

# Psychometric Properties of the Children's Automatic Thoughts Scale (CATS) in Chinese Adolescents

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**Abstract** The Children's Automatic Thoughts Scale (CATS) is a 40-item self-report questionnaire designed to measure children's negative thoughts. This study examined the psychometric properties of the Chinese translation of the CATS. Participants included 1,993 students (average age = 14.73) from three schools in Mainland China. A subsample of the participants was retested after 4 weeks. Confirmatory factor analysis replicated the original structure with four first-order factors loading on a single higher-order factor. The convergent and divergent validity of the CATS were good. The CATS demonstrated high internal consistency and test–retest reliability. Boys scored higher on the CATS-hostility subscale, but there were no other gender differences. Older adolescents (15–18 years) reported higher scores than younger adolescents (12–14 years) on the total score and on the physical threat, social threat, and hostility subscales. The CATS proved to be a reliable and valid measure of automatic thoughts in Chinese adolescents.

**Keywords** Automatic thoughts · Children automatic thoughts scale · Reliability · Validity · China

## Introduction

Negative automatic thoughts are hypothesized to play an important role in the development and maintenance of psychological symptoms among children and adolescents and these associations are predicted to be relatively specific [1, 2]. Considerable evidence has demonstrated that interventions that aim to modify such negative beliefs (e.g. cognitive behavior therapy or CBT) are efficacious in the management of emotional disorders, such as anxiety and depression among children and adolescents [3–6]. Despite this demonstrated efficacy, not all children respond maximally to CBT [7]. Understanding more about the pathological mechanisms and cognitive structures underlying emotional distress is important to enhance the effectiveness of cognitive treatments.

An important component of cognitive theory, the cognitive content specificity hypothesis assumes that specific cognitive content is associated with specific psychological disorders [2, 8]. For example, thoughts related to personal failure or loss are expected to be related to depressive symptoms, thoughts focused on threat are expected to predict symptoms of anxiety, whereas hostile thoughts are predicted to be associated with symptoms of aggression and externalizing behaviors [9, 10]. Consistent with these predictions, research has supported the associations between specific types of beliefs and particular symptom profiles [9, 11]. For example, change in threat-related but not failure-related self-statements has been shown to mediate treatment gains for adolescents with anxiety disorders [12]. Similarly, anxious automatic thoughts

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mediated the relationship between early maladaptive schemas and prospective changes in social anxiety [13]. Improvements in depressive cognitions following treatment have been shown to reflect reductions in adolescents' depressive symptoms [14, 15]. Moreover, hostile interpretations mediated the relationship between implicit hostile inferences and aggression in daily life among youth with behavioral problems [16].

At present, most of our knowledge about the specificity of cognitive appraisals among adolescents' emotional and behavioral problems has come from studies conducted in Western countries [17–19]. In order to develop a broader understanding of the nature of psychopathological features in children and adolescents, it is necessary to enhance efforts to understand negative cognitions in non-western cultures, such as Mainland China, which includes almost 20 % of the world's population. A necessary prerequisite for such research involves the development of validated measures in the appropriate language.

Several widely used and well validated measures of emotional and behavioral symptoms among young people have been translated and validated for use in China.

For example, two measures of anxious symptomatology, the screen for child anxiety related emotional disorders (SCARED) and the Spence Children's Anxiety Scale (SCAS) have been validated in Chinese youth [20, 21]. Two broader measures of symptoms for use with young people have also been translated and evaluated in adolescent Chinese samples, the Achenbach youth self-report (YSR) and the strengths and difficulties questionnaire (SDQ) [22, 23]. The successful use of these instruments points to the feasibility of incorporating Western-developed measures of psychological phenomena in children and adolescents for use in Eastern societies. However, to date, translations focus primarily on symptoms and there currently exist no validated Chinese translations that assess underlying mechanisms of emotional disorders, such as negative automatic thoughts. To supplement this area, our study examined the psychometric properties of the Chinese version of the Children's Automatic Thoughts Scale (CATS) [24].

The CATS is a comprehensive measure to assess a range of negative beliefs relevant to several common mental disorders in young people. Items were initially derived following interviews with young people and were then subject to factor analysis, producing four factors that comprise thoughts related to personal failure (e.g., "It's my fault that things have gone wrong"), social threat (e.g., "I'm worried that I'm going to get teased"), physical threat (e.g., "I'm going to have an accident") and hostility (e.g., "If someone hurts me, I have the right to hurt them back") [24]. Despite distinct loadings, the four factors were moderately correlated and therefore the best solution

included a higher-order (negative beliefs) factor onto which each of the sub-factors loaded. This correlated, four-factor structure has since been replicated in several studies [25–27]. Importantly, research has supported the specificity of the underlying cognitive appraisals in predicting childhood psychological disturbance.

In Western countries, scores on the CATS have also been shown to differ according to age and gender. For example, boys report more hostile thoughts than girls [24, 28], while girls report more social threat and failure thoughts than boys [24]. Age effects have been less consistent. Schniering and Rapee [24] found no significant differences between children aged 7–11 years and adolescents aged 12–16 years on any of the subscales of the CATS. In contrast, Hogendoorn et al. [28] found that children aged 8–11 years reported more negative thoughts related to threat and failure than adolescents aged 12–18 years.

Validation of the Chinese version of the CATS could provide professionals working with young people information about types of underlying negative beliefs that may hold potential importance for both their experience of psychological symptoms as well as their response to treatment. Thus, the aim of this study was two-fold: first, to examine the psychometric properties of the Chinese version of the CATS within a sample of adolescents from Mainland China. Given the evidence for gender and age effects noted earlier within Western countries, we also investigated differences in scores based on age and gender. The second aim was to use the factors derived from factor analysis, to examine their relationships with particular psychological problems. Based on previous studies on the specificity of cognitive content, we hypothesized that (a) a four-factor structure for the measure would be replicated; (b) threat-related thoughts would be most strongly associated with anxious symptoms; (c) failure-related thoughts would be most strongly associated with depressive symptoms; (d) hostility-related thoughts would be most strongly associated with behavioral problems.

## Methods

### Participants

Participants were Chinese school students from grades 7–12 attending three urban public schools in Beijing. The three public schools included both a middle school (Grades 7 to 9) and high school (Grades 10 to 12). The median household monthly income was in the range of 5,000 to 10,000 RMB (\$821 to \$1,642 USD). A total of 2,100 questionnaire packages were distributed and 2,003 were returned (95.4 %). Ten questionnaires with more than

20 % of missing data were excluded, leaving a total of 1,993 valid participants. The adolescents ranged in age from 12 to 18 years, with a mean of 14.83 (SD = 1.81) years. There was a total of 997 girls (50 %) and 996 boys (50 %). After 4 weeks, 212 children (10.6 %) (97 males, 115 females, mean age = 14.81, SD = 1.32 years) were retested.

## Measures

The CATS [24] consists of 40 negative self-statements, which load onto four subscales consisting of 10 items per scale. The subscales include: Personal Failure (e.g., “I am a failure”), Physical Threat (e.g., My Mum or Dad are going to get hurt), Social Threat (e.g., “Kids will think I’m stupid”) and Hostility (e.g., “I have the right to take revenge on people if they deserve it”). Using a 5-point Likert scale (0-never to 4-always), children rate how often each thought came to mind over the past week. The original (English) version of the CATS has been shown to have strong psychometric properties with internal consistency across the subscales ranging from .82 to .95 and test-retest reliabilities ranging from .66 to .80 [24–26]. The CATS can effectively discriminate between non-clinical children and those with anxiety and mood disorders [25, 26].

The original version was translated into Chinese by one of the authors (XX) and back-translated by a bilingual psychotherapist. The back-translated version was verified by the senior author (XX). Final edits were then made to the Chinese version based on feedback.

The SCARED [29] consists of 41 items, and covers 5 subscales: somatic/panic, generalized anxiety, separation anxiety, social phobia, and school phobia. Young people rate the items of each factor on a 3-point scale (0 = not at all, 1 = sometimes, and 2 = often true). The reliability for the Chinese version shows good internal consistency of .89, and a test-retest reliability of .61 over 2 weeks and .59 over 12 weeks [20]. In the present study, reliability (Cronbach’s alpha) was .93.

The SDQ [30] is a 25-item measure, that includes five subscales: four subscales assess levels of difficulties (emotional symptoms, conduct problems, hyperactivity/inattention, peer relationship problems), with higher scores indicating more severe emotional and behavioral problems and one scale measures pro-social behavior, with higher scores indicating stronger social adaptability. The Chinese version of the SDQ has strong internal consistency of .81 and a test-retest reliability of .71 [22]. To assess convergent validity in the current study, we calculated a total difficulties score comprised of two subscales including conduct problems and hyperactivity/inattention, to reflect overall behavioral problems. The pro-social behavior score

was used to assess divergent validity. In the present study, reliability (Cronbach’s alpha) was .68.

Short Moods and Feelings Questionnaire (SMFQ) [31] is a 13-item scale, which is suitable for children aged 8–16 years to assess depressive symptoms. The Chinese version has shown acceptable psychometric properties, with satisfactory internal consistency ( $\alpha = .88$ ) and test-retest reliability ( $r = .84$ ) [32]. In the present study, reliability (Cronbach’s alpha) was .88.

## Procedure

School approval and parental written informed consent for their adolescent to participate were obtained prior to data collection. Students were assured that their participation in the study was voluntary and no incentives were given for their participation. The students completed a set of questionnaires including the CATS, SCARED, SFMQ, and SDQ in their classroom after regular class. A research assistant was always present to provide clarification if necessary and to ensure confidential and independent responding.

To examine test-retest reliability of the CATS, a subsample of students completed the CATS in their classroom 4 weeks after the initial data collection.

## Data Analysis

Confirmatory factor analysis with unweighted least squares estimation using Analysis of Moment Structure (AMOS18.0) was conducted to test the fit of a four-factor structure [24, 27] to the current data. Convergent validity was assessed by examining relationships between the four factors and measures of anxiety, depression, and behavior problems. A series of multiple regressions was then carried out with measures of anxiety, depression, and behavioral problem as the dependent variables, to determine the ability of the subscales to uniquely predict different types of symptoms.

Cronbach’s alpha coefficients were calculated to examine the internal consistency of the CATS total and subscales. Pearson correlations were computed to assess test-retest reliability, and convergent and divergent validity. Age and gender differences were examined using multivariate analyses of variance (MANOVA).

## Results

### Descriptive Statistics

Sample demographic information and descriptive data for the SCARED, SMFQ, and SDQ are shown in Table 1.

**Table 1** Descriptive Data for SCARED, Depression

	All	Male	Female
<i>N</i>	1993	996 (50 %)	997 (50 %)
Age (SD)	14.73 (1.81)	14.72 (1.82)	14.73 (1.79)
Age range	12–18	12–18	12–18
SCARED		18.89 (12.60)	21.99 (13.24)
SMFQ		6.04 (5.25)	6.52 (5.29)

SCARED The Screen for Child Anxiety Related Emotional Disorders, SMFQ Short Mood and Feelings Questionnaire

**Confirmatory Factor Analysis**

Based on previous research [24, 27], we evaluated two models: the first model tested a structure consisting of four correlated factors, while the second model tested the same four factors but related through a second-order factor.

To assess the model, the goodness fit index (GFI), the normed fit index (NFI), the Relative Fit Index (RFI) and the root mean square residual (RMR) were used as goodness-of-fit indices. Values of GFI, NFI, RFI higher than .90 indicate adequate fit [33]. RMR lower than .08 indicates good fit [34]. The  $\chi^2$  values were relatively high and indicated a deviation from the hypothesized models. Since  $\chi^2$  values are known to be influenced by sample size, the other fit indices were used to further evaluate the models.

The fit indices showed that both the two models fit the data well (see Table 2). According to the target coefficient, which reflected the extent of variation in the first-order factors that can be explained by the second-order construct [35], the second model in which the four factors were related through a higher-order factor appeared to fit the data better than the first model (Target coefficient = .96).

**Reliability**

The Cronbach’s  $\alpha$  for the CATS total score was .96, indicating excellent internal consistency. The four subscales also showed strong internal consistencies (physical threat  $\alpha = .89$ , social threat  $\alpha = .90$ , personal failure  $\alpha = .92$ , hostility  $\alpha = .87$ ).

The test–retest Reliability for the CATS was examined by calculating Pearson correlations between scores at time

1 and time 2. Test–retest reliability for the total of the CATS was excellent ( $r = .81$ ) and good to excellent for all subscales (physical threat  $r = .74$ , social threat  $r = .80$ , personal failure  $r = .79$ , hostility  $r = .74$ ).

**Convergent and Divergent Validity**

Correlations were calculated between the CATS total score, CATS subscale scores and the measures of anxiety (SCARED), depression (SMFQ), behavioral symptoms (SDQ- conduct problems and hyperactivity/inattention) and prosocial scores (SDQ- pro-social behavior) (see Table 3). The correlations between anxiety and depression and the total and subscales of the CATS were significant and moderate to strong, which supports the convergent validity of the CATS. The correlations between the CATS total and subscale scores and measures of anxiety, depression and behavioral symptoms were higher than the correlations between the CATS scores and the measure of prosocial behavior (see Table 3), which supports the divergent validity of the CATS.

**Regression Analysis**

To help identify specific relationships between negative cognitions and symptoms, a series of hierarchical regressions was conducted to predict the different symptom types from negative cognitions measured by the CATS. Beta weights, *t* values and the significance levels for each variable in the final step of the model are shown in Table 4.

When anxiety (SCARED) was entered as the dependent variable, depression and behavioral symptoms explained a significant proportion of the variance at step 1 ( $r^2 = .496$ ,  $p < 0.001$ ). The four CATS subscales contributed significant additional variance at step 2 ( $r^2 = .610$ ,  $r^2\text{change} = .114$ ,  $p < 0.001$ ). Among the subscales, the physical threat, social threat, and personal failure subscales all significantly predicted symptoms of anxiety, although the strongest prediction was shown by social threat.

When depression (SMFQ) was entered as the dependent variable, anxiety and behavior symptoms explained significant variance at step 1 ( $r^2 = .561$ ,  $p < 0.001$ ) and the four subscales of the CATS contributed significant additional variance at step 2 ( $r^2 = .719$ ,  $r^2\text{change} = .158$ ,

**Table 2** Fit indices of the CATS

Model	$\chi^2$	<i>Df</i>	GFI	NFI	RFI	RMR	$\Delta\chi^2$	$\Delta df$	Target coefficient
Model 1	6,916.131	734	.979	.975	.973	.065			
Model 2	7,219.405	736	.978	.973	.972	.066	303.274	2	.957

GFI Goodness-of-Fit Index, NFI Normed Fit Index, RFI Relative Fit Index, RMR Root Mean Square Residual

**Table 3** Correlations between CATS and measures of anxiety, depression, difficulty score and prosocial score

	1	2	3	4	5	6	7	8
1 Physical threat								
2 Social threat	.721**							
3 Personal failure	.772**	.780**						
4 Hostility	.626**	.637**	.572**					
5 CATS total score	.887**	.897**	.891**	.819**				
6 Anxiety	.681**	.700**	.645**	.545**	.734**			
7 Depression	.698**	.684**	.800**	.559**	.782**	.701**		
8 Behavior symptoms	.461**	.447**	.480**	.454**	.528**	.446**	.551**	
9 Prosocial score	-.042	-.057*	-.079**	-.129**	-.090**	-.079**	-.085**	-.195**

*Physical Threat* The Children's Automatic Thoughts Scale Physical Threat subscale, *Social Threat* The Children's Automatic Thoughts Scale Social Threat subscale, *Personal Failure* The Children's Automatic Thoughts Scale Personal Failure subscale, *Hostility* The Children's Automatic Thoughts Scale Hostility subscale, *Anxiety* The Screen for Child Anxiety Related Emotional Disorders, *Depression* Short Mood and Feelings Questionnaire, *Behavior Symptoms* The total score of Strengths and Difficulties Questionnaire conduct problems subscale and hyperactivity/inattention subscale, *Prosocial Score* Strengths and Difficulties Questionnaire pro-social behavior subscale

\*  $p < 0.01$ ; \*\*  $p < 0.001$

**Table 4** Summary statistics for the final step of the equation in each regression

Variable	Beta	<i>t</i>
Dependent–anxiety		
Depression	.376	14.974**
Behavior symptoms	.026	1.504
Physical threat	.255	10.492**
Social threat	.348	14.115**
Personal failure	-.153	-5.218**
Hostility	.030	1.549
Dependent–depression		
Anxiety	.270	14.974**
Behavior Symptoms	.160	11.305**
Physical threat	.035	1.678
Social threat	-.039	-1.799
Personal failure	.530	24.163**
Hostility	.038	2.314*
Dependent–behavior symptoms		
Anxiety	.044	1.504
Depression	.378	11.305**
Physical threat	.045	1.387
Social threat	.000	.003**
Personal failure	.007	.188
Hostility	.186	7.414**

*Physical Threat* The Children's Automatic Thoughts Scale Physical Threat subscale, *Social Threat* The Children's Automatic Thoughts Scale Social Threat subscale, *Personal Failure* The Children's Automatic Thoughts Scale Personal Failure subscale, *Hostility* The Children's Automatic Thoughts Scale Hostility subscale, *Anxiety* The Screen for Child Anxiety Related Emotional Disorders, *Depression* Short Mood and Feelings Questionnaire, *Behavior Symptoms* The total score of Strengths and Difficulties Questionnaire conduct problems subscale and hyperactivity/inattention subscale

\*  $p < 0.05$ ; \*\*  $p < 0.01$

$p < 0.001$ ). The personal failure and hostility subscales both significantly predicted depression symptoms, but the strongest prediction was shown by the personal failure subscale.

Finally, when behavioral symptoms (measured by the SDQ's conduct problems and hyperactivity/inattention subscales) were entered as the dependent variable, anxiety and depression explained significant variance at step 1 ( $r^2 = .310$ ,  $p < 0.001$ ). The four CATS subscales contributed significant additional variance at step 2 ( $r^2 = .337$ ,  $r^2$ change = .027,  $p < 0.001$ ), with the social threat and hostility subscales individually showing significant relationships with behavioral symptoms. Of these subscales, the hostility subscale was the strongest predictor of behavioral symptoms.

#### Age and Gender Effects

The means and standard deviations of the SCARED total and its subscales are presented in Table 5. To protect against Type I error, multivariate analysis of variance (MANOVA) was conducted to examine gender and age effects of negative automatic thoughts on the total score and subscales of the CATS. The dependent variables were significantly affected by age  $F(4, 1986) = 7.382$ ,  $p < 0.001$ , and gender  $F(4, 1986) = 12.069$ ,  $p < 0.001$ , but there was no significant age by gender interaction,  $F(4, 1986) = 0.780$ ,  $p = 0.538$ . As depicted in Table 5, older adolescents (15–18 years old) had significantly higher scores than younger adolescents (12–14 years old) on the physical threat, social threat, and hostility subscales as well as the total score. There was no significant difference between age groups on personal failure. Boys reported higher scores on the hostility subscale. No gender

**Table 5** Comparison of the total score and the subscale scores between age groups/gender groups

	Younger		Older		Total by gender				Total by age		F
	Male	Female	Male	Female	Male	Female	Male	Female	Younger	Older	
	n = 440	n = 431	n = 556	n = 566	n = 996	n = 997	n = 996	n = 997	n = 871	n = 1,122	
Physical Threat	4.60 (6.60)	4.72 (6.84)	6.03 (7.05)	5.80 (6.79)	5.40 (6.89)	5.33 (6.83)	0.03	4.66 (6.72)	5.92 (6.92)	16.73*	
Social Threat	6.29 (7.54)	6.39 (7.51)	7.34 (7.36)	7.10 (6.95)	6.87 (7.45)	6.80 (7.20)	0.04	6.34 (7.52)	7.22 (7.15)	7.07*	
Personal Failure	5.08 (7.39)	5.50 (7.58)	6.00 (7.51)	5.77 (6.73)	5.59 (7.47)	5.65 (7.11)	0.08	5.29 (7.48)	5.88 (7.13)	3.25	
Hostility	8.12 (7.86)	6.81 (7.09)	10.15 (8.28)	7.87 (7.29)	9.25 (8.16)	7.41 (7.22)	26.75*	7.47 (7.52)	9.00 (7.88)	19.88*	
Total Score	24.08 (26.28)	23.43 (25.88)	29.52 (26.11)	26.54 (23.62)	27.22 (26.30)	25.19 (24.66)	2.50	23.76 (26.07)	28.02 (24.92)	13.89*	

*Physical Threat* The Children’s Automatic Thoughts Scale Physical Threat subscale, *Social Threat* The Children’s Automatic Thoughts Scale Social Threat subscale, *Personal Failure* The Children’s Automatic Thoughts Scale Personal Failure subscale, *Hostility* The Children’s Automatic Thoughts Scale Hostility subscale

\*  $p < 0.01$

differences were found on the physical threat, social threat and personal failure subscales or the total score.

**Discussion**

Given the limited availability of tools to assess automatic thoughts among Chinese adolescents, our study examined the psychometric properties of a Chinese translation of the CATS in an adolescent sample from Mainland China. We also investigated descriptive and normative data, including mean scores and age and gender effects. Confirmatory factor analysis replicated the original factor structure for the measure, which indicated a 4-factor model sharing a high-order factor as the best fit [24]. Hence it appears that Chinese adolescents report similar types of negative thoughts to those reported by children and adolescents from Western cultures and these thoughts appear to relate to each other similarly in China and the West Table 6.

In general, the psychometric properties of the Chinese version were solid. Reliability analyses indicated strong internal consistency for both the total score and each of the subscales ranging from .87 to .96. Similarly, adolescents in the current sample were able to report consistent results on the CATS over a one-month interval. The size of the retest reliability coefficients over four weeks was similar to that reported in Schniering and Rapee [24].

One of the strengths of the CATS has been its strong construct validity whereby specific subscales have been shown to relate to distinct symptom profiles [9, 24]. Theoretically, this finding is consistent with the specificity of cognitive appraisals that suggests that specific symptom profiles and consequently specific disorders, are related to unique content of automatic thoughts [36]. It is important, therefore, that the Chinese version of the CATS also demonstrated specific associations between separate subscales and symptom measures. Consistent with this expectation, the social threat subscale was the strongest predictor of anxiety, the personal failure subscale was the strongest predictor of depression, and the hostility subscale was the strongest predictor of behavioral symptoms. Consistent with previous findings in Western samples [9], these findings show that cognitive theories of mental disorders are likely to apply equally to young people from Chinese society. Analyses of predictors of anxiety, depression and behavioral symptoms indicated that the social threat subscale may be particularly important in the expression of anxious symptom, the personal failure subscale may particularly important for depressive symptoms, and the hostility subscale may be particularly important in behavioral symptoms.

A significant age effect was found in the current study which showed that older adolescents scored significantly

**Table 6** Factor loadings of the Chinese version of CATS

Item	PT	ST	PF	HOS
4. I'm going to have an accident	.65			
7. I'm going crazy	.66			
9. I'm going to die	.59			
12. My Mum or Dad are going to get hurt	.52			
16. I'm scared of losing control	.70			
20. I'm going to get hurt	.68			
24. Something awful is going to happen	.72			
33. I'm scared that somebody might die	.61			
36. There is something very wrong with me	.76			
39. Something will happen to someone I care about	.70			
1. Kids will think I'm stupid		.62		
6. I'm worried that I'm going to get teased		.74		
8. Kids are going to laugh at me		.69		
14. I'm going to look silly		.68		
18. People are thinking bad things about me		.77		
21. I'm afraid of what other kids will think of me		.74		
25. I look like an idiot		.74		
29. Other kids are making fun of me		.56		
31. Everyone is staring at me		.68		
32. I'm afraid I will make a fool of myself		.74		
3. I can't do anything right			.67	
11. I am worthless			.75	
13. Nothing ever works out for me anymore			.74	
17. It's my fault that things have gone wrong			.67	
23. I've made such a mess of my life			.72	
26. I'll never be as good as other people are			.77	
28. I am a failure			.77	
30. Life is not worth living			.68	
34. I will never overcome my problems			.75	
38. I hate myself			.73	
2. I have the right to take revenge on people if they deserve it				.66
5. Other kids are stupid				.42
10. Most people are against me				.69
15. I won't let anyone get away with picking on me				.67
19. If someone hurts me, I have the right to hurt them back				.66
22. Some people deserve what they get				.74
27. I always get blamed for things that are not my fault				.70
35. People always try to get me into trouble				.71
37. Some people are bad				.70
40. Bad people deserve to get punished				.71

*PT* The Children's Automatic Thoughts Scale Physical Threat subscale, *ST* The Children's Automatic Thoughts Scale Social Threat subscale, *PF* The Children's Automatic Thoughts Scale Personal Failure subscale, *HOS* The Children's Automatic Thoughts Scale Hostility subscale

higher on the total scale as well as most subscales than younger adolescents. In their original study, Schniering and Rapee [24] found no significant differences on the CATS scales between children aged 7–11 and adolescents aged 12–16. Putting these results together, it is possible that negative thoughts increase specifically during the later teenage years, which is consistent with research showing higher levels of anxiety symptoms among Chinese adolescents than children [20, 21]. Alternately, it is possible that the differences between the current results and those of Schniering and Rapee reflect minor cultural differences in reporting or experience of negative beliefs. Further research that directly compares young people from China and Western countries on negative beliefs across a broader age range would help to determine whether automatic thoughts change with development and whether this change is consistent across cultures.

In our study significant gender differences were only found on the hostility subscale, with boys reporting significantly higher scores than girls. This finding regarding thoughts of hostility among Chinese adolescents is consistent with previous research [24]. It is surprising that no significant gender differences were found on automatic thoughts related to internalizing disorders (such as social threat or personal failure) which appears contradictory to research showing that girls demonstrate higher levels of anxiety and depression than boys [19, 21, 37, 38]. This finding points to a potentially interesting disjunction between thoughts, emotional experience, and behavior or a possible cultural difference that deserves further investigation. For example, adolescents in Mainland China are under huge pressure to achieve academically and enter a good college. Such high academic expectations imposed on them by their parents and teachers may lead to threat and failure expectations in both girls and boys [39].

The present study has several limitations. First, because the sample included only community participants, the ability of the Chinese CATS to discriminate between clinical and nonclinical populations could not be examined. Previous research has shown clear differences between young people suffering specific mental disorders on particular subscales [24] and it would be valuable to examine such differences among Chinese youth. Secondly, because the sample in this study was obtained from schools in urban areas, the sample is not representative of the general population of Chinese adolescents. Further, only middle and high school students were included in this study and hence the use of the CATS among Mainland Chinese primary school children still needs to be tested.

With these limitations in mind, results of this study demonstrated that the Chinese version of the CATS performed well and showed good psychometric properties. A

reliable and valid measure of negative beliefs will be useful to facilitate research into the specificity of cognitive appraisals among children and adolescents and to improve understanding and assessment of factors underlying adolescents' psychological disorders. To our knowledge, this is the first tool to assess negative thoughts related to a broad range of mental disorders that has been tested on young people from Mainland China and can provide a useful instrument for future research into the nature of emotional and behavioral distress in Chinese youth. The scale can be used to evaluate the effect of cognitive behavioral therapy directly and in turn to provide timely and reliable data to help improve interventions for children and adolescents suffering psychological distress.

## Summary

This study examined the psychometric properties of Children's Automatic Thoughts Scale, and provided incremental contribution to understanding the specificity of cognitive appraisals among Chinese adolescents. The structure of automatic thoughts in Chinese adolescents was the same as shown in Western studies. Consistent with previous research, the social threat subscale was the strongest predictor of anxiety, personal failure was the strongest predictor of depression, and hostility was the strongest predictor of behavioral symptoms. Inconsistent with prior research, older adolescents scored significantly higher on the total scale as well as on most subscales than younger adolescents. Further research is needed to replicate these results and examine whether automatic thoughts change across development. Although several limitations should be kept in mind, this is the first study to provide broad information about the negative thoughts of Chinese adolescents.

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