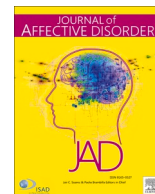




Contents lists available at ScienceDirect

Journal of Affective Disorders

journal homepage: www.elsevier.com/locate/jad

Short Communication

Alexithymia or general psychological distress? Discriminant validity of the Toronto Alexithymia Scale and the Perth Alexithymia Questionnaire

David A. Preece^{a,b,*}, Kate Petrova^c, Ashish Mehta^c, Pilleriin Sikka^{c,d,e,f}, James J. Gross^c^a Curtin University, Curtin enAble Institute & School of Population Health, Perth, Australia^b The University of Western Australia, School of Psychological Science, Perth, Australia^c Stanford University, Department of Psychology, Stanford, United States of America^d University of Turku, Department of Psychology and Speech-Language Pathology, Finland^e University of Turku, Turku Brain and Mind Center, Finland^f University of Skövde, Department of Cognitive Neuroscience and Philosophy, Sweden

ARTICLE INFO

Keywords:

Alexithymia

Distress

Toronto Alexithymia Scale

Perth Alexithymia Questionnaire

Discriminant validity

ABSTRACT

Background: Alexithymia is an important transdiagnostic risk factor for emotion-based psychopathologies. However, it remains unclear whether alexithymia questionnaires actually measure alexithymia, or whether they measure emotional distress. Our aim here was to address this discriminant validity concern via exploratory factor analysis (EFA) of the 20-item Toronto Alexithymia Scale (TAS-20) and the Perth Alexithymia Questionnaire (PAQ).

Method: United States general community adults ($N = 508$) completed the TAS-20, PAQ, and the Depression Anxiety Stress Scales-21 (DASS-21). EFA was used to examine the latent dimensions underlying these measures' scores.

Results: Our EFA extracted two higher-order factors, an "alexithymia" factor and a "general distress" factor (i.e., depression, anxiety, stress). All PAQ scores loaded cleanly on the alexithymia factor, with no cross-loadings on the distress factor. However, for the TAS-20, Difficulty Identifying Feelings (DIF) facet scores cross-loaded highly on the distress factor.

Limitations: Our sample consisted of general community adults; future work in clinical settings will be useful.

Conclusions: Our data indicate that the PAQ has good discriminant validity. However, the TAS-20 appears to have significant discriminant validity problems, in that much of the variance in its DIF facet reflects people's current levels of distress, rather than alexithymia. The TAS-20, which has traditionally been the most widely used alexithymia questionnaire, may therefore not be the optimal alexithymia tool. Our findings add to the body of evidence supporting the validity and utility of the PAQ and suggest that, moving forward, it is a superior option to the TAS-20 for alexithymia assessments.

1. Introduction

Alexithymia, meaning "no words for emotions" in Greek, was coined in the 1970's to describe a cluster of emotion processing deficits often observed in patients with psychosomatic disorders (Sifneos, 1973). Five decades of research have since consistently supported the status of alexithymia as a coherent multidimensional construct, comprised of three interrelated facets: *difficulty identifying one's own feelings* (DIF), *difficulty describing one's own feelings* (DDF), and an *externally oriented thinking style* (EOT) involving a lack of attention towards one's internal emotional states (Preece et al., 2017; Preece and Gross, 2023).

Levels of alexithymia exist on a continuum, with around 10 % of people having problematically high alexithymia (Luminet et al., 2018). Rates are often slightly higher in males than females (Levant et al., 2009). Rates are much higher in clinical samples, with around 30–50 % of psychiatric patients reporting high alexithymia (McGillivray et al., 2017). Alexithymia is now seen as a transdiagnostic risk factor for a range of psychopathologies, including depression, anxiety disorders, eating disorders, personality disorders, psychosomatic disorders, and substance use problems (Taylor et al., 1999). This appears to be in large part because alexithymia impairs downstream emotion regulation abilities, predisposing people to dysregulated emotion (Preece et al., 2022).

* Corresponding author at: Curtin University, School of Psychology, Kent Street, Bentley 6102, WA, Australia.

E-mail address: david.preece@curtin.edu.au (D.A. Preece).

<https://doi.org/10.1016/j.jad.2024.01.271>

Received 19 August 2023; Received in revised form 15 January 2024; Accepted 31 January 2024

Available online 4 February 2024

0165-0327/© 2024 The Author(s). Published by Elsevier B.V. This is an open access article under the CC BY license (<http://creativecommons.org/licenses/by/4.0/>).

The assessment of alexithymia in clinical settings and psychopathology research is therefore important. Traditionally, this has most commonly been done by psychometric self-report questionnaires such as the 20-item Toronto Alexithymia Scale (TAS-20), Perth Alexithymia Questionnaire (PAQ), or Bermond Vorst Alexithymia Questionnaire (BVAQ). However, in recent years, it has been questioned whether self-report alexithymia questionnaires are truly measuring alexithymia, or are instead measuring how distressed people currently are (e.g., Leising et al., 2009; Marchesi et al., 2014; Veirman et al., 2021). If alexithymia is to be studied and regarded as an important clinical variable in its own right, it is essential that psychometric measures of alexithymia are able to demonstrate discriminant validity (or discriminant evidence) against markers of distress.

Empirically, this discriminant validity issue can be tested directly via factor analyses of alexithymia measures alongside established measures of distress, to see whether they load onto separable higher-order dimensions (Leising et al., 2009). Under such conditions, if alexithymia measures have good discriminant validity (i.e., they measure alexithymia and not distress), we would expect two higher-order factors to be extracted: an “alexithymia” factor comprised of the DIF, DDF, and EOT scores of alexithymia measures, and a “general distress” factor comprised of scores for common negative affect symptom clusters like depression, anxiety, and stress.¹ Ideally, these two higher-order factors should be significantly positively correlated, given that alexithymia is a risk factor for psychopathology symptoms (Preece et al., 2022), but they should nonetheless be separable factors. Alternatively, if alexithymia measures have poor discriminant validity, some of their scores can be expected to cross-load onto the distress factor, or only a single higher-order factor should be extracted.

To date, few studies have investigated this. The first study to assess these higher-order dimensions was Leising et al. (2009), who compared the total scale score of the 20-item Toronto Alexithymia Scale against the subscales of the Symptom Checklist-90-Revised and Inventory of Interpersonal Problems, in a sample of 63 psychiatric patients and community members. They found that only one higher-order factor was extracted, with the TAS-20 total score loading on the same factor as psychopathology symptoms. However, since usually 100 participants are required for a robust factor analysis, the small sample size here is a limitation (Brown, 2015).

A larger-scale study was recently conducted by Preece et al. (2020a), who examined the subscales of the TAS-20, PAQ, and BVAQ across five samples ($N_s = 300, 128, 216, 148, 103$), with the subscales of the Depression Anxiety Stress Scales-21 (DASS-21) used as the markers of general distress. In all samples, two higher-order factors were extracted, reflecting “alexithymia” and “general distress”. The DIF, DDF, and EOT subscales of the PAQ and BVAQ, which were examined in two of the five samples, all loaded cleanly onto the alexithymia factor, with no cross-loadings. However, for the TAS-20, which was examined in three of the five samples, its DIF subscale consistently cross-loaded onto the distress factor. This may be because the DIF subscale of the TAS-20 contains several items that are not specific to emotion processing, but which instead appear to overlap in their content with somatic symptoms (e.g., “I have physical sensations that even doctors don’t understand”, “I

¹ We use the terms “general distress” or “general psychological distress” throughout this paper to refer to a higher-order negative affect construct, comprised of depression, anxiety, and stress symptoms (Lovibond and Lovibond, 1995; Kotov et al., 2017). This is a construct that has been well established in the literature via the testing of popular psychometric measures like the DASS-21 (Lovibond and Lovibond, 1995) and Kessler-10 (Kessler et al., 2003), both of which combine depression and anxiety symptoms into a total score as an overall marker of distress. This construct spans both the experiential/cognitive symptoms (e.g., high levels of negative feelings) and somatic symptoms (e.g., dryness in mouth, heart rate changes), as detailed in the DSM-5-TR for depressive and anxiety symptomatology.

don’t know what is going on inside me”). Two other studies have also conducted these types of factor analyses, both focusing on the PAQ, one using two community samples ($N_s = 231, 748$; Preece et al., 2018a), and one using a sample with brain injury ($N = 350$) or a general community sample ($N = 1012$; Fynn et al., 2022). In all these samples, the PAQ subscales loaded well on the alexithymia factor and had no cross-loadings on the distress factor comprised of DASS-21 scores.

Thus, across the limited data available, the PAQ has performed well so far in appearing to capture an alexithymia construct that is separable from distress, but the TAS-20 has had issues in this area. Given that the TAS-20 has been the most widely used alexithymia measure since the 1990s (Luminet et al., 2018), this could have widespread implications for the field. Also, the TAS-20 authors recently recommended that the TAS-20 should “remain the self-report measure of choice for clinicians and researchers assessing alexithymia” (Zahid et al., 2023, p. 1). There is therefore a pressing need for more studies of this type, to determine whether discriminant validity issues are indeed present in the TAS-20. Our aim here was to examine the discriminant validity of the TAS-20 and PAQ using factor analysis, to determine the extent to which scores from these self-report measures assess alexithymia or general distress. No previous study has directly compared the TAS-20 and PAQ within the same sample in this manner.

2. Method

2.1. Participants and procedure

Our sample comprised 508 adults from the general community of the United States.² They were recruited by Qualtrics Panels to be representative in terms of gender, age, and region. Sample demographic information is displayed in Table 1. All participants completed an online survey that included the TAS-20, PAQ, and DASS-21. There were no missing data.

2.2. Measures

2.2.1. Toronto Alexithymia Scale-20

The TAS-20 (Bagby et al., 1994) is a 20-item self-report measure of alexithymia. Separate DIF (7 items; e.g., “I am often confused about what emotion I am feeling”), DDF (5 items; e.g., “It is difficult for me to find the right words for my feelings”), and EOT (8 items; e.g., “I find examination of my feelings useful in solving personal problems [reverse-scored]”) subscales can be derived. All items can also be summed into a total score. Higher scores indicate higher levels of alexithymia. The TAS-20 has generally demonstrated good validity and reliability, though as above-mentioned there are some concerns about discriminant validity and the EOT score usually has low reliability (Chan et al., 2023).

2.2.2. Perth Alexithymia Questionnaire

The PAQ (Preece et al., 2018a) is a 24-item self-report measure of alexithymia. It assesses the DIF, DDF, and EOT facets of alexithymia. For DIF and DDF, separate valence-specific subscales can be derived for negative and positive emotions. It therefore has five intended subscales: Negative-DIF (4 items; e.g., “When I’m feeling bad, I can’t tell whether I’m sad, scared, or angry”), Positive-DIF (4 items; e.g., “When I’m feeling good, I can’t tell whether I’m happy, excited, or amused”), Negative-DDF (4 items; e.g., “When I’m feeling bad, I can’t find the right words to describe those feelings”), Positive-DDF (4 items; e.g., “When I’m feeling good, I can’t talk about those feelings in much depth or detail”), and General-EOT (8

² This sample has been used in several other published papers on alexithymia (Preece et al., 2020b, 2020c; Preece et al., 2022; Preece et al., 2023a, 2023a, 2023c). However, none of those papers have focused on this research question or conducted factor analyses comparing the discriminant validity of the TAS-20 and PAQ against markers of distress.

Table 1
Sample demographics.

	Frequency	%
Gender		
Female	252	49.6 %
Male	249	49.0 %
Non-binary	7	1.4 %
Age		
18–24	65	12.8 %
25–34	87	17.1 %
35–44	86	16.9 %
45–54	82	16.1 %
55–64	83	16.3 %
65+	105	20.7 %
Highest education level		
Primary school	2	0.4 %
Some high school (not complete)	12	2.4 %
High school	133	26.2 %
Some college (not complete)	139	27.4 %
Associate's degree	72	14.2 %
Bachelor's degree	99	19.5 %
Postgraduate degree	51	10.0 %
College student status		
Current student	40	7.9 %
Not a student	468	92.1 %
Region		
Midwest	111	21.9 %
Northeast	102	20.1 %
South	197	38.8 %
West	98	19.3 %
Race		
White	405	79.7 %
Black or African American	38	7.5 %
American Indian or Alaska Native	4	0.8 %
Asian	20	3.9 %
Native Hawaiian or Pacific Islander	1	0.2 %
Other	20	3.9 %
Multiple races	17	3.4 %
Prefer not to answer	3	0.6 %
Hispanic/Latino		
Yes	44	8.7 %
No	462	90.9 %
Prefer not to answer	2	0.4 %

items; e.g., “I don't pay attention to my emotions”). All items can also be summed into a total score. Higher scores indicate higher levels of alexithymia. The PAQ has demonstrated good validity and reliability (Becerra et al., 2021).

2.2.3. Depression Anxiety Stress Scales-21

The DASS-21 (Lovibond and Lovibond, 1995) is a 21-item self-report measure of depression (7 items; e.g., “I felt down-hearted and blue”), anxiety (7 items; e.g., “I was worried about situations in which I might panic and make a fool of myself”), and stress (7 items; e.g., “I found it hard to wind down”) symptoms experienced over the past week. Separate subscale scores are derived for each symptom category, and all items can also be summed into a total score as an overall marker of general psychological distress. Higher scores indicate more severe symptoms. The DASS-21 has demonstrated good validity and reliability (Lovibond and Lovibond, 1995). It was selected for use in this study because the DASS-21 is one of the most widely used and validated self-report measures of psychopathology symptoms in the field (Osman et al., 2012). Its items capture experiential/cognitive (e.g., “I couldn't seem to experience any positive feeling at all”, “I felt I was close to panic”) and somatic (e.g., “I was

aware of dryness in my mouth”, “I experienced trembling [eg. in the hands]”, “I was aware of the action of my heart in the absence of physical exertion [eg. sense of heart rate increase, heart missing a beat]”) manifestations of depression and anxiety, and thus provide good construct coverage (Lovibond and Lovibond, 1995).

2.3. Analytic strategy

Analyses were conducted using Jamovi version 2.3.26. Pearson correlations were calculated between the study variables. An Exploratory Factor Analysis (Principal Axis Factoring with Direct Oblimin rotation) was conducted on the TAS-20, PAQ, and DASS-21 subscale scores. Factor extraction was based on parallel analysis (Hayton et al., 2004). Factor loadings ≥ 0.40 were considered meaningful loadings (Brown, 2015). An oblique rotation method (Direct Oblimin) that allows for correlated factors was used for the factor analysis because, theoretically, “alexithymia” and “general distress” should be separable yet correlated constructs (e.g., alexithymia is a risk factor for the development and maintenance of affective disorders; Preece et al., 2022). Principal Axis Factoring was used as the extraction method, as it is one of the most common approaches for Exploratory Factor Analysis and has been shown to perform well in datasets with similar properties to ours (e.g., De Winter and Dodou, 2012). This approach also replicates past work in the alexithymia field (e.g., Preece et al., 2020a, 2020b) and thus maximises comparability with other findings.

We used the measures' subscale scores, rather than item scores, as the variables in the factor analyses because we were specifically interested in examining how the subscale components (i.e., DIF, DDF, and EOT, or depression, anxiety, and stress) would load onto the higher-order “alexithymia” or “general distress” factors. Moreover, when these instruments are used in clinical or research settings, it is most frequently the subscale scores (rather than individual item scores) that are used, and thus an examination of what the subscale scores are measuring has the highest practical relevance. This approach using the subscale scores as the input variables is called a second-order or higher-order factor analysis (e.g., Daros and Ruocco, 2021; Naragon-Gainey et al., 2017; Vet et al., 2005). An alternative approach would be to use the measures' items as the variables in our factor analysis (i.e., a first-order factor analysis), but this would not answer our intended research question. For example, if one does a factor analysis of the DASS-21 items, typically three lower-order factors are extracted, with items grouping into the three subscale factors of depression, anxiety, and stress (Lovibond and Lovibond, 1995). However, just because the depression, anxiety, and stress items load on separable lower-order factors (i.e., the three subscales) this does not mean that they are not all still parts of the same higher-order “general distress” construct. Indeed, when the higher-order level is examined, those DASS-21 depression, anxiety, and stress lower-order factors (subscales) consistently load well together onto the same higher-order “general distress” factor (e.g., Ruiz et al., 2017). For our research question, it is the loading of the alexithymia measures' scores on that higher-order “general distress” factor that we are interested in, and thus why the variables included in our factor analysis were the subscale scores, not the item scores.

3. Results

Descriptive statistics and reliability coefficients are provided in

Supplementary Table S1.³ All scores had acceptable internal consistency reliability ($\alpha > 0.70$) except the TAS-20 EOT subscale ($\alpha = 0.55$). Pearson correlations (see Supplementary Table S2) indicated that the subscales and total score of the TAS-20 ($r = -0.01$ – 0.65), and the subscales and total score of the PAQ ($r = 0.15$ – 0.55), were generally all significantly ($p < .05$) positively correlated with depression, anxiety, and stress (except for the TAS-20 EOT subscale; $r = -0.01$ – 0.04). In terms of demographic variables (see Supplementary Table S2), males and females did not differ in DASS-21 scores, but males had significantly higher levels of alexithymia on most TAS-20 and PAQ scores. Younger age was significantly correlated with higher DASS-21 scores and with most TAS-20 and PAQ scores.

Bartlett's Test of Sphericity ($p < .001$) and the Kaiser-Meyer-Olkin Measure of Sampling Adequacy (0.85) indicated that the data were appropriate for factor analysis. Our factor analysis extracted two factors based on parallel analysis, accounting for 64.9 % of the variance (see Table 2 for factor loadings, and Supplementary Fig. S1 for a scree plot of the factor eigenvalues). Factor 1 appeared to be the "alexithymia" factor, comprised of loadings from all the TAS-20 and PAQ subscales. Factor 2 appeared to be the "general distress" factor, comprised of loadings from all the DASS-21 subscales. These two factors were moderately positively correlated ($r = 0.45$). None of the PAQ subscales cross-loaded onto the "general distress" factor. However, the TAS-20 DIF subscale loaded more highly on the "general distress" factor (loading = 0.50) than the "alexithymia" factor (loading = 0.46).

Table 2
Factor loadings from exploratory factor analysis of the TAS-20, PAQ, and DASS-21 subscale scores.

	Factor 1 "Alexithymia"	Factor 2 "General Distress"
TAS-20		
DIF	0.46	0.50
DDF	0.66	
EOT	0.55	
PAQ		
N-DIF	0.70	
P-DIF	0.83	
N-DDF	0.77	
P-DDF	0.88	
G-EOT	0.75	
DASS-21		
Depression		0.80
Anxiety		0.85
Stress		0.93

Note. Factor loadings over 0.30 are displayed. Factor loadings ≥ 0.40 are interpreted as meaningful loadings (Brown, 2015). TAS-20 = Toronto Alexithymia Scale-20, PAQ = Perth Alexithymia Questionnaire, DASS-21 = Depression Anxiety Stress Scales-21, DIF = Difficulty identifying feelings, DDF = Difficulty describing feelings, EOT = Externally orientated thinking, N = Negative, P = Positive, G = General.

³ Mahalanobis distance thresholds (> 25) indicated that 32 of the 508 participants could be considered multivariate outliers. However, Cook's distance values for all these cases were < 1 , suggesting that none of these were influential outliers (Field, 2009). The removal of these 32 participants from the dataset did not change the pattern of results, and there were no reasons to suggest that they were not part of the population of interest. Thus, all 508 participants were retained in the data-set for the analyses.

4. Discussion

Our aim here was to test whether the TAS-20 and PAQ – two popular self-report alexithymia questionnaires – in fact measure alexithymia rather than general psychological distress. Overall, our results indicated strong discriminant validity for the PAQ, but some issues were identified in the TAS-20.

4.1. Alexithymia and general distress

Our factor analysis extracted two factors, corresponding to "alexithymia" and "general distress", and these two factors were positively correlated, as would be expected theoretically given the status of alexithymia as a risk factor for affective disorders (Preece et al., 2022). All TAS-20 and PAQ subscales loaded well onto the alexithymia factor. None of the PAQ subscales loaded onto the distress factor (i.e., comprised of the depression, anxiety, and stress subscales of the DASS-21). In contrast, the TAS-20 DIF subscale loaded more highly on the distress factor than the alexithymia factor.

This indicates that substantial variance in the TAS-20 DIF subscale appears to reflect not only alexithymia, but also how distressed respondents currently were. These findings align with those of past work in this area (e.g., Fynn et al., 2022; Leising et al., 2009; Preece et al., 2020a), indicating good discriminant validity for the PAQ, but not so for the TAS-20 DIF facet, and hence, the TAS-20 total score (as 7 out of 20 TAS-20 items [35 %] of the total score come from the DIF facet). This appears to be because the TAS-20 DIF subscale contains several items which conceptually overlap with somatic symptoms (e.g., "I have physical sensations that even doctors don't understand", "I don't know what is going on inside me"). Indeed, a recent study of the content validity of the TAS-20 found that many participants interpreted such items to be asking about psychopathology symptoms (e.g., health anxiety) rather than alexithymia (Veirman et al., 2021). Past work with popular measures of general distress, such as the DASS-21 (Lovibond and Lovibond, 1995) and Kessler-10 (Kessler et al., 2003), have found that somatic symptoms of depression and anxiety (e.g., body shaking, dryness in mouth, changes in psychomotor activity levels) usually load on the same factor as the experiential/cognitive symptoms (e.g., high levels of negative feelings). The DSM-5-TR, similarly, emphasises both somatic and experiential/cognitive symptoms within its categorisation of depressive and anxiety disorders (American Psychiatric Association, 2022). Thus, somatic symptoms are important components of general psychological distress and the TAS-20 overlaps with such symptoms. Given the central importance of being able to differentiate people's alexithymia levels from their current levels of distress (i.e., if alexithymia is to be studied and regarded as an important clinical variable in its own right), this represents a prominent issue for the utility of the TAS-20.

4.2. Implications

Taken together, our positive findings for the PAQ suggest that self-report alexithymia questionnaires can successfully assess an alexithymia construct that is separable from distress. However, the TAS-20 appears to have problems in this domain, and our data therefore indicate that caution should be used when interpreting TAS-20 scores. Because the TAS-20 DIF score appears to be confounded by distress levels, this will likely erroneously inflate the predictive value of alexithymia in predictive models of psychopathology if the TAS-20 is used. This also means that it will be important to control for distress if using the TAS-20 to compare alexithymia levels across groups, especially groups where distress levels differ (e.g., clinical vs non-clinical). Because the TAS-20 has previously been the most widely used alexithymia measure in the field, these discriminant validity issues have widespread implications for the interpretation of past alexithymia findings using the TAS-20. Coupled with the low reliability of the TAS-20 EOT facet (which

comprises 8 of the 20 items [40 %] of the TAS-20) documented across the literature (e.g., Kooiman et al., 2002; Preece et al., 2018b), these findings indicate several notable psychometric problems within the TAS-20.

When interpreting findings from those studies in the alexithymia field that have only used the TAS-20 to operationalise alexithymia, researchers should therefore be aware that any reported effect sizes for the TAS-20 DIF subscale score and TAS-20 total score are likely attributable to variance in both participants' alexithymia and distress levels, not just alexithymia. Most past studies using the TAS-20 have not controlled for participants' distress levels, and thus for much of the existing alexithymia literature it is not possible to parse how much of the observed effects are attributable to alexithymia, rather than distress. Given the large explanatory power and significant relationships that the distress construct has established in its own right with a wide variety of other psychological constructs (e.g., personality, trauma, emotion regulation, well-being, relationship functioning, demographic factors; Eisenberg et al., 2007; Levant, 1996; Klein et al., 2002), the confounding of distress within the measurement of alexithymia via the TAS-20 presents a substantial problem for the alexithymia field.

For example, in the body of literature comparing TAS-20 alexithymia levels across healthy controls and patients with different categories of psychopathology (i.e., designed to test research questions on whether alexithymia levels differ between clinical and non-clinical groups, or whether alexithymia is a risk factor for psychopathology), the DIF subscale often has the largest effect sizes in differentiating clinical and non-clinical groups (e.g., Duddu et al., 2003). Previously, this had been interpreted as strong evidence that difficulties identifying feelings have particularly high clinical relevance. That might still be the case, but our findings suggest that the relationships between alexithymia and clinical outcomes in such studies are likely inflated by the influence of distress. An alternative interpretation of those studies' results is that levels of distress (rather than alexithymia) are higher in clinical groups than non-clinical groups. Consequently, when making conclusions from past literature that has used only the TAS-20, those studies that have controlled for distress levels should be heavily prioritised.

4.3. Limitations and future directions

Whilst we think our study makes a strong contribution, several limitations of our study should be noted. First, our sample consisted of general community adults. Alexithymia research is often done in community samples and the construct manifests similarly in non-clinical and clinical samples (e.g., Fynn et al., 2022), so our findings have high relevance, but future work in clinical samples will be important to explore the generalisability of our findings. Secondly, our participants were from a single Western country and more work in other cultural groups is needed. Third, whilst the TAS-20 and PAQ are popular self-report measures, they are not the only alexithymia questionnaires in the field, and future studies might usefully extend to a broader battery of alexithymia measures. Similarly, in this study we measured general distress (depression, anxiety, and stress) using the DASS-21. This is a widely used and well-validated measure of the construct (Ruiz et al., 2017), but other studies might test the generalisability of our findings with other psychometric measures, such as the Beck Depression Inventory, Beck Anxiety Inventory, Kessler-10, Patient Health Questionnaire-9, Generalised Anxiety Disorder-7, and Symptom Checklist-90-Revised. Distress measures can differ in the extent to which they include somatic symptoms of depression and anxiety (Lovibond and Lovibond, 1995), and this might be an important content feature in determining the degree of overlap observed with the TAS-20.

5. Conclusions

Available data suggest that the PAQ is a superior option to the TAS-20 for alexithymia assessments, given the central importance of being

able to differentiate between alexithymia and distress in clinical research and practice.

Role of the funding source

None.

Funding

None.

CRediT authorship contribution statement

David A. Preece: Conceptualization, Data curation, Formal analysis, Methodology, Project administration, Writing – original draft. **Kate Petrova:** Conceptualization, Methodology, Writing – original draft. **Ashish Mehta:** Conceptualization, Methodology, Writing – original draft. **Pillieriin Sikka:** Conceptualization, Methodology, Writing – original draft. **James J. Gross:** Conceptualization, Methodology, Writing – original draft.

Declaration of competing interest

The authors declare that they have no conflicts of interest.

Acknowledgement

Ethics approval for this study was granted by the University of Western Australia Human Research Ethics Committee.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.jad.2024.01.271>.

References

- American Psychiatric Association, 2022. *Diagnostic and statistical manual of mental disorders* (5th ed., text rev.). <https://doi.org/10.1176/appi.books.9780890425787>.
- Bagby, R.M., Parker, J.D., Taylor, G.J., 1994. The twenty-item Toronto Alexithymia Scale—I. Item selection and cross-validation of the factor structure. *J. Psychosom. Res.* 38 (1), 23–32.
- Becerra, R., Baeza, C.G., Fernandez, A.M., Preece, D.A., 2021. Assessing alexithymia: Psychometric properties of the Perth alexithymia questionnaire in a Spanish-speaking sample. *Frontiers in psychiatry* 12, 710398.
- Brown, T.A., 2015. *Confirmatory Factor Analysis for Applied Research*. The Guilford Press.
- Chan, J., Becerra, R., Weinborn, M., Preece, D., 2023. Assessing alexithymia across Asian and western cultures: psychometric properties of the Perth alexithymia questionnaire and Toronto alexithymia scale-20 in Singaporean and Australian samples. *J. Pers. Assess.* 105 (3), 396–412.
- Daros, A.R., Ruocco, A.C., 2021. Which emotion regulation strategies are most associated with trait emotion dysregulation? A transdiagnostic examination. *J. Psychopathol. Behav. Assess.* 43 (3), 478–490.
- De Winter, J.C., Dodou, D., 2012. Factor recovery by principal axis factoring and maximum likelihood factor analysis as a function of factor pattern and sample size. *J. Appl. Stat.* 39 (4), 695–710.
- Duddu, V., Isaac, M.K., Chaturvedi, S.K., 2003. Alexithymia in somatoform and depressive disorders. *J. Psychosom. Res.* 54 (5), 435–438.
- Eisenberg, D., Gollust, S.E., Golberstein, E., Hefner, J.L., 2007. Prevalence and correlates of depression, anxiety, and suicidality among university students. *Am. J. Orthopsychiatry* 77 (4), 534–542.
- Fynn, D.M., Preece, D.A., Gignac, G.E., Pestell, C.F., Allan, A., Vander Kraats, C., Becerra, R., 2022. Assessing alexithymia in adults with acquired brain injury: psychometric properties of the Perth alexithymia questionnaire. *J. Affect. Disord.* 302, 224–233.
- Hayton, J.C., Allen, D.G., Scarpello, V., 2004. Factor retention decisions in exploratory factor analysis: a tutorial on parallel analysis. *Organ. Res. Methods* 7 (2), 191–205.
- Kessler, R.C., Barker, P.R., Colpe, L.J., Epstein, J.F., Gfroerer, J.C., Hiripi, E., Zaslavsky, A.M., 2003. Screening for serious mental illness in the general population. *Arch. Gen. Psychiatry* 60 (2), 184–189.
- Klein, D.N., Durbain, C.E., Shankman, S.A., Santiago, N.J., 2002. *Depression and Personality*.

- Kooiman, C.G., Spinhoven, P., Trijsburg, R.W., 2002. The assessment of alexithymia: a critical review of the literature and a psychometric study of the Toronto alexithymia Scale-20. *J. Psychosom. Res.* 53 (6), 1083–1090.
- Kotov, R., Krueger, R.F., Watson, D., Achenbach, T.M., Althoff, R.R., Bagby, R.M., Zimmerman, M., 2017. The hierarchical taxonomy of psychopathology (HiTOP): a dimensional alternative to traditional nosologies. *J. Abnorm. Psychol.* 126, 454.
- Leising, D., Grande, T., Faber, R., 2009. The Toronto alexithymia scale (TAS-20): a measure of general psychological distress. *J. Res. Pers.* 43 (4), 707–710.
- Levant, R.F., 1996. The new psychology of men. *Prof. Psychol. Res. Pract.* 27 (3), 259.
- Levant, R.F., Hall, R.J., Williams, C.M., Hasan, N.T., 2009. Gender differences in alexithymia. *Psychol. Men Masculinity* 10 (3), 190.
- Lovibond, P.F., Lovibond, S.H., 1995. The structure of negative emotional states: comparison of the depression anxiety stress scales (DASS) with the Beck depression and anxiety inventories. *Behav. Res. Ther.* 33 (3), 335–343.
- Luminet, O., Bagby, R.M., Taylor, G.J. (Eds.), 2018. *Alexithymia: Advances in Research, Theory, and Clinical Practice*. Cambridge University Press.
- Marchesi, C., Ossola, P., Tonna, M., De Panfilis, C., 2014. The TAS-20 more likely measures negative affects rather than alexithymia itself in patients with major depression, panic disorder, eating disorders and substance use disorders. *Compr. Psychiatry* 55 (4), 972–978.
- McGillivray, L., Becerra, R., Harms, C., 2017. Prevalence and demographic correlates of alexithymia: a comparison between Australian psychiatric and community samples. *J. Clin. Psychol.* 73 (1), 76–87.
- Naragon-Gainey, K., McMahon, T.P., Chacko, T.P., 2017. The structure of common emotion regulation strategies: a meta-analytic examination. *Psychol. Bull.* 143 (4), 384.
- Osman, A., Wong, J.L., Bagge, C.L., Freedenthal, S., Gutierrez, P.M., Lozano, G., 2012. The depression anxiety stress scales—21 (DASS-21): further examination of dimensions, scale reliability, and correlates. *J. Clin. Psychol.* 68 (12), 1322–1338.
- Preece, D., Becerra, R., Allan, A., Robinson, K., Dandy, J., 2017. Establishing the theoretical components of alexithymia via factor analysis: introduction and validation of the attention-appraisal model of alexithymia. *Personal. Individ. Differ.* 119, 341–352.
- Preece, D., Becerra, R., Robinson, K., Dandy, J., Allan, A., 2018a. The psychometric assessment of alexithymia: development and validation of the Perth alexithymia questionnaire. *Personal. Individ. Differ.* 132, 32–44.
- Preece, D., Becerra, R., Robinson, K., Dandy, J., 2018b. Assessing alexithymia: psychometric properties and factorial invariance of the 20-item Toronto alexithymia scale in nonclinical and psychiatric samples. *J. Psychopathol. Behav. Assess.* 40, 276–287.
- Preece, D.A., Gross, J.J., 2023. Conceptualizing alexithymia. *Personal. Individ. Differ.* 215, 112375.
- Preece, D.A., Becerra, R., Boyes, M.E., Northcott, C., McGillivray, L., Hasking, P.A., 2020a. Do self-report measures of alexithymia measure alexithymia or general psychological distress? A factor analytic examination across five samples. *Personal. Individ. Differ.* 155, 109721.
- Preece, D.A., Becerra, R., Robinson, K., Allan, A., Boyes, M., Chen, W., Gross, J.J., 2020b. What is alexithymia? Using factor analysis to establish its latent structure and relationship with fantasizing and emotional reactivity. *J. Pers.* 88 (6), 1162–1176.
- Preece, D.A., Becerra, R., Allan, A., Robinson, K., Chen, W., Hasking, P., Gross, J.J., 2020c. Assessing alexithymia: psychometric properties of the Perth Alexithymia Questionnaire and 20-item Toronto Alexithymia Scale in United States adults. *Personal. Individ. Differ.* 166, 110138.
- Preece, D.A., Mehta, A., Becerra, R., Chen, W., Allan, A., Robinson, K., Gross, J.J., 2022. Why is alexithymia a risk factor for affective disorder symptoms? The role of emotion regulation. *J. Affect. Disord.* 296, 337–341.
- Preece, D.A., Mehta, A., Petrova, K., Sikka, P., Bjureberg, J., Becerra, R., 2023a. Alexithymia and emotion regulation. *J. Affect. Disord.* 324, 232–238.
- Preece, D.A., Petrova, K., Mehta, A., Gross, J.J., 2023b. The Emotion Regulation Questionnaire-Short Form (ERQ-S): A 6-item measure of cognitive reappraisal and expressive suppression. *J. Affect. Disord.* 340, 855–861.
- Preece, D.A., Mehta, A., Petrova, K., Sikka, P., Bjureberg, J., Chen, W., Gross, J.J., 2023. The Perth Alexithymia Questionnaire-Short form (PAQ-S): A 6-item measure of alexithymia. *J. Affect. Disord.* 325, 493–501.
- Ruiz, F.J., Martín, M.B.G., Falcón, J.C.S., González, P.O., 2017. The hierarchical factor structure of the Spanish version of depression anxiety and stress Scale-21. *Int. J. Psychol. Psychol. Ther.* 17 (1), 97–105.
- Sifneos, P.E., 1973. The prevalence of 'alexithymic' characteristics in psychosomatic patients. *Psychother. Psychosom.* 22 (2–6), 255–262.
- Taylor, G.J., Bagby, R.M., Parker, J.D., 1999. *Disorders of Affect Regulation: Alexithymia in Medical and Psychiatric Illness*. Cambridge University Press.
- Veirman, E., Van Ryckeghem, D.M., Verleysen, G., De Paepe, A.L., Crombez, G., 2021. What do alexithymia items measure? A discriminant content validity study of the Toronto-alexithymia-scale-20. *PeerJ* 9, e11639.
- Vet, H.C.D., Adèr, H.J., Terwee, C.B., Pouwer, F., 2005. Are factor analytical techniques used appropriately in the validation of health status questionnaires? A systematic review on the quality of factor analysis of the SF-36. *Qual. Life Res.* 14, 1203–1218.
- Zahid, A., Taylor, G.J., Lau, S.C., Stone, S., Bagby, R.M., 2023. Examining the incremental validity of the Perth alexithymia questionnaire (PAQ) relative to the 20-item Toronto alexithymia scale (TAS-20). *J. Pers. Assess.* 1–12.