

## The 20-Item Toronto Alexithymia Scale III. Reliability and factorial validity in a community population

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### Abstract

**Objective:** Some researchers have questioned the stability of the three-factor structure of the 20-Item Toronto Alexithymia Scale (TAS-20) or the reliability of one or more factors of the scale. The aim of this study was to assess the replicability of the factor structure of the TAS-20 in a large community sample and to determine also whether the same three-factor structure can be recovered in men and women. The study also assessed the reliability of the scale and the influence of gender, age, and education on TAS-20 scores. **Method:** The TAS-20 was administered to 1933 adults (880 men and 1053 women) residing in several small cities and towns in Ontario, Canada. The factor structure of the scale was

assessed using confirmatory factor analysis (CFA). **Results:** The three-factor structure of the TAS-20 was replicable in the entire community sample and also separately in men and women. The TAS-20 and its three factors demonstrated internal reliability, and the variables of gender, age, and education accounted for relatively small or modest amounts of variability in total TAS-20 and factor scale scores. **Conclusion:** The results provide strong support for the reliability and factorial validity of the TAS-20 and indicate the importance of using CFA when assessing the replicability and theoretical integrity of the factor structure of the scale. © 2003 Elsevier Inc. All rights reserved.

**Keywords:** Alexithymia; Factorial validity; Toronto Alexithymia Scale

### Introduction

The 20-Item Toronto Alexithymia Scale (TAS-20) was developed a decade ago [1–3] and has since become the most widely used instrument for assessing alexithymia in both research and clinical practice [4–6]. Over the years, there has been an accumulation of evidence that the scale is reliable and valid [7]. Some researchers, however, have questioned the stability of the factor structure [8,9] or the reliability of one or more factors of the TAS-20 [10–12]. Others have expressed doubts that a self-report scale can adequately assess a construct that involves impairments in self-awareness [11,13–15]. There is uncertainty also over the extent to which TAS-20 scores are influenced by gender, age, and education [2,12,14,16,17]. And there are questions

as to whether the TAS-20 and the construct of alexithymia itself are valid across languages and cultures [18–20]. The purpose of this paper and a companion paper is to respond to some of these concerns. In the present paper, we report a study, which assesses the reliability and factorial validity of the TAS-20 in a large Canadian community population. In the companion paper [21], we review findings from a large number of cross-cultural studies that have evaluated different translations of the scale.

It is important to emphasize that the TAS-20, in contrast to previous measures of alexithymia, was developed using a combined empirical and rational method of scale construction with the items written to reflect the substantive domains of the alexithymia construct as defined originally by Nemiah et al. [22]. The TAS-20 yields three factors (difficulty identifying feelings, difficulty describing feelings, and externally oriented thinking), which are congruent with the salient facets of the construct [2]. Items assessing fantasy and imaginal activity, which are reduced in alexithymia, were eliminated during the development of

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the scale primarily because they had high correlations with measures of social desirability. There is evidence to suggest that reduced fantasy and imaginal activity are assessed indirectly by the externally oriented thinking factor, which correlates negatively with a measure of fantasy and imaginal activity [3]. The linking of reduced fantasy activity with externally oriented thinking is consistent with Marty and de M'Uzan's [23] concept of *pensée opératoire* from which the alexithymia construct is partly derived. Other more recently developed measures of alexithymia deviate from Nemiah et al.'s [22] definition of the construct; for example, the self-report Bermond-Vorst Alexithymia Questionnaire [24] includes a factor that assesses "emotionalizing" (which is defined as "the degree to which someone is emotionally aroused by emotion inducing events") and the Observer Alexithymia Scale [25] includes factors that assess somatization, humorlessness, and rigidity. In our view, these additional characteristics should be considered correlates or physical and psychological sequelae of alexithymia rather than core features of the construct.

The three-factor structure of the TAS-20 has been replicated in both university student and general psychiatric outpatient populations in North America by the method of confirmatory factor analysis (CFA) [2,26]. Some investigators have argued, however, that the three-factor structure is unstable or that the items are better represented by a two-factor solution. Loas et al. [27], for example, conducted principal components analysis on data collected from students at a French university and obtained a two-factor solution; the items assessing difficulty identifying feelings and difficulty describing feelings constituted a single factor and the items assessing externally oriented thinking comprised a second factor. Erni et al. [8] also obtained a two-factor solution when they used principal components analysis to determine the factor structure of a German translation of the TAS-20 with data collected from a group of Swiss medical students.

It is important to recognize that principal components analysis is an exploratory approach which is appropriate when a researcher is conducting initial forays into an area about which little is known [28]. CFA, on the other hand, is a hypothesis testing procedure that enables researchers to evaluate *a priori* theoretical models that form the basis of the factor structure of a test. It can also be used to compare the equivalence of factor structures in different samples [28,29]. As such, CFA is more appropriate than an exploratory factor analysis (EFA) for assessing the replicability of the three-factor model of the TAS-20 across different samples and cultures. When CFA was applied to the French data collected by Loas et al. [27], the original three-factor structure of the scale was found to provide a better fit than a two-factor solution [30]. And although Erni et al. [8] did not subsequently report a CFA of their data collected from German-speaking Swiss medical students, Parker et al. [26] had previously replicated the three-factor structure of

the scale by this method in a comparable sample of German university students.

In a more recent study, Kojima et al. [12] conducted a principal components analysis on data collected from a large sample of postmyocardial infarction patients of whom 95% were French Canadian. Although a three-factor solution was obtained, the item loadings did not fully correspond with those obtained in the original development of the scale. In contrast, in another recent study that was conducted in France, Loas et al. [31] used CFA and were able to replicate the original three-factor structure of the TAS-20 in both a large sample of normal adults and a large sample of psychiatric patients with eating disorders or substance use disorders.

In other research, Haviland and Reise [32] conducted confirmatory factor analyses on data sets from medical students and psychoactive substance-dependent inpatients in the United States, and reported that the three-factor solution provided a poor fit to the data in both samples. Examination of the results for the medical student sample, however, reveals that one of the goodness-of-fit indices (GFIs) met its criterion standard and two other indices were just below their criteria standards. Moreover, several other confirmatory factor analytic studies with US and Canadian student samples have yielded results that met the criterion standards for the same three GFIs [20,26]. In addition, the substance-dependent patients constituted an unusual sample as they were recently abstinent from alcohol or psychoactive drugs and completed the TAS-20 within their first week of hospitalization [33]; as such, the results of the CFA have little generalizability.

Some researchers have expressed concern about the internal consistency of one or more subscales derived from the TAS-20 factors [10–12,31,34], especially since estimates of coefficient  $\alpha$  in some studies have been below the generally recommended standard of  $>.70$  [35]. In a study with US Air Force recruits, for example, Davies et al. [10] reported an  $\alpha$  coefficient of .81 for Factor 1, but extremely low  $\alpha$  coefficients for Factors 2 (.365) and 3 (.007). It was subsequently discovered, however, that these researchers failed to reverse the scoring for the negatively keyed items on the scale; once the correct scoring was used, the  $\alpha$  coefficients increased to .76 for Factor 2 and .46 for Factor 3 [L. Stankov, personal communication, November 16, 1999].<sup>1</sup> In studies with other North American populations,  $\alpha$  coefficients range between .73 and .84 for the full TAS-20 and for the first two factors, and between .62 and .71 for the third factor [2,26,36]. Moreover, the mean interitem correlations for the three factors typically range between .20 and .40 [2,36], which is the range recommended by Briggs and

<sup>1</sup> In a separate study in which they correlated the TAS-20 with several self-report and objective indices of emotional intelligence, Davies et al. [10] mistakenly used a dichotomous rating format for the TAS-20 rather than the standard five-point Likert scale.

Cheek [37] for multifactor scales and indicates adequate homogeneity of the items for each factor.

Regretably, on the basis of the factor analytic studies by Haviland and Reise [32] and Loas et al. [27], or misleading information given by Davies et al. [10], some researchers (e.g., Jacob and Hautekeete [38]) have decided against using the TAS-20 and overlooked the substantial body of support for the reliability and validity of the scale. As Nunnally [35] points out, however, the results of factor analysis of a scale can be influenced by the type of subjects selected. Although the factor structure of translated versions of the TAS-20 has been cross-validated in normal adult samples in several different cultures [21], the replicability of the three-factor model for the original English version of the scale has been demonstrated only in relatively small samples of university students and psychiatric outpatients [2,26]. In addition, some investigators have found TAS-20 scores to be associated with male gender and higher age [14,17].

The aim of the present study was to assess the factor structure of the TAS-20 in a large adult community sample, and to determine also whether the same factor structure can be recovered in both men and women. The internal reliability of the TAS-20 and its three factors, and the influence of gender, age, and education on TAS-20 scores, were also reassessed.

## Method

### Subjects

The sample was comprised of 1933 adults (880 men and 1053 women) residing in several small cities and towns in Ontario, Canada. The participants were invited to take part in the study by means of advertisements posted in the local community. The mean age of the sample was 35.47 years (S.D. = 12.55); the mean level of education was 14.75 years (S.D. = 2.42). For ethnicity, 88.1% of the participants identified themselves as “White,” 3.0% as “Black,” 1.1% as “Asian,” 1.4% as “Native American,” and 6.4% did not indicate their background.

### Measure and procedure

The TAS-20 is a self-report scale comprised of 20 items [2]. Each item is rated on a five-point Likert scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*); five items are negatively keyed. The first factor (F1) in the three-factor model for the TAS-20 consists of seven items assessing the ability to identify feelings and to distinguish them from the somatic sensations that accompany emotional arousal (e.g., #1: “I am often confused about what emotion I am feeling” and #9: “I have feelings that I can’t quite identify”). Factor 2 (F2) consists of five items assessing the ability to describe feelings to other people (e.g., #4: “I am able to describe my feelings easily” and #17: “It is difficult for me to reveal my

innermost feelings, even to close friends”). Factor 3 (F3) consists of eight items assessing externally oriented thinking (e.g., #5: “I prefer to analyze problems rather than just describe them” and #20: “Looking for hidden meanings in movies or plays distracts from their enjoyment”). The TAS-20 was completed by the participants in their own homes under the supervision of one of several research assistants.

### Statistical analysis

In order to test whether the factor structure of the TAS-20 corresponds to the hypothetical three-factor model of alexithymia proposed and validated in our earlier studies [2,26], the items from the TAS-20 were subjected to CFA. As noted earlier, CFA differs from the more widely known and applied EFA in that it tests a hypothesized model wherein specific manifest variables (e.g., items) are proposed to represent specific latent variables (i.e., factors). In contrast, EFA extracts latent factors based on solely empirical associations among the manifest variables. CFA also offers a variety of statistical tests and indices designed to assess the “goodness-of-fit” of identified models; thus, it provides a straightforward evaluation of the proposed factor/theoretical structure.

To examine the proposed three-factor model for the TAS-20 in this large community sample, the correlation matrix consisting of the TAS-20 items was analyzed using CFA procedures with Statistica [39]. Each of the TAS-20 items was considered to be a measure of a single latent factor. Three latent factors were constructed corresponding to the factors obtained in the original development of the scale. Given the hypothesized association among the three facets of the alexithymia construct, an oblique (correlated) model was tested.

There are a wide variety of fit indices available to assess the statistical significance [40]. For the purposes of this study, we used the following indices: the GFI [41], the GFI adjusted for degrees of freedom (AGFI) [41], the comparative fit index (CFI) [42], the root mean square residual (RMSR) [42], and the root mean square error of approximation (RMSEA) [43]. Although the  $\chi^2/df$  ratio has long been employed as an indicator of model fit and is familiar to many researchers, it has been widely recognized as highly influenced by sample size, which would result in a higher possibility of rejection of the model with small discrepancies between sample covariance matrixes and the model-specified covariance matrix when the sample size is large [40,44]. As our sample was particularly large, this index of fit was not used, although we did retain the  $\chi^2$  statistic to examine differences in model fits (see below). The CFI and RMSEA were used because it has been argued recently that they provide more stable and accurate estimates than several of the other fit indices [40,44]. We included the other GFIs listed above as they were used in several previous evaluations of the TAS-20 and provide easy comparisons to these other data sets. Although there is no gold standard for accepting or rejecting a plausible model, we considered the model to have an adequate fit when the CFI > .90 [45]

Table 1  
Parameter estimates from the confirmatory factor analyses of the TAS-20

Items	Total sample ( <i>n</i> = 1933)	Men ( <i>n</i> = 880)	Women ( <i>n</i> = 1053)
<i>Factor 1: difficulty identifying feelings</i>			
1	.61	.63	.59
3	.43	.47	.38
6	.63	.59	.67
7	.55	.56	.53
9	.69	.68	.70
13	.69	.71	.67
14	.63	.66	.62
<i>Factor 2: difficulty describing feelings</i>			
2	.70	.65	.76
4	.62	.61	.62
11	.67	.71	.63
12	.58	.54	.60
17	.58	.57	.56
<i>Factor 3: externally oriented thinking</i>			
5	.36	.42	.35
8	.46	.47	.46
10	.60	.59	.58
15	.52	.52	.47
16	.41	.44	.37
18	.44	.40	.47
19	.62	.59	.61
20	.49	.42	.55

All parameter estimates are significant at the  $P < .05$  level.

and the RMSEA  $< .08$  [46]. The criterion of  $.08$  for the RMSEA is considered by some to be excessively liberal, with a coefficient of  $.05$  being necessary for unequivocal evidence of good fit; there is, however, general agreement that an RMSEA  $> .10$  is unacceptable [40,44]. The standards for the other GFIs were as follows: GFI  $> .90$ , AGFI  $> .85$ , and RMSR  $< .05$  [40,44,47]. Some of these criteria are more stringent than those used in our previous studies and recommended by Bentler [48], Cole [49], and Marsh et al. [50]. Chi-square tests were conducted to compare directly whether the three-factor model was a better fit than one-factor and two-factor models. The one-factor model was constructed by assigning all items to a single latent variable. The two-factor model was constructed by assigning the items assessing the ability to identify feelings and the ability to describe feelings to one latent factor, and the items assessing externally oriented thinking to a second latent factor. In order to determine which model best fit the item domain of the TAS-20, the one-factor and two-factor models were compared to the hypothetical three-factor model thought to represent the alexithymia construct. This analysis was carried out by taking the difference of the  $\chi^2$  and  $df$ 's for the one-factor and two-factor models and comparing them to the three-factor model by testing the resulting  $\chi^2$  value for significance. CFAs were also conducted to test whether the three-factor model was equivalent for men and women. The same indices were used to test the goodness-of-fit of the three-factor model in the two gender groups.

To evaluate the internal reliability and the item-to-scale homogeneity of the TAS-20, Cronbach  $\alpha$  coefficients and mean interitem correlation coefficients were calculated for the total scale and for each of the three factor scales. Pearson product moment correlations were calculated to examine relationships between TAS-20 scores and factor scores and age and education.

## Results

### Confirmatory factor analysis

The item to factor parameter estimates from the CFA with the three-factor model for the TAS-20 items are presented in Table 1; the GFIs are presented in Table 2. The GFI (.98), AGFI (.98), CFI (.97), RMSR (.05), and the RMSEA (.06), all met the criteria standards for adequacy of fit. All parameter estimates were significant at  $P < .05$ . The parameter estimate between F1 and F2 was  $.73$  ( $P < .05$ ), between F1 and F3 was  $.49$  ( $P < .05$ ), and between F2 and F3 was  $.63$  ( $P < .05$ ).

In evaluating whether the TAS-20 items were better represented using a one-factor model or a two-factor model, the difference in the goodness-of-fit chi-squares indicated that the three-factor solution offered a better fit to the data than the one-factor model [ $\chi^2$  difference = 1482.63 ( $df=3$ ),  $P < .001$ ] and two-factor model [ $\chi^2$  difference = 539.52 ( $df=2$ ),  $P < .001$ ].

Table 1 also presents the item to factor parameter estimates separately for men ( $n=880$ ) and women ( $n=1053$ ). The parameter estimate between F1 and F2 was  $.77$  for men and  $.72$  for women ( $P < .05$ ), between F1 and F3 was  $.50$  for men and  $.51$  for women ( $P < .05$ ), and between F2 and F3 was  $.66$  for men and  $.59$  for women ( $P < .05$ ). The GFIs for the male and female groups are shown in Table 2 and reveal that the three-factor model fit well in both genders.

### Psychometric properties of the TAS-20

The mean scores, standard deviations, internal reliability coefficients, and mean interitem correlations for the TAS-20

Table 2  
Goodness-of-fit indices for the confirmatory factor analyses of the TAS-20

Index	Total sample ( <i>n</i> = 1933)	Men ( <i>n</i> = 880)	Women ( <i>n</i> = 1053)
GFI	.98	.98	.98
AGFI	.98	.97	.97
CFI	.97	.97	.97
RMSR	.05	.05	.05
RMSEA	.06	.06	.06

GFI = goodness-of-fit index, AGFI = adjusted goodness-of-fit index, CFI = comparative fit index, RMSR = root mean square residual, RMSEA = root mean square error of approximation.



Table 3

Means, standard deviations, internal reliability coefficients (IRC), and mean interitem correlations (MIC) for the TAS-20 for men, women, and the entire sample

	Factor 1	Factor 2	Factor 3	TAS-20
<i>Men (n = 868)</i>				
Mean	14.51	13.16	19.62	47.30
S.D.	5.22	4.10	4.67	11.32
IRC	0.81	0.75	0.70	0.86
MIC	0.38	0.38	0.23	0.24
<i>Women (n = 1065)</i>				
Mean	14.27	11.96	17.93	44.15
S.D.	5.20	4.21	4.63	11.19
IRC	0.79	0.77	0.70	0.85
MIC	0.36	0.40	0.24	0.23
<i>Total (n = 1933)</i>				
Mean	14.38	12.50	18.70	45.57
S.D.	5.21	4.20	4.72	11.35
IRC	0.80	0.76	0.71	0.86
MIC	0.37	0.40	0.24	0.23

TAS-20 = 20-Item Toronto Alexithymia Scale, Factor 1 = difficulty identifying feelings, Factor 2 = difficulty describing feelings, Factor 3 = externally oriented thinking.

and its three factors are presented for the entire sample, and separately for men and women, in Table 3. With respect to mean scores, men and women did not differ on F1; however, men scored significantly higher than women on F2 ( $t=6.35$ ,  $df=1931$ ,  $P<.001$ ;  $\eta^2=.02$ ) and F3 ( $t=7.99$ ,  $df=1931$ ,  $P<.001$ ,  $\eta^2=.03$ ), and on the total TAS-20 ( $t=6.12$ ,  $df=1931$ ,  $P<.001$ ,  $\eta^2=.02$ ).

The correlations between age and the TAS-20 and its factors were low or nonsignificant: F1 was  $-.11$  ( $P<.05$ ), F2 was  $-.09$  ( $P<.05$ ), F3 was  $.00$  ( $P>.05$ ), and the total TAS-20 was  $-.08$  ( $P<.05$ ). The correlations between education and the various TAS-20 variables were also low: F1 was  $-.17$  ( $P<.05$ ), F2 was  $-.17$  ( $P<.05$ ), F3 was  $-.21$  ( $P>.05$ ), and the total TAS-20 was  $-.23$  ( $P<.05$ ).

## Discussion

The results of this study with a large English-speaking adult community sample provide strong support for the validity of the three-factor structure of the TAS-20. The three-factor model provided a better fit to the data than both a unidimensional model and a two-factor model. In addition, the parameter estimates for the relationships among the three factors provide evidence that the factors reflect three separate, yet empirically related, facets of the alexithymia construct. The three-factor structure of the TAS-20 was also replicable in men and women. These results are consistent with findings from earlier studies that used CFA to evaluate the factor structure of the TAS-20 [2,26,31], but contrast with results from studies that used principal components analysis to explore multiple solutions searching for the most

meaningful factor structure [8,12]. The latter approach can lead to controversy since different researchers can end up with very different interpretations depending on how many factors they decide to retain, what method of rotation they use, and what names they assign to the factors obtained [28,51].

The internal reliabilities of the full TAS-20 and its three factors were demonstrated in the present study by the values of the coefficient alphas, which all meet the recommended standard of  $>.70$  [32]. The homogeneity of the full scale and the factor scales was confirmed also by the mean interitem correlations, which are all within the optimal range between  $.20$  and  $.40$  [32]. Although in their study of US Air Force recruits, Davies et al. [10] obtained a coefficient  $\alpha$  of only  $.46$  for F3 (when the correct scoring was used), a study with a similar size and mean age sample of US university students yielded coefficient alphas for F3 of  $.62$  for men and  $.63$  for women [26].

Whereas some previous studies have reported a weak positive association between TAS-20 scores and age [14,17], other studies have found no association [2,16]. In the present study, the total TAS-20 and F1 and F2 correlated negatively with age; however, the magnitudes of the correlations were very low. Similar to findings from some other studies [14,16], the TAS-20 and its three factors correlated negatively with education, but again the magnitudes of these correlations were low. The finding that men scored significantly higher than women on the total TAS-20 and on the factors assessing difficulty describing feelings and externally oriented thinking is consistent with findings that have been obtained with several other community or university student samples [14,17,26]. In the present study, however, the  $\eta^2$  values indicate that the gender difference accounts for a trivial amount of the variance in the total scale and factor scale scores. In a recent study evaluating a French translation of the TAS-20, Loas et al. [31] found no significant gender difference in mean TAS-20 scores in both normal adult and psychiatric patient samples.

The mean scores obtained with our large community sample should be considered norms against which findings from future studies can be compared and assessed for clinical significance. It is noteworthy that a score that is one and one half standard deviations above the mean score for the entire community sample is very close to the cutoff score of  $\geq 61$  that has been established empirically for identifying individuals with high alexithymia [6].

Although the results of the present study strongly support the continuing use of the TAS-20 for clinical and research purposes, factorial validity is not sufficient to establish beyond question that the items of a scale are actually measuring what they are intended to measure [37,51]. For the TAS-20, however, additional evidence of construct validity has been provided by studies that have shown that the scale converges and diverges in theoretically meaningful ways with measures of closely related and unrelated constructs [3,6,7]. For example, the total scale and all three factors correlate

significantly and negatively with measures of psychological mindedness, need for cognition, emotional self-awareness, empathy, and openness to experience [3,52], and nonsignificantly with measures of agreeableness, conscientiousness, and excitement seeking [3]. Moreover, as is typical of measures of multifaceted constructs [53], the TAS-20 factors show discriminability when they are correlated with constructs that overlap with one or two facets of alexithymia (e.g., somatization and emotional creativity) but not with the entire alexithymia construct [7,54]. Although the TAS-20 correlates positively with measures of negative affectivity, there is evidence that it measures a construct that is distinct from neuroticism and depression [6,55], and that correlations with measures of somatization and emotional intelligence remain significant after controlling for negative affectivity [56]. And while some critics question the use of self-report scales to assess alexithymia, there is good agreement between TAS-20 scores and observer ratings of alexithymia [3,57–59], as well as evidence that the TAS-20 discriminates between individuals who perform well and those who perform poorly on tasks aimed at matching verbal or nonverbal emotional stimuli with verbal or nonverbal emotional responses [13]. Nonetheless, because research is enhanced by using multiple methods of measurement, we are currently developing a structured interview for assessing alexithymia.

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