Research

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Psychometric Properties of the Certainty About Mental States Questionnaire in Adolescents Aged 14-18 (CAMSQ-Y-TR)

14-18 Yaş Ergenlerde Zihinsel Durumları Belirleme Ölçeği'nin (CAMSQ-Y-TR) Psikometrik Özellikleri

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ABSTRACT

Objective: The Certainty About Mental States Questionnaire (CAMSQ) is a self-report measure of individuals' perceived certainty about their own and others' mental states. This study examined the psychometric properties of the Turkish version of the CAMSQ in adolescents aged 14-18 years (CAMSQ-Y-TR).

Method: A non-clinical sample of 576 adolescents (M = 15.49, SD = 1.31) completed the CAMSQ, the EPOCH Measure of Adolescent Well-Being (EPOCH), and the Strengths and Difficulties Questionnaire (SDQ). Construct validity was tested with exploratory (EFA) and confirmatory factor analysis (CFA); reliability, criterion validity, and measurement invariance across gender and grade level were also examined.

Results: The EFA supported a two-dimensional structure (Self-Certainty and Other-Certainty) explaining 42.01% of the total variance, and the CFA showed acceptable fit (χ^2/df = 2.69, CFI = 0.90, GFI = 0.98, RMSEA = 0.054, SRMR = 0.055). Cronbach's alpha was .85 for the total scale, .80 for Other-Certainty, and .82 for Self-Certainty. Self-Certainty was positively related to well-being and negatively related to internalizing symptoms, whereas the Other-Self discrepancy (hypermentalizing) was negatively related to well-being and positively related to internalizing and externalizing symptoms. Full scalar invariance was supported across gender and grade level.

Conclusion: The CAMSQ-Y-TR showed sufficient psychometric properties for use with Turkish-speaking adolescents aged 14-18 years.

Keywords: Mentalizing, CAMSQ, adolescence, assessment, scale

ÖZ

Amaç: Zihinsel Durumları Belirleme Ölçeği (Certainty About Mental States Questionnaire, CAMSQ), bireylerin kendilerinin ve başkalarının zihinsel durumlarını belirleme kapasitelerine ilişkin algılarını değerlendiren öz bildirime dayalı bir ölçme aracıdır. Bu çalışmada CAMSQ'nun Türkçe formunun 14-18 yaş ergen örnekleminde (CAMSQ-Y-TR) psikometrik özellikleri incelenmiştir.

Yöntem: Klinik olmayan 576 ergenden (yaş Ort. = 15.49, SS = 1.31) oluşan örnekleme CAMSQ, EPOCH Ergen İyi Oluş Ölçeği (EPOCH) ve Güçler ve Güçlükler Anketi (SDQ) uygulanmıştır. Yapı geçerliği açımlayıcı (AFA) ve doğrulayıcı faktör analizi (DFA) ile sınanmıştır. Ayrıca güvenirlik, ölçüt geçerliği ve cinsiyet ile sınıf düzeyi açısından ölçme değişmezliği incelenmiştir.

Bulgular: AFA, toplam varyansın %42.01'ini açıklayan iki boyutlu bir yapıyı (Öz-Belirleme ve Diğerini-Belirleme) desteklemiştir. DFA sonuçları kabul edilebilir düzeyde uyum göstermiştir (χ^2/sd = 2.69, CFI = 0.90, GFI = 0.98, RMSEA = 0.054, SRMR = 0.055). Cronbach alfa katsayısı ölçeğin tamamı için .85, Diğerini-Belirleme için .80 ve Öz-Belirleme için .82 olarak bulunmuştur. Öz-Belirleme iyi oluşla pozitif ve içselleştirme belirtileriyle negatif yönde ilişkiliyken Diğer-Öz farkı (hipermentalizasyon) iyi oluşla negatif ve içselleştirme ile dışsallaştırma belirtileriyle pozitif yönde ilişkili bulunmuştur. Cinsiyet ve sınıf düzeyi açısından tam skalar değişmezlik sağlanmıştır.

Sonuç: CAMSQ-Y-TR'nin Türkçe konuşan 14-18 yaş ergenlerde kullanılabilecek düzeyde psikometrik özelliklere sahip olduğu görülmüştür.

Anahtar sözcükler: Zihinselleştirme, CAMSQ, ergenlik, değerlendirme, ölçek

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Introduction

Mentalizing is a transdiagnostic factor that contributes to adolescents' well-being, ability to maintain healthy relationships, and mental health problems (Ballespí et al. 2018). Its importance has increased across disciplines in recent years (Di Stefano et al. 2017, Chevalier et al. 2023). Mentalizing is associated with various psychological symptoms and mental disorders in adolescents (Abate et al. 2017, Chevalier et al. 2023, Parolin et al. 2023, Doba et al. 2025). On the other hand, its relationship with psychological well-being and resilience has a protective factor role against mental problems in the developmental process (Ballespí et al. 2018, Parolin et al. 2023, Wais et al. 2024). In this regard, practical and valid measurement tools are needed to assess mentalizing in adolescents.

Mentalizing refers to the ability to evaluate the mental states of self and others (Bateman and Fonagy 2010). This ability is shaped based on the caregiver-infant relationship and continues to develop through social interactions (Fonagy et al. 1998, Allen et al. 2008, Luyten and Fonagy 2015, Crone and Fuligni 2020). Hence, in adolescence, mentalizing ability continues to develop through ongoing learning about the complex aspects of the social environment (Guazzelli, Williamson and Mills 2023). This ability is important in maintaining social adaptation and psychological health (Müller et al. 2023). The ability to mentalize, which consists of two dimensions that determine the mental states of oneself and others, has two maladaptive dimensions: overmentalizing and hypermentalizing (Fonagy et al. 2016; Müller et al. 2023).

Impairments in mentalizing ability are reported to be associated with mental disorders and symptoms in adolescents (Abate et al. 2017, Ballespí et al. 2021a, Cortes-Garcia et al. 2021, Vahidi et al. 2021, Doba et al. 2025). For instance, anorexia nervosa in adolescents (Cortes-Garcia et al. 2021) is associated with mental health symptoms and problems such as borderline personality disorder (Cortes-Garcia et al. 2021, Vahidi et al. 2021, Wais et al. 2024), post-traumatic stress disorder (PTSD) (Abate et al. 2017, Wais et al. 2024, Doba et al. 2025), internalizing (Chevalier et al. 2023, Parolin et al. 2023), and externalizing (Derome et al. 2024, Lee et al. 2024) problems. Some studies remark on the effect of mentalizing on emotion regulation in mental health problems in adolescents (Vahidi et al. 2021, Parolin et al. 2023). Moreover, rather than its relationship with psychopathology, the relationship of mentalizing with well-being (Ballespí et al. 2018) and resilience (Ballespí et al. 2018, Wais et al. 2024) is emphasized more.

Self-mentalizing (identifying one's own mental states) and other-mentalizing (identifying others' mental states) dimensions of mentalizing have different functions. While the self-mentalizing dimension contributes to clarity about one's own emotions and self-regulation (Ballespí et al. 2021b), the other-mentalizing dimension is important in creating a predictable and meaningful environment (Bateman and Fonagy 2010). Hypomentalizing and hypermentalizing are two maladaptive components associated with impairments in mentalizing (Fonagy et al. 2016). Two dimensions (Ballespí et al. 2018) or two maladaptive components of mentalizing are considered to be related to different mental health problems (Fonagy et al. 2016). Besides, research indicates contradictory results. For instance, while hypermentalizing was reported to mediate the relationship between PTSD symptoms and aggressive behaviors in adolescents aged 12-17 years who were admitted to a private psychiatric hospital, hypomentalizing was reported to show no mediating role (Abate et al. 2017). On the other hand, exposure to multiple types of childhood trauma may contribute to severe PTSD in adolescence and young adulthood through a variety of complex pathways, including both hypomentalizing and maladaptive emotion regulation strategies (Doba et al. 2025). Another study showed that, among the mentalization components (self-mentalization and other-mentalization), only self-mentalizing moderates the relationship between social anxiety and self-efficacy (Ballespí et al. 2021a). Another study detected no relationship between self- and other-mentalizing and internalizing and externalizing symptoms of adolescents (Ballespí et al. 2021b).

While hypermentalizing refers to being very certain about one's own and others' mental states beyond the evidence, hypomentalizing refers to having little certainty about these mental states (Fonagy et al. 2016). In contrast, while Müller et al. (2023) described hypomentalizing as associated with low self-certainty, hypermentalizing was defined as a situation in which certainty about others' mental states exceeds certainty about one's own mental states. They also stated that there is no evidence that high judgment about oneself and low judgment about the mental states of others lead to psychopathology.

Given the fundamental role of mentalizing in psychotherapies (Sharp and Rossouw 2024), developing valid and reliable assessment methods and tools to assess mentalizing in adolescents seems important (Martin-Gagnon et al. 2023). Self-report measures of mentalizing have been used with adolescents from early adolescence onward, and instruments such as the 13-item Reflective Functioning Questionnaire for Youth (RFQY-13) and the adolescent forms of the Mentalization Questionnaire (MZQ) were validated in samples covering the age range studied here (Eloranta et al. 2022, Martin-Gagnon et al. 2023). Although self-understanding is still developing in mid-adolescence, adolescents in this period can report how certain they feel about their own and others' mental states, and the Certainty About Mental States Questionnaire (CAMSQ) is designed to capture this perceived certainty (Müller et al. 2023). Among these self-report tools, the Turkish adult form of the Mentalization Scale (MentS) (Dimitrijević et al. 2018, Törenli Kaya et al. 2023) and the Finnish adult form of the MZQ (Hausberg et al. 2012, Eloranta et al. 2022) have been adapted for adolescents. Besides, the RFQY-13 was adapted from different adolescent forms (Martin-Gagnon et al. 2023). The Turkish adolescent form of the MentS (Deniz and Uluç 2024) and the Finnish and Turkish adolescent forms of the MZQ have psychometric limitations (Eloranta et al. 2022, İlk and Bilge 2024). In contrast, none of the self-report assessment tools, except the adult form of the CAMSQ, assess the balance between the level of perception and interpretation of one's own and others' mental states (Müller et al. 2023).

This study adds to the literature in two main ways. First, it introduces the first adolescent version of the CAMSQ, which is currently the only self-report tool that measures how certain someone feels about their own and others' mental states, as well as the balance between them (the Other-Self discrepancy). Second, it gives researchers and clinicians a short tool to assess mentalizing in Turkish-speaking adolescents aged 14 to 18. The goal was to test the psychometric properties of the adult Turkish CAMSQ (Usluoglu et al. 2024) in a non-clinical adolescent group, using the Strengths and Difficulties Questionnaire (SDQ) (Güvenir et al. 2008) and the EPOCH Measure of Adolescent Well-Being (EPOCH) (Demirci and Ekşi 2015) to check criterion-related validity. Based on results from the adult version (Müller et al. 2023, Usluoglu et al. 2024), we expected that (a) the CAMSQ-Y-TR would show the same two-factor structure (Self-Certainty and Other-Certainty) and have good reliability; (b) CAMSQ scores would be positively linked to well-being (EPOCH); and (c) low Self-Certainty and a higher Other-Self discrepancy (hypermentalizing) would be linked to more internalizing and externalizing symptoms (SDQ). We also expected the factor structure to be consistent across gender and grade level.

Method

Sample

The study was conducted in high schools (Grades 9-12) in Mersin, a province in the Mediterranean region of Türkiye. Participants were recruited through convenience sampling. Inclusion criteria were (a) being between 14 and 18 years of age, (b) being enrolled in one of the participating high schools, and (c) providing written parental consent together with adolescent assent. Adolescents without parental consent and those who returned incomplete questionnaires were excluded. The final sample consisted of 576 adolescents (M = 15.49, SD = 1.31; 367 female, 63.72%). The sample was non-clinical in the sense that participants were recruited from the general school population rather than through clinical services or referral, and no psychiatric diagnosis or treatment status was used as a selection criterion.

The sample size was determined on the basis of commonly recommended case-to-item ratios for factor-analytic studies: at least 10 cases per item are recommended for scale validation research (Nunnally 1978), and samples of 500 or more are characterized as very good for factor analysis (Comrey and Lee 1992). The final sample of 576 yields a case-to-item ratio of approximately 29:1 for the 20-item CAMSQ and is well above the minimum of 200 cases recommended for confirmatory factor analysis (Kline 2016). Data were collected between December 2023 and February 2025. Demographic information of the participants is presented in Table 1.

Table 1. Demographic characteristics of the participants			
Variable	**Group**	**n**	**%**
Gender	Female	367	63.72
	Male	209	36.28
Grade	9	227	39.40
	10	127	22.04
	11	101	17.53
	12	121	21.06

n = number of participants; % = percentage of the total sample (N = 576).

Procedure

Ethics approval for the study was obtained from the Toros University Scientific Research and Publication Ethics Committee with reference number 21.11.2024/188. Participants were verbally informed about the study before data collection began, and written informed consent was obtained from their parents.

The appropriateness of the statements in the adult Turkish version of the scale for adolescents was assessed by four experts. These assessments were made by an adolescent psychiatrist and three psychologists who worked with adolescents and had at least a doctoral degree. The experts suggested that the statement "I know what my strong aspects are" in item 11 of the scale be changed to "I know what my strengths are". The approval of the authors of the original scale was sought for this change. The authors of the scale stated that this change in item 11 was within the limits of the original form and that the English version of the statement provided to them corresponded to the German version of this item ("Ich kenne meine Stärken"). Thus, they accepted that the Turkish version of the scale for adolescents is still the Turkish version of the original form of the CAMSQ and approved the change. After this change, an application was made for ethical approval, and the data were collected after ethical approval was obtained.

The scales were administered to the participants by the researchers face-to-face, in paper-and-pencil format, in their classrooms during regular school hours. Completion took approximately 20 minutes. The scales were administered after obtaining consent from one of the parents.

Scales

The EPOCH and the SDQ were preferred as criterion measures because both instruments have Turkish forms validated in adolescent samples, are brief enough for classroom administration, and correspond to the well-being and symptom domains examined in previous CAMSQ validation studies (Müller et al. 2023, Usluoglu et al. 2024).

The Certainty about Mental States Questionnaire (CAMSQ)

The CAMSQ was developed to assess adult individuals' perceptions of their mentalizing abilities (Müller et al. 2023). The questionnaire assesses this ability via 20 items responded on a 7-point Likert scale (never = 1, rarely = 2, occasionally = 3, sometimes = 4, often = 5, usually = 6, always = 7) with two dimensions based on the level of determining one's Self-Certainty (SC) and Others-Certainty (OC). The scale assesses two maladaptive components of mentalizing. Hence, low scores in the Self-Certainty dimension of the scale are associated with hypomentalizing, which is one of the maladaptive forms of evaluation. It is related to hypermentalizing, which is a situation in which the person's scores of mentalizing the other exceed the scores of mentalizing oneself (OC - SC > 0). The internal consistency coefficients are ω = .91/.89 for the Self-Certainty dimension and ω = .90/.88 for the Others-Certainty dimension. The CAMSQ was adapted into Turkish by Usluoglu et al. (2024), and Cronbach's α and McDonald's omega (ω) values for the Self-Certainty sub-scale were found to be .89 and .90, respectively. For the Others-Certainty sub-scale, these values were found to be .88 and .89, respectively.

The EPOCH Measure of Adolescent Well-Being (EPOCH)

The EPOCH Scale was developed based on Seligman's five dimensions of well-being (Kern et al. 2016). The

dimensions adapted for adolescents include engagement, perseverance, optimism, connectedness, and happiness. The scale includes 20 items, with 4 items in each dimension. The items in the scale are scored using a 5-point Likert scale from 1 (never) to 5 (always). The evaluation of the scale is reported by averaging the scores in each dimension to produce scores between 1 and 5, and these five dimensions are reported using a dashboard approach. The scale was adapted into Turkish by Demirci and Ekşi (2015); while the internal consistency coefficient is .95 for the total scale, the internal consistency coefficients range between .72 and .88 for the sub-scales. Higher scores indicate higher levels of well-being. In the current study, Cronbach's alpha calculated for the total scale was .85.

The Strengths and Difficulties Questionnaire (SDQ)

The SDQ, developed by Goodman (1997), was adapted into Turkish by Güvenir et al. (2008) (SDQ-TUR). The adolescent form of the scale consists of five sub-scales and 25 items. The sub-scales of the scale consist of behavioral problems, attention deficit and hyperactivity problems, emotional problems, peer problems, and social behaviors. Higher scores obtained from the sub-scales other than the social behaviors sub-scale indicate a problem. Cronbach's alpha ranges between 0.22 and 0.71 for the total score and sub-scales (Güvenir et al. 2008). In the current study, Cronbach's alpha was calculated as .60 for the total score of the scale. In this study, two subscales of the SDQ-TUR were used to assess externalizing problems (behavior problems and attention deficit and hyperactivity problems items) and internalizing problems (emotional problems and peer problems items) (Goodman et al. 2010).

Statistical Analysis

We conducted all statistical analyses using JASP version 0.18.1 (JASP Team 2023) and R version 4.2.2 (R Core Team 2022). Prior to the main analyses, we computed descriptive statistics (means and standard deviations) for all study variables and examined skewness and kurtosis values to evaluate the univariate normality of the distributions (George and Mallery 2010). We also examined multivariate normality with Mardia's coefficients; both multivariate skewness (234.82, $p < .001$) and kurtosis (781.20, $p < .001$) were significant, indicating deviation from multivariate normality.

We tested the construct validity of the Turkish adolescent version of the CAMSQ (CAMSQ-Y-TR) with both Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA). Before running the EFA, we checked if the data were suitable for factor analysis using the Kaiser-Meyer-Olkin (KMO) measure and Bartlett's test of sphericity. We considered KMO values above .50 and a significant Bartlett's test as signs that the data were appropriate. We decided how many factors to keep by looking at eigenvalues greater than one, and we reviewed the solution by examining item factor loadings, communalities (h^2), and the total variance explained.

Next, we ran a CFA to confirm the scale's two-factor structure using maximum likelihood (ML) estimation. Because the CAMSQ items use a seven-point response scale, we treated them as approximately continuous; ML estimation performs adequately with ordinal items that have five or more response categories (Rhemtulla et al. 2012). Given the deviation from multivariate normality, we based our judgment of model fit on several indices together rather than on the chi-square statistic alone. We checked model fit with several standard indices: chi-square divided by degrees of freedom (χ^2/df), Root Mean Square Error of Approximation (RMSEA), Comparative Fit Index (CFI), Goodness-of-Fit Index (GFI), Adjusted Goodness-of-Fit Index (AGFI), and Standardized Root Mean Square Residual (SRMR). According to established guidelines, we saw χ^2/df values below 3 as acceptable, RMSEA and SRMR values below 0.08 as reasonable, and CFI values above 0.90 as evidence of a good fit between the model and the data. We also interpreted GFI values above 0.90 and AGFI values above 0.85 as signs of explained variance and adjusted fit (Schermelleh-Engel et al. 2003, Hoe 2008). We checked if item loadings were statistically significant, using t (z) values over 2.58 ($p < .01$) as evidence that each item represented its latent construct (Kline 2016).

We checked the scale's reliability using Guttman's split-half coefficient, Cronbach's alpha, and McDonald's omega (ω), and we further examined corrected item-total correlations. To test convergent reliability and validity at the construct level, we calculated composite reliability (CR) and average variance extracted

(AVE) for each dimension. We considered AVE values of .50 or higher and CR values of .60 or higher as signs of good construct reliability (Fornell and Larcker 1981).

To check criterion validity, we calculated Pearson correlation coefficients between CAMSQ scores and related measures. These included the Self-Certainty and Other-Certainty sub-scales, hypermentalizing, EPOCH, and the internalizing and externalizing scores from the Turkish version of the Strengths and Difficulties Questionnaire (SDQ-TUR). Hypermentalizing was operationalized as the Other-Self discrepancy (Other-Certainty minus Self-Certainty). In addition, a post hoc sensitivity analysis was conducted in G*Power 3.1 (Faul et al. 2009) to determine the smallest correlation coefficient detectable with the available sample (α = .05, two-tailed, power = .80).

Finally, we checked if the scale measured the same construct across different groups by testing measurement invariance with multigroup confirmatory factor analysis. We compared configural, metric, and scalar models for gender and grade level (9th-10th and 11th-12th grades). We used ΔCFI ≤ .010 and ΔRMSEA ≤ .015 as criteria, with differences below these thresholds indicating support for the more constrained model (Cheung and Rensvold 2002, Chen 2007).

Results

Table 2 presents the descriptive statistics regarding the self-report tools used in the study.

Table 2. Descriptive statistics regarding scale scores

Variable	n	M	SD	Skewness	Kurtosis	CRa
CAMSQ	576	103.7743	17.81288	-0.559	0.409	.854
OC	576	51.2986	10.53364	-0.440	0.394	.796
SC	576	52.4757	10.37150	-0.567	-0.031	.822
EPOCH	576	67.2760	12.72349	-0.138	-0.245	.848
SDQ-TUR	576	25.3437	5.30102	0.397	0.771	.602

CAMSQ = The Certainty About Mental States Questionnaire; OC = Other-Certainty; SC = Self-Certainty; EPOCH = The EPOCH Measure of Adolescent Well-Being; SDQ-TUR = The Strengths and Difficulties Questionnaire (Turkish version); CRα = Cronbach's alpha coefficient; *n* = number of participants; *M* = mean; *SD* = standard deviation.

Construct Validity

Exploratory Factor Analysis (EFA)

The conformity of the data to factor analysis was assessed using the Kaiser-Meyer-Olkin (KMO) sample adequacy measure and Bartlett's sphericity test. The KMO value was calculated as 0.902, indicating that the sample size was highly adequate for factor analysis. Item-level KMO values ranged from 0.846 to 0.932, all of which were well above the critical threshold of 0.50. The Bartlett sphericity test was found to be significant ($\chi^2(190) = 2810.06$, $p < .001$).

The two-dimensional solution explained 42.01% of the total variance (the Other-Certainty dimension explained 21.34%, and the Self-Certainty dimension explained 20.67%). Following Promax rotation, the correlation between the two factors was found to be r = 0.445. The common factor variances of the items ranged from 0.201 to 0.652. All twenty items loaded appropriately on the dimension to which they theoretically belong. The factor loadings of the items ranged from 0.383 to 0.686. The EFA item loadings are presented in Table 3.

Confirmatory Factor Analysis (CFA)

Confirmatory Factor Analysis (CFA) was conducted to evaluate the construct validity of the CAMSQ-Y-TR. Table 4 presents the model fit indices, and Table 5 shows the item loadings. Figure 1 displays the path coefficients of the CFA model. All item t-values exceeded the threshold value of 2.58 at the .01 significance level, indicating that each item significantly explained its corresponding latent construct (Kline 2016). The model showed acceptable fit indices (χ^2/df = 2.69, RMSEA = 0.054, CFI = 0.90, GFI = 0.98, AGFI = 0.85, SRMR = 0.055), supporting the adequacy of the model (Schermelleh-Engel et al. 2003, Hoe 2008). The chi-square

test itself was significant ($\chi^2(169) = 452.50$, $p < .001$); this is expected in large samples because the statistic is sensitive to sample size (Kline 2016). Because the CFI was at the lower bound of the acceptable range, the overall fit should be read as adequate rather than strong. These findings support the construct validity of the CAMSQ-Y-TR.

Table 3. EFA item load values

Item	Other-Certainty	Self-Certainty	h^2
Other-Certainty			
CAMSQ2	0.627	0.280	0.391
CAMSQ3	0.625	0.254	0.408
CAMSQ6	0.667	0.222	0.510
CAMSQ8	0.683	0.342	0.439
CAMSQ10	0.701	0.244	0.553
CAMSQ12	0.595	0.292	0.337
CAMSQ15	0.404	0.383	0.201
CAMSQ17	0.667	0.366	0.402
CAMSQ18	0.654	0.266	0.447
CAMSQ19	0.696	0.260	0.528
Self-Certainty			
CAMSQ1	0.303	0.547	0.269
CAMSQ4	0.259	0.628	0.409
CAMSQ5	0.399	0.545	0.248
CAMSQ7	0.393	0.577	0.280
CAMSQ9	0.141	0.686	0.645
CAMSQ11	0.323	0.632	0.374
CAMSQ13	0.383	0.681	0.416
CAMSQ14	0.040	0.621	0.652
CAMSQ16	0.353	0.679	0.427
CAMSQ20	0.198	0.628	0.464
	Eigenvalue	R^2	CVE
Other-Certainty	5.880	21.34	
Self-Certainty	2.404	20.67	42.01

CAMSQ = The Certainty About Mental States Questionnaire; EFA = Exploratory Factor Analysis; h^2 = communality; R^2 = explained variance (%); CVE = cumulative variance explained (%). Factor loadings in bold indicate the dimension on which the item loads.

Table 4. Fit indices for the items of the scale

Goodness of Fit Index	Acceptable Limit	Value
χ^2	-	452.50
df	-	169
p (χ^2)	-	< .001
χ^2 / df	<5	2.6893
CFI	>0.90	0.90
GFI	>0.90	0.98
AGFI	>0.85	0.85
SRMR	<0.08	0.055
RMSEA	<0.08	0.054

χ^2 = chi-square; df = degrees of freedom; CFI = Comparative Fit Index; GFI = Goodness-of-Fit Index; AGFI = Adjusted Goodness-of-Fit Index; SRMR = Standardized Root Mean Square Residual; RMSEA = Root Mean Square Error of Approximation.

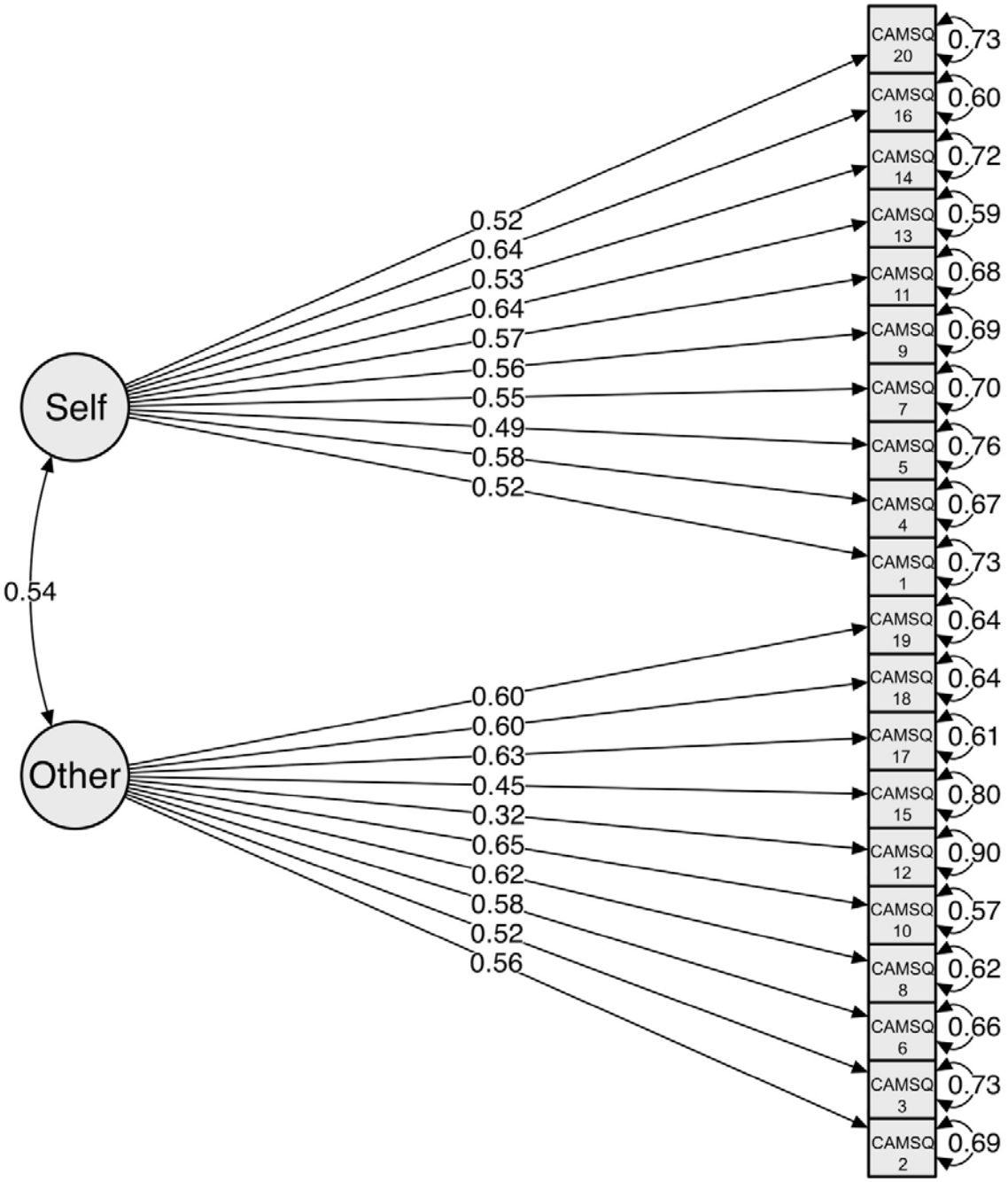


Figure 1. Model plot

Reliability

The reliability analysis of the CAMSQ-Y-TR included Guttman's split-half coefficient, Cronbach's alpha, and McDonald's omega coefficient. The analysis also reported composite reliability (CR) and average variance extracted (AVE) values. Both dimensions demonstrated high internal consistency (ω = 0.796 for Other-Certainty and ω = 0.819 for Self-Certainty). However, the AVE values fell below the 0.50 criterion (Other-Certainty: 0.348; Self-Certainty: 0.328). Nevertheless, the fact that the composite reliability values were significantly above the 0.60 criterion indicates that the constructs were reliably measured (Fornell and Larcker 1981) (see Table 6). We also examined how Cronbach's alpha would change if each item were removed. Deleting any single item did not raise the alpha of its dimension, with one exception: removing item 12 would increase the Other-Certainty alpha from .80 to .82 and the total-scale alpha from .85 to .87. We return to this item in the Discussion.

Table 5. Confirmatory factor analysis: standardized factor loadings							
Item	***β***	**SE**	***z***	***p***	**95% CI Lower**	**95% CI Upper**	***R²***
Other-Certainty							
CAMSQ2	0.558	0.068	13.352	< .001	0.784	1.054	0.311
CAMSQ3	0.517	0.065	12.201	< .001	0.668	0.924	0.268
CAMSQ6	0.583	0.067	14.068	< .001	0.816	1.081	0.340
CAMSQ8	0.618	0.063	15.099	< .001	0.835	1.084	0.382
CAMSQ10	0.653	0.070	16.162	< .001	1.003	1.280	0.426
CAMSQ12	0.324	0.118	7.299	< .001	0.632	1.096	0.105
CAMSQ15	0.446	0.076	10.256	< .001	0.632	0.931	0.199
CAMSQ17	0.625	0.067	15.298	< .001	0.905	1.170	0.391
CAMSQ18	0.600	0.060	14.478	< .001	0.759	0.997	0.360
CAMSQ19	0.598	0.068	14.504	< .001	0.857	1.124	0.357
Self-Certainty							
CAMSQ1	0.515	0.067	11.9794	< .001	0.6787	0.944	0.266
CAMSQ4	0.577	0.061	13.7992	< .001	0.7243	0.964	0.333
CAMSQ5	0.493	0.067	11.4797	< .001	0.6387	0.901	0.243
CAMSQ7	0.549	0.064	12.9544	< .001	0.7043	0.955	0.301
CAMSQ9	0.559	0.078	13.1602	< .001	0.8732	1.178	0.313
CAMSQ11	0.567	0.071	13.4640	< .001	0.8258	1.107	0.322
CAMSQ13	0.638	0.065	15.6874	< .001	0.9006	1.157	0.408
CAMSQ14	0.531	0.076	12.4873	< .001	0.8077	1.108	0.282
CAMSQ16	0.636	0.066	15.5133	< .001	0.8950	1.153	0.404
CAMSQ20	0.521	0.079	12.2529	< .001	0.8184	1.130	0.271

CAMSQ = The Certainty About Mental States Questionnaire; β = standardized factor loading; SE = standard error; z = test statistic; 95% CI = 95% confidence interval (lower and upper limits) for the unstandardized estimate; R^2 = proportion of item variance explained by the factor. All loadings are significant at $p < .001$.

Criterion-Related Validity of the Scale

For the criterion-related validity, the relationships between the CAMSQ-Y-TR, EPOCH, and SDQ-TUR internalizing and externalizing sub-scales were analyzed using Pearson correlation. The post hoc sensitivity analysis indicated that the sample of 576 provided 80% power to detect correlations of $r \geq .12$ ($\alpha = .05$, two-tailed); all statistically significant coefficients reported below exceed this threshold. Table 7 demonstrates the analysis results. The correlation matrix presents the relationships between the variables under investigation. The CAMSQ exhibits a strong and statistically significant positive correlation with both Other-Certainty ($r = 0.855$, $p < .001$) and Self-Certainty ($r = 0.850$, $p < .001$), suggesting a substantial degree of association among these constructs. Additionally, Self-Certainty and Other-Certainty are moderately correlated ($r = 0.452$, $p < .001$), indicating a meaningful but less pronounced relationship compared to their respective associations with the CAMSQ. While no significant relationship existed between hypermentalizing and the CAMSQ ($r = 0.017$, $p > .05$), hypermentalizing was positively correlated with Other-Certainty ($r = 0.534$, $p < .001$) and negatively correlated with Self-Certainty ($r = -0.513$, $p < .001$). This suggests that hypermentalizing, a maladaptive component, is not associated with the general level of mentalizing, but is associated with the disruption of the balance between Self-Certainty and Other-Certainty levels. EPOCH demonstrates statistically significant positive correlations with the CAMSQ (r =

0.364, p < .001), Other-Certainty (r = 0.185, p < .001), and Self-Certainty (r = 0.438, p < .001). These results imply that EPOCH shares a moderate association with these constructs, with the strongest correlation observed with Self-Certainty. However, there is a negative relationship between EPOCH and hypermentalizing (r = -0.237, p < .001). These results show that adolescents' level of psychological well-being may increase with healthy and balanced mentalizing, while hypermentalizing may negatively affect well-being. SDQ-TUR-INT demonstrates a statistically significant negative correlation with Self-Certainty (r = -0.183, p < .001) and a positive correlation with hypermentalizing (r = 0.233, p < .001). SDQ-TUR-EXT shows a positive relationship with hypermentalizing (r = 0.109, p < .01). These results suggest that while having too little and too much certainty about mental states can lead to internalizing problems, too much certainty about others' mental states can lead to externalizing problems. Overall, the correlation matrix supports the criterion-related validity of the CAMSQ.

Table 6. Reliability analysis results

Items	Guttman's split-half coefficient	Cronbach α	McDonald ω	CR	AVE	Mean	SD	Corrected item-total correlation
Other-Certainty		0.796	0.796	0.841	0.348			
CAMSQ2						5.0041	1.64884	0.452
CAMSQ3						4.8852	1.54573	0.437
CAMSQ6						5.2008	1.65650	0.443
CAMSQ8						5.6783	1.55428	0.519
CAMSQ10						4.7193	1.75182	0.473
CAMSQ12						5.5389	2.76798	0.246
CAMSQ15						5.1025	1.74144	0.450
CAMSQ17						5.4201	1.65685	0.515
CAMSQ18						5.6639	1.40466	0.458
CAMSQ19						5.0410	1.63583	0.477
Self-Certainty		0.822	0.819	0.829	0.328			
CAMSQ1						5.2336	1.55354	0.421
CAMSQ4						5.7254	1.44666	0.454
CAMSQ5						5.7234	1.52841	0.469
CAMSQ7						5.6250	1.47280	0.494
CAMSQ9						5.2234	1.80386	0.424
CAMSQ11						5.3873	1.68932	0.493
CAMSQ13						5.2520	1.60594	0.553
CAMSQ14						5.2889	1.77957	0.326
CAMSQ16						5.3340	1.59475	0.534
CAMSQ20						4.5020	1.87603	0.417
Total	0.826	0.854						

CAMSQ = The Certainty About Mental States Questionnaire; CR = Composite Reliability; AVE = Average Variance Extracted; α = Cronbach's alpha; ω = McDonald's omega; SD = standard deviation.

Table 7. Criterion validity results

Variable	1	2	3	4	5	6	7
1. CAMSQ	1						
2. OC	0.855***	1					
3. SC	0.850***	0.452***	1				
4. HMZ	0.017	0.534***	-0.513***	1			
5. EPOCH	0.364***	0.185***	0.438***	-0.237***	1		
6. SDQ-TUR-INT	-0.070	0.062	-0.183***	0.233***	-0.275***	1	
7. SDQ-TUR-EXT	0.017	0.070	-0.043	0.109**	-0.058	0.359***	1

CAMSQ = The Certainty About Mental States Questionnaire; OC = Other-Certainty; SC = Self-Certainty; HMZ = hypermentalizing (Other-Self discrepancy); EPOCH = The EPOCH Measure of Adolescent Well-Being; SDQ-TUR-INT = The Strengths and Difficulties Questionnaire (Turkish version) internalizing; SDQ-TUR-EXT = The Strengths and Difficulties Questionnaire (Turkish version) externalizing. *p < .05. **p < .01. ***p < .001.

Measurement Invariance

To evaluate whether the scale measures the same construct across subgroups, measurement invariance was tested using multigroup confirmatory factor analysis. The configural, metric (loading invariance), and scalar (intercept invariance) models were compared for gender (female/male) and grade level (9th-10th/11th-12th grade), respectively. Invariance was assessed using the thresholds ΔCFI ≤ .010 and ΔRMSEA ≤ .015 (Cheung and Rensvold 2002, Chen 2007). For both groupings, the ΔCFI and ΔRMSEA values remained below the thresholds in both the metric and scalar phases, thus supporting full measurement invariance (scalar level). This finding indicates that the scale scores are comparable across gender and grade-level groups. The results are presented in Table 8 and Table 9.

Table 8. Measurement invariance across gender

Model	χ^2	df	CFI	RMSEA	ΔCFI	ΔRMSEA
Configural	745.56	338	0.853	0.050	-	-
Metric	760.27	356	0.854	0.048	+0.001	-0.001
Scalar	793.13	374	0.849	0.048	-0.005	0.000

χ^2 = chi-square; df = degrees of freedom; CFI = Comparative Fit Index; RMSEA = Root Mean Square Error of Approximation; ΔCFI = change in CFI relative to the previous model; ΔRMSEA = change in RMSEA relative to the previous model.

Table 9. Measurement invariance across grade levels

Model	χ^2	df	CFI	RMSEA	ΔCFI	ΔRMSEA
Configural	712.78	338	0.865	0.048	-	-
Metric	749.96	356	0.858	0.048	-0.007	0.000
Scalar	785.37	374	0.852	0.048	-0.006	0.000

χ^2 = chi-square; df = degrees of freedom; CFI = Comparative Fit Index; RMSEA = Root Mean Square Error of Approximation; ΔCFI = change in CFI relative to the previous model; ΔRMSEA = change in RMSEA relative to the previous model.

Discussion

The EFA results supported the two-dimensional structure of the scale, which explained 42.01% of the total variance (Other-Certainty: 21.34%; Self-Certainty: 20.67%). The CFA results also supported the two-dimensional structure of the scale, each dimension consisting of ten items [χ^2/df = 2.6893, CFI = 0.90, GFI = 0.98, RMSEA = 0.054, SRMR = 0.055], in line with the findings obtained with the adult forms (Müller et al. 2023, Usluoglu et al. 2024). Because the CFI was at the lower bound of the commonly used cutoff, we read the model fit as acceptable rather than strong. Before administration, the adult Turkish form had been reviewed by four experts for its suitability for adolescents, and one statement was modified with the approval of the authors of the original scale; the EFA then pointed to the same two-factor solution as in the adult form. Even so, the factor structure was carried over from the adult version, and the EFA and CFA were run on the same sample; replication in an independent adolescent sample is therefore needed.

For the criterion validity of the instrument, the relationships were analyzed between the CAMSQ total score, the Other-Certainty and Self-Certainty sub-scales, hypermentalizing (Other-Self discrepancy), which is the maladaptive mentalizing component, EPOCH, and the internalizing and externalizing sub-scales of the SDQ-TUR. Analysis results indicated a positive relationship between the CAMSQ total score, Other-Certainty, and Self-Certainty and EPOCH, and a negative relationship between hypermentalizing and EPOCH (Müller et al. 2023). Studies conducted with adults have not examined the relationship between the scale total score and well-being and psychological symptoms (Jansen et al. 2023, Müller et al. 2023, Usluoglu et al. 2024). On the other hand, studies that used different adolescent self-report instruments reported no significant relationship between adolescents' mentalizing level and psychopathology (Ballespí et al. 2018), while mentalizing level was associated with well-being and resilience (Ballespí et al. 2018, İlk and Bilge 2024). The results of this study also found that the CAMSQ total score was not associated with internalizing and externalizing problems. A negative relationship was detected between Self-Certainty and internalizing symptoms assessed by the SDQ-TUR and a positive relationship between hypermentalizing and internalizing and externalizing symptoms assessed by the SDQ-TUR. Hence, internalizing and externalizing symptoms increase as individuals' Self-Certainty decreases and Other-Certainty increases.

These results provided support indicating that while low Self-Certainty is a maladaptive profile in internalizing symptoms, hypermentalizing (Other-Self discrepancy) exhibits positive associations consistent with psychological symptom outcomes (Müller et al. 2023). It also confirmed that the two maladaptive components of mentalizing were associated with different mental health problems (Fonagy et al. 2016).

The lack of association between the CAMSQ total score and the SDQ scores should be read with two points in mind. First, the internal consistency of the SDQ-TUR total score in this sample was low (α = .60), and low reliability in a criterion measure attenuates observed correlations; the true associations may therefore be somewhat larger than those found here. Second, the CAMSQ total score combines two dimensions that are only moderately correlated (r = .45) and that showed different patterns: Self-Certainty was related to internalizing symptoms whereas Other-Certainty was not. Associations in opposite directions can cancel each other out at the total-score level. Consistent with Müller et al. (2023), the subscale scores and the Other-Self discrepancy carry the clinically relevant information, and the total score should be treated only as a global index of perceived certainty about mental states.

The reliability of the scale was analyzed using Guttman's split-half coefficient, Cronbach's alpha, and McDonald's omega. The CAMSQ Guttman's split-half coefficient was calculated as 0.83, while Cronbach's alpha was found to be .85, .80, and .82 for the total scale score, Other-Certainty, and Self-Certainty, respectively. The McDonald's omega values were found to be .80 for Other-Certainty and .82 for Self-Certainty. The determined reliability values were found to be consistent with previous studies (Müller et al. 2023, Usluoglu et al. 2024).

At the item level, two items deserve comment. The corrected item-total correlation of item 12 (.25) fell below the commonly used .30 benchmark, and item 14 (.33) was close to it. An inspection of the raw data showed that a single out-of-range entry (a value outside the 1-7 scale) had inflated the variance of item 12; when this entry was treated as missing, the corrected item-total correlation of item 12 rose to .45 and the Cronbach's alpha of the Other-Certainty dimension rose from .80 to .83. The weak value therefore appears to reflect a recording error in one case rather than a malfunction of the item, and the item was retained. Item 14 remained at an acceptable level and loaded clearly on its own factor in both the EFA and the CFA. It should also be noted that item means were generally high (mostly above 5 on the 7-point scale); this may have restricted variance in this non-clinical sample, and possible ceiling effects should be checked in clinical samples.

In addition, multigroup confirmatory factor analysis-based measurement invariance demonstrated that the scale measures the same structure across subgroups (gender and grade level). Changes in model fit indices remained within the recommended threshold limits (ΔCFI $\leq$ .010; ΔRMSEA $\leq$ .015). These results suggest that the scale measures the same structure equivalently for both female and male adolescents, as well as across different grade-level groups. Furthermore, it allows for unbiased mean comparisons among these subgroups (Cheung and Rensvold 2002, Chen 2007).

The study has some limitations. Data of the study were from a non-clinical population. In addition, all of the assessment tools used in criterion validity consisted of self-report tools. The participants may have responded to the data collection tools under the influence of social desirability. Because the scale was administered in a single session, test-retest reliability could not be estimated with intraclass correlation coefficients; the stability of scores over time remains to be examined. The expert review of item wording was qualitative, and quantitative content validity indices (e.g., a content validity index) were not computed. The scale could be further validated through studies using methods based on clinical sampling and performance evaluations and applications in different periods.

Conclusion

This study looked at how well the Turkish version of the CAMSQ works with adolescents aged 14 to 18 who are not in clinical settings. The results showed that the CAMSQ-Y-TR keeps the original two-factor structure (Self-Certainty and Other-Certainty), has a good model fit and internal consistency, and is

meaningfully linked to well-being and internalizing symptoms. It also measures the same thing across different genders and grade levels. Because of this, the CAMSQ-Y-TR can be used as a short and practical self-report tool for studying how certain Turkish-speaking adolescents feel about mental states.

Future studies should replicate the two-factor structure. Future research should check if the two-factor structure holds up in other groups of adolescents, both in the community and in clinical settings. It would also be helpful to test the scale's reliability over time, assess its content validity, and examine how it relates to other mentalizing measures and clinician ratings. Studies could also explore if the scale can detect changes after mentalization-based treatments, and use long-term studies to see how certainty about mental states changes during adolescence and affects later well-being and mental health. These steps would help show how useful the scale is in clinical work.

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Addendum 1. Turkish Version of The Adolescence Certainty About Mental States Questionnaire (CAMSQ-Y-TR)

Instruction

People regularly evaluate their own and others' emotions, thoughts, and behaviors. Below are various statements that a person might use to describe themselves. Please respond by checking the box next to the answer option that best applies to you for each statement.

		Hiçbir Zaman	Nadiren	Bazen	Yarı yarıya	Sıklıkla	Genellikle	Her zaman
1	En derin istek ve arzularımı bilirim.							
2	Karşımdakinin kendisiyle barışık olup olmadığını anlayabilirim.							
3	Başkalarının bir şeye nasıl tepki vereceğini bilirim.							
4	Bazı şeylerin beni neden mutlu ettiğini bilirim.							
5	Davranışlarımla neyi elde etmeye çalıştığımı bilirim.							
6	Gruptaki bir kişinin ne zaman sıkıntılı hissettiğini anlayabilirim.							
7	Bazı şeylere neden ilgi duyduğumu bilirim.							
8	Diğer insanların söylediklerinde samimi olmadıklarını anlayabilirim.							
9	Duygularımı anlarım.							
10	Diğer insanlar düşüncelerini sakladığında bunu anlarım.							
11	Güçlü yönlerimin neler olduğunu bilirim.							
12	Diğer insanların bir şeyi komik bulmuş gibi davranmalarını anlarım.							
13	Bir konu hakkında neden kararlı bir fikre sahip olduğumu bilirim.							
14	Moralimin neden bozuk olduğunu bilirim.							
15	Bir insanın güvenilir olup olmadığını anlarım.							
16	Davranışımın nedenlerini bilirim.							
17	Diğer insanlar birinden faydalandığında bunu anlarım.							
18	Başka birinin söylediklerimden sıkılıp sıkılmadığını anlarım.							
19	Bir insanın yüzüne baktığımda onun nasıl hissettiğini anlarım.							
20	Zor bir durumda benim için en iyi kararın ne olduğunu bilirim.							

Scoring

Items are scored by calculating the average of the responses (never = 1, rarely = 2, sometimes = 3, half the time = 4, often = 5, usually = 6, always = 7).

Other-Certainty = 2, 3, 6, 8, 10, 12, 15, 17, 18, 19

Self-Certainty = 1, 4, 5, 7, 9, 11, 13, 14, 16, 20

Other-Self Difference (distinction) = Other-Certainty – Self-Certainty

Because the simple difference score is confounded with the Self-Certainty and Other-Certainty scales, it is recommended that the analysis of the Other-Self difference be conducted using Conditional Regression Analysis (CRA; Humberg et al. 2018).