

A Validation Study of the Korean-Ruminative Response Scale in Korean Adolescents

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Objective We aimed to evaluate the psychometric properties of Korean version of Ruminative Response Scale (K-RRS) for Korean adolescents.

Methods A community sample of 1220 adolescents was recruited from middle schools and high schools. Exploratory factor analyses and confirmatory factor analyses were conducted, and additional analyses were performed to assess the reliability and validity of the K-RRS.

Results An exploratory factor analysis of a sample of adolescents (n=550) yielded a three factor structure: 'depressive rumination', 'reflective pondering', and 'brooding'. Confirmatory factor analyses of another sample of adolescents (n=530) supported the three-factor model for the K-RRS. The K-RRS was found to have good internal consistency and construct validity.

Conclusion Our results suggest that K-RRS is a valid measurement to assess rumination in adolescents, as well as in adults.

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Key Words Ruminative Response Scale, Validation, Adolescence, Factor structure.

INTRODUCTION

Rumination is a repetitive and conscious thought focusing on the same theme, and it suggests intrusive and unpleasant cognitive processes.^{1,2} Rumination is considered as a relatively stable maladaptive coping strategy that maintains or exacerbates negative emotions.^{3,4} Furthermore, rumination is a symptomatic feature of both dysthymia and depression, and it is regarded as a vulnerability factor and persistence factor of depression.^{5,6} A recent study revealed that rumination can substantially contribute to triggering or experiencing anger.⁷

Several measurements have been developed to assess rumination as follows: Ruminative Response Scale (RRS),⁸ Rumina-

tion on Sadness Scale (RSS),⁹ and Ruminative Thought Style Questionnaire (RTS).¹⁰ Among these measurements, Nolen-Hoeksema and Morrow⁸ developed the Ruminative Response Scale (RRS) which is a subscale of the Response Style Questionnaire (RSQ). The RRS consists of 22 items describing ruminative responses which are related to depressed mood.

Numerous validity studies of the RRS have shown that a moderate correlation was observed between the RRS scores and depression symptoms, and correlations were found among the RRS scores, current depressive symptoms, worst depressive symptoms in lifetime, neurosis, Beck Depression Inventory, and Mood and Feeling Questionnaire (MFQ).^{11,13} Also Lam et al.¹⁴ found that the RRS scores predict severity of depression and higher ruminative response style is closely linked with social function impairment in a non-clinical population. Furthermore, several studies have shown that rumination response measured with the RRS predicts severity and duration of depressive episodes in depressed patients.^{11,15,16} Nolen-Hoeksema reported that rumination predicted depressive disorders, including new onsets of depressive episodes and chronicity of depressive disorders.¹⁶ Robert et al.¹¹ suggested that rumination might reflect an important cognitive manifestation of neuroticism that increase vulnerability to episodes of persistent dysphoria.

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The RRS is the most widely used measurement for assessing ruminative response since it is known to have a good validity, including both predictive and concurrent validity.

The factor analyses of the RRS have also been investigated in various samples. Roberts et al.¹¹ conducted an exploratory factor analysis on the RRS scores of undergraduates and retained a three-factor model of which the factors were labeled as 'symptom-based rumination', 'introspection and self-isolation', and 'self-blame'. Treynor et al.¹⁷ attempted to remove 12 depression-related items from the RRS and conducted factor analyses in an adult community sample. These analyses indicated a two-factor model of which the factors were labeled as 'reflective pondering' and 'brooding'. The items on the reflection factor suggest a purposeful turning inward to engage in cognitive problem solving to alleviate one's depressive symptoms. In contrast, the items on the brooding factor reflect a passive comparison of one's current situation with some unachieved standard. In a Korean population, a three-factor model was identified on the RRS scores of undergraduates as follows: 'self-reproach', 'reflection', and 'depressive rumination'.¹⁸ In addition, Lam et al.,¹⁴ conducted exploratory factor analysis on the RRS scores of depressed outpatients and identified a four-factor model as follows: 'symptom-based rumination', 'isolation/introspection', 'self-blame', and 'analysis to understand'.

Rumination has been regarded as one of the processes that transforms normative distress, especially sadness, into depression¹⁹ and was mentioned as a critical factor to explain depression in adolescents as well as in adults.²⁰

Rumination has also been advanced as a possible explanation for both the increase in depressive symptoms as well as the emergence of gender differences in depressive symptoms, during adolescence.²¹⁻²³ However, mixed results have been reported regarding an association between rumination and depression in adolescents,²⁴⁻²⁷ and empirical evidence for rumination during this critical period is still lacking. Furthermore, there is only one validity study to date regarding the RRS in adolescents, which was conducted by Burwell and Shirk.²⁸ A total of 168 adolescents from a community participated in their study and exploratory factor analyses were performed. They retained a two-factor model of which the factors were labeled 'brooding' and 'reflection', and the items included in each factor were similar to principal components analysis results of Treynor et al.¹⁷ However, participants were instructed to endorse self-relevant and specific social stressors while completing the RRS which is different from the original method of administration. Thus, some findings from their study may not be generalized to other samples.

In the present study, we examined validity of the RRS which is the most widely used, empirically and theoretically support the measurement for rumination in Korean adoles-

cents. In particular, we examined factor structure of the RRS and psychometric properties such as reliability and validity.

METHODS

Participants

A community sample of 1220 adolescents was recruited from middle schools and high schools in Seoul (2.7%), Daejeon (45.7%), Daegu (9.8%), and Gyeonggi Province (41.9%) from January 2012 until June 2012. The purpose and methodology of the present study were reviewed by school authorities, who confirmed that risk of the study was very low. All students received an explanation of the study, and every procedure was conducted under the permission of class teachers. Of the 1220 participants, 1117 (559 boys, 558 girls) signed the consent forms; and 1080 participants provided with complete data, so they were included in the analysis. Participants were randomly assigned to group A or group B. Exploratory factor analyses were conducted in group A (n=550), and confirmatory factor analyses were conducted in group B (n=530). Of the 1080 participants, 107 were in the first year of middle school, 141 were in the second year of middle school, 146 were in the third year of middle school, 223 were in the first year of high school, 230 were in the second year of high school, and 233 were in the third year of high school, at the time of assessment.

Measurements

Korean-Ruminative Response Scale

The Ruminative Response Scale (RRS), which is a part of the larger Response Styles Questionnaire, includes 22 items describing the ruminative responses which are highly related to depressed mood.¹⁹ The RRS demonstrated high internal reliability, with Cronbach's α ranging from 0.88-0.92,^{15,19,29-33} and good test-retest reliability was shown with the range from 0.67-0.80.³⁰⁻³² Each item is scored on a 4-point Likert scale ranging from 1 (almost never) to 4 (almost always), yielding the total scores ranging from 22 to 88. A higher score of RRS indicates prominent ruminative response style. The Korean version of Ruminative Response Scale (K-RRS) was used in the study and the Cronbach's α was 0.89.¹⁸

Children's Depression Inventory

The Children's Depression Inventory (CDI) is a 27-item self-report questionnaire designed to assess various symptoms of depression in children and adolescents of age 7-17 years.³⁴ Each item consists of three statements from which the child is instructed to choose the one that best describes him or her over the past 1 week. Each item is scored 0, 1, or 2 with a score of 2 representing the most severe choice. The total scores on

the CDI range from 0 to 54. A higher score of CDI indicates greater depressive symptoms. Although a few participants in this sample (5.37%) were older than the normative age limit of 17, the CDI is clinically used in 18-year-olds to maintain consistency of measures with prior researches on adolescents.^{35,36} The Korean version of Children's Depression Inventory was used in the present study and the Cronbach's α was 0.88.³⁷

Revised Children's Manifest Anxiety Scale

The Revised Children's Manifest Anxiety Scale (RCMAS) is a 37-item self-report instrument designed to assess the traits of anxiety in children and adolescents of age 6-19 years.³⁸ The RCMAS consists of 28 Anxiety items and 9 Lie (social desirability) items. A response of "Yes" indicates that the item is descriptive of the subject's feelings or actions, whereas a response of "No" indicates that the item is generally not descriptive. The Korean version of Revised Children's Manifest Anxiety Scale was used in the study.³⁹

Statistical analysis

Exploratory factor analyses were conducted to identify the

factor structure of the K-RRS, using SPSS version 20 for Windows. Additional analyses were performed to assess test reliability and validity of the K-RRS. Confirmatory factor analyses were conducted for extracted factors using AMOS Version 20, and the goodness of fit model was evaluated.

RESULTS

Factor analysis of the Ruminative Response Scale among Korean adolescents

Exploratory factor analysis

We conducted exploratory factor analysis of the Ruminative Response Scale among Korean adolescents using principal component analysis with Oblimin rotation, as correlated factors were hypothesized. Exploratory factor analyses results are presented in Table 1. Our analyses resulted in three factors with eigenvalues greater than 1, which accounted for a total of 58.85% of the variance. Factor 1 accounted for a total of 48.13%, Factor 2 accounted for a total of 5.89% and Factor 3 accounted for 4.84%.

Table 1. Exploratory factor analysis of K-RRS among Korean adolescents (N=550)

K-RRS item	Rotated factor coefficient		
	Factor 1	Factor 2	Factor 3
1 Think about how alone you feel.	0.73	0.11	0.03
2 Think "I won't be able to do my job if I don't snap out of this?"	0.47	0.17	-0.21
3 Think about your feelings of fatigue and achiness.	0.69	-0.06	-0.16
5 Think "What am I doing to deserve this?"	0.52	0.13	-0.18
6 Think about how passive and unmotivated you feel.	0.56	0.10	-0.17
8 Think about how you don't seem to feel anything anymore.	0.85	0.07	0.22
9 Think "Why can't I get going?"	0.47	0.26	-0.17
17 Think about how sad you feel.	0.64	0.25	-0.04
19 Think about how you don't feel up to doing anything.	0.48	-0.06	-0.41
7 Analyze recent events to try to understand why you are depressed.	0.24	0.56	-0.08
11 Go away by yourself and think about why you feel this way	0.08	0.56	-0.28
12 Write down what you are thinking and analyze it.	0.08	0.70	0.13
20 Analyze your personality to try to understand why you are depressed.	-0.10	0.77	-0.23
21 Go someplace alone to think about your feelings.	0.12	0.71	-0.07
22 Think about how angry you are with yourself.	0.09	0.57	-0.14
4 Think about how hard it is to concentrate.	0.48	-0.29	-0.52
10 Think "Why do I always react this way?"	0.30	0.14	-0.44
13 Think about a recent situation, wishing it had gone better.	-0.02	0.10	-0.74
14 Think "I won't be able to concentrate if I keep feeling this way?"	0.05	0.17	-0.64
15 Think "Why do I have problems other people don't have?"	0.26	0.16	-0.49
16 Think "Why can't I handle things better?"	0.01	0.05	-0.81
18 Think about all your shortcomings, failings, faults, mistakes.	-0.02	0.20	-0.69
Eigenvalue	10.59	1.30	1.06
Variance per factor (%)	48.13	5.89	4.84
Total variance (%)		58.85	

Factor loadings of 0.4 and above are marked in bold. Factor 1: Depressive Rumination, Factor 2: Reflective Pondering, Factor 3: Brooding

The items suitable for a factor, as proposed by Floyd and Widaman,⁴⁰ were determined as follows: 1) factor loadings are greater than 0.30–0.40, and 2) factor loading difference should be greater than 0.10 when one item loads on more than two factors.

In our study, Factor 1 was labeled as ‘depressive rumination’ which consists of 8 items including ‘Think about how sad you feel,’ and ‘Think about how alone you feel.’ Factor 2 was labeled as ‘reflective pondering’ which consists of 6 items including ‘Write down what you are thinking and analyze it,’ and ‘Analyze your personality to try to understand why you are depressed.’ Factor 3 was labeled as ‘brooding’ which consists of 6 items including ‘Think “Why can’t I handle things better?,”’ and ‘Think “Why do I have problems other people don’t have?”’

Confirmatory factor analysis

Structural equation modeling approach was conducted to verify the goodness-of-fit of a three-factor model of the K-RRS. First, confirmatory factor analysis was conducted for retained three-factor model from exploratory factor analysis. Then

the maximum likelihood method was used for estimating parameters of observation-driven model. The three-factor structural model of K-RRS is presented in Table 2 and Figure 1.

Among the goodness-of-fit indices, CMIN/DF (χ^2/df) was greater than 3 which did not meet the criterion suggested by Brinker & Dozois.¹⁰ However, considering that χ^2 test is sensitive to sample size, other goodness-of-fit indices (GFI=0.874, AGFI=0.845, TLI=0.897, CFI=0.908, RMSEA=0.076, RMR=0.031) seemed relatively acceptable.³⁰ Therefore, a three-factor model for the K-RRS was considered to be appropriate. Also, the standardized regression coefficients of three factors and 22 items of K-RRS ranged from 0.56 to 0.80, and all the path coefficients were statistically significant at the level of $p<0.01$.

Reliability

Internal consistency

The Cronbach’s α was 0.95 for the entire scale of K-RRS. The Cronbach’s α for ‘depressive rumination,’ ‘reflective pon-

Table 2. Goodness-of-fit Indices for K-RRS model: confirmatory factor analysis (N=530)

Goodness-of-fit Indices	χ^2	df	RMSEA	TLI	CFI
K-RRS three factors 20 items	654.986	167	0.074	0.910	0.921

K-RRS: Korean-Ruminative Response Scale, RMSEA: Root Mean Square Error of Approximation, TLI: Tucker-Lewis Index, CFI: Comparative Fit Index

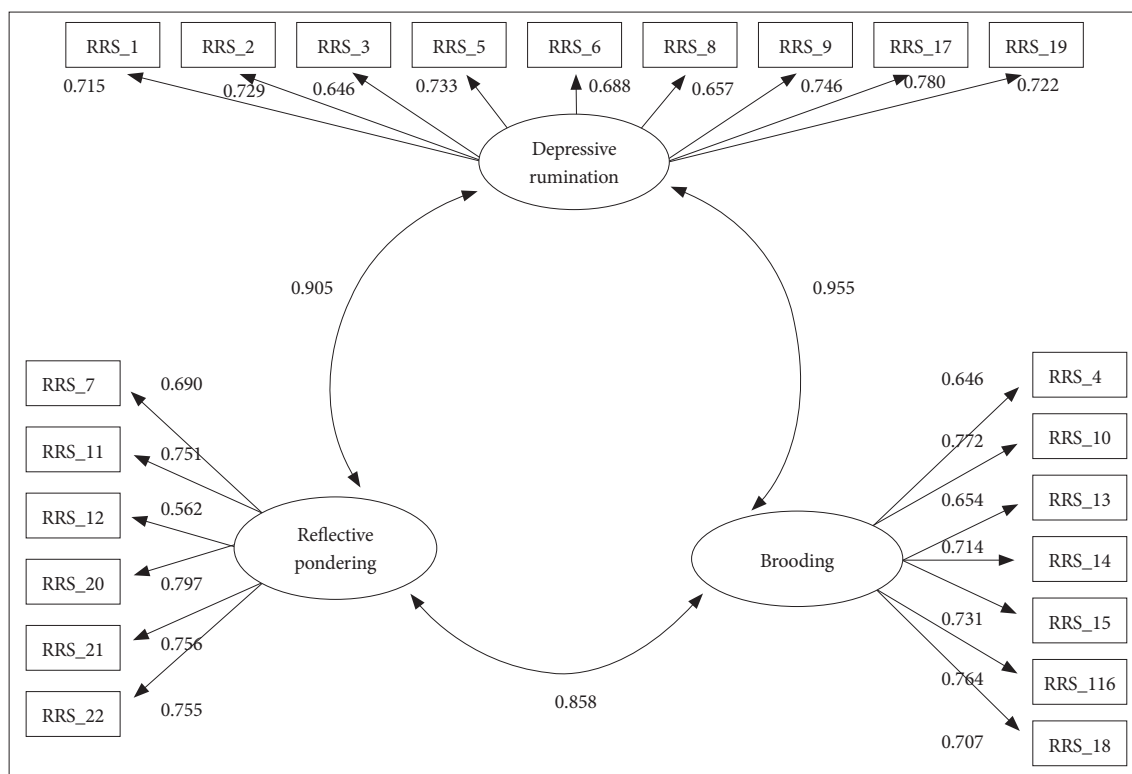


Figure 1. Three-factor structural model of Korean-Ruminative Response Scale (K-RRS).

dering' and 'brooding' factor were 0.90, 0.86, and 0.88, respectively. In overall, internal consistency for the sub-factors of K-RRS seemed to be good.

Table 3. Correlation between an item and total score of K-RRS

K-RRS total score	p
Item 1	0.699**
Item 2	0.722**
Item 3	0.672**
Item 4	0.644**
Item 5	0.720**
Item 6	0.694**
Item 7	0.688**
Item 8	0.627**
Item 9	0.744**
Item 10	0.746**
Item 11	0.733**
Item 12	0.512**
Item 13	0.674**
Item 14	0.722**
Item 15	0.743**
Item 16	0.737**
Item 17	0.775**
Item 18	0.711**
Item 19	0.722**
Item 20	0.717**
Item 21	0.703**
Item 22	0.683**

**p<0.01. K-RRS: Korean-Ruminative Response Scale

Item-total score correlations

The correlations between an item and the total score of the K-RRS ranged from $\gamma(1108)=0.51$ (item 12) to $\gamma(1108)=0.78$ (item 17) which demonstrates high inter-item consistency (Table 3).

Construct validity

To explore the relations among K-RRS, CDI, and RCMAS, Pearson's correlations were conducted. As shown in Table 4, significant positive relations were observed among the total score and three sub-factor scores of K-RRS, depression, and trait anxiety indicated good convergent validity.

Gender differences in K-RRS, CDI, and RCMAS

We examined the gender differences in total score and three sub-factor score of K-RRS, CDI, and RCMAS (presented in Table 5). Girls showed significantly higher scores on K-RRS total scores, depressive rumination factor, reflective pondering factor, brooding factor, and RCMAS compared to boys. However, gender differences were not apparent in CDI scores.

DISCUSSION

In this study we explored factor structure of the RRS, which is designed to measure rumination in Korean adolescents, and we further examined reliability and validity of the RRS.

Our results suggest that Cronbach's α and inter-item consistency of the K-RRS are adequate in Korean adolescents. In

Table 4. Relations among K-RRS, CDI, and RCMAS (N=1043-1092)

Measurement	K-RRS total score	Depressive rumination	Reflective pondering	Brooding	CDI	RCMAS
K-RRS total score	-					
Depressive rumination	0.95**	-				
Reflective pondering	0.88**	0.77**	-			
Brooding	0.93**	0.83**	0.72**	-		
CDI	0.54**	0.59**	0.41**	0.48**	-	
RCMAS	0.62**	0.63**	0.46**	0.60**	0.63**	-

**p<0.01. K-RRS: Korean-Ruminative Response Scale, CDI: Children's Depression Inventory, RCMAS: Revised Children's Manifest Anxiety Scale

Table 5. Gender differences in K-RRS, CDI, and RCMAS

	Boys (N=540), M (SD)	Girls (N=540), M (SD)	t	p
K-RRS total score	36.31 (12.99)	40.73 (13.85)	-5.42	0.000
Depressive rumination	14.41 (5.55)	16.25 (5.69)	-5.43	0.000
Reflective pondering	9.37 (3.69)	10.38 (4.11)	-4.29	0.000
Brooding	12.57 (4.83)	14.13 (5.19)	-5.15	0.000
CDI	13.86 (7.42)	14.05 (6.94)	-0.42	0.67
RCMAS	9.84 (6.02)	12.54 (5.66)	-7.62	0.000

K-RRS: Korean-Ruminative Response Scale, CDI: Children's Depression Inventory, RCMAS: Revised Children's Manifest Anxiety Scale

addition, internal consistency for the sub-factors of K-RRS was considered to be adequate, which also means that the overall reliability is good. Therefore, it is expected that the sub-factors of the K-RRS would be useful as sub-concepts of rumination in future studies. Furthermore, total score and three sub-factor score of the K-RRS were significantly positively correlated with depression and anxiety which reflects good internal validity. In summary, our results suggest that K-RRS is a useful measurement to assess rumination in adolescents, as well as in adults.

Our exploratory factor analyses resulted in a three-factor model of which the factors were labeled as 'depressive rumination', 'reflective pondering', and 'brooding'. This is similar to Roberts and colleagues' analysis which retained a three-factor model, with the factors labeled as 'symptom-based rumination', 'introspection and self-isolation', and 'self-blame'.¹¹ Also, our factor structure was similar to the adult sample by Treynor et al.,¹⁷ and the sample of Korean college students by Kim et al.¹⁸ of.

The results of our study with Korean adolescents are consistent with much of the prior researches but we also pointed to some of the important differences from rumination studies of adult samples. First, item 4 (Think about how hard it is to concentrate.) and item 19 (Think about how you don't feel up to doing anything.) were excluded in the present study, whereas, they were included in the studies of adults. Considering that item 4 and 19 were excluded in Burwell & Shirk' results on adolescents,²⁸ questions about concentration or motivation might not be effective for measuring rumination in adolescents because they are under academic pressure and cognitive burden, compared to adults.

Second, gender differences were not observed in CDI which measures depression in children and adolescents; however, girls showed higher scores on total scores and sub-factor scores of the K-RRS. It is regarded as one of the most reliable findings of psychiatric epidemiology that compared to men, women are twice as likely to develop depression, and their depression is likely to be more severe. These gender differences in depression rate do not appear significantly in prepubescent children. However, consensus has been reached that gender differences in depression becomes significant between the ages of 11 and 15.⁴¹⁻⁴³ Nolen-Hoeksema demonstrated that gender differences in rumination contribute to the emergence of gender differences in depression during adolescence; that is, girls enter adolescence with a greater tendency to respond to stress with rumination than boys, and this response style contributes to the emergent gender difference in depressive symptoms.^{20,31} In the present study, gender differences were apparent in rumination which is known to have negative effects on depressive symptoms, but gender differences were

not observed in depression levels. These results indicate that gender difference may appear in rumination distinctively from current depressive symptoms, which is inconsistent with Nolen-Hoeksema's assertion. Recent studies on rumination have shown similar results as ours,^{18,26} and a few longitudinal studies suggest that rumination is likely to be linked with emergence of future depressive symptoms rather than current depressive symptoms.^{27,28}

Lastly, stronger correlations were observed between K-RRS and RCMAS, which is an anxiety measurement, than with CDI, which is a depression measurement, and girls showed significantly higher anxiety level than boys in the present study. Recently several researchers argue that rumination is closely linked to depression. However, when anxiety or worrying is considered together, there is less ability to predict depression.^{44,45} Furthermore, a study by Ward et al.⁴⁶ revealed that ruminators tend to feel more insecure about their solutions for a problem, than non-ruminators. Also, Lyubomirskys et al.⁴⁷ reported that the contents of ruminations reflect feelings of insecurity in the controlling or managing situations. This feeling of insecurity is regarded as a main element of anxiety.^{48,49} Nolen-Hoeksema¹⁶ showed rumination predicted anxiety symptoms as well as depressive disorder, and Brozovich et al.⁵⁰ suggested that rumination may have a more significant role than reappraisal, in understanding the fluctuations of social anxiety during cognitive behavioral therapy for social anxiety disorder. Considering that anxiety is considered as a risk factor for depression as well as rumination,^{51,52} there may be conceptual overlapping between rumination and anxiety, although further research is needed.

The results of our study should be considered in light of the following limitations: 1) structured interview or psychiatric history taking was not performed in the process of recruiting participants. Thus, there is a concern that we may not have distinguished between the normal controls and the participants with mental illness. 2) We were unable to confirm the criterion validity in a clinical sample. It is essential to have normative data when using the K-RRS in the clinical setting. Therefore, further research is needed on the K-RRS of adolescents with anxiety disorders or mood disorders.

In summary, we explored reliability and validity of the RRS which is the most widely used rumination measurement in Korean adolescents, and we also confirmed the sub-factors of rumination by using factor analysis. Our results revealed that K-RRS is a valid measurement to assess rumination in adolescents as well as in adults.

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