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Articles

Psychometric Properties of the Toronto Alexithymia Scale in Italian Adolescents

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Abstract

Background: Alexithymia, a personality construct inhibiting emotional awareness, remains a challenging area of study, particularly among adolescents. Utilizing the Toronto Alexithymia Scale-20 (TAS-20), this research investigates its factorial structure and psychometric properties in community adolescents.

Method: Through two separate studies, the factor structure of the TAS-20 is evaluated in samples of adolescents and the new factor structure is explored in relation to the emotional-behavioral functioning of adolescents. Specifically, in Study 1, a total of 416 adolescents aged between 14 and 18 years (Mage = 16.4; SD = 1.36) were included, of whom 42.5% were males. In Study 2, a total of 114 adolescents aged between 14 and 18 years (Mage = 15.65; SD = 1.2) were included, of whom 30.7% were males.

Results: Study 1, employing exploratory factor analysis, revealed a 12-item three-factor solution (49.11% of variance), termed Lack of Emotional Awareness (LEA, including items related to difficulties to identify or describe feelings), Lack of Attitude towards Introspection (LAI), and Tendency towards Concreteness (TC). Confirmatory factor analysis confirmed this structure. Study 2 replicated the TAS-12 structure in a separate sample, affirming its robustness. Gender differences were examined, indicating that girls had higher scores in LEA and LAI, aligning with previous research. Lastly, associations with emotional-behavioral functioning demonstrated LEA's links to internalizing and externalizing problems, while LAI was associated with anxiety/depression, and TC did not show significant associations.

Conclusions: These findings suggest the TAS-12 is a suitable tool for assessing alexithymia in adolescents, albeit with caution due to limitations in generalizability. Further research in clinical populations and cross-cultural contexts is recommended. Importantly, the TAS-12 may support early identification of emotional processing difficulties in adolescents, which are often linked to internalizing and externalizing symptoms. Clinically, this tool could assist practitioners in tailoring interventions aimed at improving emotional awareness and regulation, potentially mitigating associated psychological distress. Further research in clinical populations and cross-cultural contexts is recommended.

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1. Introduction

Alexithymia is a firmly established personality construct that hampers and disrupts normal affect-regulating abilities (Taylor & Bagby, 2013). Nemiah et al. (1976) conceptualized the term "alexithymia," literally meaning "lack of words to express emotion," as a construct consisting of the following core characteristics: (a) difficulty identifying feelings and distinguishing between feelings and the bodily sensations of emotional arousal; (b) difficulty in finding words to describe feelings to other people; (c) constricted imaginal processes, as evidenced by a paucity or absence of fantasies referable to drives and feelings; and (d) a cognitive style that is concrete and externally oriented (Gangemi et al., 2021; Kiskimska & Martínez-Sánchez, 2023; Luminet et al., 2018; Taylor & Bagby, 2013; Taylor et al., 1997). Decades of research with adult populations have demonstrated significant associations between elevated levels of alexithymia and a wide range of physical (Chatzi et al., 2009; Korkoliakou et al., 2014; Martínez et al., 2015; Pintaudi et al., 2021; Renzi et al., 2020; Ricciardi et al., 2023) and mental disorders (Biolcati et al., 2021; De Berardis et al., 2013, 2017; De Panfilis et al., 2015; Di Giuseppe & Conversano, 2022; Di Trani et al., 2017; Li et al., 2015; Nouemssi et al., 2021), calling for more investigation into this construct.

As regards physical disorders, alexithymia has been consistently linked to adverse outcomes in both chronic and general medical conditions. Individuals with high levels of alexithymia often struggle to identify and articulate emotional distress, which can lead to maladaptive coping strategies, poorer treatment adherence, and increased somatic symptom reporting. In chronic illnesses such as diabetes, hypertension, and chronic pain disorders, alexithymia has been associated with worse disease management and heightened perception of symptom severity (Lumley et al., 2007; Mattila et al., 2009). Moreover, alexithymia is linked to increased healthcare utilization due to persistent unexplained physical symptoms and reduced health-related quality of life (Taylor & Bagby, 2013).

Within this framework, several authors emphasize the importance of studying alexithymia in youths, particularly in adolescence (Parker et al., 2010; Taylor & Bagby, 2012), given it is considered a critical period for the development of personality and related risks and vulnerabilities (Parker et al., 2010; Reardon et al., 2009; Taylor & Bagby, 2012). Moreover, adolescents' alexithymia appears to be associated with poor physical and mental health, both in adolescence and adulthood (Ballarotto et al., 2017; Cerutti et al., 2020; Rieffe et al., 2010; Tambelli et al., 2021).

Regarding the latter, alexithymia has been associated with the expression of symptomatology linked to mood-emotional alteration (i.e., internalizing symptoms such as anxiety, depression,

and somatic complaints) and externalizing symptoms in the form of behavioural problems such as aggressive or rule-breaking behaviours (Honkalampi et al., 2009; Pace et al., 2023; Rieffe et al., 2010). Therefore, investigating alexithymia in adolescents would help further explore this developmental theory of alexithymia and increase knowledge in this field, which may contribute to the development of clinical intervention programs aimed at promoting emotional awareness to counteract the negative consequences of emotional difficulties (Runcan, 2020).

However, one major limitation of investigating alexithymia in adolescents is the use of adult measures to assess the construct. Specifically, almost all existing research studies on adolescent alexithymia have utilized the twenty-item Toronto Alexithymia Scale (TAS-20; Bagby et al., 1994a), which is the most widely used measure for assessing alexithymia (Loas et al., 2017; Parker et al., 2010). The importance of adapting the TAS-20 for use with adolescents is highlighted by several crucial factors. Adolescence is primarily a critical developmental phase marked by significant changes in emotional, psychological, and social aspects. During this period, the ability to recognize and articulate emotions is crucial, as it supports emotional regulation, improves social interactions, and strengthens mental well-being. The presence of alexithymia in young individuals can hinder their emotional development, increase psychological distress, and raise the risk of mental health issues. Therefore, a dependable alexithymia assessment tool tailored for adolescents could facilitate early detection, intervention, and support for those facing challenges in managing (Teixeira et al., 2022). The TAS-20 consists of three subscales: Difficulty Identifying Feelings (DIF), Difficulty Describing Feelings (DDF), and Externally Oriented Thinking (EOT), representing a three-factor structure that has been well-validated in various adult populations (Parker et al., 2010). However, the suitability of this three-factor structure is not fully supported by contrasting findings in the adolescent population. Specifically, six studies found the best fit for the original three-factor model (Joukamaa et al., 2007; Karukivi et al., 2010a; Loas et al., 2012; Parker et al., 2010; Säkkinen et al., 2007; Zimmermann et al., 2007). In contrast, four other studies found a better fit for a four-factor model (Craparo et al., 2015; Ling et al., 2016; Loas et al., 2017; Meganck et al., 2012).

In addition to these inconsistent results, another problem is that the TAS-20 used with adolescent samples often exhibits poor psychometric properties, such as low internal reliability indicated by unacceptable Cronbach's alpha values (Loas et al., 2017). One possible explanation for this phenomenon, suggested by Parker et al. (2010), is the age differences in reading and comprehension levels of the TAS-20, particularly for the EOT factor (Loas et al., 2017). Indeed, Loas and colleagues (2017) examined the measurement invariance of the factor structure for the TAS-20 in groups of young adolescents (13 to 14 years), middle adolescents (15 to 16 years), older adolescents (17 to 18 years), and young adults (19 to 21 years old). They found that the

original three-factor model of the scale fit the data well only in the young adult sample, while the model was only marginally supported for the older and middle adolescent groups and not supported in the youngest group (Bagby et al., 2020).

The effect of binary gender could also be considered when testing the best-fitting factorial structure of the TAS-20 in adolescents, considering the different gender differences in the results depending on the type of outcome considered. For example, there is a higher prevalence of alexithymia in females when employing a categorical approach (Joukamaa et al., 2007; Manninen et al., 2011; Paull, 2013; Säkinen et al., 2007), but higher mean values in males when using a dimensional approach (Joukamaa et al., 2007; Parker et al., 2010; Schimmenti et al., 2017).

Given the contrasting findings in the literature, further investigation into the factorial structure of the TAS-20 is needed. This is in line with the general recommendation to improve our understanding of the suitability of using this questionnaire with adolescents (Bagby et al., 2020; Muzi et al., 2023).

Based on the aforementioned information, previous studies have not yet established the optimal factorial structure of the TAS-20 that provides satisfactory reliability indexes in this particular population. To address this gap, two different studies will be conducted. Specifically, Study 1 will examine the factorial structure of the TAS-20 in a sample of community adolescents. To understand the specific characteristics of adolescence, a bottom-up approach will be used, starting with the data. Exploratory factor analysis will be conducted, followed by confirmatory factor analysis. In Study 2, the factorial structure identified in Study 1 will be confirmed in another sample of adolescents. Additionally, gender differences and associations with adolescent emotional-behavioral functioning will be investigated.

Study 1

1.1 Hypothesis

Given the methodological limitations and conflicting findings regarding the factorial validity of the TAS-20 in adolescent populations, the present research sets out to clarify the instrument's psychometric structure in this age group. Study 1 aims to explore the underlying factorial structure of the TAS-20 in a community sample of adolescents using a bottom-up, data-driven approach. It is hypothesized that a structure different from the original three-factor model may better represent the construct in adolescents, potentially yielding a more developmentally appropriate configuration.

2. Materials and Method

2.1 Participants and procedure

Through collaboration with secondary schools, the TAS-20 was administered to a convenience sample of Italian adolescents aged 14-18 years. Inclusion criteria were: age between 14 and 18 years; absence of diagnoses for severe cognitive disabilities and/or psychiatric diagnoses; absence of psychological treatments; adequate understanding of the Italian language.

An a priori power analysis was conducted using the G*Power 3.1.9.6 software, to determine the sample size necessary to test our hypotheses. In our objectives, we aimed to verify the factorial structure of TAS-20. The degrees of freedom were 5. The chosen critical alpha value was .01, while the 1-beta value was .99, and the effect size w was .30. Based on this, a was determined required sample size of 373 subjects. Therefore, the sample we collected satisfies the size necessary to test the hypotheses formulated. The recruited sample was composed of 416 adolescents ranging from 14 to 18 years ($M_{age} = 16.04$; $SD = 1.36$), of whom 42.5% ($N = 177$) were males.

After obtaining written informed consent signed by both parents and the adolescent, the TAS-20 questionnaire was administered.

2.2 Measures

The Toronto Alexithymia Scale (TAS-20) is a self-report questionnaire consisting of 20 items (Bagby et al., 1994a, 1994b; Italian version - Bressi et al., 1996). Each item is rated on a 5-point Likert scale, ranging from 1 (Strongly disagree) to 5 (Strongly agree), with five items reverse-scored. The scale's structure comprises three factors that align theoretically with the alexithymia construct. Factor 1 (DIF) assesses the ability to identify and differentiate feelings from somatic sensations accompanying emotional arousal. Factor 2 (DDF) comprises five items measuring the capacity to articulate feelings to others, while Factor 3 (EOT) consists of eight items evaluating externally oriented thinking. Higher scores on these dimensions indicate greater maladaptive functioning. The scale demonstrates good internal consistency and test-retest reliability (the internal reliability coefficient for the total score is .86). Furthermore, research has shown the TAS-20 to be stable and consistent across both clinical and nonclinical populations (Parker et al., 2003), with its psychometric properties also evaluated in younger adolescents by Craparo et al. (2015). The TAS-20 has been utilized in various studies involving adult and adolescent samples with eating disorders (Corcos et al., 2000; Franzoni et al., 2013).

2.3 Data Analysis

Descriptive analyses were conducted, and the normality of the variables was checked. To explore the latent factor structure of the TAS-20 and to carry out an item analysis, a series of

exploratory factor analysis (EFA) was performed using maximum likelihood factoring estimation with Oblimin rotation. The Kaiser–Meyer–Olkin (KMO) measure of sampling adequacy was found to be .81, surpassing the recommended threshold of .60 for conducting the exploratory factor analysis. Additionally, Bartlett's test of sphericity, which tests the null hypothesis that none of the variables are significantly correlated, was significant ($\chi^2(190) = 1932.35, p < .001$), indicating the suitability of the data for factor analysis (Bartlett, 1950; Meyers et al., 2006).

Furthermore, a confirmatory factor analysis (CFA) of the structure derived by the EFA was performed using MPLUS 8.4 (Muthén & Muthén, 2007). According to literature (Bollen & Long, 1993), the model was assessed by several goodness-of-fit criteria: the chi-square value (χ^2); the Comparative Fit Index (CFI); the Tucker-Lewis Index (TLI); the Root Mean Square Error of Approximation (RMSEA); the Standardized Root Mean Square Residual (SRMR). Confirmatory analyses were also conducted on two models identified in the literature, i.e., the classic three-factor classic model (Bagby et al., 1994a, 1994b), and the four-factor model proposed by Ling et al., (2016).

All analyses were conducted through SPSS v.28 and MPLUS 8.4 software and considered statistically significant with $p < .05$.

3. Results

3.1 Item analysis of the TAS-20 applied to a sample of adolescents

In order to conduct an accurate item analysis on the TAS-20 applied to adolescent participants, a series of EFAs with Oblimin rotation (Kaiser's normalization) and ML extraction were analyzed. In the first (a five-factor solution was found - the first six eigenvalues are as follows: 4.47, 2.02, 1.78, 1.27, 1.15, 1), all 20 items of the TAS-20 were included, and five of them showed inadequate factorial characteristics. In particular, items 8 (i.e., "I prefer to just let things happen rather than to understand why they turned out that way"), and 17 (i.e., "It is difficult for me to reveal my innermost feelings, even to close friends") saturated too weakly ($< .35$) with the dimension they belonged to; items 7 (i.e., "I am often puzzled by sensations in my body"), TAS 9 (i.e., "I have feelings that I can't quite identify"), and item 13 (i.e., "I don't know what's going on inside me") showed more than one relevant saturation. Successively, the other two items (item 12, i.e., "People tell me to describe my feelings more", that saturated too weakly ($< .35$) with the dimension it belonged to, and item 10 (i.e., "Being in touch with emotions is essential") that showed more than one relevant saturation) were discarded analyzing a second EFA conducted on the remaining 15 items (a five-factor solution was found - the first six eigenvalues are as follows: 2.98, 1.96, 1.66, 1.13, 1.01, .86). Finally, a last item (item 4, i.e., "I am able to

describe my feelings easily”, that showed more than one relevant saturation) was excluded following the results of a third EFA conducted on the remaining 13 items (a three-factor solution was found - the first four eigenvalues are as follows: 2.89, 1.74, 1.66, .95).

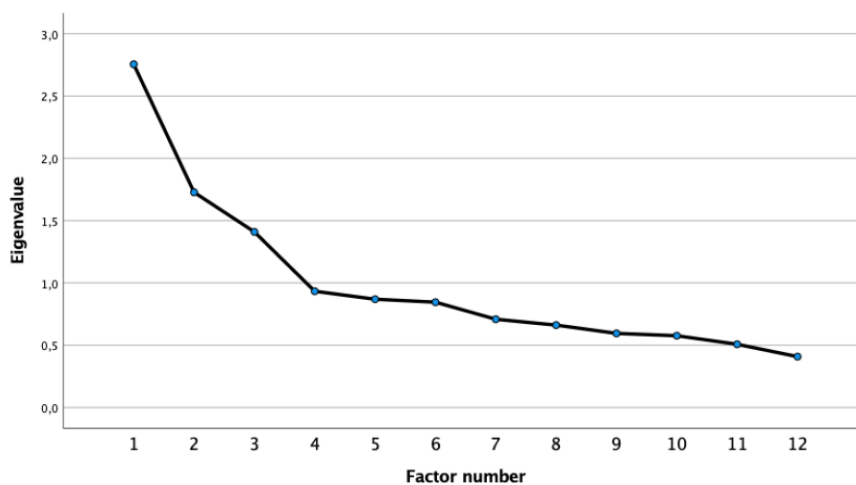
In Figure 1, a scree plot was reported illustrating the results of a final EFA on the 12-item version of the TAS for adolescents.

The scree plot indicated the expected three-factor solution as the best one (the first four eigenvalues are as follows: 2.76, 1.73, 1.41, .93), accounting for 49.11% of the variance. Of the three factors, the first factor included six items and explained 22.96% of the variance, with factor loadings ranging between $|.40|$ and $|.76|$. We named it “Lack of Emotional Awareness” (LEA) because it included items pertaining to both DIF and DDF of the original 4-factor model (for a detailed explanation of factors and names, see discussion below). The second factor explained 14.4% of the variance, had factor loadings ranging between $|.47|$ and $|.69|$, and contained three items of the previous factor EOT in the TAS-20. Because these three items indicated a lack of interest in one's own and other mental states, we called this second factor a “Lack of Attitude towards Introspection” (LAI). Lastly, the third factor comprised the other three items of TAS-20/EOT indicating the preference of the concrete and pragmatic aspects of the experience, so we called this third factor “Tendency towards Concreteness” (TC) (11.75% of variance explained, factor loadings range between $|.41|$ and $|.75|$).

The highest within-factors correlations were between LEA and TC ($r = -.26$), followed by the correlations between LAI and TC ($r = -.07$), and the lower was between LEA and LAI ($r = .004$).

Figure 1.

Scree Plot



Testing the robustness of the three-factorial structure of the TAS-12 for adolescents

The 12-item solution has been tested in the CFA. Confronting the fit criteria with those established by the literature (Hu & Bentler, 1999; Kenny, 2020; Steiger, 1990), this model showed acceptable fit indices, $\chi^2(50) = 103.27$, $p < .001$; CFI = .92; TLI = .90; RMSEA = .051 (90% CI = .037–.065); SRMR = .049. Factors score determinacies were .88 for F1, .76 for F2, and .75 for F3, confirming the goodness of the structure.

Table 1 shows factor loadings greater than .35, obtained from CFA. For each item, the factor of the original scale to which it belonged is indicated.

Table 1.

Factor loadings of the 12-item solution of the TAS

	F1: LEA	F2: LAI	F3: TC
1. I am often confused about what emotion I am feeling (DIF)	.76		
2. It is difficult for me to find the right words for my feelings (DDF)	.70		
11. I find it hard to describe how I feel about people. (DDF)	.51		
14. I often don't know why I am angry (DIF)	.48		
3. I have physical sensations that even doctors don't understand (DIF)	.42		
6. When I am upset, I don't know if I am sad, frightened, or angry (DIF)	.43		
18. I can feel close to someone. even in moments of silence (EOT)		.54	
5. I prefer to analyze problems rather than just describe them (EOT)		.52	
10. Being in touch with emotions is essential (EOT)		.60	
16. I prefer to watch "light" entertainment shows rather than psychological dramas (EOT)			.58
15. I prefer talking to people about their daily activities rather than their feelings (EOT)			.59
20. Looking for hidden meanings in movies or plays distracts from their enjoyment (EOT)			.39

Note. F1: LEA = Factor 1, Lack of Emotional Awareness; F2: LAI = Factor 2, Lack of Attitude towards Introspection; F3: TC = Factor 3, Tendency towards Concreteness. The factor of the original scale to which each item belonged is reported, *i.e.*, DIF = Difficulty Identifying Feelings; DDF = Difficulty Describing Feelings; EOT = Externally-Oriented Thinking.

Furthermore, in order to verify the structure of the scale, also the original three-factor model [DIF (items 1, 3, 6, 7, 9, 13, and 14), DDF (items 2, 4, 11, 12, and 17) and EOT (items 5, 8, 10, 15, 16, 18–20)] (Bagby et al., 1994a, 1994b), and the four-factor model proposed by Ling et al. (2016) [DIF (items 1, 3, 6, 7, 9, 13, and 14), DDF (items 2, 4, 11, 12, and 17), PR (items 5, 8, and 20), and IM (items 10, 15, 16, 18, and 19)] were tested through CFA.

Results showed that in both cases the models had not acceptable fit indices, i.e., for the three-factor model: $\chi^2(167) = 636.03$, $p < .001$; CFI = .73, TLI = .70; RMSEA = .082 (90% CI = .076–.089), SRMR = .084; and for the four-factor model: $\chi^2(164) = 627.89$, $p < .001$; CFI = .74, TLI = .70, RMSEA = .083 (90% CI = .076–.089), SRMR = .084.

4. Discussion Study 1 results

This first study aimed to examine the factorial structure of the TAS-20 in a sample of community adolescents, using a bottom-up approach. The exploratory factor analyses showed the inadequate psychometric characteristics of several items. Therefore, it was necessary to perform several EFAs to eliminate items that saturated too weakly with the dimension they belonged to (i.e., items 8, 17, 12), or that showed more than one relevant saturation (i.e., items 7, 9, 13, 10, 4).

The items that were eliminated belonged to all three factors of the classic TAS-20 model (DIF, DDF, and EOT), but they seem to be related to a deeper connection with the emotional sphere, which remains more abstract and not anchored to specific emotions. (e.g., items 13 and 17, see above). On the other hand, the items that emerge from the EFA, whose factorial structure is also confirmed in the CFA, appear to be more closely linked to specific emotions (e.g., item 5, “I prefer to analyze problems rather than just describe them”, item 6, “When I am upset, I don’t know if I am sad, frightened, or angry”, item 14, “I often don’t know why I am angry”; item 15, “I prefer talking to people about their daily activities rather than their feelings”). As you can see, in these latter items, specific emotions are mentioned, or more specific situations are exemplified compared to the items that were eliminated. The adolescent period is a time in which the youth are involved in several tasks comprising: negotiating puberty and completing the growth, dealing with a sexually dimorphic body profile, maturing cognitive skills and a specific personal and sexual individuality, and acquiring emotional and personal independence from their parents (Christie & Viner, 2005). The emotional area is particularly complex during this period and adolescents showed greater fluctuations in their emotional states, more intense emotional experiences, and stronger biases and faster reaction times toward emotional stimuli compared with children and adults (Gilbert, 2012; Silk et al., 2009). Therefore, we can wonder if, during this period, it could be "naturally" difficult to understand certain emotions needing to mention a specific emotion to reflect upon in their experiences.

The factorial structure emerging from the data of our adolescent sample is based on a three-factor model, which is different from the original four-factor model. Analyzing the factor loadings shown in Table 1, we can define the first factor as "Lack of Emotional Awareness" (LEA), as it comprises items regarding difficulties in being aware and in contact with one's own feelings with consequent difficulties in communicating affective dimensions to others. In fact,

the first factor was composed of items belonging to DIF and DDF in Bagby et al. (1994a, 1994b) model.

The second and the third factors were composed of three items of EOT, respectively. Previously, other authors (Ling et al., 2016; Meganck et al., 2012) highlighted the EOT tendency to split into two factors called "pragmatic thinking" and "lack of subjective significance or importance of emotions". In this study, the EOT factor seems to divide differently. Specifically, the second factor identified can be termed "Attitude towards introspection-lack thereof" (LAI) because it comprises items 5, 10, and 18, describing an attitude in examining and in touch with one's own mental and emotional processes. These three items are all reversed ones, so the factor label includes the note "lack of" to clarify that it should be used to evaluate the lack of attitude toward introspection. The third factor identified was named "Tendency towards concreteness" (TC) because it comprises items 15, 16, and 20, which highlight a tendency to focus one's thoughts on concrete and pragmatic aspects rather than on emotional and introspective aspects. As previously highlighted, this factorial model also demonstrated robustness in the CFA and showed better fits compared to the classic three-factor model (Bagby et al., 1994a, 1994b), as well as the four-factor model proposed by Ling and colleagues (2016), calling for further testing of this factorial structure in other samples for confirmation.

Study 2

5. Hypothesis

Based on the previous findings, Study 2 will test the factorial solution identified in Study 1 through confirmatory factor analysis in a separate adolescent sample. Additionally, it is hypothesized that gender will moderate the expression of alexithymia, with differences in factor scores across male and female participants. Furthermore, it is expected that alexithymia—particularly difficulties in identifying and describing feelings—will be positively associated with internalizing and externalizing emotional-behavioral symptoms, supporting its relevance to adolescent mental health.

6. Materials and Method

6.1 Participants and procedure

An a priori power analysis was conducted using the G*Power 3.1.9.6 software, to determine the sample size necessary to test our hypotheses. In our objectives, we wanted to verify a difference between the means based on gender ($k = 2$). The number was therefore calculated based on ANOVA analyzes conducted. The number of groups considered was two (males and females). The degree of freedom in the numerator was 1. The chosen critical alpha value was .05, while the 1-beta value was .95, and the effect size F was .45. Based on this, a was determined required sample size of 100 subjects. Furthermore, we aimed to verify possible associations between

adolescents' levels of alexithymia and their emotional-behavioral. An a priori power analysis was conducted. The chosen critical alpha value was .05, while the 1-beta value was .95, and the effect size was .30. Based on this, a was determined required sample size of 115 subjects. Therefore, the sample we collected satisfies the size necessary to test the hypotheses formulated.

Through collaboration with a secondary school, 117 families of adolescents were contacted. After obtaining written informed consent from both parents and adolescents, a battery of questionnaires (described below) was administered to them. The administration takes place in groups during a classroom lecture. Inclusion criteria were: age between 14 and 18 years; absence of diagnoses for severe cognitive disabilities and/or psychiatric diagnoses; absence of psychological treatments; adequate understanding of the Italian language. Three adolescents were excluded from the total convenience sample, due to many missing answers. The final sample was composed of 114 adolescents (69.3% females; Mage=15.65 years; SD=1.2).

6.2 Measures

The Toronto Alexithymia Scale – 20 items (TAS-20; Bagby et al., 1994a, 1994b; Italian version – Bressi et al., 1996), described above.

The Youth Self Report 11-18 years. The YSR (Achenbach & Rescorla, 2001; Italian Version-Frigerio et al., 2004) is a self-report questionnaire for the study of psychological/psychiatric symptoms, and it consists of 112 items exploring different symptoms/behaviors in the last six months. Each item has to be rated on a three-point scale ranging from 2, indicating that the symptom is present most of the time or applies well, to 0, indicating the absence of symptom or problem behavior. The YSR total problem scale can be divided into nine syndrome subscales: Withdrawn/depressed, Somatic complaints, Anxious/depressed, Social problems, Thought Problems, Attention problems, Delinquent behavior, Aggressive behavior, and Self-destructive/identity problems. Withdrawn/depressed, Somatic complaints, and Anxious/depressed together comprise a broad Internalizing problems dimension, whereas Delinquent and Aggressive behaviors together constitute an Externalizing problems dimension. The sum of all scales scores provides a Total score. This questionnaire has shown good psychometric properties (internal consistency and reliability). Cronbach's alpha values ranged from .68 to .84 for subscales, and a Cronbach's alpha of .92 was obtained for the Total Score in the present study.

6.3 Data Analyses

Descriptive analyses (frequencies, means [M], and standard deviations [SD]) were reported, and the normality of the variables was assessed. To examine the factorial structure of the TAS-12, CFA was performed using MPLUS 8.4 software. Subsequently, a univariate analysis of variance was conducted to examine potential gender differences in both the TAS-12 scores and the YSR.

Finally, correlation analyses using Pearson's correlation coefficient were conducted to explore positive associations between the factors of the TAS-12 and the dimensions of the YSR. All analyses were conducted through SPSS v.28 and MPLUS 8.4 software and considered statistically significant with $p < .05$.

7. Results Study 2

7.1 CFA

In order to verify the factorial structure, a CFA of the model identified in Study 1 was conducted. The results revealed acceptable fit indices: $\chi^2(50) = 60.38$, $p > .05$; CFI = .95; TLI = .94; RMSEA = .043 (90% CI = .000–.077); SRMR = .061. The factor score determinacies were .90 for F1, .79 for F2, and .96 for F3, confirming the robustness of the structure.

7.2 Gender differences

To examine gender differences in alexithymia and emotional-behavioral functioning, an analysis of variance (ANOVA) was conducted. The independent variable was gender, while the dependent variables included the three factors of TAS-12 and the YSR subscales and total score. Table 2 presents the results, indicating that girls had higher scores on LEA ($p < .001$).

Table 2.

Average scores and standard deviations of males and females on scores at TAS-12 and YSR

	Boys	Girls	F (1,112)	Eta squared	<i>p</i>
TAS-12/LEA	15.09 (4.82)	18.90 (4.94)	14.67	.116	<.001
TAS-12/LAI	10.00 (2.71)	11.06 (2.65)	3.84	.033	.052
TAS-12/TC	8.54 (2.60)	9.02 (2.53)	.87	.008	.354
YSR/Anxious/Depressed	5.80 (3.85)	8.46 (4.35)	9.68	.080	.002
YSR/Withdrawn /Depressed	4 (3.24)	4.87 (3.27)	1.73	.015	.191
YSR/Somatic Complaints	3.06 (2.28)	5.89 (3.22)	22.05	.165	<.001
YSR/Social Problems	3.11 (3.16)	4.28 (3.39)	2.97	.026	.087
YSR/Thought Problems	4.63 (3.62)	5.37 (3.88)	.913	.008	.341
YSR/Attention Problems	6.46 (3.16)	6.89 (3.03)	.474	.004	.493
YSR/Delinquent behavior	7.03 (5.23)	4.72 (4.53)	5.71	.048	.019
YSR/Aggressive behavior	8.91 (5.15)	9.81 (4.95)	.776	.007	.380
YSR/Internalizing Problems	12.86 (7.12)	19.21 (9.25)	13.06	.104	<.001
YSR/Externalizing Problems	15.94 (9.41)	14.53 (8.33)	.642	.006	.425
YSR/Total score	48.03 (21.69)	55.9 (23.33)	2.88	.025	.093

Note. LEA = Lack of Emotional Awareness; LAI = Lack of Attitude towards Introspection; TC = Tendency towards Concreteness.

7.3 Associations between alexithymia and emotional-behavioral functioning

Finally, to examine the associations between adolescents' levels of alexithymia and their emotional-behavioral functioning, a Pearson correlation analysis was conducted. Table 3 displays significant associations between LEA and YSR scores of anxiety/depression ($p < .001$), withdrawal/depression ($p < .001$), somatic complaints ($p < .001$), social problems ($p < .05$), thought problems ($p < .001$), attention problems ($p < .001$), aggressive behavior ($p < .05$), internalizing problems ($p < .001$), and total score ($p < .001$). Additionally, LAI was significantly associated with anxiety/depression ($p < .05$). No association was found between TC and adolescents' emotional-behavioral functioning.

Table 3.

Pearson correlation coefficients between TAS-12 factors, age and emotional-behavioral functioning (YSR)

	LEA	LAI	TC
Age	-.039	.124	-.006
YSR/Anxious/Depressed	.424**	.221*	.088
YSR/Withdrawn /Depressed	.378**	.062	.119
YSR/Somatic Complaints	.398**	.179	.176
YSR/Social Problems	.208*	.077	.027
YSR/Thought Problems	.355**	.183	.170
YSR/Attention Problems	.312**	.077	.123
YSR/Rule breaking behavior	-.051	-.212	-.036
YSR/Aggressive behavior	.246*	.124	.129
YSR/Internalizing Problems	.480**	.191	.148
YSR/Externalizing Problems	.114	-.048	.054
YSR/Total score	.385**	.123	.145

Note. LEA = Lack of Emotional Awareness; LAI = Lack of Attitude towards Introspection; TC = Tendency towards Concreteness ** $p < .001$; * $p < .05$.

8. Discussion Study 2

This second study aimed at investigating the factorial structure of the TAS-12 identified in Study 1 in another sample of adolescents, also investigating gender differences and associations with adolescents' emotional-behavioral functioning.

The CFA conducted confirmed the robustness of the structure, which showed acceptable fit indices. This is a promising result, as different studies that have investigated the factorial structures of the TAS-20 in adolescent samples have found different factorial structures in different samples (e.g., Craparo et al., 2015; Joukamaa et al., 2007; Ling et al., 2016; Loas et al., 2017; Zimmermann et al., 2007). This is the first study that confirms a factorial structure of the TAS-20 across various adolescent samples.

Regarding gender differences, findings showed that girls had a higher lack of emotional awareness and lack of attitude towards introspection than boys. This result is in line with only part of previous studies on community samples, showing girls as more alexithymic (Joukamaa et al., 2007; Manninen et al., 2011; Mendia et al., 2024; Paull, 2013; Säkkinen et al., 2007). However, their higher difficulties in identifying and describing feelings compared to boys at a dimensional level are only partly in line with existing findings (Muzi & Pace, 2020; Honkalampi et al., 2009; Manninen et al., 2011; Paull, 2013), contrasting other ones (Joukamaa et al., 2007; Parker et al., 2010; Schimmenti et al., 2017). Differently, finding boys showing greater externally oriented thinking is fully in line with existing literature (Karukivi et al., 2010a, 2010b; Muzi & Pace, 2020; Paull, 2013; van der Crujisen et al., 2019). A possible explanation is that, during adolescence, girls are more careful about their inner state, so they live this peculiar developmental phase experiencing confusion about their feelings and emotional states, whereas boys appear more immature and/or less interested in paying attention to inner emotional states. Finally, we examined the associations between adolescents' levels of alexithymia and their emotional-behavioral functioning. Findings showed significant correlations between Lack of Emotional Awareness and the total levels of emotional-behavioral symptoms shown by the adolescents, specifically internalizing symptoms such as anxiety, depression, withdrawal, and somatic complaints, as well as social problems, thought problems, attention problems, and aggressive behaviors. Additionally, a lack of attitude toward introspection was significantly associated with higher levels of anxiety and depression, while a tendency toward concreteness and pragmatism was not associated with adolescents' emotional-behavioral functioning. Taken together, these results may highlight the specificities of the adolescent period. On the one hand, a lack of awareness of emotions is associated with various areas of dysfunctional emotional-behavioral profiles, both in the internalizing and externalizing domains, in line with previous findings (Kahn & Jaffee, 2022; Honkalampi et al., 2009; Rieffe et al. 2010; Venta et al., 2013). On the other hand, the results show that a tendency toward concrete, pragmatic thinking is not associated with difficulties in emotional-behavioural functioning. We can hypothesize that this tendency might be natural during adolescence, a period characterized by intense and fluctuant emotional states, both positive and negative (Gilbert, 2012). However, overall, the TAS-12 showed correlations with emotional-behavioural problems consistent with previous findings, which can further support the robustness of this proposed factorial structure.

9. Strengths and Limitations

Overall, the two studies suggest the robustness and the stability of the results of a shortened version of the instrument TAS-20, called TAS-12 when used in two large samples of Italian adolescents. However, different limitations confine the soundness of these findings. First, the

use of a community sample only from one Country, i.e., an Italian sample coming from low-risk families, is a limitation that calls for further cross-cultural studies to confirm the TAS-12 factorial structure in other populations of adolescents from different cultural backgrounds and in different languages. Moreover, the TAS-12 should be administered to adolescents from clinical and at-risk populations as well, in order to check the feasibility of its use across different populations. Furthermore, other psychometric properties of the study were not assessed at this stage, for example, its concurrent validity with another instrument, such as the Toronto Structured Interview for Alexithymia (Muzi et al., 2023), or test-retest reliability, and can be addressed by future investigation. Lastly, in a general paucity of studies. The TAS-12 could be a feasible alternative to TAS-20 for assessing alexithymia in adolescent samples aged 13-18 years old, but further cross-cultural studies, including either community, at-risk, and clinical samples, are needed to confirm this statement.

10. Conclusions

The findings from the two studies provide valuable contributions to the understanding and measurement of alexithymia in adolescence. Study 1 proposed a revised 12-item version of the TAS (TAS-12), identifying a three-factor structure—Lack of Emotional Awareness, Lack of Attitude Toward Introspection, and Tendency Toward Concreteness—which better fits the developmental characteristics of adolescents than existing adult-based models. Study 2 confirmed the robustness and replicability of this structure in an independent sample, providing the first evidence of a stable factorial structure of the TAS in adolescents across different groups. Furthermore, the studies revealed meaningful gender differences and demonstrated that specific alexithymic dimensions, particularly lack of emotional awareness and introspection, are significantly associated with a wide range of emotional-behavioral problems in youth. In contrast, a tendency toward concrete thinking did not appear to be maladaptive, possibly reflecting a normative developmental feature of adolescence. Together, these results underscore the importance of developmentally appropriate tools for assessing alexithymia and suggest that the TAS-12 may serve as a promising instrument for identifying emotional difficulties in adolescents, with implications for early intervention and clinical practice.

Ethical approval

The study received ethical approval from the Ethics Committee of the Department of Dynamic and Clinical Psychology, and Health Studies, University of Rome “La Sapienza” (Protocol No. 0000598, 11/04/2022).

Informed Consent Statement

Written consent from adolescents and their parents were obtained.

Data Availability Statement

The data are available upon request to the authors.

Conflict of Interest Statement

The authors declare that the research was conducted in the absence of any potential conflict of interest.

Authors' Contribution

Conceptualization: GB; SM; AR; MDT; CSP; Methodology: FD; MDT; CSP; Formal analysis: GB; FD; Data Curation: GB; SM; SC; CSP; Writing - Original Draft: GB; AR; SM; Writing - Review & Editing: GB; AR; MDT; CSP; Visualization: MDT; CSP; Supervision: MDT; CSP; Project administration: GB; AR; MDT; CSP.

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