


## Research

# Enabling brief assessments of alexithymia: psychometric properties of the Russian version of the Perth Alexithymia Questionnaire-Short Form (PAQ-S) and its correlates with ill-being and well-being

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## Abstract

Alexithymia is a trait involving deficits in emotion processing. As an important risk factor for a wide range of psychopathologies, its assessment is important in both research and clinical practice. Originally developed in English, the Perth Alexithymia Questionnaire-Short Form (PAQ-S) is a 6-item self-report measure of alexithymia, with its brevity designed to enable alexithymia assessments in a wide range of settings. In the present research, we aimed to introduce the first Russian version of the PAQ-S and examine its psychometric properties. Our sample consisted of 203 Russian-speaking adults aged 18–74 years, recruited from the general community in Russia. The PAQ-S's factor structure was verified with confirmatory factor analysis. Convergent and divergent validity was assessed via relationships with psychopathology symptoms and well-being. Internal consistency reliability was evaluated. The Russian version of the PAQ-S demonstrated strong factorial validity, with support for the intended 1-factor structure as an overall marker of alexithymia. The PAQ-S total scale score showed good internal consistency reliability. As expected, its convergent and divergent validity was also supported. PAQ-S scores were significant predictors of higher ill-being (anxiety, depression, and stress) and lower well-being, thus demonstrating the high clinical relevance of the alexithymia construct as measured by the PAQ-S. There were no gender differences in PAQ-S scores, and alexithymia was higher in younger people and those with less education. Overall, the Russian PAQ-S therefore demonstrated strong psychometric properties as a brief and robust measure of overall alexithymia, performing similarly to other language versions.

**Keywords** Alexithymia · Anxiety · Assessment · Depression · Perth Alexithymia Questionnaire · Psychopathology · Questionnaire · Risk factor · Well-being

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## 1 Introduction

Alexithymia is a trait involving a cluster of emotion processing deficits: difficulties identifying one's own feelings (DIF), difficulties describing one's own feelings (DDF), and an externally orientated thinking style (EOT) characterized by rarely focusing attention on emotions [1, 2]. As defined in the *attention-appraisal model of alexithymia*, together these alexithymic deficits reflect difficulties at the *attention* (EOT) and *appraisal* (DIF, DDF) stages of emotion processing [1]. Alexithymia was first coined in the 1970's by Nemiah and Sifneos [3] based on their observations of these features in many of their psychiatric patients. Alexithymia appears to impair emotion regulation [4, 5] and is an important transdiagnostic risk factor for a range of psychopathologies, including anxiety disorders, depression, substance use disorders, personality disorders, eating disorders, and psychosomatic disorders (e.g., [5–10]). Thus, alexithymia assessments are of high importance in a wide range of clinical and research settings.

For assessing alexithymia across negative and positive emotions, the Perth Alexithymia Questionnaire (PAQ) was introduced in 2018 [11]. This 24-item questionnaire has since become established as one of the most widely used and psychometrically sound tools for assessing alexithymia (e.g., Preece et al. [11], Chan et al. [12], Fynn et al. [13], Greene et al. [14]), enabling the deriving of reliable subscale scores for all the facets of alexithymia across negative and positive emotions (five subscales: Negative-Difficulty identifying feelings, Positive-Difficulty identifying feelings, Negative-Difficulty describing feelings, Positive-Difficulty describing feelings and General-Externally orientated thinking), as well as a total scale score as an overall marker of alexithymia. Originally developed in English, the PAQ has since been translated and validated across over 15 languages (e.g., Becerra et al. [15], Kiskimska et al. [16], Larionow et al. [17], Mazidi et al. [18]), including the Russian version of the PAQ which has displayed good psychometric performance [19].

In order to further enable alexithymia assessments in time-pressured settings, a 6-item version of the PAQ was recently created, called the Perth Alexithymia Questionnaire-Short Form (PAQ-S) [20]. Its items span the DIF, DDF, and EOT facets of the construct. The PAQ-S is designed to provide a total score, representing an overall level of alexithymia [20]. Prior to the PAQ-S, most available alexithymia tools required 20–40 items to be administered (e.g., [21, 22]). In contrast, the brief format of the PAQ-S means it can optimize the practicality and accessibility of alexithymia assessments, thus enabling assessments in a much broader range of settings. For example, its format is well suited to performing quick screening assessments among clinical and normative groups. It is also a good fit for research designs requiring the tracking of alexithymia over time (i.e., repeated administrations), such as in the brief electronic surveys used in ecological momentary assessment designs, or for large-scale epidemiological surveys where alexithymia is just one of many constructs of interest and thus a measure is required that can capture alexithymia in a highly efficient manner with few items [20].

To date, the psychometrics of the original English [20] and Polish [23] language versions of the PAQ-S have been tested. These versions have shown good psychometric properties, with factor analysis supporting the intended 1-factor structure (i.e., all items being strong markers of the general alexithymia construct), good internal consistency reliability, and strong convergent and divergent validity, as well as good ability to predict psychopathology symptoms and well-being levels [20, 23]. Measurement invariance was also tested in the Polish study, finding the Polish PAQ-S was invariant across age and gender categories [23]. On present evidence, the PAQ-S, like its long-form, therefore seems to have good validity across different languages and cultures.

Our aim in this study was to introduce the first Russian version of the PAQ-S and assess its psychometric properties. There is presently no Russian version of the PAQ-S, so we derived one from the Russian long-form [19]. Based on past work with the PAQ-S [20, 23], we predicted that:

1. The theoretically informed 1-factor structure of the PAQ-S would be a good fit to the data;
2. The PAQ-S would have good internal consistency reliability;
3. Higher PAQ-S alexithymia levels would correlate positively with anxiety, depression and stress symptoms, and negatively with well-being;
4. PAQ-S scores would be significant positive predictors of these psychopathology symptoms and negative predictors of well-being (controlling for demographic characteristics).

## 2 Method

### 2.1 Procedure and participants

The study followed the Declaration of Helsinki Ethical Principles [24]. Between February 2023 to October 2023, participants from the general population in Russia were recruited via social media pages (i.e., *V Kontakte*, *Instagram*, and *Telegram*). Participants completed an online survey administered via the Google Forms platform. All participants provided informed consent for their data to be used. The study was anonymous and voluntary, and there was no reimbursement for the respondents.

Our sample consisted of 203 Russian-speaking adults, with 151 females (74.38% of the total sample) and 52 males (25.62%), with ages ranging from 18 to 74 years (mean = 23.58, standard deviation = 8.70). People with a higher education degree made up 55.17% ( $n = 112$ ) of the respondents and with those with secondary education 44.83% ( $n = 91$ ).

### 2.2 Measures

Our participants filled out a demographic questionnaire (age, gender, and education) and a short battery of psychometric self-report measures. Internal consistency reliability coefficients for all administered questionnaires are displayed in Table 1.

1. *The Perth Alexithymia Questionnaire-Short Form* (PAQ-S). The PAQ-S is a 6-item self-report measure of alexithymia [20]. Items are scored on a 7-point scale, ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). The PAQ-S uses a total scale score (ranging from 6 to 42), which is calculated by summing the scores of all items. Higher scores indicate higher overall levels of alexithymia. For this study, the instructions and six translated items from the Russian PAQ [19] were the base for developing this Russian version of the PAQ-S. A copy of the PAQ-S is provided in Supplementary Materials.
2. *The Patient Health Questionnaire-4* (PHQ-4). The PHQ-4 [25] is a 4-item self-report measure of anxiety and depression symptoms experienced over the previous two weeks. It comprises two 2-item subscales: anxiety (e.g., “*Not being able to stop or control worrying*”) and depression (e.g., “*Little interest or pleasure in doing things*”). Items are scored on a 4-point scale, ranging from 0 (*not at all*) to 3 (*nearly every day*). A total score can be also computed by summing the scores of all items. This total score constitutes an overall marker of psychological distress. Higher scores indicate higher levels of symptoms. In this study, the Russian version of the PHQ-4 was used [26, 27].
3. *The Perceived Stress Scale-4* (PSS-4). The PSS-4 [28] is a 4-item self-report measure of perceived stress during the previous month. It comprises four items (e.g., “*In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?*”), which are scored on a 4-point Likert scale from 0 (*never*) to 4 (*very often*). Higher scores indicate higher levels of perceived stress. In this study, the Russian version of the PSS-4 was used [29, 30].
4. *The Warwick-Edinburgh Mental Wellbeing Scale* (WEMWBS). The WEMWBS [31] is a 14-item measure of positive well-being over the last two weeks. Items (e.g., “*I’ve been feeling optimistic about the future*”) are scored on a 5-point Likert

**Table 1** Descriptive statistics and internal consistency reliability coefficients for the study variables

Scale/subscale	Total sample ( $n = 203$ )						Females ( $n = 151$ )		Males ( $n = 52$ )	
	$\omega$ (95% CI)	$\alpha$ (95% CI)	$M$	$SD$	Skewness	Kurtosis	$M$	$SD$	$M$	$SD$
PAQ-S Total score	0.78 (0.72; 0.83)	0.78 (0.73; 0.82)	16.86	7.00	0.61	-0.08	16.63	7.15	17.54	6.54
PHQ-4 Anxiety	0.69 (0.58; 0.77)	0.69 (0.59; 0.77)	2.11	1.58	0.73	-0.29	2.23	1.61	1.77	1.45
PHQ-4 Depression	0.69 (0.57; 0.78)	0.69 (0.60; 0.77)	2.67	1.48	0.63	-0.07	2.69	1.52	2.63	1.40
PHQ-4 Total score	0.76 (0.69; 0.81)	0.76 (0.70; 0.81)	4.79	2.68	0.67	-0.04	4.92	2.77	4.40	2.36
PSS-4 Total score	0.78 (0.71; 0.83)	0.77 (0.72; 0.82)	10.56	3.25	0.20	-0.33	10.79	3.30	9.90	3.04
WEMWBS Total score	0.89 (0.86; 0.91)	0.88 (0.86; 0.90)	48.86	8.38	-0.41	-0.23	48.77	8.66	49.13	7.57

PAQ-S, Perth Alexithymia Questionnaire-Short Form; PHQ-4, Patient Health Questionnaire-4; PSS-4, Perceived Stress Scale-4; WEMWBS, Warwick-Edinburgh Mental Wellbeing Scale;  $M$ , mean;  $SD$ , standard deviation,  $\alpha$ , Cronbach’s alpha;  $\omega$ , McDonald’s omega; 95% CI, 95% confidence interval

scale from 1 (*none of the time*) to 5 (*all of the time*), and are summed into a total scale score. A higher score indicates a higher general level of well-being. In this study, the Russian translation of the WEMWBS was used [32].

### 2.3 Analytic strategy

Statistical analyses were carried out using Statistica 13.3 and R 4.3.1 with the *lavaan* (for confirmatory factor analysis) and *psych* (for reliability analysis) statistical packages.

#### 2.3.1 Factor structure

We examined the factor structure of the PAQ-S using confirmatory factor analysis (maximum likelihood estimation with robust standard errors and the Satorra–Bentler scaled test statistic). We tested the 1-factor model that was supported in the original PAQ-S study [20]. All items were specified to load on a single “general alexithymia” factor. This model also included several correlated error terms (between items 1 and 2; items 3 and 6; and items 4 and 5); this reflected the underlying theoretical structure of the alexithymia construct [11], accounting for the close connection between those two items designed to assess the appraisal of negative emotions, those two items on the appraisal of positive emotions, and those two items on EOT.

Model goodness-of-fit was judged based on the following fit index values: root mean square error of approximation (RMSEA) with 90% confidence intervals (90% CI), standardized root mean square residual (SRMR), comparative fit index (CFI), and Tucker–Lewis index (TLI). RMSEA and SRMR values  $\leq 0.08$  indicate acceptable fit and values  $\leq 0.06$  excellent fit. CFI and TLI values  $\geq 0.90$  indicate acceptable fit and values  $\geq 0.95$  excellent fit [33].

#### 2.3.2 Internal consistency reliability

McDonald’s omega values ( $\omega$ ) and Cronbach’s alpha coefficients ( $\alpha$ ) with 95% confidence intervals were calculated. For these coefficients, values  $\geq 0.70$  were judged as acceptable,  $\geq 0.80$  as good, and  $\geq 0.90$  as excellent [34].

#### 2.3.3 Convergent and divergent validity

For assessing convergent validity of the PAQ-S, we calculated Pearson correlations between alexithymia (PAQ-S scores) and anxiety and depression symptoms (PHQ-4 scores), as well as stress (PSS-4 scores). For assessing divergent validity, we calculated Pearson correlations between PAQ-S scores and well-being (WEMWBS scores).

#### 2.3.4 Predictive role of alexithymia in psychopathology symptoms and well-being

We ran five hierarchical multiple regression analyses to explore whether PAQ-S scores predicted significant variance in various clinically relevant criterion variables: PHQ-4 anxiety scores, PHQ-4 depression scores, PHQ-4 total scores, PSS-4 scores, and WEMWBS well-being scores. In the first step of the regression, we controlled for demographic factors (gender, age, education). In the second step, the PAQ-S total score was added to the model.

#### 2.3.5 Demographic differences

Pearson correlations between PAQ-S scores and age were calculated. We compared the PAQ-S scores between females and males, as well as between people with higher education levels and secondary education levels using Student’s *t*-tests. For these tests, we calculated Cohen’s *d* effect size using the Psychometrica calculator [35].

## 3 Results

### 3.1 Descriptive statistics

Table 1 presents descriptive statistics for all study variables. In the total sample, skewness ranged from  $-0.41$  to  $0.73$  across the variables, whereas kurtosis ranged from  $-0.33$  to  $-0.04$ , indicating that all the study variables were reasonably normally distributed.

### 3.2 Factor structure

Our confirmatory factor analysis indicated that the PAQ-S was well represented by the 1-factor model. All items loaded well on the “general alexithymia” factor (loadings = 0.55–0.58; see Table 2), and the model had all fit index values in the excellent range: RMSEA = 0.051 [90% CI 0.000; 0.129], SRMR = 0.035, CFI = 0.991, and TLI = 0.977.

### 3.3 Internal consistency reliability

As reported in Table 1, the PAQ-S total score showed acceptable internal consistency reliability ( $\omega$  and  $\alpha = 0.78$ ).

### 3.4 Convergent and divergent validity

PAQ-S scores were positively correlated (all  $p$ s < 0.001) with anxiety symptoms ( $r = 0.29$ ), depression symptoms ( $r = 0.30$ ), the PHQ-4 Total score ( $r = 0.34$ ), stress ( $r = 0.33$ ), as well as negatively correlated with well-being ( $r = -0.48$ ), thus supporting good convergent and divergent validity.

### 3.5 Regression analyses

Across our five regression analyses, the PAQ-S was a significant predictor of clinically relevant variables (see Table 3). After accounting for the variance explained by demographic factors, PAQ-S scores accounted for a significant additional 5.5% of the variance in anxiety, 5.5% in depression, 7.2% in overall psychological distress (PHQ-4 Total scores), 9.7% in stress, and 22.4% in well-being. PAQ-S scores were a positive predictor of ill-being (i.e., anxiety, depression, overall distress, and stress) and a negative predictor of well-being.

### 3.6 Demographic differences

Pearson correlations between PAQ-S scores and age were significant and negative ( $r = -0.23$ ,  $p < 0.001$ ), indicating that younger people tended to have higher levels of alexithymia. Our Student’s  $t$ -test revealed no statistically significant differences in PAQ-S scores between females and males ( $t = -0.81$ ,  $df = 201$ ,  $p = 0.420$ , Cohen’s  $d = -0.13$ ). We also compared levels of alexithymia between people with a higher education degree ( $n = 112$ ) and people with secondary education ( $n = 91$ ). There were statistically significant differences between people with higher education levels ( $M = 15.27$ ,  $SD = 6.68$ ) compared to people with secondary education levels ( $M = 18.82$ ,  $SD = 6.91$ ), with people with higher education reporting lower levels of alexithymia ( $t = 3.71$ ,  $df = 201$ ,  $p < 0.001$ , Cohen’s  $d = 0.52$ ).

**Table 2** Descriptive statistics for the PAQ-S items and their standardized factor loadings on the “general alexithymia” factor from confirmatory factor analysis ( $n = 203$ )

PAQ-S Items	<i>M</i>	<i>SD</i>	Skewness	Kurtosis	Factor loadings
1. When I’m feeling <i>bad</i> (feeling an unpleasant emotion), I can’t find the right words to describe those feelings	2.92	1.59	0.72	−0.49	0.577
2. When I’m feeling <i>bad</i> , I can’t tell whether I’m sad, angry, or scared	2.71	1.78	0.97	−0.22	0.564
3. I tend to ignore how I feel	3.23	1.75	0.46	−0.81	0.558
4. When I’m feeling <i>good</i> (feeling a pleasant emotion), I can’t find the right words to describe those feelings	2.88	1.65	0.75	−0.46	0.581
5. When I’m feeling <i>good</i> , I can’t tell whether I’m happy, excited, or amused	2.70	1.74	0.88	−0.38	0.578
6. I don’t pay attention to my emotions	2.42	1.63	1.09	0.17	0.545

PAQ-S, Perth Alexithymia Questionnaire-Short Form; *M*, mean; *SD*, standard deviation. All factor loadings are statistically significant ( $p$ s < 0.001)

**Table 3** Regression models for predicting psychopathology symptoms and well-being (n = 203)

Predictors	PHQ-4 Anxiety symptoms	PHQ-4 Depression symptoms	PHQ-4 Total score	PSS-4 Total score	WEMWBS Total score
First step (gender, education, and age as inputted predictors)					
Gender (females = 0, males = 1)	-0.40	0.01	-0.38	-0.80	0.19
Education (secondary = 0, high = 1)	-0.25	-0.34	-0.59	-0.07	0.07
Age	<b>-0.22**</b>	<b>-0.22**</b>	<b>-0.26***</b>	<b>-0.18*</b>	0.14
Model parameters	$F(3, 199) = 6.16, p < 0.001$	$F(3, 199) = 5.90, p < 0.001$	$F(3, 199) = 7.78, p < 0.001$	$F(3, 199) = 3.27, p = 0.022$	$F(3, 199) = 1.45, p = 0.230$
Proportion of variance explained (R <sup>2</sup> , %)	8.5	8.2	10.5	4.7	2.1
Second step (gender, education, age and PAQ-S scores as inputted predictors)					
Gender (females = 0, males = 1)	-0.47	-0.05	-0.52	<b>-0.99*</b>	0.93
Education (secondary = 0, high = 1)	-0.09	-0.20	-0.29	0.35	-1.57
Age	<b>-0.18*</b>	<b>-0.18*</b>	<b>-0.21**</b>	-0.12	0.06
PAQ-S Total scores	<b>0.25***</b>	<b>0.25***</b>	<b>0.28***</b>	<b>0.33***</b>	<b>-0.50***</b>
Model parameters	$F(4, 198) = 8.04, p < 0.001$	$F(4, 198) = 7.83, p < 0.001$	$F(4, 198) = 10.65, p < 0.001$	$F(4, 198) = 8.30, p < 0.001$	$F(4, 198) = 16.10, p < 0.001$
Proportion of variance explained (R <sup>2</sup> , %)	14.0	13.7	17.7	14.4	24.5
ΔR <sup>2</sup> (%) between the two steps	5.5	5.5	7.2	9.7	22.4

PAQ-S, Perth Alexithymia Questionnaire-Short Form; PHQ-4, Patient Health Questionnaire-4; PSS-4, Perceived Stress Scale-4; WEMWBS, Warwick-Edinburgh Mental Wellbeing Scale; \*  $p < 0.05$ , \*\*  $p < 0.01$ ; \*\*\*  $p < 0.001$ . Significant predictors are in bold

## 4 Discussion

The aim of this study was to examine the psychometric properties of the first Russian version of the PAQ-S. Overall, the Russian version of the PAQ-S appeared to maintain the strong psychometrics of the other language versions, demonstrating good validity and reliability.

The Russian PAQ-S had a factor structure well represented by the intended 1-factor model, thus supporting the summing of all items into a total scale score, and supporting the validity of a strong general alexithymia factor. These findings are consistent with past work with the original English [20] and Polish [23] versions of the PAQ-S, thus supporting cross-cultural consistency in the measure and structure of alexithymia. These findings with the PAQ-S further demonstrate that a robust marker of overall alexithymia can be extracted using just six items, thus providing the field with a highly practical and accessible option for alexithymia assessments across a range of settings.

The convergent and divergent validity of the Russian PAQ-S was also supported. We revealed that higher alexithymia levels (higher PAQ-S scores) were correlated with higher ill-being scores (i.e., anxiety, depression and stress symptoms), with the size of these correlations being similar to the correlations presented in the original English [20] and the Polish PAQ-S validation studies [23]. Higher alexithymia levels were also robustly associated with lower well-being scores. These results are also in line with the past work [23], supporting the high clinical relevance of the alexithymia construct. Indeed, after controlling for demographic factors, our regression analyses indicated that PAQ-S scores were positive and moderate predictors of anxiety, depression, and stress symptoms, as well as a negative and strong predictor of well-being. Our data therefore support the status of alexithymia as an important transdiagnostic risk factor for psychopathology [36–38]. The alexithymia field has often focused more so on relations with ill-being compared to well-being, and thus our findings of strong relationships with low well-being have good novelty in demonstrating that alexithymia may also play a role in reduced positive experiences. Given that alexithymia impairs emotion regulation [4, 5], and that emotion regulation is important in up-regulating positive experiences to facilitate well-being [39], these relationships between alexithymia and well-being are in line with the specifications of conceptual models linking alexithymia, emotion regulation, and affective outcomes, namely the *attention-appraisal model of alexithymia* [1] and the *process model of emotion regulation* [40].

As for demographic differences, in this data-set, there were no statistically significant gender differences in alexithymia levels. People with higher education levels had lower alexithymia than people with secondary education, supporting previous conclusions [41]. We also found that younger people tended to report higher alexithymia. In general, these results correspond with the those presented in the Polish validation study of the PAQ-S [23] and several other reports in the alexithymia field (e.g., [42]). However, there are some inconsistencies across the alexithymia literature with respect to links with demographic factors, regardless of the alexithymia measure used. For example, some data have found higher alexithymia levels in males [41, 43], or have found that alexithymia can increase with age [41]. Further work with larger more diverse samples, and ideally longitudinal designs, will be required to determine how (or whether) PAQ-S scores differ across different demographic groups. Conclusions on demographic influences in this study should be considered tentative.

### 4.1 Limitations and future directions

Whilst our sample size was sufficient for the psychometric analyses we conducted, our analyses were carried out on a relatively small sample from the general community sample of Russian people, and no clinical samples were included. We also did not examine some psychometric properties, such as test–retest reliability, and we did not directly compare the performance of the PAQ-S with the longer PAQ. All our concurrent validity markers were self-report questionnaires, and future work with performance-based or behavioral markers of relevant constructs would be useful. Our study is cross-sectional, therefore, the temporal order of alexithymia and its correlates cannot be established here. As aforementioned, future research in more diverse samples, with longitudinal research designs, will therefore be beneficial.

## 5 Conclusions

Our data suggest that the Russian version of the PAQ-S has good psychometric properties as an overall measure of alexithymia. As a brief and freely available questionnaire, the PAQ-S should therefore help to substantially enhance the accessibility of robust alexithymia assessments in a variety of settings.

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**Author contributions** PL (70%): conceptualization, formal analysis, data curation, investigation, methodology, writing, reviewing and editing, and project administration. DAP (15%): writing, reviewing, and editing. MVI (10%): data curation, and investigation. EKS (5%): data curation, and investigation. All authors approved the final article and agreed to the authorship order.

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**Data availability** The raw data supporting the conclusions of this article will be made available by the corresponding author on a reasonable request.

## Declarations

**Ethics approval and consent to participate** This study was conducted in accordance with the 1964 Declaration of Helsinki Ethical Principles and its later amendments. The Commission for the Ethical Evaluation of Empirical Research Projects of the Department of Psychology of the HSE University approved the study.

**Informed consent** Written informed consent was obtained digitally from all individual participants included in the study.

**Competing interests** The authors declare that they have no conflict of interest.

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## References

1. Preece DA, Gross JJ. Conceptualizing alexithymia. *Pers Individ Dif*. 2023;215: 112375. <https://doi.org/10.1016/j.paid.2023.112375>.
2. Preece D, Becerra R, Allan A, Robinson K, Dandy J. Establishing the theoretical components of alexithymia via factor analysis: introduction and validation of the attention-appraisal model of alexithymia. *Pers Individ Dif*. 2017;119:341–52. <https://doi.org/10.1016/j.paid.2017.08.003>.
3. Nemiah JC, Sifneos PE. Psychosomatic illness: a problem in communication. *Psychother Psychosom*. 1970;18(1):154–60. <https://doi.org/10.1159/000286074>.
4. Preece DA, Mehta A, Petrova K, Sikka P, Bjureberg J, Becerra R, Gross JJ. Alexithymia and emotion regulation. *J Affect Disord*. 2023;324:232–8. <https://doi.org/10.1016/j.jad.2022.12.065>.
5. Preece DA, Mehta A, Becerra R, Chen W, Allan A, Robinson K, Boyes M, Hasking P, Gross JJ. Why is alexithymia a risk factor for affective disorder symptoms? The role of emotion regulation. *J Affect Disord*. 2022;296:337–41. <https://doi.org/10.1016/j.jad.2021.09.085>.
6. Di Tella M, Benfante A, Airale L, Castelli L, Milan A. Alexithymia and hypertension: does personality matter? A systematic review and meta-analysis. *Curr Cardiol Rep*. 2023;25(7):711–24. <https://doi.org/10.1007/s11886-023-01894-7>.
7. Nicolò G, Semerari A, Lysaker PH, Dimaggio G, Conti L, D'Angerio S, Procacci M, Popolo R, Carcione A. Alexithymia in personality disorders: correlations with symptoms and interpersonal functioning. *Psychiatry Res*. 2011;190(1):37–42. <https://doi.org/10.1016/j.psychres.2010.07.046>.
8. Nowakowski ME, McFarlane T, Cassin S. Alexithymia and eating disorders: a critical review of the literature. *J Eat Disord*. 2013;1:21. <https://doi.org/10.1186/2050-2974-1-21>.
9. Muir X, Preece DA, Becerra R. Alexithymia and eating disorder symptoms: the mediating role of emotion regulation. *Aust Psychol*. 2023. <https://doi.org/10.1080/00050067.2023.2236280>.
10. Orsolini L. Unable to describe my feelings and emotions without an addiction: the interdependency between alexithymia and addictions. *Front Psychiatry*. 2020;11: 543346. <https://doi.org/10.3389/fpsy.2020.543346>.
11. Preece D, Becerra R, Robinson K, Dandy J, Allan A. The psychometric assessment of alexithymia: development and validation of the Perth Alexithymia Questionnaire. *Pers Individ Dif*. 2018;132:32–44. <https://doi.org/10.1016/j.paid.2018.05.011>.
12. Chan J, Becerra R, Weinborn M, Preece D. 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*. 2023;105(3):396–412. <https://doi.org/10.1080/00223891.2022.2095641>.
13. Fynn DM, Preece DA, Gignac GE, Pestell CF, Allan A, Vander Kraats C, Green SL, Weinborn M, Becerra R. Assessing alexithymia in adults with acquired brain injury: Psychometric properties of the Perth Alexithymia Questionnaire. *J Affect Disord*. 2022;302:224–33. <https://doi.org/10.1016/j.jad.2022.01.091>.
14. Greene D, Hasking P, Boyes M, Preece D. Measurement invariance of two measures of alexithymia in students who do and who do not engage in non-suicidal self-injury and risky drinking. *J Psychopathol Behav Assess*. 2020;42(4):808–25. <https://doi.org/10.1007/s10862-020-09806-7>.
15. Becerra R, Baeza CG, Fernandez AM, Preece DA. Assessing alexithymia: psychometric properties of the Perth Alexithymia Questionnaire in a Spanish-speaking sample. *Front Psychiatry*. 2021;12: 710398. <https://doi.org/10.3389/fpsy.2021.710398>.



16. Kiskimska ND, Martinez-Sanchez F. Spanish adaptation of the Perth Alexithymia Questionnaire: psychometric properties. *Mediterr J Clin Psychol*. 2023. <https://doi.org/10.13129/2282-1619/mjcp#3717>.
17. Larionow P, Preece DA, Mudlo-Glagolska K. Assessing alexithymia across negative and positive emotions: psychometric properties of the Polish version of the Perth Alexithymia Questionnaire. *Front Psychiatry*. 2022;13:1047191. <https://doi.org/10.3389/fpsy.2022.1047191>.
18. Mazidi M, Azizi A, Becerra R, Gross JJ, Zarei M, Mirshafiei M, Preece DA. Cross-cultural validation and measurement invariance of the Perth Alexithymia Questionnaire (PAQ): a study in Iran and the USA. *Aust Psychol*. 2023. <https://doi.org/10.1080/00050067.2023.2217325>.
19. Larionow P, Preece DA, Khokhlova OY, Iakovleva MV. Assessing alexithymia: psychometric properties of the russian version of the Perth Alexithymia Questionnaire. *Clin Psychol Special Educ*. 2023;12(1):43–65. <https://doi.org/10.17759/cpse.2023120103>.
20. Preece DA, Mehta A, Petrova K, Sikka P, Bjureberg J, Chen W, Becerra R, Allan A, Robinson K, Gross JJ. The Perth Alexithymia Questionnaire-Short Form (PAQ-S): a 6-item measure of alexithymia. *J Affect Disord*. 2023;325:493–501. <https://doi.org/10.1016/j.jad.2023.01.036>.
21. Bagby RM, Taylor GJ, Parker JDA. The twenty-item Toronto Alexithymia Scale: II. Convergent, discriminant, and concurrent validity. *J Psychosom Res*. 1994;38(1):33–40. [https://doi.org/10.1016/0022-3999\(94\)90006-X](https://doi.org/10.1016/0022-3999(94)90006-X).
22. Vorst HCM, Bermond B. Validity and reliability of the Bermond-Vorst Alexithymia Questionnaire. *Pers Individ Dif*. 2001;30(3):413–34. [https://doi.org/10.1016/S0191-8869\(00\)00033-7](https://doi.org/10.1016/S0191-8869(00)00033-7).
23. Larionow P, Preece DA, Mudlo-Glagolska K. The Polish version of the Perth Alexithymia Questionnaire-Short Form (PAQ-S): psychometric properties and norms. *Journal of Sexual and Mental Health*. In print.
24. World Medical Association. World Medical Association Declaration of Helsinki: ethical principles for medical research involving human subjects. *JAMA*. 2013;310(20):2191–4. <https://doi.org/10.1001/jama.2013.281053>.
25. Kroenke K, Spitzer RL, Williams JB, Löwe B. An ultra-brief screening scale for anxiety and depression: the PHQ-4. *Psychosomatics*. 2009;50(6):613–21. <https://doi.org/10.1176/appi.psy.50.6.613>.
26. Patient Health Questionnaire Screeners. 2023. <https://www.phqscreeners.com>. Accessed 06 Nov 2023.
27. Pogosova NV, Dovzhenko TV, Babin AG, Kursakov AA, Vygodin VA. Russian version of PHQ-2 and 9 questionnaires: sensitivity and specificity in detection of depression in outpatient general medical practice. *Cardiovasc Ther Prev*. 2014;13(3):18–24. <https://doi.org/10.15829/1728-8800-2014-3-18-24>.
28. Cohen S, Kamarck T, Mermelstein R. A global measure of perceived stress. *J Health Soc Behav*. 1983;24(4):385–96.
29. Ababkov VA, Barisnikov K, Vorontzova-Wenger OV, Gorbunov JA, Kapranova SV, Pologaeva EA, Stuklov KA. Validation of the Russian Version of the Questionnaire «Scale of Perceived Stress–10». *Vestnik of Saint Petersburg University. Psychology*. 2016;2:6–15.
30. Zolotareva AA. Psychometric properties of the Russian version of the perceived stress Scale (PSS–4, 10, 14). *Clin Psychol Special Educ*. 2023;12(1):18–42. <https://doi.org/10.17759/cpse.2023120102>.
31. Tennant R, Hiller L, Fishwick R, Platt S, Joseph S, Weich S, Parkinson J, Secker J, Stewart-Brown S. The Warwick-Edinburgh Mental Well-being Scale (WEMWBS): development and UK validation. *Health Qual Life Outcomes*. 2007;5(1):63. <https://doi.org/10.1186/1477-7525-5-63>.
32. Robinson OC, Lopez FG, Ramos K, Nartova-Bochaver S. Authenticity, social context, and well-being in the United States, England, and Russia: a three country comparative analysis. *J Cross Cult Psychol*. 2013;44(5):719–37. <https://doi.org/10.1177/0022022112465672>.
33. Hu LT, Bentler PM. Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Struct Equ Model*. 1999;6(1):1–55. <https://doi.org/10.1080/10705519909540118>.
34. Groth-Marnat G. *Handbook of psychological assessment*. 5th ed. Hoboken: John Wiley & Sons; 2009.
35. Lenhard W, Lenhard A. Computation of effect sizes. 2016. [https://www.psychometrica.de/effect\\_size.html](https://www.psychometrica.de/effect_size.html). Accessed 06 Nov 2023.
36. Grabe HJ, Spitzer C, Freyberger HJ. Alexithymia and personality in relation to dimensions of psychopathology. *Am J Psychiatry*. 2004;161(7):1299–301. <https://doi.org/10.1176/appi.ajp.161.7.1299>.
37. Fava GA, Cosci F, Sonino N. Current psychosomatic practice. *Psychother Psychosom*. 2017;86(1):13–30. <https://doi.org/10.1159/000448856>.
38. Marchesi C, Brusamonti E, Maggini C. Are alexithymia, depression, and anxiety distinct constructs in affective disorders? *J Psychosom Res*. 2000;49(1):43–9. [https://doi.org/10.1016/S0022-3999\(00\)00084-2](https://doi.org/10.1016/S0022-3999(00)00084-2).
39. Gross JJ. Emotion regulation: current status and future prospects. *Psychol Inq*. 2015;26(1):1–26. <https://doi.org/10.1080/1047840X.2014.940781>.
40. Gross JJ. The extended process model of emotion regulation: elaborations, applications, and future directions. *Psychol Inq*. 2015;26(1):130–7. <https://doi.org/10.1080/1047840X.2015.989751>.
41. Mattila AK, Salminen JK, Nummi T, Joukamaa M. Age is strongly associated with alexithymia in the general population. *J Psychosom Res*. 2006;61(5):629–35. <https://doi.org/10.1016/j.jpsychores.2006.04.013>.
42. Moriguchi Y, Maeda M, Igarashi T, Ishikawa T, Shoji M, Kubo C, Komaki G. Age and gender effect on alexithymia in large, Japanese community and clinical samples: a cross-validation study of the Toronto Alexithymia Scale (TAS-20). *BioPsychoSocial Med*. 2007;1:7. <https://doi.org/10.1186/1751-0759-1-7>.
43. Levant RF, Hall RJ, Williams CM, Hasan NT. Gender differences in alexithymia. *Psychol Men Masc*. 2009;10(3):190–203. <https://doi.org/10.1037/a0015652>.

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