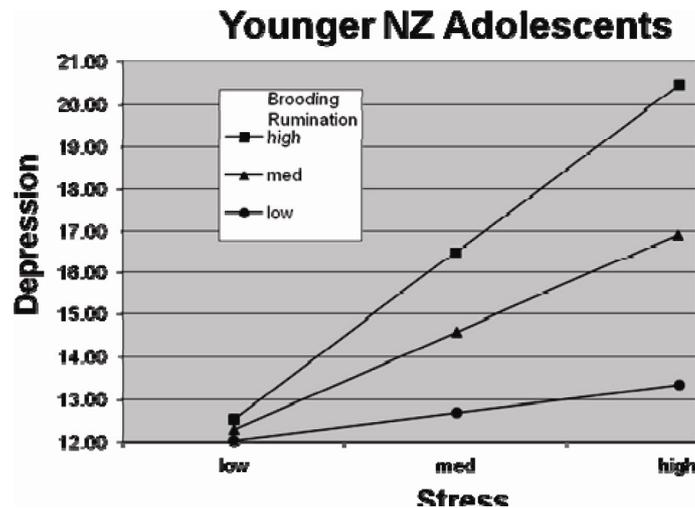


Figure 1. Focal relationship of brooding rumination exacerbating the relationship between everyday life event stress on depressive symptoms for younger New Zealand adolescents (10-13 yrs)

Our cross-cultural predictions stated that age and gender would moderate differentially for Chinese and New Zealand youth. We did not find evidence that gender either separately or jointly with age differentially moderated across country, but we did find evidence in this four-way interaction that age by itself differentially moderated the focal relationship. Specifically, we noted here that New Zealand youth across this age span from 10 to 15 years manifested the predicted exacerbation effect, but we found the predicted relationship only in older Chinese adolescents, not younger Chinese adolescents.

Two lower level interaction terms subsumed in the just-discussed four-way interaction yielded statistical significance, and will be discussed briefly because they elucidate the pattern evident in the four-way interaction and they support the prediction that this process occurs differently in the two countries. In particular, the stress by country and the brooding rumination by country interactions proved to be significant, $\beta_s = -.09$ and $-.32$, $p_s = .002$ and $.001$ respectively. In both cases the NZ participants evidenced a stronger relationship between the independent variable (everyday stress and brooding rumination) with depressive symptoms than did the Chinese participants. In sum, and as the four-way interaction intimated, everyday stress and brooding rumination seemed to manifest stronger relationships with the outcome variable for the New Zealand sample than for the Chinese sample.

Despite the fact that gender was not involved in any interactions with country, gender was found to be involved in several illuminating relationships itself. In particular, three significant interactions involving gender were identified: stress by gender; brooding rumination by gender; and stress by brooding rumination by gender, $\beta = .34$, $p = .01$. Since the three-way interaction subsumed the two lower-level interactions, it will be explored here. The best way to probe the three-way interaction was to examine whether the two genders evidenced the focal relationship similarly or not. As expected, males did not yield a significant interaction, $\beta = -.17$, $p = .11$, but females did, $\beta = .20$, $p = .03$. Female adolescents (collapsed over country and age) manifested the predicted focal relationship noted above, but males did not.

4. Discussion

The chief goals of the present study were to determine whether Chinese and New Zealand adolescents differed in their levels of self-reported negative emotional processes, and to document whether the associations among stress, brooding rumination, and depressive symptoms were similar between the two country groups. Although it was predicted that Chinese youth would report higher levels of all three key variables, they were found to report higher brooding rumination and depressive symptoms, but not everyday stress. We are not certain why we did not obtain a consistent country-level difference across these three variables, but it may be attributable to culture-level response bias (Kagitcibasi, 2005) or to an insensitive measure of everyday life stress in the Chinese context. The most parsimonious explanation may be the latter one, namely that our everyday life event stress measure did not allow Chinese adolescents to indicate the major sources of stress in their lives. Nevertheless, predictable differences in specific everyday life stressors were identified, i.e. Chinese participants reported higher stress intensity for issues such as low grades and living in crowded conditions, whereas NZ participants

reported more stress about physical appearance and parent conflict. With regard to gender and age differences, results showed that females and older adolescents in both countries generally reported higher levels of the three variables, as expected. And finally, the moderation results obtained here supported the view that although brooding rumination seemed to exacerbate the stress to depression relationship similarly for Chinese and New Zealand adolescents, the process seemed to begin earlier for the Western sample than for the Asian sample.

4.1 Mean Differences between Countries

Cross-cultural comparisons of Asian and Western adolescents on rumination are scant. Although Tsai, Chang, Sanna, and Herringshaw (2011) compared Asian- and European-American students on variables relevant to the present study, and although it seems that their Asian-American subgroup reported higher rumination in support of the present hypothesis, this result is not conclusive because the participants were university students (older than in the present study) and the researchers did not assess brooding rumination. Jose and Schurer's (2010) study of several different cultural groups of New Zealand adolescents is more relevant, but as noted earlier in this paper they did not compare groups on the measure of brooding rumination. They found, as predicted, that the minority groups of Asian and Maori New Zealanders reported higher general rumination than the majority European New Zealanders. The present study found Chinese youth reporting higher brooding rumination and depressive symptoms, and this fact is congruent with their findings, but more extensive cross-cultural comparisons are needed before we can conclude that Asian youth broadly and generally enact and report more brooding rumination than Western youth.

We are unaware of any other study that has compared rate of brooding rumination in Chinese and Western adolescents. We predicted that Chinese adolescents would report more rumination because earlier studies have found that Chinese seem to engage in more emotion-focused coping (Rao et al., 2002). The interdependent view of the self in Asian cultures characterizes the person not as separate from the social context, but as part of a wider community (Markus & Kitayama, 1991). Sakamoto, Kambara, and Tanno (2001) suggest that the Asian culture emphasises the utility of self-reflection in situations of interpersonal conflict and that these ruminative thoughts may lead to problem solving and avoidance of non-normative behavior. Thus, we would argue that rumination in the Asian context may be motivated, at least partially, by a desire to be properly integrated and function cohesively with one's collectives. In contrast, in Western countries, rumination is depicted simply as an internal psychological dynamic focused on one's thoughts and feelings related to depression, which tends to worsen the person's psychological adjustment (e.g., Nolen-Hoeksema et al., 2008). A more nuanced conceptualisation of the costs and pay-offs of rumination is needed because it seems that rumination may produce a paradoxical situation in which the individual pays a cost with higher negative affect but accrues a benefit by being more sensitive to interpersonal demands.

4.2 Test of the Exacerbation Hypothesis

The focal hypothesis of the present study was supported: younger NZ adolescents and older Chinese adolescents (and older NZ adolescents to a lesser extent) evidenced the predicted moderation by brooding rumination of the stress to depression relationship. Although this moderation hypothesis has not been frequently tested or supported, several previous studies should be noted. Marks, Sobanski, and Hine (2010) found support for the focal hypothesis with a sample of Australian high school students, however, they used a different measure of rumination that did not capture brooding rumination. In comparison, Schwartz and Koenig (1996) did not find a significant buffering effect in a younger sample. In sum, evidence is lacking that this exacerbation relationship will be broadly found among adolescents in different cultures around the world, but the present study suggests that both Chinese and New Zealand young and middle adolescents evidence this phenomenon.

Despite this seeming similarity, we found some interesting differences in how this dynamic was manifested. The regression results showed that both stress and brooding rumination more strongly predicted depressive symptoms in New Zealand than in China, and the focal relationship was found to occur at a younger age in New Zealand than in China as well. These results support our aforementioned view that rumination might be more directly related to maladjustment in Western countries than in Asian countries (e.g., Nolen-Hoeksema et al., 2008; Sakamoto et al., 2001). However, the older Chinese adolescents (14-15 yrs) yielded data in which brooding rumination exacerbated the stress to depression relationship, and this fact suggests that this type of rumination is not entirely useful and functional in the Asian context.

The results for gender were unrelated to country membership. The focal relationship was found to exist among females of both countries, but males of both countries did not evidence this exacerbation effect. These results are congruent with several recent studies that have focused on the debut of the gender difference in rumination (Broderick & Korteland, 2002, 2004; Cox, Mezulis, & Hyde, 2010; Jose & Brown, 2008), although why girls

alone manifest this pattern is presently unclear. Cross-cultural studies may help in understanding the origins of this phenomenon.

4.3 Limitations and Future Directions

We are not certain that the three measures used in these two countries measured the same psychological phenomena. Although cultural invariance was demonstrated in the present case, future work, including qualitative assessments, should verify that the emic meanings of these constructs map onto the etic measurements used here.

A longitudinal examination of the relationships among stress, brooding rumination, and depressive symptoms is needed to clarify how the identified exacerbating relationship described here is manifested over time. Although we set up the focal relationship as one in which stressful events predicted depressive symptoms, it is possible that a bi-directional relationship exists between stress and depression and possibly with brooding rumination as well.

Although this study made a tentative step toward identifying some cross-cultural similarities and differences with regard to how stress, brooding rumination, and depressive symptoms are related to each other in two countries that represent the Asian-Western dichotomy, much more needs to be done in this vein. Is it the case that brooding rumination imparts some adaptive function, particularly in collectivist societies? Future work would do well to obtain subjective psychological self-reports (as done here) in conjunction with measures of sociocultural adaptation (e.g., observable evidence of successful work and personal relationships) as it may be the case that high ruminators pay a psychological price for their successful behavioral integration within groups. And it is very possible that this ratio of price to pay-off may vary across different cultures. An intriguing possibility is that both collectivist individuals and females may use more brooding rumination for similar reasons: to understand themselves and fit into complex relationships better.

4.4 Conclusions

Chinese adolescents as opposed to NZ adolescents, and female adolescents as opposed to male adolescents, reported using higher levels of brooding rumination. Brooding rumination for both Chinese and NZ adolescents and for females (but not males) exacerbated the relationship between stressful events and depressive symptoms. Thus, individuals who engaged in high levels of brooding rumination manifested a stronger relationship between stress and depression. Chinese and NZ adolescents evidenced similarity for this dynamic, but based on the present cross-sectional data it seems that it develops earlier in New Zealand than in China.

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Notes

Note 1. NZ respondents yielded an average total score of 16.99 for everyday life event stress intensity, and Chinese respondents yielded an average score of 9.40. The total score was divided by the number of items (50), yielding an average per item intensity score of .340 for NZ adolescents, and this compares with an average per item intensity score of .188 for the Chinese adolescents. Each individual's score in their relevant national group had the appropriate number subtracted from it before the MANOVA was computed again. By doing so, individuals' score are equalized across national group. Thus, for example, any general response set by Chinese adolescents to underestimate stressor intensity was removed by this transformation.

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