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# Rumination subtypes in relation to problematic substance use in adolescence

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ABSTRACT

The present study investigated the cross-sectional relations of rumination subtypes (brooding and reflection) with alcohol and drug consumption and substance use problems in a community sample of 189 adolescents aged 14–19 years. Lower reflection was related to higher drug consumption and higher brooding was associated with more substance use problems, independently of depressive symptoms. Furthermore, substance use problems were predicted by lower reflection, albeit only among boys. Although replication is needed, these results highlight the maladaptive role of brooding and the potentially protective role of reflection in adolescent substance use.



## 1. Introduction

In adolescence, several biological and psychological factors increase youngsters' vulnerability to adjustment problems, such as hazardous substance use. The National Survey on Drug Use and Health reported that 7.6% of the youngsters between 12 and 17 years were classified with substance dependence or abuse in the past year (Substance Abuse and Mental Health Services Administration, 2009). For prevention and intervention, it is important to investigate factors associated with an increased vulnerability to problematic substance use. The present study will focus on rumination as a vulnerability factor.

Rumination is the tendency to repetitively and passively focus on symptoms of distress and on the possible causes and consequences of these symptoms (Nolen-Hoeksema, 1991). It has been shown to play a role in the onset, severity and persistence of depressive symptoms (Nolen-Hoeksema, Wisco, & Lyubomirsky, 2008; Watkins, 2008). Furthermore, rumination is assumed to be a stable individual characteristic which does not decrease once the depressive symptoms are alleviated (Nolen-Hoeksema & Davis, 1999).

There is also evidence that rumination may increase the risk for maladaptive behaviors, such as problematic substance use. People high on rumination may use substances to temporarily avoid self-directed rumination (Nolen-Hoeksema, Stice, Wade, & Bohon, 2007). Consistent with this, it has been suggested that people high on private self-consciousness (which is related to rumination) may use alcohol as an attempt to 'escape from the self' (e.g., Hull, 1981). More recently, Nolen-Hoeksema and Harrell (2002) found in an adult community sample that rumination was associated with alcohol problems and the tendency to use alcohol and drugs to cope with stress. Furthermore, in women, rumination significantly predicted alcohol-related problems at a 1-year follow-up. In a longitudinal study of female adolescents, rumination predicted the onset of substance abuse and future increase in substance abuse symptoms over 4 years (Nolen-Hoeksema et al., 2007). Caselli, Bortolai, Leoni, Rovetto, and Spada (2008) found that problem drinkers reported significantly more rumination than social drinkers and that rumination predicted category membership as a problem drinker and alcohol use, independently of depression. Finally, in a sample of patients following treatment, Caselli et al. (2010) found a significant association between rumination at baseline and alcohol use at follow-up, over and above baseline levels of depression and alcohol use. These results support the existence of an association between rumination and problematic substance use. However, most studies are limited to adults or female adolescents, resulting in a lack of research on rumination and onset of problematic substance use in a mixed adolescent sample.

Recently, depression researchers have started to consider rumination as a two-dimensional construct (e.g., Treynor, Gonzalez, & Nolen-Hoeksema, 2003). Brooding refers to "a passive comparison of one's current situation with some unachieved standards" (Treynor et al., 2003, p. 256), whereas reflection comprises "a purposeful training inward to engage in cognitive problem solving to alleviate one's depressive symptoms" (p. 256). The tendency to passively or self-critically dwell on one's feelings (i.e., brooding) is associated with maladaptive coping strategies, whereas the active examination of one's emotions (i.e., reflection) is associated with adaptive coping strategies (Burwell & Shirk, 2007). Several researchers

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(see Watkins (2008) for a review) have explained the more maladaptive consequences of brooding as a result of its particularly negative thought content, characterized by self-evaluative, self-critical, and self-judgmental analyses. According to Burwell and Shirk (2007), brooding reflects a failure to disengage from stress and negative emotions, whereas reflection is related to voluntary coping aimed to change the stressor or one's attitude toward the stressor, resulting in greater self-awareness and emotional clarity.

The two-dimensional structure has been replicated both in adult (e.g., Schoofs, Hermans, & Raes, 2010) and pre-adult samples (e.g., Burwell & Shirk, 2007; Verstraeten, Vasey, Raes, & Bijttebier, 2010). With the exception of the study of Nolen-Hoeksema et al. (2007), who investigated the association between brooding (but not reflection) and substance abuse, no studies thus far investigated the relations between rumination subtypes and problematic substance use. Research on depression, however, suggests that brooding represents the more maladaptive facet of rumination, whereas reflection is largely benign (Burwell & Shirk, 2007; Raes, 2010; Raes & Hermans, 2008; Treynor et al., 2003). The first aim of the present study is to investigate if this also holds in the domain of problematic substance use. We hypothesize that high brooding and low reflection will be related to the substance use variables.

There is clear evidence that depression is often accompanied by substance use problems (Davis, Uezato, Newell, & Frazier, 2008). However, most studies investigating associations between rumination and problematic substance use did not control for depressive symptoms. As a result, it is difficult to understand if the associations are related to high co-morbidity of depression or if rumination represents an independent vulnerability factor for substance use problems. Notable exceptions are the studies of Caselli et al. (2008, 2010) in which the association between rumination and alcohol use emerged independently of depressive symptoms. The second aim of the present study is to examine associations of rumination subtypes with problematic substance use while controlling for depressive symptoms. We hypothesize that associations will remain when controlling for depressive symptoms.

Several studies have indicated that women are more likely to ruminate than men, and that rumination partly accounts for the higher rates of depressive symptoms among women compared to men (Nolen-Hoeksema, 2004). Furthermore, several studies have investigated the moderating role of gender in the relation between rumination subtypes and depressive symptoms. Burwell and Shirk (2007) found that only brooding predicted the development of depressive symptoms over time among girls. Verstraeten et al. (2010) found that lower reflection predicted higher depressive symptoms at a 1-year follow-up among boys. With regard to problematic substance use, however, no study thus far investigated gender differences in the associations with rumination subtypes. One study (Nolen-Hoeksema & Harrell, 2002) did examine gender differences, albeit in the association between the overall level of rumination and alcohol use problems. Separate regression analyses for men and women revealed that rumination predicted alcohol-related problems at a 1-year follow up only in women. The third aim of the present study is to investigate if the associations between brooding, reflection and problematic substance use are moderated by gender. Given the inconsistent findings for depression, and the lack of studies in the substance use literature, no specific hypotheses are put forward here.

## 2. Method

### 2.1. Participants

Two hundred and sixty-two 9th trough 12th graders were recruited from two Belgian secondary schools. Of them, 17.6% ($n = 46$) did not consent to participating, 5.7% ($n = 12$) was sick on the day of testing, 0.7% ($n = 3$) was not traceable and the data of 0.4% ($n = 1$) was deleted due to unreliability. This resulted in a sample of 200 participants. Of them, 5.5% ($n = 11$) was removed from further analyses as they were identified as outliers (see Section 3.1). The final sample consisted of 189 participants (50.3% girls) with a mean age of 16.67 years (SD = 1.26, range 14.08–19.83).

### 2.2. Instruments

Rumination to negative affect/depressed mood was measured by means of the *Ruminative Response Scale* (RRS; Nolen-Hoeksema & Morrow, 1991). This self-report questionnaire consists of 22 items to be rated on a 4-point scale. The brooding (e.g., "Why do I always react this way?") and reflection (e.g., "I analyze recent events to try to understand why I am depressed") subscales, as identified by Treynor et al. (2003), are calculated by summing the five corresponding items for each subscale. Previous studies have supported the reliability and the validity of the RRS (Schoofs et al., 2010; Treynor et al., 2003).

Severity of depressive symptomatology is assessed with the *Beck Depression Inventory-II* (BDI-II; Beck, Steer, & Brown, 1996). This is a 21-item self-report inventory tapping cognitive, affective and somatic depressive symptoms. For each item, participants had to rate on a 4-point scale how they felt during the past two weeks. The reliability and validity of the BDI have been demonstrated (Beck et al., 1996; Van der Does, 2002).

Alcohol consumption was assessed by means of the first three items of the *Alcohol Use Disorder Identification Test* (AUDIT; Saunders, Aasland, Babor, de la Fuente, & Grant, 1993). These items tap frequency of drinking, typical number of drinks consumed and number of binge drink episodes (six or more drinks). Items have to be scored on a 5-point scale and summed to calculate a total alcohol consumption score. The AUDIT has proven to be appropriate for alcohol screening of adolescents (Reinert & Allen, 2007). Furthermore, adequate reliability and validity is reported for both the original instrument and for the consumption scale used in the present study (Reinert & Allen, 2007). In a similar way, the level of drug consumption was assessed using three items of the *Drug Use Disorder Identification Test* (Berman, Bergman, Palmstierna, & Schlyter, 2005), tapping frequency of drug use, number of drug consumptions on a typical day and frequency of heavy use. The DUDIT was validated in a sample of heavy drug users, as well as in the general population (Berman et al., 2005) and was found to be internally consistent in several adolescent samples (e.g., Hillege, Das, & de Ruiter, 2010).

The occurrence of negative consequences as a result of alcohol and/or drug use was assessed by means of a modification of the *Rutgers Alcohol Problem Index* (RAPI; White & Labouvie, 1989), which is a popular measure of the severity of adolescent drinking problems. Participants were instructed to indicate on a 5-point scale how frequently they had experienced each negative consequence due to alcohol and/or drug use. For an example of a similar approach, see Skitch and Abela (2008). Previous research has supported the reliability and validity of the RAPI in adolescent samples (Ginzler, Garrett, Baer, & Peterson, 2007; White & Labouvie, 1989).

### 2.3. Procedure

Adolescents were sent home with a letter describing the aim of the study, inviting them to take part and asking parental permission to do so. The questionnaires were completed during regular school hours in one session of about two hours. The instruments were administered in a fixed order and the first author and three master students were available to answer questions.

### 2.4. Analyses

Data were analyzed using SPSS 17. For individuals with <10% missing values on a single questionnaire, missing values on individual items were substituted by the mean score of the remaining non-missing items in the subscale (Dodeen, 2003). Means and SDs for all scales were calculated for the total group and for girls and boys separately. An independent sample *t*-test was used to test if gender differences were significant. Furthermore, zero-order correlations were used to investigate associations between all variables. Regression analyses were used to examine to which extent response styles and their interactions with gender predict alcohol consumption, drug consumption and substance use problems independently of depressive symptoms. All predictors were standardized. Significant interactions were calculated using Preacher's interaction slopes calculator (Preacher, Curran, & Bauer, 2006) and interpreted following the recommendations of Aiken and West (1991).

## 3. Results

### 3.1. Preliminary analyses

The data of 200 participants were examined for normality. All measures except BDI, DUDIT-C and RAPI were normally distributed (skewness and kurtosis variables were between −2 and +2). Eleven participants had at least one outlying score (i.e., ⩾3 SDs above or below the mean) on one of these scales; these cases were dropped from the analyses (Field, 2008), resulting in a sample of 189 participants and in normal skewness and kurtosis for the scores on all measures, except for DUDIT-C and RAPI scores. A $\log_{10}$ transformation was conducted to correct for non-normality on the latter scores. Because there are zero scores in the data of these variables, we added a constant (i.e., 1) to the scores before taking the log (Field, 2008).

### 3.2. Descriptive data

Table 1 reveals that all scales showed acceptable to good internal consistency (Cronbach's alpha). Gender differences emerged for the BDI, the AUDIT-C, the DUDIT-C and the RAPI, indicating that boys reported lower levels of depressive symptoms and higher levels of alcohol and drug consumption and substance related problems.

### 3.3. Intercorrelations

Table 2 shows significant positive associations between brooding, reflection and BDI scores as well as between all substance use variables. Brooding was significantly associated with RAPI scores, indicating that youngsters with higher brooding report more substance use problems. Reflection showed a marginally significant negative association with DUDIT-C scores ($p = .06$), suggesting a tendency for youngsters with low reflection to report higher levels of drug consumption.

**Table 1**
Cronbach's alphas, means and standard deviations of all scales for the total group and for boys and girls separately.

| | α | Total group | Boys | Girls | *t*(187) |
|---|---|---|---|---|---|
| RRS-brooding | .77 | 8.96 (3.00) | 8.60 (2.76) | 9.33 (3.18) | 1.69 |
| RRS-reflection | .72 | 7.10 (2.34) | 6.83 (2.26) | 7.37 (2.41) | 1.59 |
| BDI | .82 | 6.65 (5.45) | 5.81 (4.80) | 7.47 (5.93) | 2.12*,a |
| AUDIT-C | .84 | 4.42 (3.12) | 5.53 (3.29) | 3.32 (2.51) | −5.21***,a |
| DUDIT-C | .87 | .80 (1.66) | 1.15 (1.89) | .45 (1.32) | −2.93**,a |
| RAPI | .85 | 3.87 (6.08) | 5.40 (6.63) | 2.36 (5.08) | −3.54***,a |

[a] Degrees of freedom deviant from *N*−2 (i.e., for BDI df = 180, for AUDIT-C df = 173.83, for DUDIT-C df = 165.84, for RAPI df = 174.34) because of correction for unequal variances.
* $p \leqslant .05$.
** $p \leqslant .01$.
*** $p \leqslant .001$.

**Table 2**
Intercorrelations between all scales.

| | RRS-brooding | RRS-reflection | BDI | AUDIT-C | DUDIT-C |
|---|---|---|---|---|---|
| RRS-reflection | .49** | – | | | |
| BDI | .53** | .40** | – | | |
| AUDIT-C | −.06 | −.09 | −.06 | – | |
| DUDIT-C[a] | .03 | −.14+ | −.03 | .50** | – |
| RAPI[a] | .15* | .00 | .12 | .65** | .61** |

[a] DUDIT-C and RAPI scores are $\log_{10}$ transformed.
+ $p \leqslant .10$.
* $p \leqslant .05$.
** $p \leqslant .001$.

### 3.4. Hierarchical linear regression analyses

Three hierarchical linear regression analyses with alcohol consumption (AUDIT-C), drug consumption (DUDIT-C) and substance use problems (RAPI) as criterion variables were performed. Gender and age were entered in step 1, brooding and reflection in step 2, BDI scores in step 3 and the brooding × gender and reflection × gender interactions in step 4[1] (Table 3). Collinearity statistics indicated no multicollinearity in the data that could have biased the regression.

AUDIT-C scores were predicted only by age and gender, with older individuals and boys reporting higher levels of alcohol consumption.

DUDIT-C scores were predicted by age, gender and low reflection: higher drug consumption was associated with older age, male gender and low reflection, even when controlling for depressive symptoms. The final model also revealed a main effect of high brooding and a gender × reflection interaction (suggesting that lower reflection is associated with higher drug consumption only in boys). However, this finding should be interpreted with some caution, since $\Delta R^2$ for the final step was not significant.

RAPI scores were predicted by high brooding, indicating that higher levels of brooding were predictive of higher levels of self-reported substance use problems. This effect did not disappear when controlling for depressive symptoms. Furthermore, a significant reflection × gender interaction emerged, indicating that low levels of reflection predict high RAPI scores only in boys (Fig. 1). The simple slope for reflection for girls was 0.03, $t(181) = 0.54$, $p = .60$, whereas for boys it was −0.16, $t(181) = -3.14$, $p = .002$.

## 4. Discussion

The present study examined the associations between brooding and reflection on the one hand and alcohol and drug consumption and substance use problems on the other hand. Furthermore, it investigated if the associations are independent of depressive

[1] To compare the results with previous studies on rumination and substance use, we also conducted the same regression analyses with the total RRS scale. Results, however, showed that there were no significant main or interaction effects with the total RRS scale. Such lack of effects might be explained by the fact that brooding is mainly positively related, whereas reflection is mainly negatively related to the substance use variables.

**Table 3**
Hierarchical linear regression analyses predicting alcohol consumption (AUDIT-C), drug consumption (DUDIT-C) and substance use problems (RAPI).

| | | AUDIT-C | | | DUDIT-C[a] | | | RAPI[a] | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | *B* | SE *B* | *β* | *B* | SE *B* | *β* | *B* | SE *B* | *β* |
| Step 1 | Gender | −.91 | .20 | −.29*** | −.06 | .02 | −.21** | −.13 | .03 | −.27*** |
| | Age | 1.13 | .20 | .36*** | .03 | .02 | .12 | .11 | .03 | .24*** |
| | | $R^2$ = .25*** | | | $R^2$ = .07*** | | | $R^2$ = .16*** | | |
| Step 2 | Gender | −.89 | .20 | −.29*** | −.06 | .02 | −.20** | −.14 | .03 | −.29*** |
| | Age | 1.16 | .20 | .37*** | .04 | .02 | .14* | .12 | .03 | .26*** |
| | Brooding | .18 | .23 | .06 | .04 | .02 | .16 | .12 | .04 | .25*** |
| | Reflection | −.33 | .23 | −.11 | −.05 | .02 | −.20* | −.05 | .04 | −.10 |
| | | $R^2$ = .26*** | $\Delta R^2$ = .01 | | $R^2$ = .10*** | $\Delta R^2$ = .03* | | $R^2$ = .20*** | $\Delta R^2$ = .05** | |
| Step 3 | Gender | −.88 | .20 | −.28*** | −.06 | .02 | −.20** | −.14 | .03 | −.30*** |
| | Age | 1.17 | .20 | .38*** | .04 | .02 | .14* | .12 | .03 | .25*** |
| | Brooding | .23 | .25 | .07 | .04 | .02 | .16 | .10 | .04 | .21* |
| | Reflection | −.31 | .23 | −.10 | −.05 | .02 | −.19* | −.05 | .04 | −.11 |
| | BDI | −.10 | .24 | −.03 | −.00 | .02 | −.01 | .04 | .04 | .09 |
| | | $R^2$ = .26*** | $\Delta R^2$ = .00 | | $R^2$ = .10** | $\Delta R^2$ = .00 | | $R^2$ = .21*** | $\Delta R^2$ = .01 | |
| Step 4 | Gender | −.87 | .20 | −.28*** | −.05 | .02 | −.20** | −.14 | .03 | −.29*** |
| | Age | 1.20 | .20 | .39*** | .04 | .02 | .16* | .13 | .03 | .28*** |
| | Brooding | .27 | .26 | .09 | .05 | .03 | .19* | .12 | .04 | .25** |
| | Reflection | −.35 | .23 | −.11 | −.06 | .02 | −.22** | −.07 | .04 | −.14 |
| | BDI | −.13 | .24 | −.04 | −.01 | .02 | −.03 | .03 | .04 | .07 |
| | Brooding × gender | −.02 | .24 | −.01 | −.02 | .02 | −.07 | −.06 | .04 | −.13 |
| | Reflection × gender | .41 | .23 | .13 | .05 | .02 | .18* | .09 | .04 | .20** |
| | | $R^2$ = .28*** | $\Delta R^2$ = .02 | | $R^2$ = .13*** | $\Delta R^2$ = .02 | | $R^2$ = .24*** | $\Delta R^2$ = .03* | |

[a] DUDIT and RAPI scores are $\log_{10}$ transformed.
* $p \leqslant .05$.
** $p \leqslant .01$.
*** $p \leqslant .001$.

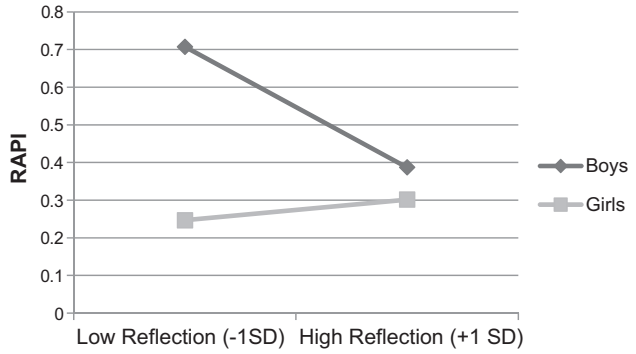


**Fig. 1.** Reflection × gender interaction predicting $\log_{10}$ transformed RAPI scores.

symptoms and if they are moderated by gender. As far as we know, no previous study has addressed these research questions.

The first aim was to examine the associations of rumination subtypes with substance use variables. We hypothesized that high brooding and low reflection would be related to the substance use variables. Consistent with the first part of our hypothesis and with the results of Nolen-Hoeksema et al. (2007), brooding emerged as a significant predictor of the RAPI, indicating that youngsters with higher levels of brooding had more substance use related problems. This supports the maladaptive role of brooding that had already been evidenced in depression research (e.g., Burwell & Shirk, 2007; Raes, 2010; Raes & Hermans, 2008). A recent study in an adult community sample suggests that individuals with a tendency to ruminate are at increased risk for substance misuse, because the use of substances helps them to distract or escape from their ruminative thoughts and as such cope with stress (Nolen-Hoeksema & Harrell, 2002). Although in the present study substance use motives were not assessed, it is possible that the youngsters in our sample with a tendency to brood have more substance use related problems because they use alcohol and/or drugs to alleviate the feelings of distress associated with the brooding. According to Cooper's (1994) drinking motives theory, people who drink alcohol to cope with distress have more alcohol-related problems, even after controlling for consumption level. In accordance with the second part of our hypothesis, low reflection emerged as a significant predictor of drug consumption: youngsters with lower levels of reflection reported higher drug consumption. This suggests that reflection plays a protective role and is consistent with previous evidence outside the substance use field (e.g., Verstraeten et al., 2010).

Our second aim was to examine the extent to which the associations of brooding and reflection with substance use variables still hold after controlling for depressive symptoms. As expected, both the associations of high brooding and low reflection with substance use variables remained significant when depressive symptoms were controlled for, indicating that response styles are independent predictors of problematic substance use. This finding is consistent with our hypothesis and with the results of Caselli et al. (2008, 2010) who also found an association between rumination and alcohol use, over and above depressive symptoms.

With regard to the third aim, our study showed that the effect of reflection on substance use problems was moderated by gender. Only among boys, low levels of reflection were predictive of substance use problems. This is consistent with a study of Verstraeten et al. (2010) who reported similar findings for depressive symptoms. Overall our findings suggest that the tendency to engage in cognitive problem solving to alleviate one's negative feelings (i.e., reflection) may serve as a protective factor for drug consumption and for the occurrence of substance use problems, the latter albeit only among boys.

How can brooding be related to substance use problems without also being associated with a higher alcohol or drug consumption (although for the latter higher brooding was related to drug consumption, in the final non-significant step of the regression analyses)? According to Stewart, Morris, Mellings, and Komar (2006) maladaptive reasons for drinking (such as drinking to cope with negative feelings, a mechanism often highlighted as an explanation for the rumination – substance use relation) can be as

strongly predictive of drinking problems as heavy drinking itself. This means that when people grab on alcohol to cope with their feelings the risk for alcohol-related problems increases, regardless of their level of alcohol consumption (Stewart et al., 2006). This might explain why brooding is related to substance use problems, and not to consumption levels.

The findings of this study have clinical relevance. Intervention programs that focus on rumination in substance using adolescents should pay attention to the brooding aspect of rumination. More specifically, youngsters should be taught about the adverse consequences of their brooding and should be encouraged to search for more adaptive distracting behaviors to counter their re-cyclic thinking and as such reduce the risk of taking alcohol or drugs to deal with it (Caselli et al., 2008, 2010). The way these interventions are conducted, however, might not be different from the usual rumination interventions.

Finally, several limitations should be addressed. First, the design of the study is cross-sectional so no conclusions on the direction of effects can be drawn. Prospective designs are needed to address this issue. Second, to understand the associations between brooding, reflection and problematic substance use, future studies need to include a measure assessing substance use motives. Third, given that rumination is also related to symptoms of anxiety (Watkins, 2008 for a review), it would have been better to control for level of anxiety (in addition to depression levels) in the association between rumination and substance use. Fourth, the present study only relied on self-report data of substance use, which might be influenced by social desirability. However, previous research has indicated that self-report questionnaires are valid to assess substance use, when participants are assured of confidentiality (Winters, Stinchfield, Henly, & Schwartz, 1990). Finally, the sample was community-based. As such, the present results should be replicated in a clinical population.

## 5. Conclusion

In conclusion, the present study shows that low reflection and high brooding are predictors of drug consumption and substance use problems respectively, and that these results are independent of depressive symptoms. Furthermore, low reflection is related to higher substance use problems among boys. These results highlight both the maladaptive role of brooding and the potentially protective role of reflection. Although this is the first study investigating both brooding and reflection in problematic substance use and results need replication, our results suggest that both brooding and reflection are important predictors of substance use.

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