



Review article

Twenty-five years with the 20-item Toronto Alexithymia Scale

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ABSTRACT

Objective: Twenty-five years ago, this journal published two articles reporting the development and initial validation of the 20-Item Toronto Alexithymia Scale (TAS-20). Since then the literature on alexithymia has burgeoned with the vast majority of this research using the TAS-20, including multiple language translations of the scale.

Method: In this article we review the psychometric literature evaluating various aspects of the reliability and validity of the TAS-20 and examine some of the controversies surrounding the scale and the construct it assesses. We reflect on the ways in which the TAS-20 has advanced the measurement of the construct and theory of alexithymia. We also discuss recent developments and some future directions for the measurement of alexithymia.

Results: Although not without some controversy, the preponderance of the accumulated evidence over a 25-year period supports various aspects of the reliability and validity of the TAS-20, including findings from confirmatory factor analytic and convergent and discriminant validity studies which are consistent with Nemiah et al.'s (Nemiah et al., 1976 [3]) and Taylor and colleagues (Taylor et al., 1997 [9]) theoretical formulations and definition of the alexithymia construct.

Conclusions: Based on the accumulated empirical evidence of 25 years, we conclude that the TAS-20 is a reliable and valid instrument and accurately reflects and measures the construct as it was originally defined by Nemiah et al. (Nemiah et al. (1976) [3] as composed of deficits in affect awareness and expression and *pensée opératoire* (operational thinking). Clinicians and researchers can use the TAS-20 to confidently measure alexithymia, the roots of which have foundations in psychosomatic medicine.

1. Introduction

Twenty-five years have elapsed since the *Journal of Psychosomatic Research* published two articles reporting the development and initial validation of the 20-Item Toronto Alexithymia Scale (TAS-20) [1,2]. During that time the TAS-20 has been translated into thirty different languages (or dialects of the same language) and has become worldwide the most frequently and widely used measure of the alexithymia construct. According to a recent search using Clarivate Analytics Web of Knowledge, 3662 publications included citations to one or both of the two original articles. As support for the reliability and validity of the scale accumulated, and with its availability in multiple languages, the TAS-20 has contributed substantially to a rapid expansion of alexithymia research and in a variety of research areas that extend far beyond exploring associations with somatic, substance use, and post-traumatic stress disorders, with which alexithymia was originally

linked [3,4]. Many investigations of alexithymia now focus on the examination of potential underlying mechanisms (e.g., emotional and cognitive processing deficits), the etiology (e.g., attachment, genetics), bio-markers (e.g., brain imaging, physiological), cross-cultural variation, co-morbidity, and psychotherapy treatment outcome studies [5,6].

One of our primary goals in developing the TAS-20 was to provide a common, reliable and valid metric of the alexithymia construct that can be employed across various research sites and clinical settings. Another equally important goal was to advance the theoretical parameters of the construct using classical test theory methods and a measurement-based strategy [7,8]. As reflected in this 25-year review of the TAS-20, both of these goals have been largely achieved. The alexithymia construct is now widely, if not universally, accepted to be defined by four inter-related facets – difficulty identifying feelings and distinguishing between emotional feelings and the bodily sensations of emotional arousal; difficulty finding words to describe feelings to other people;

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constricted imaginal processes; and an externally-oriented style of thinking [9]. Each of these theoretically informed facets are captured and collectively operationalized by the TAS-20 item set, which form factor analytically derived scales that measure these facets. The externally oriented style of thinking and constricted imaginal processes facets correspond to *pensée opératoire* (operatory thinking); we will describe in detail in Sections 7.1 how these two facets are captured by the EOT factor scale of the TAS-20. During the 25 years a large body of research has accumulated mostly supporting the validity and reliability of the TAS-20. It is important to acknowledge, nonetheless, that the development and validation of a psychological test is an ongoing process that must take into account new methodologies for evaluating the psychometric properties of test instruments, as well as any changes in the conceptualization of the construct a particular test is designed to measure [10]. For example, as Caspi and colleagues [11] point out, the traditional view of psychiatric disorders as distinct, episodic, and categorical conditions is now “challenged by evidence that many disorders are sequentially co-morbid, recurrent/chronic, and exist on a continuum” (p. 119). Similarly, many psychological and psychiatric constructs are conceptualized dimensionally rather than categorically, especially those defining personality characteristics that are often *tendencies* to think, feel, or act in certain ways, and reflect individual differences “*in degree*” rather than “*in kind*”. Both the DSM-5 and the ICD-11 include dimensional models and traits for conceptualizing and diagnosing personality disorders. Taxometric methods, long used by psychopathology researchers, and statistical software to apply these methods, are now readily available to test the latent structure (i.e., *taxa* vs. *continua*) of a construct [12]. Whereas classical test theory methods were most commonly used for personality test construction at the time when the TAS-20 was developed, several contemporary methods are now used to develop or evaluate tests, including item response theory, measurement invariance, bifactor modeling, and exploratory structural equation modeling; even the traditional criterion standards for evaluating the goodness of fit of different factor structure models have evolved, becoming more stringent [10].

As the developers of the TAS-20, we have sought to keep abreast of these advances in psychometric theory and methods and have applied several of these contemporary methods in our ongoing program of research on the measurement and psychometric evaluation of the alexithymia construct. In this article we review studies that have examined the psychometric properties of the TAS-20, including the many translations of the scale, and focus on the extent to which the internal structure of the scale is consistent across multiple samples and also conforms with the existing theoretical model of alexithymia. We describe some ways in which the TAS-20, together with a structured interview measure derived from the scale, have advanced the conceptualization and understanding of the alexithymia construct. Although almost all of the results from the studies that we review in this article have been published previously, our aim is to integrate the findings from these studies in an effort to provide researchers and clinicians with a comprehensive account of the strengths and limitations of the TAS-20. We also offer some recommendations for assessing alexithymia effectively in patients with somatic or psychiatric disorders.

2. Psychometric studies

As outlined in earlier publications [1,9], the TAS-20 was developed in an attempt to overcome shortcomings in the 26-item version of the scale – the TAS [13] – which was constructed almost a decade after Nemiah, Freyberger, and Sifneos [3] defined the salient components of the alexithymia construct. Factor analysis of TAS data yielded four factors theoretically congruent with the construct—difficulty identifying feelings (DIF), difficulty describing feelings to others (DDF), reduced daydreaming (RD), and an externally oriented style of thinking

(EOT). Further evaluation of the scale revealed that the first two factors (DIF and DDF) were not entirely independent, and the fantasy/daydreaming factor correlated negatively with the DIF factor [1]. Results from causal modeling procedures suggested that the items assessing fantasy and daydreaming had little theoretical coherency with the other facets of the alexithymia construct [14]. This was an important finding as our primary guiding principle of developing a scale for measuring the alexithymia construct was that it be theory driven. To this end, a new pool of items was generated for the purpose of developing a psychometrically improved version of the scale that was also theoretically consistent with the alexithymia construct. In the process of revision, all of the items assessing directly daydreaming and other imaginal activity were eliminated because of low item-total correlations and/or high correlations with a measure of social desirability [1]. Several other items were eliminated because they failed to meet the criterion for meaningful factor loadings. Exploratory factor analysis (EFA) of the remaining 20 items yielded three factors corresponding to the DIF, DDF, and EOT factors of the original TAS. In contrast to the TAS there was no significant cross loading of items on the factors of the TAS-20. In a separate study, results of confirmatory factor analyses indicated that the three-factor structure was stable and replicable in both university student and psychiatric outpatient samples [1].

For readers who are not familiar with the TAS-20, each of the twenty items is rated on a 5-point Likert scale; five of the items are reverse scored. Increasing scores indicate higher degrees of alexithymia. Although the TAS-20 was developed with the intention of using the total sum score, many researchers quickly chose to report the factor (sub)scale scores. The use of these factor “subscales” has led to questions regarding how the TAS-20 operationalizes the alexithymia construct. As we will discuss later, recent research using advanced statistical modeling suggests the use of a single total score is viable, even preferable, to the use of factor scores and that each component (or factor scale) contributes significantly, although differentially, to the overall measurement of alexithymia.

2.1. Internal reliability

In the initial derivation and validation studies of the TAS-20 with student ($N = 401$) and psychiatric outpatient ($N = 218$) samples, Cronbach alpha coefficients were 0.80 and 0.83, respectively, for total scores; 0.79 and 0.81 for the DIF factor scale; 0.75 and 0.75 for the DDF factor scale; 0.66 and 0.64 for the EOT factor scale [1]. The mean inter-item correlation coefficients (AICs) for these two samples were in the acceptable to optimal range for scale homogeneity [15] – 0.16 and 0.19, respectively, for the total scale; 0.35 and 0.39 for the DIF factor scale; 0.38 and 0.38 for the DDF factor scale; 0.20 and 0.19 for the EOT factor scale. In a later study with a large Canadian community sample ($N = 1933$), alpha coefficients and AICs were 0.86 and 0.23, respectively, for the total scale score; 0.71 and 0.37 for DIF; 0.76 and 0.40 for DDF; and 0.71 and 0.24 for EOT [16]. By 2003 there were 18 different language translations of the TAS-20, most of which showed adequate to good internal reliability for the total scale and the DIF and DDF factor scales; for some of these translations, however, the EOT factor scale had lower alpha coefficient estimates compared to the DIF and DDF factor scales [17]. Overall, these values, derived in adequately sized samples, suggest that the scale has adequate-to-excellent internal reliability. Several explanations for the lower alpha coefficients for the EOT factor scale have been suggested in the literature, including cultural differences and/or a response bias to the reverse-scored items on this factor scale.

Since 2003 many additional translations of the scale have been made and evaluated including Arabic [18], Brazilian Portuguese [19], Farsi [20,21], Hungarian [22], Romanian [23], Russian [24], Serbian [25], Slovakian [26], Turkish [27], and Urdu [28] translations, as well as new or revised Mandarin [29], Japanese [30], Hebrew [31], and

Greek [32] translations and slightly different Spanish translations for use in Argentina [33], Chile [34], and Spain [35].¹ The development of most of these translations of the TAS-20 involved back-translation procedures and passed through several iterations of feedback from the authors (i.e., RMB, JDAP, GJT). Most of these later translations show adequate to good internal reliability for the total scale and the DIF and DDF factor scales; but again, lower estimates of internal reliability are reported for the EOT factor scale in some but not all studies. Future studies might estimate coefficient omega (ω), which is a relatively recent statistic used to estimate internal reliability and is considered a more accurate estimate of internal consistency than the reliability estimate of coefficient alpha [36].

2.2. Retest reliability

In our original study, the TAS-20 demonstrated adequate retest reliability across a time period of three-weeks [1]. Comparable levels of retest reliability have been reported in subsequent studies with a wide array of time intervals between scale administration and re-administration, ranging from two weeks to 11 years [20,21,29,30,35,37–41]. These retest reliability coefficients were calculated with either Pearson or intraclass correlations. The average Pearson correlation across these studies was 0.74, range 0.57 to 0.87; the average intraclass correlation was 0.79, range 0.61 to 0.88, with larger estimates associated with shorter intervals, but it is notable that large estimates were achieved with five year ($r = 0.69$, $N = 901$, $p < .001$) [41] and even 11 year ($r = 0.70$, $N = 3083$, $p < .001$) [39] intervals, providing strong evidence of longitudinal stability. These findings suggest that the retest reliability of the TAS-20 on average and across studies is good-to-excellent [42].

2.3. Absolute vs. relative stability

One criticism of the TAS-20 is that the scores are subject to state effects secondary to an illness or an acute psychiatric condition (e.g., depression, anxiety, substance withdrawal) compromising the capacity of the TAS-20 to assess alexithymia in medical and psychiatric studies. This assertion is based solely on findings from studies in which TAS-20 scores are shown to increase in the context of an illness or distressed states and do not fully capture the complexity of personality trait stability. As argued by Santor et al. [43], it is important to recognize the distinction between absolute stability (i.e., the extent to which scores differ or change over time) vs. relative stability (i.e., the extent to which relative differences among a sample of individuals remains the same over time even in the context of change in illness symptomatology or distress). Evidence of relative stability even without demonstration of absolute stability is indicative that a test score is a stable trait marker for the construct it measures. Investigations examining the absolute and relative stability of the TAS-20 in studies across a variety of medical and psychiatric disorders and even community samples have supported its relative stability [39,44–46]; notwithstanding, researchers might control for differing levels of anxiety and depression across individuals by using measures of these constructs as a covariate (see Section 7.3).

2.4. Factorial validity

It is important for all psychological tests to demonstrate factorial validity across multiple samples. Factorial validity can be regarded as a form of construct validity in that the factor structure of a scale represents the operationalization of a theoretical construct [7,8]. In our

original study, confirmatory factor analysis (CFA) of TAS-20 item sets from university and psychiatric outpatient samples yielded a correlated, three-factor structure that mapped onto three facets of the alexithymia construct (DIF, DDF, and EOT), met the criterion standards for goodness of fit that were commonly used at that time [47,48], and provided a better fit than one-factor and two-factor solutions [1].² This correlated, three-factor structure of the TAS-20 has since been replicated in numerous studies using clinical and nonclinical samples. The replication of the factor structure in different languages is critical given the worldwide use of the TAS-20. The first eighteen translations of the TAS-20, which we reported and referenced in 2003 [17], used the same criterion standards for evaluating goodness of model fit that were used in our original study, with all meeting the standards set by Anderson and Gerbing [48]. Since 2003, most studies have used more stringent criterion values (see Hu and Bentler [49] and Browne and Cudeck [50]) to assess goodness of fit. In a study we conducted with a large English-speaking community sample [16], and also in a study with separate English-speaking aboriginal community-based and forensic samples [51], a three-factor structure was again the best fit even with these more contemporary and stricter standards. Of the sixteen translations of the TAS-20 that have been developed or revised since 2003, ten met at least two contemporary (i.e., stricter) criterion standards for assessing goodness of fit of the three-factor model (Arabic, Brazilian Portuguese, Farsi, Greek, Hebrew, Hungarian, Japanese, Mandarin, Romanian, and Spanish). The Russian, Slovene, and Turkish translations, and an adaptation of the Spanish translation for use in Argentina, failed to meet contemporary standards, but met the criteria standards used in our original study. In several studies model fit was improved after including a method factor for reverse scored items, and in some studies the EOT factor split into a Pragmatic thinking factor and an Importance of emotions factor (e.g., for the Mandarin, Russian, and Japanese translations).³

It is important to note that contemporary thinking on the matter of goodness of fit indices emphasizes that the more stringent criterion standards for determining adequacy of fit of a factor model should not be considered universal “gold standards” and may sometimes even be unobtainable [52]. Moreover, Sellbom and Tellegen [10] argue that model fit must be evaluated not only by statistical criteria but also in light of previous studies and theoretical considerations. The accumulation of CFA results supporting the three-factor solution of the TAS-20 indicates that different criteria to assess fit converge on more or less good fits across multiple samples and that overall the three-factor model is consistent with theoretical parameters of the alexithymia construct defined by Nemiah et al. [3] and Taylor et al. [9] and suggests that this model is stable and replicable. It is important to acknowledge that the EOT factor produces low estimates of internal consistency in some, but certainly not all studies; and that some EOT items may have low loadings on the EOT factor; and that the EOT factor does not always correlate as strongly with the DIF and DDF factors, as do the DIF and DDF factors with one another. It is equally important to note, however, that from a theoretical perspective, the EOT factor and an impoverished fantasy life comprise *pensée opératoire*, which is a critical component of the overall alexithymia construct [3]. Moreover, and as we report in the next Section, the pattern and magnitude of correlations between the EOT factor scale and measures of constructs associated with alexithymia are as strong, and even stronger in some studies, than the DIF and DDF factor scales.

² As we noted earlier and will describe in Section 7.1, there is evidence that the EOT factor also partially and indirectly assesses the fourth facet of the alexithymia construct (viz, constricted imaginal processes).

³ The Urdu translation met criterion standards only after removing four items; the Serbian translation was not evaluated with CFA; the Spanish translation developed for use in Chile was developed without our collaboration and failed to meet acceptable fit for the three-factor model.

¹ The translations of the TAS-20 developed and evaluated prior to 2003 and used in empirical studies since they were developed are in the following languages: Danish, Dutch, Finnish, French, German, Hindi, Italian, Korean, Lithuanian, Norwegian, Portuguese, and Swedish [17].

2.5. Convergent and discriminant validity

Factorial validity (i.e., internal factor structure) is not sufficient on its own to establish that the items of a scale are actually measuring what they are intended to measure [53]. It is important also to establish that the scale correlates in expected ways with measures of external criteria [7,8]. For the TAS-20 additional evidence of construct validity has been provided in numerous studies, which in general demonstrate that the total scale and its three factor scales converge and diverge in theoretically meaningful ways with measures of closely related and unrelated constructs. In an initial validation study with a university student sample ($N = 85$) [2], the total scale and all three factors correlated significantly and negatively with measures of psychological mindedness and need for cognition (the tendency to engage in and enjoy analytical thought), and with the Openness to experience (O) domain⁴ and the receptivity to Feelings facet scale of the NEO Personality Inventory (NEO-PI) [54], and except for the DDF factor scale also with the Fantasy facet scale of the NEO-PI. In a subsequent study with a substantially larger sample of Canadian community participants ($N = 809$) [55], the total TAS-20 and the DDF and EOT factor scales correlated significantly and negatively with O and with the Feelings facet scale; there was a moderate negative correlation between EOT and the Fantasy facet scale, and significant but low magnitude negative correlations between this facet scale and the total TAS-20 and DDF. Further evidence that the TAS-20 converges with measures of the O domain of the five-factor model of personality (FFM) was found in larger British and Canadian student samples, a clinical sample in Germany, and a community sample in Japan [30,55,56].

In other studies, the TAS-20 and its three factor scales correlated significantly and negatively with measures of affective orientation (the extent to which individuals are aware of and use affects to guide communication) [57]; trait emotional intelligence [20,28,58–60]; emotional self-awareness [58,61]; (cognitive) empathy [19,58,61]; perspective taking (the ability to take the perspective of others in terms of their mental state) [62]; with the effectiveness/authenticity (the skill to express emotions adroitly and honestly) scale of the Emotional Creativity Inventory [63]; and with subscales of the Emotional Approach Coping Scale that assess emotional processing (active attempts to acknowledge and understand emotions) and emotional expression (volitional expressing of emotion without reference to the type or valence of emotion [59]).

The pattern of correlations of the TAS-20 and its three factor scales with measures of closely related constructs supports the convergent validity of the scale. Fewer studies have reported findings pertaining to the discriminant validity of the TAS-20. In the initial validation study, correlations between the TAS-20 and the Agreeableness (A) and Conscientiousness (C) domains of the FFM assessed with the NEO-PI were non-significant, which were expected as these personality trait domains are unrelated to alexithymia [2].⁵ In later studies with larger British, Canadian, and Swiss student samples, Canadian and Japanese community samples, and a German clinical sample, negative correlations between the TAS-20 and the A and C domains were mainly low in magnitude and often non-significant, except for moderate correlations with C in the Canadian student sample, and with A and C in the Japanese community sample [30,55,56]. In the Swiss student sample, the TAS-20 was unrelated to the trait of impulsiveness assessed with both

the Impulsiveness facet of the Neuroticism domain of the NEO PI-R and the I₇ Impulsiveness Questionnaire [64]. Grabe and colleagues [65] examined the relationship between the TAS-20 and Cloninger's psychobiological model of personality in a sample of psychiatric outpatients. While they found a hypothesized moderate correlation with Harm Avoidance (e.g., total TAS-20 was 0.53), correlations for the other temperament variables were exceedingly low.

(-0.14 to -0.16 with total TAS-20).

One limitation of the studies examining the pattern of convergent and discriminant validity of the TAS-20 is that the other constructs used in most of these studies were assessed with self-report measures, which may spuriously inflate estimates of convergent validity due to shared measurement method with the TAS-20 (i.e., both the estimators and criterion are self-report). Several studies, however, have employed "performance-based" estimators of constructs related (or unrelated) to the alexithymia construct. In a comprehensive multi-method/multi-measure study, Lumley et al. [59] examined the association of the TAS-20 with a performance-based measure of emotional intelligence (EI), a construct that shares many features with the alexithymia construct, using the Mayer-Salovey-Caruso Emotional Intelligence Test (MSCEIT) [66]. The MSCEIT is composed of ability tests and a series of questions that are thought to measure four aspects of EI, each with a corresponding subscale – Perceiving Emotions, Using Emotions, Understanding emotions, and Managing Emotions. In a sample of college students ($N = 140$), TAS-20 total scores correlated significantly with the MSCEIT total score -0.37 ($p < .001$) and with each of MSCEIT subscales, ranging from -0.25 to -0.33 (all $ps < 0.01$). Moreover, each of the TAS-20 subscales correlated significantly with the MSCEIT total score ranging from -0.22 (DDF) to -0.44 (EOT), all $ps < 0.01$.

We are aware of two studies that have examined the validity of the TAS-20 using performance-based measures derived from the Rorschach Test. Although the Rorschach Test was originally conceptualized and used as a projective test, it is now widely regarded as a performance-based instrument in that the focus is now on how the test-taker(s) cognitively form their percepts, rather than its content. Complex algorithms are used to derive various indexes and scales based on the testee's cognitive processing. Tibon and colleagues [67] reported that one of these indexes thought to be associated with alexithymia (i.e., 'Reality-fantasy') correlated significantly with the TAS-20 total score ($r = 0.60$) and with each of the factor scales—DIF, $r = 0.64$; DDF, $r = 0.432$; EOT, $r = 0.515$ (all $ps < 0.001$) in a sample of patients with inflammatory bowel disease (IBD) ($N = 92$). Porcelli and Mihura [68] selected a set of three indexes, which were then weighted to form a Rorschach Alexithymia Scale (RAS) for assessing the overall alexithymia construct. In a study with a sample composed of psychiatric patients and medical patients with IBD ($N = 219$), the TAS-20 total score correlated significantly with the RAS ($r = 0.78$) as did also each of the factor scales – DIF, $r = 0.78$; DDF, $r = 0.63$; EOT, $r = 0.69$ (all $ps < 0.001$).

Another performance-based measure is the Perception of Affect Task (PAT), which includes four subtasks that require individuals to match verbal or nonverbal emotion stimuli with verbal or nonverbal emotion responses. In a study with a sample of 380 nonclinical participants, the TAS-20 total score correlated significantly and negatively with the accuracy rate on each of the subtasks of the PAT and with the PAT total score ($r = -0.32$); each of the TAS-20 factor scales also correlated significantly and negatively with the PAT total score, ranging from -0.19 to -0.29 , all $ps < 0.01$ [69].

In a similar vein, other studies have examined relations between the TAS-20 and non-self-report measures of alexithymia including the Observer Alexithymia Scale and the modified Beth Israel Hospital Psychosomatic Questionnaire. These studies were reviewed recently by Taylor et al. [70] and Sekely et al. [71].

⁴ The openness to experience dimension of the personality includes several elements theoretically related to the alexithymia construct such as active imagination, attentiveness to inner feelings, preference for variety, and intellectual curiosity. Individuals who score high on O are curious about both inner and outer worlds, and experience both positive and negative emotions more keenly than those who score low [54].

⁵ The NEO-PI does not include subscales for the facets of A and C. These were introduced in the revised version of the inventory.

2.6. Measurement invariance

Despite replication of the standard three-factor structure of the TAS-20 across most translated versions of the scale, it cannot be assumed that observed differences in mean TAS-20 scores can be interpreted similarly across different languages and cultural or ethnic groups. For this reason, we adopted the view that it is necessary to also establish measurement invariance (MI), a view that has become increasingly relevant in recent years for transcultural research with various psychological measures. This is essential for psychosomatic and psychiatric research studies in which investigators wish to compare results across samples from different countries. One method of testing MI is to use multi-group confirmatory factor analyses (CFAs), first to establish a baseline model of a scale, and then to conduct increasingly restrictive multigroup CFAs to evaluate configural, metric, scalar, and residual error levels of MI [72].

One strength of the validation study of the Arabic translation of the TAS-20 is that in addition to an Arab-speaking sample of students from Algeria, Oman, and Gaza, the researchers included a similar sized sample of English-speaking students in Canada [18]. The standard three-factor model of the TAS-20 was invariant across the two samples. The finding that both Arabic men and women scored significantly higher on the TAS-20 than Canadian men and women is therefore likely due to some cultural differences in the awareness and communication of emotional feelings. In another study, our research team evaluated MI of the English and French versions of the TAS-20 using data from a large sample of Canadian military recruits ($N = 17,866$) in whom 71% spoke English and 29% spoke French as their first language [73]. The results demonstrated MI of the three-factor model with an additional method factor comprised of reverse scored items. In an earlier study, Culhane et al. [74] demonstrated MI of the TAS-20 across predominantly self-identified U.S. Anglo and U.S. Hispanic samples of undergraduate students. Although this study demonstrated invariance across ethnic groups, both groups completed the English version of the TAS-20.

It may also be important to establish factorial invariance across clinical and nonclinical samples, and across different modes of administration of a scale. In the original validation of the Italian translation of the TAS-20, Bressi et al. [38] demonstrated partial invariance between a normal adult sample and a sample of medical and psychiatric outpatients. And in a study in Belgium, Meganck et al. [75] demonstrated partial measurement invariance of the Dutch translation of the TAS-20 across a sample of psychiatric outpatients and a student sample. More recently, Preece et al. [76] demonstrated MI of the TAS-20 across a psychiatric sample and a nonclinical adult sample in Australia. Factorial invariance has also been demonstrated across Internet and pencil and paper methods of administration of the TAS-20 [77], which is important since using Internet versions of psychological tests allows researchers to collect data quickly from large and diverse samples.

Although we have reviewed studies using multi-group CFA to establish invariance, another method for evaluating MI is to conduct differential item functioning analyses [78]. We used this method to evaluate different translations of the Toronto Structured Interview for Alexithymia, which we discuss in Section 5.1.

2.7. Bifactor modeling

Given that many researchers report TAS-20 factor scale scores, it is important to evaluate whether these scores provide unique information beyond the total score provided by the full scale. One approach to answering this question is bifactor modeling, a method that has become more commonly used to evaluate and conceptualize multifaceted psychological constructs [79]. By specifying the items on a scale to load onto a general factor made up of all of the items, and to also load on a subfactor representing a narrower construct, the bifactor model tests the commonality among and unique contributions of the facets. To date, few researchers have applied bifactor modeling to evaluate the

TAS-20. Reise and colleagues [80] estimated a TAS-20 bifactor measurement model in a large student sample and concluded that TAS-20 total scores are largely reflective of variation on a single construct, and that factor scale scores do not provide unique and reliable information beyond total scores. Similar findings were reported by Gignac et al. [81] in an earlier study with a small Australian community sample; the fit of the bifactor model was improved after adding a method factor for negatively worded (i.e., reverse scored) items. More recently, Tullio et al. [82] examined and compared multiple factor structures for the TAS-20 in student samples, including bifactor models and common method models that account for negatively worded items. The best fitting model was a two-factor bifactor model with DIF and DDF combined, and the negatively worded items dropped.

Our team recently tested a bifactor model of the TAS-20 with data from a large community sample [83]. Like the previous investigations, we found that the majority of variance in TAS-20 total scores is reflective of a single construct (i.e., alexithymia). This suggests that TAS-20 total scores can be reported without concern that these scores represent an unknown admixture of subscale multidimensionality. Our results also revealed that the DIF and DDF factor scale scores are capturing the same construct represented by the general factor (or by a total score). We found also that a substantial portion of variance in EOT factor scale scores was reflective of variation on a construct somewhat separate from the construct assessed by total scores, while a smaller portion of variance was reflective of the construct assessed by total scores. Further studies are needed to attempt to replicate the bifactor model of the TAS-20 with clinical samples. As recommended by Sellbom and Tellegen [10], it will be important also to examine the comparative usefulness of a bifactor model for predicting conceptually relevant external criteria.

3. Relations between the TAS-20 and negative affect

Many studies have reported significant positive correlations between the TAS-20 and measures of negative affect, in particular with anxiety and depression; the correlations are primarily with the DIF and DDF factor scales and are usually nonsignificant with the EOT factor scale [84,85]. Several studies have also shown that alexithymia, assessed with the TAS-20, is related to the Neuroticism domain (N) in the FFM, which encompasses a tendency to experience a range of negative affects [30,55,56], prompting some to suggest that the TAS-20 is more likely a measure of negative affect or general psychological distress rather than alexithymia itself [64,86–88]. Marchesi et al. [86], for example, found that differences in TAS-20 scores observed between various psychiatric patient groups and a nonpatient group disappeared after controlling for the effect of anxiety and depression severity. Other studies, however, have reported nonsignificant correlations between the TAS-20 (or original 26-item TAS) and measures of anxiety and/or depression [89,90]; and, although high TAS-20 scores are often associated with high depression scores, in a study with a Finnish general population sample the items of the TAS-20 and the 21-item Beck Depression Inventory loaded on separate factors with only a minor overlap concerning physical worries [91]. Moreover, even though TAS-20 scores may be moderately inflated by anxiety or depression and thus lack absolute stability, as we outlined earlier in Section 2.3, there is strong evidence of relative stability, which is a better indicator of whether a personality construct is a stable trait and not simply reflective of distress or illness severity. There is evidence also that alexithymia assessed with the TAS-20 is not merely equivalent to the construct of neuroticism but is represented by a cluster of traits across the domains of the FFM of personality [55,92].

The finding of positive relations between the TAS-20 and measures of negative affect is consistent with a theoretical proposal we first made in 1991 that the features of the alexithymia construct reflect a deficit in the cognitive processing of emotions, which remain undifferentiated and poorly regulated [93]. Three years later, Sifneos [94] similarly

referred to alexithymia as “a deficit in the cognitive processing of emotions” (p.194), and more recently Vanheule [95] conceptualized alexithymia as “a difficulty in processing and regulating affective arousal by means of mental representations” (p. 332). Because of this deficit, the negative affects evoked by stressful or conflicting events remain unmodulated and may be communicated as somatic sensations or symptoms or expressed through impulsive behaviors such as substance use or bingeing on food, which may serve to down-regulate emotional arousal. This theoretical model of alexithymia does not blur the definition of the construct, a concern expressed by Leising et al. [87], but rather offers a conceptual understanding of processes underlying the strong associations that empirical studies have found between alexithymia (assessed with the TAS-20) and substance use disorders and eating disorders [96], as well as evidence that the DIF factor scale of the TAS-20 contributes to the presence and persistence of medically unexplained somatic symptoms [97,98].⁶

Notwithstanding the association between the TAS-20 and negative affect, the TAS-20 can effectively assess alexithymia in patients with severe psychiatric disorders. For example, in a study that included comparing levels of alexithymia across three different clinical groups, Lysaker and colleagues [99] found that the group of patients with borderline personality disorder and the group with schizophrenia had significantly higher TAS-20 total scores and all three factor scale scores than the group of patients with substance use disorders; the difference between the borderline personality disorder group and the substance use disorder group remained significant for the total TAS-20 and DIF factor scale scores even after controlling for global psychopathology and overall personality traits (excluding borderline personality disorder traits).

4. Assessing alexithymia in children and adolescents

Because affect development and affect regulating capacities are being developed during childhood and adolescence, we are reluctant to identify alexithymia in individuals under the age of 17 years, which was the lowest age of participants in the university student samples on which the TAS-20 was developed and validated [1]. Nonetheless, by rewording and simplifying most of the items from a Dutch translation of the TAS-20, Rieffe and colleagues [100] developed an alexithymia measure (subsequently called the Children's Alexithymia Scale (CAS)) that could be used with children or young adolescents. Confirmatory factor analyses of CAS data from samples of children (mean age 11 years) and young adolescents (mean age 13 years) supported the three-factor model from the adult TAS-20, although many of the EOT items loaded poorly on the EOT factor scale, and the internal reliability of the EOT factor was unacceptably low. Rieffe et al. [101] reported a pattern of similar results with a Farsi translation of the CAS with a sample of Iranian children and young adolescents (mean age of 12 years). Other researchers evaluated a French translation of the CAS with a small sample of children (mean age of 12 years) and reported unacceptably low internal reliability coefficients for the DIF and EOT factor scales [102]. Despite the limitations of the CAS, Gatta et al. [103] investigated pediatric patients with primary headache (age 8 to 17) and reported significantly higher levels of alexithymia in a group of children with tension-type headaches when compared with children with

migraine headaches and a control group.

Several researchers have formally evaluated the psychometric properties of the TAS-20 for use with adolescent respondents and reported mostly poor results. Sakkinen et al. [104], for example, administered a Finnish-language version of the TAS-20 to a community-based sample of Finnish adolescents (12 to 17 years of age). Their results supported the original three-factor model developed from the adult form, although five items from the EOT subscale had non-significant factor loadings. Internal reliability coefficients for the DDF and EOT factors were generally problematic ($\alpha < 0.70$) for adolescents of all ages, while reliabilities for the younger adolescents (12 to 14 years) tended to be substantially lower than those found for older adolescents (15 to 17 years). Similarly, poor results were reported for adolescent samples that completed French [105] or Dutch translations of the TAS-20 [106]. Other studies using adolescent samples have reported similar difficulties replicating the three-factor model for the scale and/or poor internal reliabilities [107,108].

A possible explanation for the poor psychometric properties of the TAS-20 in adolescent samples was provided by Parker et al. [109], who examined measurement invariance of the factor structure for the scale in groups of young adolescents (13 to 14 years), middle adolescents (15 to 16 years), and older adolescents (17 to 18 years). The study also included a large sample of young adults (19 to 21 years old). Although the original three-factor model of the TAS-20 showed good fit to the data in the young adult sample, the model was only marginally supported for the older and middle adolescent groups. The model could not be satisfactorily reproduced in the youngest adolescent group, suggesting a systematic decline in the quality of self-report assessment for younger respondents. Parker and colleagues opine that the key explanation for this decline is the reading and comprehension levels of the specific assessment tool.

5. Self-report vs. multi-method measurement of alexithymia

Some authors have questioned the use of the TAS-20 or other self-report scales to assess alexithymia arguing that individuals with high levels of the trait may be unable to accurately evaluate their awareness of emotional feelings [110,111]. We recognized this potential limitation in 1997 [9], stating that “a self-report measure alone may not adequately assess affective and cognitive capacities that individuals with severe alexithymia may not know they lack” (p. 64). We therefore recommended that “clinicians should use the TAS-20 as a screening device for alexithymia and evaluate the significance of an individual patient's score in the context of information from other sources including clinical observations, reports from close friends or relatives of the patient, and results from other personality tests” (p. 64) [9]. Our own approach to assessing alexithymia in clinical situations is to first allow the patient to give their history in a free, uninterrupted manner, and to ask them to elaborate if they use any affect words (e.g., What does it feel like to be angry or nervous?). We then administer the TAS-20, as well as a measure of emotional intelligence such as the BarOn Emotion Quotient Inventory (EQ-i) [112], which includes subscales for assessing emotional self-awareness and empathy, and the revised NEO PI [54] to gain a profile of basic personality traits, including receptivity to feelings and interest in imaginal activity on the O dimension [9,55]. In an earlier publication we provided case examples to illustrate this approach [55].

We have also argued previously that empirical research on alexithymia is always enhanced by the use of a multi-method approach to measuring the construct [9,16,70]. Using multiple methods eliminates the potential influence of measurement-method-based response biases associated with mono-method assessment. For this reason, while we were constructing the TAS-20, we also developed a modified 12-item version of the 17-item interviewer-rated Beth Israel Hospital Psychosomatic Questionnaire (BIQ) developed by Sifneos [113]; we reported significant correlations between the self-report TAS-20 and the

⁶ Some clinicians and researchers may mistakenly take the term ‘alexithymia’ literally and assume that individuals with high alexithymia do not experience emotional distress and are totally without words for emotions. As we have reviewed elsewhere [70], it is important to remember the distinction between emotions and feelings that was emphasized by Sifneos and Nemiah, who also reported that individuals with alexithymia commonly mention anxiety and complain of depression, and may also talk about nervousness, agitation, restlessness, irritability, and tension (i.e., negative affects). They are therefore able to respond to items on self-report measures of negative affect but have difficulty elaborating on their subjective emotional experiences when asked to do so.

modified BIQ [2]. As we describe in the next Section, we later developed the Toronto Structured Interview for Alexithymia (TSIA), which also correlates significantly with the TAS-20 [114]. Several researchers in Japan, Italy, Belgium, Germany, and Switzerland have followed our recommendation for multi-method measurement by using translated versions of the TSIA or modified BIQ to supplement the TAS-20 [115–121], but far too many investigators still rely solely on the TAS-20 to measure alexithymia.

6. The Toronto structured interview for alexithymia

Mindful of the need for a multimethod approach to assess alexithymia, we developed a structured interview method—the Toronto Structured Interview for Alexithymia (TSIA) [114]. This measure is comprised of 24 items (questions) that are largely based on the TAS-20 items (with the addition of some items written to assess imaginal processes) distributed equally over four subscales representing DIF, DDF, EOT, and imaginal processes (IMP). Each item is scored on a three-point format. The TSIA is designed to allow the assessor to probe or explore a response so as to clarify or (de)contextualize a respondent's answer, leading to a more nuanced meaning or nature of the person's response. In the original scale development study, the TSIA demonstrated adequate internal, inter-rater reliability, and retest reliability, as well as concurrent validity with the TAS-20; factor analysis revealed evidence of a hierarchical factor structure consisting of four lower-order factors (DIF, DDF, EOT, and IMP) nested under two higher-order factors (Affect Awareness and Operative Thinking). Most correlations between the lower-order factors were high. Similar results were reported for Dutch, German, and Italian translations of the TSIA [122–124]. Using differential item functioning analyses, we collaborated with some colleagues and demonstrated measurement equivalence (invariance) of the English, Dutch, German, and Italian versions of the TSIA not only across language, but also across gender and clinical status [125]. The finding of measurement equivalence for the four language versions of the TSIA allows researchers to make substantive interpretations of any differences in TSIA scores observed among groups, but measurement equivalence may not hold for groups that speak other languages. In a later study, we tested a bifactor model of the TSIA using data from a large heterogeneous multi-language sample [126]. The results supported a general factor of alexithymia that accounts for the commonality shared by the facets, and therefore supports using the total TSIA score as a general measure of the alexithymia construct and is consistent with the results of bifactor modeling of the TAS-20.

To date, the TSIA has been used in only a small number of empirical studies. In one study, Italian translations of the TAS-20 and the TSIA were administered to a group of parents and their adolescent daughters with a diagnosis of anorexia nervosa; the structured interview allowed detection of a greater level of alexithymia compared with the self-report TAS-20, especially in the parents [117]. As the authors of the study point out, an advantage of the TSIA in detecting the actual level of alexithymia is that it eliminates or attenuates confounding factors such as negative affect states and defense mechanisms. Indeed, in contrast to the TAS-20, there is preliminary evidence that the TSIA is unrelated to neuroticism and self-assessed current depression and trait anxiety [119,121].

Whereas the TAS-20 can be completed in less than ten minutes, a drawback of the TSIA is that it takes about 45–60 min to administer and score, and interrater agreement must be established. In an attempt to shorten the time for administering the TSIA, Sekely, Taylor and Bagby [127] recently applied item response theory (IRT) analysis to create a shortened version of the instrument. This reduced the length of the interview by 50% while still yielding 65% of the test information; however, no IMP items were retained in the shortened version. Further validation of the short version must be conducted before it can be recommended for wide use.

7. Controversial issues

7.1. Measurement of the reduced fantasy facet of alexithymia

The absence of a reduced fantasizing factor on the TAS-20 led Sifneos [128] and others (e.g., Vorst and Bermond [129] and Henry et al. [130]) to argue that the scale does not measure the alexithymia construct as it was originally conceptualized. As we described in Section 2, the items we wrote to assess fantasy and other imaginal activity were not retained on the TAS-20 because they did not meet certain statistical criteria. There is accumulating evidence, however, that the EOT factor scale assesses this facet of the alexithymia construct indirectly. For example, studies examining the convergent validity of the TAS-20 have found that the EOT factor scale correlated negatively with the Fantasy facet scale of the NEO PI ($r = -0.45, p < .01$) in a student sample ($N = 83$) [2] and the Revised NEO PI ($r = -0.30, p < .01$) in a community sample ($N = 809$) [55], and, as we noted in Section 2.5, also strongly and positively with the Rorschach Reality-Fantasy Index ($r = 0.515, p < .001$) on which higher scores reflect a reality-oriented thinking style and an impoverished capacity for imaginal activity [67]. In addition, in an adult community sample, Henry and colleagues [130] found that the EOT factor scale correlated negatively with the Fantasy subscale of the Interpersonal Reactivity Inventory (IRI) ($r = -0.57, p < .01, N = 248$), which measures “the tendency to transpose oneself imaginatively into the emotions and behavior exhibited by fictitious characters” (p. 536). These findings are consistent with the theoretical model of alexithymia formulated by Nemiah et al. [3] in which, as noted earlier, an externally oriented thinking style and reduced fantasy activity together correspond to the concept of *pensée opératoire* described by Marty and de M'Uzan [131].

It is possible that the seven items on the Fantasy subscale of the IRI provide a reliable way for assessing the reduced fantasy facet of alexithymia, but this requires further studies. A CFA of the TAS-20 and the Fantasy subscale data in the community sample found that a four-factor model (DIF, DDF, EOT, and the Fantasy subscale) provided a better fit than one-factor and three-factor models, thereby providing support for the original conceptualization of the alexithymia construct [130].⁷

Given the difficulty with assessing the reduced fantasizing facet of the alexithymia construct, some researchers have questioned whether reduced fantasy and other imaginal activity should be considered part of the construct, and have also suggested revising the EOT factor scale so that all of the items assess the extent to which individuals pay attention to their emotions [132]. In our opinion such a re-conceptualization of alexithymia changes the original definition of the construct [3] and in effect creates a different construct. We disagree also with other researchers who propose different types of alexithymia based on whether individuals assessed with the Bermond-Vorst Alexithymia Questionnaire [129] manifest deficits in both the cognitive dimension and the affective dimension (which includes the capacity for fantasizing) of the construct or in only one dimension or the other [133]. Studies using cluster analysis [134] or latent profile analysis [135,136] have failed to support subtypes as defined by Moorman and colleagues [133].

7.2. Low reliability of the EOT factor scale

The finding of low internal reliability of the EOT factor scale, especially with many of the translated versions of the TAS-20, casts some doubt on the use of this factor scale as a subscale. In several CFA studies, improvement of model fit after allowing reverse scored (i.e., negatively worded) items to load on a method factor highlighted

⁷ In contrast to the fantasy and imaginal processing items that were evaluated during the process of developing the TAS-20 [1], the Fantasy subscale of the IRI was unrelated to a measure of social desirability [130].

potential problems with the four EOT items that are reverse scored. Interviews with several young Peruvian adults after they had completed an early Spanish translation of the TAS-20, revealed a tendency to rephrase these items to gain a better understanding of the meaning, which often formed double-ended statements resulting in responses that were opposite to the original intent [137]. For the Urdu translation of the TAS-20 [28], the reverse scored EOT items were removed because of factor loadings less than 0.35, but even then, the internal reliability coefficient for the remaining four EOT items was only 0.60. Some items, such as item 18 ('I can feel close to someone, even in moments of silence'), appear to have a different meaning in different cultures. With the Portuguese translation of the TAS-20, Torres et al. [138] obtained an adequate fit of the three-factor model in a sample of female anorexia nervosa patients only after removing two EOT items. As Ryder et al. [139] point out, in contrast to DIF and DDF, the EOT items emphasize interests and preferences rather than deficits, and responses may therefore "reflect a cognitive style rooted in cultural values about emotion" (p. 41). Ryder and colleagues cite some studies in which Chinese samples scored significantly higher on the TAS-20 than European Canadian samples; this finding was attributable to group differences on the EOT factor scale, whereas no significant differences were observed on the DIF and DDF factor scales.

Although the reliability of the EOT factor might be improved by rewriting the negatively worded items, in university student samples this factor scale correlated in expected ways (and more strongly than the DIF and DDF factors) with measures of constructs theoretically related to alexithymia including psychological mindedness ($r = -0.54$, $p < .01$, $N = 85$), need for cognition ($r = -0.44$, $p < .01$, $N = 85$), and openness to experience ($r = -0.61$, $p < .01$, $N = 83$) [2], and also with the performance-based Reading the Mind in the Eyes Test ($r = -0.48$, $p < .005$, $N = 86$) [140]. With a multi-method measurement approach, the EOT facet of the alexithymia construct can be assessed with the TSIA; the internal reliability coefficients for the EOT subscale with the English version of the TSIA, and also for the Dutch, German, and Italian translations of the instrument are all ≥ 0.70 (range = 0.70 to 0.82) [114,122–124].

7.3. Correlations with measures of negative affect

Given that all self-report measures of alexithymia may be inflated by anxiety or depression, researchers should consider partialing the variance for negative affect in their analyses investigating alexithymia. This is especially important when selecting groups of high and low alexithymic subjects and comparing them on variables of interest. In neuroimaging studies, for example, Moriguchi and Komaki [141] point out that neuroticism and alexithymia show very different levels of neural activation in response to external emotion-inducing stimuli.

Some researchers suggest that the positive correlations between the TAS-20 and measures of negative affect may be partly methodological artifacts due to the self-report nature of the various measures [119]. Such artifacts are reduced by the use of multiple methods of measurement. For a series of neuroimaging studies in Japan, high and low alexithymic participants were selected only if they scored in the high or low range on both the self-report TAS-20 and a structured interview version of the modified BIQ [115,116,142]. An alternative is to administer both the TAS-20 and the TSIA. In a study with a sample of Italian adults [119], the TAS-20 correlated significantly with the TSIA after controlling for depression and anxiety ($r = 0.54$, $p < .001$, $N = 111$) assessed with the Beck Depression Inventory II (BDI-II) and the Spielberger State-Trait Anxiety Inventory-Y2 (STAI-Y2); whereas the total TAS-20 and the DIF and DDF factors correlated significantly with the BDI-II, and the DIF correlated with the STAI-Y2, no significant correlations were found between the TSIA and all its subscales and both BDI-II and STAI-Y2. In another study, the TSIA and its DIF, DDF, and EOT subscales did not correlate with the N domain of the FFM of personality; the IMP subscale had a moderate negative, but nonsignificant, correlation with N [121].

8. Refining the conceptualization of the alexithymia construct

In the early years of alexithymia research, there was a tendency to categorize patients into 'alexithymic' and 'non-alexithymic' groups on the assumption that the construct defines a type of person qualitatively distinct from others, rather than a personality trait that varies quantitatively in the population. We even proposed some preliminary TAS-20 cutoff scores for classifying patients into one or other group [9]. In hindsight, this was a mistake; subsequent studies using the taxometric method have contributed substantially to resolving uncertainty as to whether alexithymia should be conceptualized as a categorical or dimensional construct. In the first study we performed three non-redundant taxometric procedures — maximum covariance (MAXCOV), mean above minus mean below a cut (MAMBAC), and latent mode factor analysis (L-mode) — using scores on the three factor scales of the TAS-20 as indicators. The analyses were conducted separately in large English-speaking community and undergraduate student samples and in a smaller sample of psychiatric outpatients [143]. The results across the three taxometric procedures and the different samples provided strong support for conceptualizing alexithymia as a dimensional construct. In collaboration with some colleagues, a second taxometric investigation was conducted to evaluate whether the results of the first study would generalize to a population whose primary language was not English, and also across gender [144]. The same three non-redundant taxometric procedures were performed with data from a very large general population sample from Finland, and for men and women separately, using the same item sets from the TAS-20 as indicators. The outcomes for all three samples were similar to those obtained in the first study and provided further empirical evidence that alexithymia is a dimensional construct.

Since the taxometric analyses in the two studies cited above were based solely on data collected with the self-report TAS-20, and did not include an indicator for the reduced fantasizing facet of the alexithymia construct, we conducted a third study in which the four subscales of the TSIA were used as indicators [145]. The data for this study came from a mixed multinational sample of 842 participants, all of whom had been assessed with the TSIA in their respective language (English, Dutch, German, or Italian). Two-thirds of the total sample were either psychiatric or medical patients, and one-third were community-based adults. The three non-redundant taxometric procedures produced unambiguously dimensional solutions, providing further evidence that the salient features of the alexithymia construct are continuously distributed in the population. The similar dimensional results obtained with the TAS-20 and the TSIA speak to the equivalence of alexithymia's latent structure across different assessment methods, making it unlikely that method-specific effects are responsible for the dimensional findings.

The results from the taxometric investigations indicate that the TAS-20, TSIA, and other measures of alexithymia ought to yield continuous scores rather than categorical scores. We have therefore recommended that clinicians should avoid telling patients that they are either alexithymic or non-alexithymic, and to explain instead that like most other personality traits, people show varying degrees of alexithymia. Further, we recommend that researchers analyze TAS-20 scores as a continuous variable rather than classify participants into alexithymic and non-alexithymic groups. However, there may be some studies, such as certain neuroimaging studies, for which the TAS-20 cutoff scores are useful to identify groups of individuals with extreme levels (high or low) of alexithymia.

Conceptualizing alexithymia as a dimensional construct has important implications for exploring its etiology. As reviewed elsewhere [143], a dimensional latent structure of a personality construct is incongruent with single gene effects and with single discrete environmental effects but could implicate a combination of genetic and environmental factors. Several twin studies in which TAS-20 data were collected have provided evidence that both genetic factors and (mostly

unshared) environmental factors contribute to individual differences in alexithymia [146]. Findings from attachment and trauma research suggest that the major environmental factors contributing to the etiology of alexithymia are adverse childhood experiences resulting in insecure attachment styles [147]. In most of these studies, alexithymia was assessed with the TAS-20.

9. Contributions of the TAS-20 to psychosomatic research and clinical practice

The development of the TAS-20 contributed to a rapid expansion of empirical research exploring relations between alexithymia and a wide variety of medical illnesses and psychiatric disorders. Porcelli and Taylor [148] provided an extensive review of psychosomatic research using the TAS-20, and a discussion of relations between alexithymia and physical illness. Morie and Ridout [96] reviewed empirical studies that have investigated the potential role of alexithymia in eating disorders. Because of space limitations we can only highlight some interesting findings from a few empirical studies and mention their relevance to clinical practice.⁸ One important finding is that although alexithymic characteristics were observed initially among patients suffering from so-called 'classic psychosomatic diseases' [3], empirical studies have demonstrated that high TAS-20 scores are much more likely to be found among patients with eating disorders or functional gastrointestinal disorders (FGIDs). For example, whereas high TAS-20 scores may be found in about one third of patients with IBD, high alexithymia scores may be present in as many as two-thirds of patients with FGIDs. And although both alexithymia and depression have been found to predict treatment outcome for FGID patients, TAS-20 scores were the stronger predictor of both recovery status and overall reduction in gastrointestinal symptoms [149]. Clinicians might improve treatment outcome for FGID patients by identifying those with high TAS-20 scores and attempting to improve their skills for managing emotions evoked by stressful situations.

Empirical studies have consistently found that patients with eating disorders score significantly higher on the TAS-20 than healthy controls, particularly on the DIF and DDF factor scales [96]. And although depression may contribute to this difference, the weight of evidence suggests that alexithymia in eating disorder patients is not simply a consequence of comorbid depression, and that high levels of alexithymia are associated with poorer long-term outcome. Clinicians need to identify alexithymia in their eating disorder patients and include psychotherapeutic strategies for reducing alexithymic characteristics among their treatment interventions.

Several studies have used the TAS-20 to investigate associations between alexithymia and cardiovascular disease. In an investigation of a large general population sample in Germany, alexithymia was found to be an independent risk factor for hypertension and subclinical atherosclerosis (carotid plaques) and was not mediated by known medical and behavioral risk factors including smoking, work load, BMI, serum lipid levels, comorbid diabetes, and previous myocardial infarction [150]. There is some evidence also that individuals with high TAS-20 scores who are experiencing symptoms of an acute myocardial infarction may delay seeking urgent medical care [151]; this is likely because of an impaired ability to appraise and appreciate the meaning of bodily sensations. In a case-control study of post-myocardial infarction patients who received group therapy aimed at reducing alexithymia and were followed for two years, those patients whose TAS-20 scores had decreased experienced fewer cardiac events (reinfarction, sudden cardiac death, or rehospitalization) than patients whose TAS-20

scores had remained unchanged [152].

In other research, diabetic patients with high TAS-20 scores were found to have as much as a 3-fold greater risk for poor glycemic control than those with low TAS-20 scores [153]. And in a study with a large general population sample from Finland, TAS-20 scores were associated with somatization independently of anxiety, depression, somatic diseases, and potentially confounding sociodemographic variables [97]. There is evidence also that alexithymia assessed with the TAS-20 predicts adherence to antiretroviral therapy in people with human immunotherapy virus [154]. Consequently, psychotherapies aimed at enhancing emotion awareness and the ability to recognize different affect states might increase adherence to medical procedures and interventions.

10. Conclusions

During the past 25 years, research on the measurement of alexithymia has continued to provide support for the reliability and validity of the TAS-20 and for its use in the fields of psychosomatic medicine and mental health. There is accumulating evidence that the TAS-20 demonstrates reliability and factorial validity in many different languages and cultures, which support the use of the scale for alexithymia research in countries in which those languages are spoken. Although this enables a comparison of findings from studies in these different countries, a difference in TAS-20 mean scores cannot be interpreted equally across the different languages unless measurement equivalence is established across the languages. The TAS-20 has some limitations, but there are methods to compensate for these, including controlling for negative affect and supplementing the scale with a validated non-self-report measure of alexithymia when assessing the construct. The TAS-20 spawned the development of the TSIA, and both instruments have helped refine the conceptualization of alexithymia as a dimensional construct. Although more bifactor analytic studies are needed, the finding of a general factor of alexithymia with both the self-report TAS-20 and an interview measure of alexithymia implies that clinicians and researchers can be confident in using the total TAS-20 score and the total TSIA score as measures of individual differences in alexithymia, and suggests that factor scale scores may be less reliable without accounting for general factor variance. Another future direction for alexithymia measurement research is to evaluate the validity of the short version of the TSIA to establish if it would be of practical value to clinicians and researchers with time constraints. In addition, given the importance of using multiple methods to assess a construct, and following a relatively recent resurgent movement to develop and use informant ratings to measure personality traits, we are in the process of developing an informant version of the TAS-20 [155]. Informant reports might offset potentially biased self-reports including an inability of some individuals with high levels of alexithymia to evaluate accurately their awareness of emotional feelings.

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⁸ Studies reporting high levels of alexithymia among patients with various psychiatric disorders (including autistic spectrum disorder, depressive disorders, panic disorder, posttraumatic stress disorder, and substance use disorder) have been reviewed in other publications [6,9].

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