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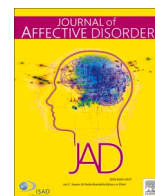
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Research paper

The Perth Alexithymia Questionnaire-Short Form (PAQ-S): A 6-item measure of alexithymia

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ABSTRACT

Background: Alexithymia is a trait characterized by difficulties identifying feelings, difficulties describing feelings, and externally orientated thinking. It is widely regarded as an important transdiagnostic risk factor for a range of psychopathologies, including depressive and anxiety disorders. Whilst several well-validated psychometric measures of alexithymia exist, these are relatively lengthy, thus limiting their utility in time-pressured settings. In this paper, we address this gap by introducing and validating a brief 6-item version of the Perth Alexithymia Questionnaire, called the Perth Alexithymia Questionnaire-Short Form (PAQ-S).

Method: Across two studies with adult samples (Study 1 $N = 508$ United States community; Study 2 = 378 Australian college students), we examined the psychometric properties of the PAQ-S in terms of its factor structure, reliability, and concurrent/criterion validity.

Results: In exploratory and confirmatory factor analyses, all PAQ-S items loaded well on a single general alexithymia factor. The PAQ-S total score had high reliability, and correlated as expected with the long-form of the PAQ, as well as other established markers of alexithymia, emotion regulation, and affective disorder symptoms. **Limitations:** Our samples were general community or college student samples from two Western countries; future validation work in clinical samples and more diverse cultural groups is thus needed.

Conclusions: The PAQ-S retains the psychometric strengths of the PAQ. As such, the PAQ-S can be used as a quick, robust measure of overall alexithymia levels. The introduction of the PAQ-S hence enables valid assessments of alexithymia in a more diverse range of settings and research designs.

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1. Introduction

Alexithymia is a trait comprised of *difficulty identifying one's own feelings* (DIF), *difficulty describing feelings* (DDF), and an *externally orientated thinking style* (EOT) characterized by a predominant focus on the external world rather than on internal emotional states (Preece et al., 2017).¹ First coined by American psychiatrists in the 1970s (Sifneos, 1973), over the past five decades alexithymia has become established as an important transdiagnostic risk factor for a variety of psychopathologies (Taylor et al., 1999). Prominent areas of research include the latent structure of the construct itself (Preece et al., 2020a), its distributions within community and clinical populations (McGillivray et al., 2017), genetic and environmental influences (Jørgensen et al., 2007), and its relationship with psychopathology symptoms (Bankier et al., 2001).

Much of this research has been enabled by the development of psychometric tools to operationalise alexithymia, most commonly with self-report questionnaires like the 20-item Toronto Alexithymia Scale (TAS-20; Bagby et al., 1994), Bermond-Vorst Alexithymia Questionnaire (BVAQ; Vorst and Bermond, 2001), or Perth Alexithymia Questionnaire (PAQ; Preece et al., 2018a). However, whilst such questionnaires have demonstrated many strengths, one key practical limitation is their length. For example, the three popular questionnaires mentioned above range from 20 to 40 items. Such length is valuable for capturing detailed information about each specific facet of alexithymia, for maximising reliability, and is well-suited to studies where alexithymia is a primary or sole focus.

Unfortunately, existing measures may be infeasible in time-pressured settings (e.g., busy clinical wards), or research designs requiring a large battery of measures where alexithymia is just one of many variables of interest, or where repeated daily or weekly assessments are needed. In such contexts, researchers and clinicians may instead prefer a short alexithymia measure, designed with just enough items to provide a robust *overall* marker of alexithymia.

Indeed, there is excellent evidence that much of the variance in the items of existing alexithymia measures is accounted for by a strong general factor, thus providing the rationale for a short measure designed to capture this general factor (Carnovale et al., 2021). Being able to measure general alexithymia efficiently and reliably in a variety of clinical and research settings is critical for gaining a deeper understanding of the phenomenon and how it relates to other traits, behaviors, and other clinically and theoretically meaningful outcomes. However, there is presently a lack of brief validated questionnaires designed for this purpose. Thus, the aim of this paper is to introduce a 6-item version of the PAQ called the Perth Alexithymia Questionnaire-Short Form (PAQ-S).

The 24-item long form of the PAQ is based on the *attention-appraisal model of alexithymia*, where EOT reflects difficulties focusing attention on emotions, and DIF and DDF reflect difficulties accurately appraising emotions (Preece et al., 2017). The PAQ has items assessing all three established facets of alexithymia, evenly weighted at 8-items each across the DIF, DDF, and EOT facets. For the DIF and DDF facets, separate subscales assess them for negative or positive emotions. Thus, the PAQ has an intended five-subscale structure: *Negative-Difficulty Identifying Feelings* (N-DIF; “When I'm feeling bad, I can't tell whether I'm sad,

angry, or scared”), *Positive-Difficulty Identifying Feelings* (P-DIF; “When I'm feeling good, I can't make sense of those feelings”), *Negative-Difficulty Describing Feelings* (N-DDF; “When I'm feeling bad, I can't talk about those feelings in much depth or detail”), *Positive-Difficulty Describing Feelings* (P-DDF; “When I'm feeling good, if I try to describe how I'm feeling I don't know what to say”), and *General-Externally Orientated Thinking* (G-EOT; “I prefer to just let my feelings happen in the background, rather than focus on them”). These subscales are also designed to be summed into several composite scores, including a total scale score as an overall marker of alexithymia.

The intended five-subscale structure has so far been supported across all published factor analyses, with those studies that have tested a bifactor model also supporting the presence of a strong general alexithymia factor (e.g., Becerra et al., 2021; Preece et al., 2018a). Furthermore, analyses of internal consistency have demonstrated high reliability for all PAQ subscales and the total scale score ($\alpha > 0.80$). The PAQ has been found to correlate with markers of other theoretically relevant constructs (e.g., emotion regulation, psychopathology symptoms), supporting the clinical relevance of PAQ scores in clinical, community, and university student samples (e.g., Chan et al., 2022; Greene et al., 2020; Fynn et al., 2022; Preece et al., 2020b, 2020c). In our view, these strong psychometric properties make the PAQ an excellent base for the creation of a brief measure of alexithymia.

In this paper, we describe the development of the 6-item PAQ-S, and then report the results of two studies where we examined its psychometric properties. We assess the factor structure, internal consistency, and concurrent/criterion validity of the PAQ-S.

1.1. PAQ-S initial development and item selection

In determining the items and structure of the PAQ-S, we were principally driven by several core conceptual criteria. First, like the long-form PAQ, we wanted to have an equal number of items corresponding to the DIF, DDF, and EOT facets of the construct. DIF, DDF, and EOT are all well-established facets of alexithymia (Watters et al., 2016), and thus to properly capture the conceptual breadth of the construct all must ideally be represented in any brief measure of alexithymia. Second, alexithymia manifests across both negative and positive emotions (i.e., people can have difficulty processing their negative or positive emotions; Preece et al., 2020b), and consequently the long form PAQ has some DIF and DDF items that ask specifically about negative emotions (i.e., the N-DIF and N-DDF subscales) and other items that ask specifically about positive emotions (i.e., the P-DIF and P-DDF subscales). Prior work has shown that, statistically, both these emotional valence domains contribute unique variance to the general alexithymia factor (e.g., Fynn et al., 2022). In the PAQ-S, we therefore wanted to ensure that both valence domains were represented.

The combination of the above two requirements meant that 6-items was the smallest number of items that could form the PAQ-S; two DIF items (one from the N-DIF subscale and one from the P-DIF subscale), two DDF items (one from the N-DDF subscale and one from the P-DDF subscale), and two EOT items (both from the G-EOT subscale). Elsewhere, statistical criteria have also dictated that a minimum of three items are required to derive a reliable latent factor (provided the items are sound), with more items generally increasing reliability (Brown, 2015). Therefore, comfortable that we were above that threshold for the generation of a total scale score, and wanting to maximise the brevity of the measure to optimise its utility, we settled on a 6-item format for the

¹ Some authors also consider *difficulties fantasising* or *constricted imaginal processes* to be a fourth component of alexithymia. However, presently the majority of statistical evidence suggests difficulties fantasising are not part of the same latent alexithymia construct as DIF, DDF, and EOT, and the most used measures of alexithymia consequently do not assess it (for detailed discussions of this issue, see Preece et al., 2020a; Taylor and Bagby, 2021). The Perth Alexithymia Questionnaire (i.e., the focus of this manuscript) is based on the *attention-appraisal model of alexithymia* (Preece et al., 2017), which does not include difficulties fantasising as part of the construct.

PAQ-S.² A 6-item format is employed in widely used brief measures of other clinically relevant constructs (e.g., the 6-item Kessler-6 distress scale; Kessler et al., 2003), and thus has a precedent of acceptability within the literature and clinical practice.

In terms of which six of the 24 PAQ items to select, past psychometric work with the PAQ has found all 24 items to load highly on their intended factor (Preece et al., 2018a), and thus, psychometrically, all items seemed strong potential candidates. In this context, we were principally informed by the content of the items. The order of the items in the original 24-item PAQ was not randomly chosen, but rather carefully selected so as to maximise clarity for respondents and most closely exemplify the key features of each alexithymia facet (Preece et al., 2018a). For example, PAQ items 1 and 4, the first items to mention negative or positive emotions, respectively, contain definitions of what is meant in the scale by the terms “feeling bad” or “feeling good”; thus, such items should not be removed from any short form if clarity of the measure is to be maintained. With these content considerations in mind, we decided that the 6-item PAQ-S should be comprised of the first 5 items of the PAQ, and PAQ item 9 (an EOT item) used instead of PAQ item 6 (also an EOT item) because we felt item 9 (“I don't pay attention to my emotions”) most closely represented the EOT facet as it is defined within the attention-appraisal model of alexithymia (Preece et al., 2017). In sum, the PAQ-S therefore consists of an item set with 2 DIF, 2 DDF, and 2 EOT items, with an even distribution of negative and positive valence items. See Table 1 for a list of the PAQ-S items.

Table 1
Item content and numbering of the six PAQ-S items and their ordering in the original long-form PAQ.

PAQ-S item number	PAQ item number	Alexithymia component assessed	Item content
1	1	DDF	When I'm feeling bad (feeling an unpleasant emotion), I can't find the right words to describe those feelings.
2	2	DIF	When I'm feeling bad, I can't tell whether I'm sad, angry, or scared.
3	3	EOT	I tend to ignore how I feel.
4	4	DDF	When I'm feeling good (feeling a pleasant emotion), I can't find the right words to describe those feelings.
5	5	DIF	When I'm feeling good, I can't tell whether I'm happy, excited, or amused.
6	9	EOT	I don't pay attention to my emotions.

Note. DIF = Difficulty identifying feelings, DDF = Difficulty describing feelings, EOT = Externally orientated thinking, PAQ = Perth Alexithymia Questionnaire, PAQ-S = Perth Alexithymia Questionnaire-Short Form.

² We acknowledge that other PAQ item combinations would be possible, and with more items there are possible short forms that could still retain the capacity to derive subscale scores. However, the 24-item PAQ already has only 4-items for most of its subscales. Thus, since a minimum of 3-items are required to derive a robust subscale score (Brown, 2015), in our view, the size difference between potential 3-item subscales and the existing 4-item subscales was not sufficient to warrant a new short form of that type. We, therefore, chose to focus instead on creating an extremely brief measure that would focus on the assessment of the alexithymia general factor.

2. Study 1: psychometrics in a general community sample

2.1. Method

2.1.1. Participants and procedure

Our first study utilised a general community sample of 508 adults from the United States (US) that completed an anonymous online survey battery. This sample was recruited by an online survey recruitment company (Qualtrics Panels), to be representative of the US adult population in terms of gender (males = 49 %, females = 49.6 %, other = 1.3 %), age ($M = 46.65$, $SD = 17.43$, range = 18–88), and geographic region (Midwest = 21.9 %, Northeast = 20.1 %, South = 38.8 %, West = 19.3 %). In terms of highest level of education, 28.5 % reported it was some high school, 27.4 % some college (but not completed), and 43.7 % had an associate's, bachelor's, or postgraduate degree. 7.9 % were currently college students. For ethnicity, 79.7 % reported being White, 7.5 % Black, 3.9 % Asian, and the remainder another race or multiple ethnicities.

2.1.2. Materials

Participants completed the long form of the PAQ, and we extracted responses for the relevant 6 items of the PAQ-S (i.e., the PAQ-S was not administered independently from the PAQ). The battery of questionnaires administered also included self-report measures of emotion regulation and affective disorder symptoms, used here to test the concurrent validity of the PAQ-S.

2.1.2.1. PAQ and PAQ-S. The PAQ (Preece et al., 2018a) is a 24-item self-report measure of alexithymia. Items are answered on a 7-point Likert scale, with higher scores indicating higher levels of alexithymia. Five subscale scores can be derived from the PAQ (N-DIF, P-DIF, N-DDF, P-DDF, G-EOT), as well as a total scale score as an overall marker of alexithymia. The PAQ has demonstrated good validity and reliability across a range of samples (Fynn et al., 2022). The PAQ-S contains six items from the PAQ, designed to be summed into a total scale score.

2.1.2.2. TAS-20. The TAS-20 (Bagby et al., 1994) is a 20-item self-report measure of alexithymia. Items assess the DIF (“I am often confused about what emotion I am feeling”), DDF (“It is difficult for me to find the right words for my feelings”), and EOT (“Being in touch with emotions is essential [reverse-scored]”) facets of the construct. Items are answered on a 5-point Likert scale, with higher scores indicating higher levels of alexithymia. The TAS-20 developers recommend that only the total scale score from the measure is used (Bagby et al., 2007), as the EOT items have low internal consistency if facet-level subscales are extracted (Kooiman et al., 2002). There are also some concerns about the discriminant validity of some TAS-20 DIF items (e.g., “I have physical sensations that even doctors don't understand”) against somatic symptoms of depression and anxiety, as these DIF items have been found to overlap statistically with depression and anxiety scores (e.g., Leising et al., 2009; Marchesi et al., 2014; Preece et al., 2020b). Overall, though, the TAS-20 has been found to have good validity and reliability as a marker of alexithymia (Bagby et al., 2007). The TAS-20 total scale score had good internal consistency in our sample ($\alpha = 0.86$).

2.1.2.3. Emotion Regulation Questionnaire (ERQ). The ERQ (Gross and John, 2003) is a 10-item measure of two emotion regulation strategies, *cognitive reappraisal* (“I control my emotions by changing the way I'm thinking about the situation”) and *expressive suppression* (“I control my emotions by not expressing them”). Items are answered on a 7-point Likert scale, with higher scores indicating more frequent usage of a strategy. Cognitive reappraisal is generally regarded as an adaptive strategy, and expressive suppression as a maladaptive strategy, so a pattern of scores characterized by low cognitive reappraisal and high expressive suppression indicates emotion regulation difficulties (Gross

and John, 2003). The ERQ has demonstrated good validity and reliability (Gross and John, 2003), and had good levels of internal consistency in our sample ($\alpha_{\text{reappraisal}} = 0.88$, $\alpha_{\text{suppression}} = 0.75$).

2.1.2.4. Perth Emotion Regulation Competency Inventory (PERCI). The PERCI (Preece et al., 2018b) is a 32-item measure of emotion regulation ability. It is comprised of eight subscales, each assessing a different facet of emotion regulation ability for negative or positive emotions: *Negative-Controlling Experience* (“When I’m feeling bad, I don’t know what to do to feel better”), *Negative-Inhibiting Behavior* (“When I’m feeling bad, I have trouble controlling my actions”), *Negative-Activating Behavior* (“When I’m feeling bad, I can’t get motivated to do important things [work, chores, school, etc.]”), *Negative-Tolerating Emotions* (“When I’m feeling bad, I must try to totally eliminate those feelings”), *Positive-Controlling Experience* (“I don’t know what to do to create pleasant feelings in myself”), *Positive-Inhibiting Behavior* (“When I’m feeling good, I can’t keep control over myself [in terms of my behaviors]”), *Positive-Activating Behavior* (“When I’m feeling good, I have trouble completing tasks that I’m meant to be doing”), and *Positive-Tolerating Emotions* (“When I’m feeling good, I believe those feelings are unacceptable”). These subscales can be combined into various composite scores, including a total scale score as an overall marker of emotion regulation ability. All items are answered on a 7-point Likert scale, with higher scores indicating more emotion regulation difficulties (i.e., poorer emotion regulation ability). The PERCI has demonstrated good validity and reliability (Preece et al., 2021), and all scores had good internal consistency in our sample ($\alpha = 0.81–0.94$).

2.1.2.5. Depression Anxiety Stress Scales-21 (DASS-21). The DASS-21 (Lovibond and Lovibond, 1995) is a 21-item measure of depression, anxiety, and stress symptoms experienced over the past week. Items are answered on a 4-point Likert scale. Separate scores can be derived for depression, anxiety, and stress, with higher scores indicating more severe symptoms. The DASS-21 has demonstrated good validity and reliability (Lovibond and Lovibond, 1995), and all subscales had good internal consistency in our sample ($\alpha = 0.88–0.93$).

2.1.3. Analytic strategy

Statistical analyses were conducted using JASP software.

2.1.3.1. Factor structure. Given this was the first study of the PAQ-S, we examined its structure using an exploratory factor analysis (EFA) of the six items (principal axis factoring, direct oblimin rotation, extraction of optimum number of factors based on parallel analysis). Whilst previous work with the 24-item PAQ has consistently supported a multi-factor structure, in contrast, with such a small pool of items in the short form we anticipated that a single factor solution for the PAQ-S would likely be a good representation of the data. This is because in multidimensional constructs with an underlying general factor, convergence on a single factor solution becomes more likely as the number of included items for each facet reduces (Fossati et al., 2017). Factor loadings ≥ 0.40 were considered meaningful loadings (Comrey and Lee, 1992).

2.1.3.2. Internal consistency reliability. We calculated Cronbach’s α and McDonald’s omega (ω) reliability coefficients for the PAQ-S total score, and compared these with those of the long-form PAQ. Reliability coefficients ≥ 0.70 were considered acceptable, ≥ 0.80 good, and ≥ 0.90 excellent (Groth-Marnat and Wright, 2016).

2.1.3.3. Concurrent validity. Pearson correlations were calculated between the PAQ-S and the PAQ, TAS-20, ERQ, PERCI, and DASS-21. Given that the PAQ-S is comprised of a subset of the items from the PAQ, we anticipated an extremely high correlation between their total scale scores. To support concurrent validity, we also expected that the PAQ-S and PAQ would display a similar pattern of correlations with

another measure of alexithymia and the measures of emotion regulation and affective disorder symptoms. We expected a high correlation between the PAQ-S and the TAS-20, as the measures are designed to assess the same construct. In terms of emotion regulation, because alexithymia seems to impair emotion regulation abilities (Gross, 2015), we expected high PAQ-S scores to associate with lower use of cognitive reappraisal (i.e., a generally adaptive emotion regulation strategy) and greater use of expressive suppression (i.e., a generally maladaptive emotion regulation strategy) on the ERQ. Similarly, we expected high levels of alexithymia to be associated with greater overall emotion regulation difficulties on the PERCI. As alexithymia is an established risk factor for affective disorder symptoms (Preece et al., 2022; Taylor et al., 1999), we also expected positive correlations between PAQ-S scores and depression, anxiety, and stress symptoms on the DASS-21.

2.1.3.4. Criterion validity. To further test the clinical relevance of the PAQ-S, relative to the PAQ, we conducted a set of regression analyses with an alexithymia score predicting depression, anxiety, or stress symptoms. We conducted three regressions with the PAQ-S total scale score used as the predictor variable, predicting either the depression, anxiety, or stress score from the DASS-21. Next, we conducted three regressions with the long-form PAQ total scale score used as the predictor variable. As such, together these regression analyses allow for a direct comparison of the predictive value of the total scores from the short and long forms of the PAQ.

2.2. Results and discussion

Descriptive statistics for all administered measures are provided in Table 2.

2.2.1. Factor structure

EFA of the six PAQ-S items extracted a single factor solution. All six items loaded well (0.48–0.73) on this “general alexithymia” factor (see Table 3), thus supporting their summing into a total scale score as an overall marker of alexithymia. This single factor accounted for 43.3% of the variance in PAQ-S item scores.

2.2.2. Reliability

Cronbach’s α (0.82) and McDonald’s ω (0.82) coefficients indicated that the PAQ-S total scale score had good levels of reliability. As anticipated, these reliability coefficients were lower than those of the 24-item PAQ ($\alpha = 0.95$, $\omega = 0.95$), but still in a strong psychometric performance range.

2.2.3. Concurrent and criterion validity

The PAQ-S total scale score correlated highly with the PAQ total scale score ($r = 0.90$, $p < .001$) and all its subscales ($r_s = 0.70–0.79$, $p < .001$). The two forms also showed a similar pattern of theoretically congruent correlations with the other alexithymia, emotion regulation, and affective disorder symptom measures. Across alexithymia measures, the PAQ, PAQ-S, and TAS-20 were all very highly correlated. Higher levels of alexithymia were associated with lesser use of cognitive reappraisal, greater use of expressive suppression, more emotion regulation difficulties across all subscales of the PERCI, and more severe depression, anxiety, and stress symptoms (see Table 4 for all correlations).

Our regression analyses indicated that the PAQ-S total scale score accounted for a significant 16.4% of the variance in depression ($F[1, 506] = 99.34$, $p < .001$, $R^2 = 0.164$ [95% CI = 0.11–0.22]), 13.1% in anxiety ($F[1, 506] = 76.11$, $p < .001$, $R^2 = 0.13$ [95% CI = 0.08–0.19]), and 14.9% in stress ($F[1, 506] = 88.65$, $p < .001$, $R^2 = 0.15$ [95% CI = 0.10–0.21]). This amount of variance did not differ significantly (i.e., overlapping 95% confidence intervals) from that accounted for by the long-form PAQ total scale score. In regressions with the long-form PAQ, its total scale score accounted for 16% of the variance in depression ($F[1,$

Table 2
Descriptive statistics and internal consistency reliability coefficients.

Measure	Study 1 (N = 508)						Study 2 (N = 378)					
	Total		Males		Females		Total		Males		Females	
	M (SD)	Range	α	ω	M (SD)	M (SD)	M (SD)	Range	α	ω	M (SD)	M (SD)
PAQ-S												
Total scale score	18.30 (7.83)	6–42	0.82	0.82	18.90 (7.54)	17.65 (8.07)	18.75 (8.05)	6–41	0.86	0.86	18.33 (7.18)	18.91 (8.35)
PAQ												
Total scale score	73.62 (28.72)	24–168	0.95	0.95	77.29 (27.48)	68.83 (29.46)	75.60 (30.93)	24–163	0.97	0.97	77.05 (30.00)	75.25 (31.31)
N-DIF	12.04 (6.27)	4–28	0.88	0.88	12.16 (5.88)	11.79 (6.57)	13.60 (6.42)	4–28	0.92	0.92	12.55 (5.93)	14.01 (6.54)
P-DIF	10.06 (5.30)	4–28	0.86	0.86	10.60 (5.10)	9.54 (5.48)	11.08 (5.85)	4–28	0.93	0.93	11.75 (5.62)	10.90 (5.91)
N-DDF	14.09 (6.73)	4–28	0.88	0.88	14.51 (6.44)	13.58 (6.93)	14.71 (6.75)	4–28	0.93	0.92	13.70 (6.22)	15.09 (6.91)
P-DDF	11.86 (5.93)	4–28	0.86	0.87	12.86 (5.91)	10.89 (5.81)	12.03 (5.87)	4–28	0.91	0.91	12.85 (5.65)	11.77 (5.94)
G-EOT	25.57 (10.34)	8–56	0.87	0.88	27.16 (10.02)	24.04 (10.43)	24.18 (11.38)	8–56	0.93	0.93	26.21 (11.15)	23.48 (11.38)
TAS-20												
Total scale score	48.87 (12.89)	20–80	0.86	0.87	50.40 (12.34)	47.02 (12.98)	49.73 (13.09)	21–81	0.88	0.89	49.29 (12.03)	49.93 (13.47)
ERQ												
Cognitive reappraisal	28.78 (7.36)	6–42	0.88	0.88	28.55 (7.37)	29.04 (7.33)	27.45 (6.79)	6–42	0.88	0.88	27.04 (6.61)	27.60 (6.89)
Expressive suppression	15.04 (5.33)	4–28	0.75	0.76	16.30 (5.21)	13.86 (5.18)	14.83 (5.42)	4–28	0.82	0.83	15.95 (5.07)	14.45 (5.50)
PERCI												
Total scale score	89.12 (32.66)	32–218	0.94	0.94	91.50 (34.26)	86.44 (30.84)	102.01 (32.69)	32–221	0.95	0.95	106.06 (29.77)	100.75 (33.60)
Negative-Controlling Experience	13.08 (6.34)	4–28	0.83	0.83	13.17 (6.43)	12.91 (6.27)	14.52 (5.76)	4–28	0.86	0.87	14.22 (5.35)	14.66 (5.90)
Negative-Inhibiting Behavior	11.38 (6.71)	4–28	0.90	0.90	11.99 (7.10)	10.73 (6.20)	12.76 (5.97)	4–28	0.88	0.88	13.05 (5.70)	12.66 (6.08)
Negative-Activating Behavior	15.36 (7.15)	4–28	0.92	0.92	14.39 (7.29)	16.21 (6.89)	18.74 (6.00)	4–28	0.93	0.93	18.30 (5.61)	18.92 (6.13)
Negative-Tolerating Emotions	15.30 (5.95)	4–28	0.82	0.82	16.06 (5.95)	14.64 (5.86)	14.43 (5.98)	4–28	0.90	0.90	14.78 (5.89)	14.34 (6.02)
Positive-Controlling Experience	11.49 (5.70)	4–28	0.81	0.81	11.80 (5.94)	11.09 (5.44)	13.48 (5.91)	4–28	0.86	0.86	14.38 (5.39)	13.18 (6.06)
Positive-Inhibiting Behavior	7.77 (4.79)	4–28	0.84	0.84	8.49 (5.05)	6.97 (4.37)	9.44 (5.00)	4–28	0.86	0.86	10.69 (4.83)	9.01 (5.00)
Positive-Activating Behavior	8.03 (4.50)	4–28	0.85	0.85	8.40 (4.77)	7.68 (4.23)	10.76 (5.28)	4–28	0.91	0.91	12.22 (5.03)	10.27 (5.29)
Positive-Tolerating Emotions	6.71 (4.29)	4–28	0.87	0.87	7.20 (4.39)	6.22 (4.13)	7.88 (4.78)	4–28	0.91	0.91	8.24 (5.14)	7.72 (4.65)
DASS-21												
Depression	5.46 (5.82)	0–21	0.93	0.93	5.49 (6.12)	5.38 (5.54)	6.96 (5.65)	0–21	0.92	0.93	6.96 (5.70)	6.97 (5.67)
Anxiety	4.25 (4.84)	0–21	0.88	0.88	4.03 (4.64)	4.27 (4.86)	6.06 (4.93)	0–20	0.87	0.87	4.98 (4.51)	6.46 (5.03)
Stress	5.92 (5.32)	0–21	0.90	0.91	5.87 (5.42)	5.89 (5.21)	8.25 (5.06)	0–21	0.88	0.89	7.28 (4.84)	8.60 (5.11)

Note. DASS-21 = Depression Anxiety Stress Scales, ERQ = Emotion Regulation Questionnaire, G-EOT = General-Externally Orientated Thinking, N-DDF = Negative-Difficulty Describing Feelings, N-DIF = Negative-Difficulty Identifying Feelings, P-DDF = Positive-Difficulty Describing Feelings, P-DIF = Positive-Difficulty Identifying Feelings, PAQ = Perth Alexithymia Questionnaire-Short Form, PAQ-S = Perth Alexithymia Questionnaire-Short Form, PERCI = The Perth Emotion Regulation Competency Inventory.

506] = 96.18, $p < .001$, $R^2 = 0.16$ [95 % CI = 0.11–0.22]), 12.6 % in anxiety ($F[1, 506] = 73.11$, $p < .001$, $R^2 = 0.13$ [95 % CI = 0.08–0.18]), and 15.1 % in stress ($F[1, 506] = 90.03$, $p < .001$, $R^2 = 0.15$ [95 % CI = 0.10–0.21]). As such, the PAQ-S total scale score demonstrated strong concurrent and criterion validity, performing similarly to the long-form PAQ.

3. Study 2: psychometrics in a college student sample

3.1. Method

The aim of Study 2 was to test the replicability of findings from Study 1, and to administer the PAQ-S and PAQ as standalone measures (rather than extracting the PAQ-S items from a PAQ administration like in Study 1; see recommendations from Smith et al., 2000). We used broadly the same methodology as Study 1, with a few exceptions. First, we used

confirmatory factor analysis (CFA), rather than EFA, to confirm the 1-factor structure observed in Study 1. Second, our sample comprised Australian college students, rather than USA community adults.

3.2. Participants and procedure

378 Australian college students completed the PAQ-S as part of a battery of measures in an online survey. Participants received course credit for participating in the survey. Most of the students were female (73.8 % female, 25.7 % male, 0.5 % other) with an average age of 23.07 years ($SD = 7.28$, range = 16–55). Most (60.1 %) participants reported no history of being formally diagnosed with a mental health disorder. The majority of participants were born in Australia (72.8 %); data on ethnicity were not collected.

Table 3

Factor loadings on the “general alexithymia” factor from exploratory (EFA; Study 1) or confirmatory (CFA; Study 2) factor analyses of the six PAQ-S items.

Item		Study 1 EFA	Study 2 CFA
1	When I'm feeling bad (feeling an unpleasant emotion), I can't find the right words to describe those feelings.	0.73	0.67
2	When I'm feeling bad, I can't tell whether I'm sad, angry, or scared.	0.74	0.71
3	I tend to ignore how I feel.	0.59	0.67
4	When I'm feeling good (feeling a pleasant emotion), I can't find the right words to describe those feelings.	0.70	0.65
5	When I'm feeling good, I can't tell whether I'm happy, excited, or amused.	0.66	0.71
6	I don't pay attention to my emotions.	0.48	0.59

Note. CFA values are presented for the 1-factor model with the addition of the theoretically informed correlated error terms (i.e., the best fitting solution in Study 2).

3.3. Materials

In addition to the PAQ-S and PAQ, participants also completed the same emotion regulation and affective disorder symptom measures as in Study 1.

3.4. Analytic strategy

All analyses were completed using JASP software, except for CFAs, which were performed using R software (*lavaan* package; Rosseel et al., 2017).

3.4.1. Factor analysis

Using CFA, we tested the goodness-of-fit of the 1-factor model for the 6-item PAQ-S. We tested two models: (1) a simple version of this model without any correlated error terms, and (2) a variant with some theoretically informed correlated error terms. These error terms reflected the multifaceted nature of the alexithymia construct, whereby there is a theoretical distinction between the attention (EOT) and appraisal (DIF, DDF) stages of emotion processing (Preece et al., 2017). As such, in the correlated error term model, the error terms of the two EOT PAQ-S items (items 3 and 6) were allowed to correlate. Similarly, the error terms of the two items that both assessed the appraisal (DIF or DDF) of negative emotions (items 1 and 2) were allowed to correlate, as were the error terms of those two items that both assessed the appraisal of positive emotions (items 4 and 5). The rationale for allowing these correlations in the model was to account for the higher conceptual/wording similarities between these item pairings, and also to account for consistent findings with the long-form PAQ that the DIF and DDF facets within each valence domain are highly correlated (e.g., Preece et al., 2020b).

Goodness-of-fit for the factor solutions was judged based on four fit indices: CFI, TLI, RMSEA, and SRMR. CFI and TLI values ≥ 0.90 indicate acceptable fit (and ≥ 0.95 excellent fit), as do RMSEA and SRMR values ≤ 0.08 (and ≤ 0.06 excellent fit). AIC was also examined (which corrects for model parsimony), with lower scores indicating a better fitting solution (Byrne, 2010).

3.4.2. Reliability, concurrent validity, criterion validity

These analyses were performed in the same manner as in Study 1.

3.5. Results and discussion

Descriptive statistics for all administered measures are provided in Table 2.

Table 4

Pearson bivariate correlations between the PAQ-S, PAQ, TAS-20, ERQ, PERCI, and DASS-21.

	Study 1		Study 2	
	PAQ-S total scale score	PAQ total scale score	PAQ-S total scale score	PAQ total scale score
<i>PAQ</i>				
Total scale score	0.90	1.00	0.86	1.00
N-DIF	0.79	0.84	0.74	0.85
P-DIF	0.76	0.83	0.73	0.83
N-DDF	0.78	0.86	0.73	0.86
P-DDF	0.75	0.85	0.72	0.85
G-EOT	0.71	0.80	0.74	0.86
<i>TAS-20</i>				
Total scale score	0.70	0.77	0.79	0.85
<i>ERQ</i>				
Cognitive reappraisal	-0.23	-0.24	-0.23	-0.28
Expressive suppression	0.46	0.51	0.56	0.62
<i>PERCI</i>				
Total scale score	0.53	0.57	0.63	0.72
Negative-Controlling Experience	0.47	0.50	0.58	0.64
Negative-Inhibiting Behavior	0.42	0.43	0.49	0.55
Negative-Activating Behavior	0.35	0.38	0.34	0.44
Negative-Tolerating Emotions	0.22	0.24	0.47	0.56
Positive-Controlling Experience	0.45	0.49	0.53	0.59
Positive-Inhibiting Behavior	0.37	0.42	0.43	0.48
Positive-Activating Behavior	0.40	0.43	0.40	0.44
Positive-Tolerating Emotions	0.37	0.42	0.46	0.49
<i>DASS-21</i>				
Depression	0.41	0.40	0.37	0.47
Anxiety	0.36	0.36	0.37	0.40
Stress	0.39	0.39	0.33	0.40

Note. All $ps < .001$. TAS-20 = Toronto Alexithymia Scale, DASS-21 = Depression Anxiety Stress Scales, ERQ = Emotion Regulation Questionnaire, G-EOT = General-Externally Orientated Thinking, N-DDF = Negative-Difficulty Describing Feelings, N-DIF = Negative-Difficulty Identifying Feelings, P-DDF = Positive-Difficulty Describing Feelings, P-DIF = Positive-Difficulty Identifying Feelings, PAQ = Perth Alexithymia Questionnaire-Short Form, PAQ-S = Perth Alexithymia Questionnaire-Short Form, PERCI = The Perth Emotion Regulation Competency Inventory.

3.5.1. Factor analysis

CFAs indicated that the 1-factor model with the correlated error terms demonstrated an excellent fit to the data ($\chi^2 = 10.65$ [$df = 6, p = .100$], CFI = 0.995, TLI = 0.989, RMSEA = 0.045 [90 % CI = 0.000–0.078], SRMR = 0.017, AIC = 7808.913). Inclusion of the three theoretically informed correlated error terms was necessary, because without them the 1-factor model had poor fit ($\chi^2 = 198.194$ [$df = 9, p < .001$], CFI = 0.816, TLI = 0.693, RMSEA = 0.236 [90 % CI = 0.215–0.257], SRMR = 0.103, AIC = 8142.467). Modification indices highlighted the value of including these particular correlated error terms (i.e., the modification index values for those three correlated error terms were the highest within the model, at 139.54 to 160.24). In the 1-factor

model with correlated error terms, all six PAQ-S items loaded well on the “general alexithymia” factor (see Table 3 for factor loadings).³

3.5.2. Reliability

As in Study 1, the PAQ-S total score exhibited good internal consistency according to Cronbach's alpha and McDonald's omega coefficients (α and $\omega > 0.85$) (see Table 2).

3.5.3. Concurrent and criterion validity

Concurrent and criterion validity patterns also replicated those from Study 1. The PAQ-S and PAQ total scale scores were highly correlated ($r = 0.86, p < .001$). Both scores also correlated in the expected manner with other measures of alexithymia, emotion regulation, and affective disorder symptoms. Both forms of the PAQ correlated highly with the TAS-20. Higher levels of alexithymia were significantly associated with lesser use of cognitive reappraisal and greater use of expressive suppression (on the ERQ), more emotion regulation difficulties (on all PERCI subscales), and more symptoms of depression, anxiety, and stress symptoms (on the DASS-21) (see Table 4).

In the regression analyses, the PAQ-S total score accounted for a significant 13.8 % of the variance in depression ($F[1, 376] = 59.96, p < .001, R^2 = 0.14$ [95 % CI = 0.08–0.20]), 13.9 % in anxiety ($F[1, 376] = 60.62, p < .001, R^2 = 0.14$ [95 % CI = 0.08–0.20]), and 10.8 % in stress ($F[1, 376] = 45.67, p < .001, R^2 = 0.11$ [95 % CI = 0.06–0.17]). This was not significantly different (i.e., overlapping 95 % confidence intervals) from the performance of the long-form PAQ total score. The long-form PAQ total score accounted for 21.9 % of the variance in depression ($F[1, 376] = 105.47, p < .001, R^2 = 0.22$ [95 % CI = 0.15–0.29]), 16.1 % in anxiety ($F[1, 376] = 72.39, p < .001, R^2 = 0.16$ [95 % CI = 0.10–0.23]), and 16.2 % in stress ($F[1, 376] = 72.87, p < .001, R^2 = 0.16$ [95 % CI = 0.10–0.23]). Thus, again, the PAQ-S and PAQ performed similarly.

4. General discussion

Our aim was to introduce the PAQ-S as a brief measure of alexithymia, and to test its psychometric properties across two studies. Overall, our data indicate that the PAQ-S has strong validity and reliability as a measure of alexithymia.

Across these two studies, the PAQ-S conformed well to its intended 1-factor structure, with all 6 items loading well on the general alexithymia factor. As aforementioned, the 24-item PAQ has a multidimensional factor structure corresponding to its established 5-subscale structure (Preece et al., 2018a); however, our intention with the PAQ-S was to use a smaller subset of items that was likely to yield a single factor solution (because it did not have the required 3 items per facet to produce a separable factors for each subscale component; Brown, 2015). This intention and design decision was driven by the robust findings across a range of longer alexithymia measures, that much of the variance in alexithymia can be accounted for by a strong general factor, and consequently that it is often the total scale scores of these measures that are primarily used in research and clinical settings (Bagby et al., 1994). Our results with the PAQ-S further support the validity of this alexithymia general factor, and importantly, demonstrate that a robust (i.e., with high internal consistency reliability) marker of overall alexithymia can be derived from just six items. This PAQ-S item set, in our view, successfully maintains the content breadth of the construct by including an even number of items for all three alexithymia facets, and covering both the negative and positive emotional valence domains.

Indeed, the validity of the PAQ-S was further supported in both our

studies by the similarity of its performance to the established 24-item PAQ. Total scale scores from these two forms showed very high correlations, and correlated with the TAS-20 and markers emotion regulation and affective disorder symptoms in similar ways. As expected, high levels of alexithymia were related to more overall emotion regulation difficulties, lesser usage of adaptive emotion regulation strategies (cognitive reappraisal), greater usage of maladaptive emotion regulation strategies (expressive suppression), and more severe depression, anxiety, and stress symptoms. Moreover, the PAQ-S retained similar predictive value (in terms of variance accounted for in categories of psychopathology symptoms) to the long form PAQ, despite being only one quarter of the size. Such patterns are consistent with theorising that alexithymia impairs emotion regulation abilities, and that it is a key transdiagnostic risk factor for emotional disorders like depression and anxiety (Taylor et al., 1999).

Taken together, these findings suggest that the PAQ-S assesses a robust and clinically relevant alexithymia construct. By doing so in just six items (relative to the 20–40 items of popular existing alexithymia measures), the PAQ-S should therefore usefully increase the accessibility of alexithymia assessments in time-pressured settings. For example, this might foreseeably enable more regular screening for alexithymia in clinical settings, or more capacity to assess alexithymia within large-scale research batteries. Of course, relative to longer alexithymia measures (like the PAQ, TAS-20, or BVAQ), a key compromise in the PAQ-S is that the small number of items does not allow for the deriving of subscale scores specific to the DIF, DDF, and EOT facets of alexithymia. For clinical or research questions requiring facet-level analysis of the alexithymia construct (Bankier et al., 2001), longer measures are therefore likely to be more appropriate. However, a substantial portion of alexithymia studies already rely primarily on longer measures' total scale scores (i.e., markers of overall alexithymia rather than the facets) and, in particular, the developers of the TAS-20 have recommended that their popular 20-item measure only be used to derive a total scale score (in response to criticisms of the low reliability of the TAS-20 EOT subscale score; Bagby et al., 2007). Thus, we expect the PAQ-S will have substantial utility, much like established brief measures of other clinically relevant constructs.

4.1. Limitations and future directions

Whilst we believe our introduction of the PAQ-S makes a substantial contribution to the field, several limitations of our two studies should be mentioned that will require further research. First, whilst we have discussed potential clinical use of the PAQ-S, neither of our samples were clinical samples. Alexithymia is a dimensional construct present in non-clinical populations (Luminet et al., 2021), and research in the field is often done with general community or student groups, so we think our psychometric data here still has high relevance to the field. Nonetheless, it remains to be seen whether the PAQ-S will perform similarly to the PAQ in clinical samples, and thus further research in this area is required. In particular, whilst we have speculated on the likely advantages of a short form within time-pressured settings (as this has been the case for other constructs; Kessler et al., 2003), it will be important for future studies to directly compare whether patients, participants, and clinicians in these settings indeed consider the 6-item form to have increased acceptability compared to longer form alexithymia scales. Second, in Study 1 the PAQ-S and PAQ were not administered as separate instruments, rather the six PAQ-S items were extracted from an administration of the 24-item PAQ. This approach is common in the early phases of scale development, but it will have somewhat inflated the similarity we observed between the PAQ-S and PAQ in Study 1. It is therefore reassuring that when the PAQ-S and PAQ were administered separately (in Study 2) similar patterns emerged, but it will be important to continue testing the replicability of these findings. Third, in both studies our samples were comprised of adults from Western countries. We considered the US and Australia useful sample sources for our

³ An EFA of the study 2 data (like Study 1) also supports a 1-factor solution, with the single extracted factor accounting for 50 % of the variance in PAQ-S scores, with strong factor loadings on this “general alexithymia” factor ranging from 0.66 to 75.

purposes here, as much of the long-form PAQ development work has been done in adult or student groups from these two countries (e.g., Preece et al., 2018a, 2018b, 2020c), thus providing a good platform for comparability when interpreting the current PAQ-S findings. However, future examination of the PAQ-S across different cultural groups and adolescent samples will be of central importance to establish the generalizability of our findings. Fourth, concurrent and criterion validity was tested using only other self-report questionnaires. Though these self-report tools are all popular in the field, further research examining how the PAQ-S relates to other structured interview, behavioral, or lab-based markers of emotional and clinical constructs is needed.

5. Conclusions

Our data suggest that the PAQ-S has excellent validity and reliability as a brief 6-item marker of overall alexithymia. As such, by reducing the number of items whilst maintaining the strong psychometrics of the 24-item PAQ, the PAQ-S has excellent potential to enhance the viability of alexithymia assessments in time-pressured research and clinical settings.

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CRedit authorship contribution statement

David A. Preece: Conceptualization, Methodology, Formal analysis, Data curation, Writing – original draft, Project administration. **Ashish Mehta:** Conceptualization, Methodology, Writing – original draft. **Kate Petrova:** Conceptualization, Methodology, Writing – original draft. **Pilleriin Sikka:** Conceptualization, Methodology, Writing – original draft. **Johan Bjureberg:** Conceptualization, Methodology, Writing – original draft. **Wai Chen:** Conceptualization, Methodology, Writing – original draft. **Rodrigo Becerra:** Conceptualization, Methodology, Writing – original draft. **Alfred Allan:** Conceptualization, Methodology, Writing – original draft. **Ken Robinson:** Conceptualization, Methodology, Writing – original draft. **James J. Gross:** Conceptualization, Methodology, Writing – original draft.

Conflict of interest

None.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.jad.2023.01.036>.

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