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Positive and Negative Affect Schedule (PANAS): Psychometric Properties and Discriminative Capacity in Several Chilean Samples

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Abstract

We evaluated the factor structure, reliability, and discriminative capacity of the Positive and Negative Affect Schedule (PANAS) questionnaire in four different samples: two general adult populations ($N = 1{,}548$, $N = 964$), one

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adolescent population ($N = 1{,}044$), and young people with depressive symptomatology ($N = 307$). Exploratory factor analyses (EFAs) were performed with subsamples from Studies 1 ($n = 773$) and 2 ($n = 527$), finding that the two- and three-factor solutions had a good fit. In a confirmatory factor analysis, the two-factor solution resulted in an adequate fit in a second set of subsamples from both studies ($n = 775$, $n = 517$). In Study 3, we found good convergent and divergent validity with adequate and significant correlations found for depression (Beck's Depression Inventory), anxiety (State–Trait Anxiety Inventory), and neuroticism and extroversion (Big Five Inventory). In Study 4, the results of an EFA performed in a subsample ($n = 154$) found that the two- and three-factor solutions were appropriate with the former solution being confirmed in a second subsample ($n = 153$). Reliability was $\alpha = .85$ for positive affect and $\alpha = .87$ for negative affect. The PANAS questionnaire showed adequate indicators of validity and reliability in adult and adolescent populations as well as in a sample with depressive symptoms.

Keywords
positive affect, negative affect, PANAS, psychometrics properties, depressive symptomatology

Affect has been studied by psychologists throughout the history of psychological science. Positive affect (PA) and negative affect (NA) are conceptualized as dimensions distinct from emotional experience (Quinceno & Vinaccia, 2014; Watson, Clark, & Stasik, 2011; Watson & Tellegen, 1985). From this point of view, PA seems to be related to well-being, satisfaction with life, and broad social relationships, whereas NA is related to distress and difficulties with overcoming difficult situations (Chavarría & Barra, 2014; Ortiz, Gómez-Pérez, Canoino, & Barrera-Herrera, 2016; Pedrosa, Celis-Atenas, Suárez-Álvarez, García-Cueto, & Muñiz, 2015; Vera-Villarroel, Valtierra, & Contreras, 2016; Watson, Clark, & Tellegen, 1988). NA correlates with health complaints and different somatic symptoms (Bianchi & Henao, 2015; Watson & Pennebaker, 1989), whereas PA is related to socializing and extraversion (Watson, Clark, McIntyre, & Hamaker, 1992). It also seems that PA is related, for example, to success in finding a job (Burger & Caldwell, 2000). Research has also found that NA is an important component of depression and anxiety and that the level of PA in individuals with depression tends to be low (Clark & Watson,

1991; Torrente, Piqueras Rodríguez, Orgilés, & Espada, 2014). In this context, Watson, Clark, and Tellegen (1988) created the Positive and Negative Affect Schedule (PANAS) with the aim of measuring these two dimensions.

In recent decades, PANAS have been adapted and validated in different countries and languages, for example, in Argentina (Moriondo, Palma, Medrano, & Murillo, 2012), India (Pandey & Srivastava, 2008), Italy (Terracciano, McCrae, & Costa, 2003), Korea (Lim, Yu, Kim, & Kim, 2010), Mexico (Robles & Páez, 2003), Peru (Gargurevich & Matos, 2012), and Spain (Buz, Pérez-Arechaederra, Fernández-Pulido, & Urchaga, 2015; López-Gómez, Hervás, & Vázquez, 2015). There is also an international version of the scale developed by Thompson (2007), which can be applied to nonnative English speakers. The scale has also been applied in schools in its modified version for children (Laurent et al., 1999), children and parents (Ebesutani, Okamura, Higa-McMillan, & Chorpita, 2011), and children and adolescents (Sandín, 2003). Validations have also been conducted on clinical samples such as in-patient medical rehabilitation, forensic samples (Leune & Beauducel, 2011), substance abusers (Serafini, Malin-Mayor, Nich, Hunkele, & Carroll, 2016), and adult women with fibromyalgia (Estévez-López et al., 2016). The results of these aforementioned studies have verified the fit of the scale in terms of both estimation of reliability, with Cronbach's α being over .80, and the assessment of temporal stability, with correlations among the evaluations being over .60. No single solution has been found in studies of the instrument's factor structure.

In its original version, Watson et al., (1988), using an exploratory factor analysis (EFA) with orthogonal (varimax) rotation, established a factor structure of two noncorrelated factors. The PANAS questionnaire has been assessed on this basis in different studies including cross-cultural studies that have evaluated this factor solution using EFA and confirmatory factor analysis (CFA). The results of these studies have differed in terms of the internal structure of the instrument, which ranges from two to three factors. One of the main issues with studies of the internal structure of the PANAS questionnaire is the use of its different versions as well as the use of different factor extraction techniques. These techniques include a principal components analysis and a varimax or oblimin rotation for the exploratory analyses and the Pearson or polychoric correlation in the confirmatory analyses.

The main results obtained in the different studies using an EFA with varimax rotation include a solution of two noncorrelated factors. These results have been found in children (Ebetusani et al., 2011) in the

adaptations in Argentina with 39% of the explained variance (Morriondo et al., 2012), in India with 57.8% of the explained variance (Pandey & Srivastava, 2008), and in Italy with a confirmatory analysis using the unweighted least squares estimator (Terracciabo, McCrae, & Costa, 2003). Other studies offer a solution of two correlated factors, as in the adaptation in Peru that performed a CFA and in the Korean adaptation that used a robust maximum likelihood estimator (Lim et al., 2010). This factor solution has also been replicated in a sample with children (Laurent et al., 1999). Studies have even provided evidence of a more complex structure, where a three-factor model is suggested, differentiating between a dimension of fear and another of upset (Gaudreau, Sanchez, & Blondin, 2006; Killgore, 2000). This solution was reported by Gaudreau, Sanchez, and Blondin (2006) who compared athletes in France and Canada. Solutions have been reported in the literature where the two-factor solution is replicated and a third general factor is associated with affective polarity, such as that found in the German adaptation, which uses models with a diagonally weighted least squares estimator.

As already described, the PANAS has been validated in different countries and samples. Nevertheless, the use of a psychometric instrument is only possible if it is adapted to a specific country and culture. A study was published by Dufey and Fernández (2012), in which the PANAS was applied to Chilean university students; however, the characteristics of the sample used in that study did not allow its results to be extrapolated to the general population. Additionally, that study, which validated the PANAS in a sample of Chilean university students, did not include a CFA, which is important given that a consensus has yet to be reached regarding the factor structure of the instrument and of the entire construct.

It is therefore necessary to know the psychometric properties of the PANAS for a Spanish-speaking culture like Chile's, which considers the characteristics of the general population (different samples) and presents confirmatory empirical evidence of the instrument's factor structure. It must also be specified that studies of the scale in Spanish-speaking samples have consistently indicated the presence of two factors unrelated to each other in nonclinical populations (i.e., Sandín et al., 1999). Therefore, it is important to test whether this factor structure is valid for other samples in Chile.

The aim of the present study was to evaluate the psychometric properties of the PANAS in the Chilean population using different samples (adults, adolescents, and young people with depressive symptomatology). This study evaluated the factor structure and the reliability of the instrument

as well as the ability to discriminate in subjects with different levels of depressive symptomatology. This leads us to the following hypothesis:

Hypothesis 1: In the general adult population, the data will show an adequate fit in the estimation of reliability; the confirmatory factor structure will adjust to the model of two noncorrelated factors originally proposed by the author.

Hypothesis 2: In an adolescent population, the data will maintain an adequate fit in the estimation of reliability; the confirmatory factor structure will adjust to the model of two noncorrelated factors originally proposed by the author.

Hypothesis 3: NA will be related positively to anxiety (state–trait), depression, and neuroticism and negatively to extroversion. PA will be related positively to extroversion and negatively to anxiety (state–trait), depression, and neuroticism.

Hypothesis 4: In the sample of health centers' patients, the data will maintain an adequate fit in the estimation of reliability; the confirmatory factor structure will adjust to the model of two noncorrelated factors originally proposed by the author. There will be significant differences between the categories without depressive symptoms, symptoms of other depressive disorders, and symptoms of major depression in NA and PA, where NA will have higher scores in major depressive symptomatology and PA will have higher scores in the participants without depression.

To fulfill the aims of this investigation, we decided to divide it into four studies. The first seeks to verify Hypothesis 1, the second to answer Hypothesis 2, the third to verify Hypothesis 3, and the fourth to verify Hypothesis 4.

Method

Participants

Study 1. Using convenience sampling, a sample of 1,548 participants ranging in age from 18 to 60 years ($M_{age} = 26.67$ years, $SD = 10.52$) was evaluated. Of these, 55.43% were women; their occupations varied between university or technical students and workers. The sample was divided randomly into two to conduct the EFA ($n = 773$, 54.85% women, aged 18–60

years, $M_{age} = 26.71$ years, $SD = 10.63$) on the first half and then the CFA on the second half ($n = 775$, 56% women, aged 18–60 years, $M_{age} = 26.62$ years, $SD = 10.41$).

Study 2. We evaluated 1,044 teenagers aged between 13 and 17 years ($M_{age} = 15.52$ years, $SD = 1.05$). Of these, 55.56% were women, and all were high school students. The sample was divided into two to conduct an EFA ($n = 527$, 56.6% women, aged 13–17 years, $M_{age} = 15.5$ years, $SD = 1.06$) on the first and then a CFA on the other sample ($n = 517$, 55.51% women, aged 13–17 years, $M_{age} = 15.55$ years, $SD = 1.03$).

Study 3. The participants were 964 adults (50.3% women) aged between 18 and 60 years ($M_{age} = 30.36$ years, $SD = 14.66$).

Study 4. The last study was conducted on an intentional sample of 307 young people aged between 18 and 29 years ($M_{age} = 21.17$ years, $SD = 2.33$) who attend different university health centers. This sample was comprised of 49.5% men and 50.5% women. The sample was divided into two to conduct an EFA ($n = 154$, 50% women, aged 18–29 years, $M_{age} = 21.16$ years, $SD = 2.43$) first and then a CFA on the other half ($n = 153$, 51% women, aged 18–29 years, $M_{age} = 21.18$ years, $SD = 2.23$). The participants were placed in three groups according to the Patient Health Questionnaire-9 (PHQ9) test: (1) those not presenting depression ($n = 103$), (2) those with a symptomatology of another depressive disorder (this criterion includes dysthymia and minor depression; $n = 103$), and (3) those with symptoms of a major depressive disorder ($n = 101$).

Procedure

The procedure was approved by the institutional review board of the University of Santiago of Chile (approval letter no. 41). The informed consent was signed by the interviewers with a copy for the respondent. The confidentiality of the responses was ensured by numbering the questionnaire when the participant answered it, excluding personal identification in the database.

All the questionnaires were applied in Chile (Santiago and Temuco). The participants were contacted in various contexts (high schools, universities, public and private institutions, and companies), declared through self-reporting, and eliminated once they were entered into the database. All the participants who agreed to respond to the test voluntarily signed an

informed consent. None received economic compensation for their participation. Once the informed consent had been signed, the interviewers went on to explain the task and give them the questionnaire.

The adolescents who wished to participate in Study 2 agreed verbally to answer the questionnaire. Additionally, a parent/guardian had to authorize the adolescent's participation by signing an informed consent that explained the conditions and characteristics of the study.

The participants in Study 4 were recruited from different university health centers, having attended for mental health issues, declared through self-reporting.

The descriptive quantitative data analyses of the study, sample, and the PANAS scale were done with the software R v. 3.4.0 (R Development Core Team, 2017) using the *Psych* v.1.7.2 package (Revelle, 2017) and the *car* v. 2.1-5 package (Fox & Weisberg, 2011). The same packages were also used to analyze the internal validity of the scale by Cronbach's α.

For Studies 1, 2, and 4, we evaluated the internal structure of the PANAS, for which EFA and CFA for ordinal variables were performed with polychoric correlation and robust estimator (weighted least squares mean- and variance-adjusted [WLSMV]) using Mplus v.7.4 (Muthén & Muthén, 1998–2015).

Studies 1, 2, and 4 first examined whether the correlation matrix of the 20 items on the scale was suitable to perform a factor analysis. Bartlett's sphericity test for Study 1, $\chi^2(190) = 10{,}034.26$, $p < .001$, Study 2, $\chi^2(190) = 3{,}328.103$, $p < .001$, and Study 4, $\chi^2(190) = 1{,}195.06$, $p < .001$, indicated that the items were not independent. Moreover, the Kaiser–Meyer–Olkin coefficient (.92 for Study 1, .87 for Study 2, and .83 for Study 4) indicated that the correlations between pairs of items could be explained by the remaining items.

The WLSMV was used as the robust estimator because the categorical variables were not distributed normally and the items presented negative and positive asymmetries. For the selection of items, factor load values over 0.3 were considered adequate.

For Study 3, we evaluated the convergent and discriminant validity of the PANAS with other scales that measure depression, anxiety, and personality traits through Pearson correlations.

In Study 4, an multivariate analysis of variance (MANOVA) was performed between the PA and NA and the variables age, gender, and degree of depressive symptoms. Relations were established between the PANAS, and the degree of depressive symptomatology presented by the participants.

Instruments

PANAS. This is a self-report consisting of two scales designed to measure PA and NA (Watson et al., 1988). Respondents are asked to read 20 words that describe a series of feelings and emotions and then indicate the extent to which they usually feel them, responding on a Likert-type scale ranging from *very slightly or not at all* (1) to *extremely* (5). The present study used the Spanish version adapted by Sandín (2003). Total scores on each scale (PA and NA) are obtained by adding the scores for each item. Estimations of the internal consistency have varied from $\alpha = .86$ to $\alpha = .90$ for the PA scale and from $\alpha = .84$ to $\alpha = .87$ for the NA scale (Watson et al., 1988).

In conjunction with the PANAS, other instruments were used to assess discriminant validity (State–Trait Anxiety Inventory [STAI] for anxiety, Beck's Depression Inventory [BDI] for depression, and Big Five Inventory [BFI] for neuroticism) and convergent validity (Big Five extroversion).

BDI (revised version). Designed to measure the severity of the cognitive, affective, behavioral, and psychophysiological symptoms of depression (Beck, Rush, Shaw, & Emery, 1979). The instrument contains 21 questions answered on a scale ranging from *absence of the symptom* (0) to *maximum intensity of the symptom* (3). High indices of internal consistency have been found in the Spanish validation of the questionnaire of $\alpha = .83$ and $\alpha = .90$ in the Chilean population (Melipillán-Araneda, Cova-Solar, Rincón-González, & Valdivia-Peralta, 2008; Sanz & Vázquez, 1998).

STAI. The Spanish version validated in Chile by Vera-Villarroel, Celis-Atenas, Córdova-Rubio, Buela-Casal, & Spielberger (2007) was used (Spielberger, Gorsuch, & Lushene 1970). The State Anxiety subscale measures anxiety as a temporary emotional condition, and the Trait Anxiety subscale evaluates anxiety as a more permanent emotional state of tension. The instrument consists of two subscales, each composed of 20 items, measuring state and trait anxiety. The STAI state subscale asks respondents to rate how they feel "right now . . . at this moment" using a 4 point Likert-type scale ranging from *not at all* (0) to very much so (3). The STAI trait subscale asks respondents to rate how they feel "in general" using a 4 point Likert-type scale ranging from *almost never* (0) to *almost always* (3).

The Spanish adaptation shows adequate indicators of reliability and validity (Bermúdez, 1978a, 1978b). The Chilean adaptation shows excellent Cronbach's αs of .92 for the State subscale and .87 for the Trait

subscale (Vera-Villarroel, Celis-Atenas, Córdova-Rubio, Buela-Casal, & Spielberger, 2007).

BFI. This is designed to describe and assess the personality using five factors: extroversion, agreeableness, conscientiousness, neuroticism, and openness (John & Srivastava, 1999). In its Spanish version, it consists of 44 items that evaluate the five dimensions of the Big Five model (John & Srivastava, 1999). Extroversion is related to activity and energy, sociability, and positive emotions; agreeableness is about a prosocial orientation, altruism, and modesty; responsibility is linked to goal-directed behavior and self-control; neuroticism includes sadness, anxiety, nervousness, and tension; and finally, openness evaluates depth, mental openness, and life experience (Benet-Martínez & John, 1998). The Spanish version shows good Cronbach's αs between .84 and .88 for each of its five factors, replicating the five-factor structure and explaining 73% of the variance (Baader et al., 2012; Benet-Martínez & John, 1998; Rodriguez-Fornells, Lorenzo-Seva, & Andres-Pueyo, 2001).

In Chile, this questionnaire was adapted for the Chilean population in 2012 in the doctoral thesis of the authors of this study (Celis-Atenas, 2014). This adaptation was carried out with a total of 2,295 people (1,025 men and 1,270 women) aged between 18 and 60 years with a mean of 32.60 years ($SD = 11.87$). In the analysis of item discrimination and functioning, all but 4 items reached a discrimination index greater than .20. Unidimensionality was assessed with an EFA, obtaining acceptable fit indices for each of the dimensions on this questionnaire. The Cronbach's α estimated for each of the dimensions was adequate, over .79 in every case, an estimation similar to that obtained in its original version and the Spanish translation (Benet-Martínez & John, 1998; Rodriguez-Fornells et al., 2001).

PHQ-9 Depression Scale. The Spanish version was used (Diez-Quevedo, Rangil, Sánchez-Planell, Kroenke, & Spitzer, 2001) and validated in Chile by Baader et al. (2012; Kroenke, Spitzer, & Williams, 2001). The questionnaire measures the presence of depressive symptoms based on Diagnostic and Statistical Manual of Mental Disorders-IV criteria. It consists of 9 items answered on a Likert-type scale from 0 to 3 according to the frequency of the symptom in the last 2 weeks, where 0 = *never*, 1 = *some days*, 2 = *more than half of the days*, and 3 = *almost every day*. The questionnaire has shown adequate psychometric properties and sensitivity in detecting depression in different studies (Baader et al., 2012; Diez-Quevedo et al., 2001; Kroenke & Spitzer, 2002). The following classification is made according to the scores obtained on the scale: no depressive symptoms, symptoms of other types of

depression like dysthymia or anhedonia, and symptoms of major depression (Kroenke & Spitzer, 2002).

Results

Study 1

EFA. As a first step in delineating the factor structure, two or three factors were considered given their suitable indices of fit (Table 1) and Cattell's scree test (eigenvalues > 1; Hu & Bentler, 1999). However, the root mean square error of approximation (RMSEA) was higher than .06 for both models according to the criteria of Hu and Bentler (1999), although some authors have suggested that values close to or less than .08 indicate an adequate fit (Leach et al., 2008).

When the two- and three-factor solutions were compared, the indices of fit of both (Table 2) indicated significant improvements in the three-factor model over the two-factor model, $\chi^2(18) = 370.115$, $p < .001$. The three-factor solution was not, however, consistent with the theoretical solution, that is, the NA is two factor, since no item loaded into the third factor with adequate factor loads: All were below .45 and 2-item factor loads were not significant (Table 3). In a two-factor solution, all the items presented factor loads over .5; therefore, the decision was made not to eliminate items. The correlation between the two factors found (two-factor solution) was close to 0 and not significant ($r = .013$, $p > .05$).

CFA. The indices of fit of this model were adequate. The goodness-of-fit indicators of both the EFA and CFA are provided in Table 1.

The loads for both factors were good with values between .58 and .864 for PA and between .681 and .853 for NA. The correlation between the two factors found (two-factor solution) was close to 0 and not significant ($r = .066$, $p > .05$). These results were consistent with Hypothesis 1. Table 2 shows the factor loads for the EFA and CFA.

Reliability. In the total sample showed a reliability of $\alpha = .91$ for both the PA and the NA.

Study 2

EFA. To begin, a two- or three-factor structure was considered, given each one's suitable indices of fit (Table 1) and Cattell's scree test

Table 1. Fit Indices for Tested Models.

Solution	Version	χ^2	*df*	*p*	χ^2/df	RMSEA	$p \leq .05$	CFI	TLI	SRMR	*n*
Study 1											
One factor	EFA	7,059.622	170	≤.001	41.53	.229	0	.658	.618	.279	773
Two factors	EFA	915.395	151	≤.001	6.06	.081	0	.962	.952	.038	773
Three factors	EFA	451.127	133	≤.001	3.39	.056	.044	.984	.977	.028	773
Two factors	CFA	1,006.539	169	≤.001	5.96	.08	0	.961	.956	—	775
Study 2											
One factor	EFA	3,544.174	170	≤.001	20.85	.194	0	.404	.333	.188	527
Two factors	EFA	666.243	151	≤.001	4.41	.08	0	.909	.885	.053	527
Three factors	EFA	339.102	133	≤.001	2.55	.054	.16	.964	.948	.035	527
Two factors	CFA	587.366	169	≤.001	3.48	.069	0	.93	.921	—	517
Study 4											
One factor	EFA	716.498	170	≤.001	4.21	.144	0	.737	.706	.166	154
Two factors	EFA	264.443	151	≤.001	1.75	.07	.012	.945	.931	.07	154
Three factors	EFA	196.778	133	≤.001	1.48	.056	.273	.969	.956	.054	154
Two factors	CFA	306.441	169	≤.001	1.81	.073	.003	.945	.938	—	153

Note. χ^2= chi squared; *df* = degrees of freedom; CFI = comparative fix index; TLI = Tucker–Lewis index; RMSEA= root mean square error of approximation; EFA = exploratory factor analysis; CFA = confirmatory factor analysis; SRMR = standardized root mean square residual.

Table 2. Exploratory and Confirmatory Factor Analyses (Study 1).

	EFA					CFA	
	Two Factors		Three Factors			Two Factors	
Item	1	2	1	2	3	1	2
P01	.017	**.628***	.031	**.635***	−.095	**.669**	
P03	.129*	**.820***	.132*	**.818***	.076	**.821**	
P05	−.023	**.820***	−.03	**.814***	.161	**.855**	
P09	−.016	**.852***	−.017	**.847***	.107	**.864**	
P10	−.127*	**.541***	−.122*	**.541***	−.019	**.58**	
P12	.119*	**.753***	.134*	**.762***	−.079	**.788**	
P14	.110*	**.710***	.121*	**.713***	−.032	**.738**	
P16	.191*	**.647***	.186*	**.644***	.145	**.69**	
P17	−.024	**.715***	−.013	**.719***	−.054	**.699**	
P19	−.017	**.762***	−.018	**.757***	.094	**.827**	
P02	**.700***	−.143*	**.703***	**−.140***	.08		**.681**
P04	**.803***	.023	**.752***	.017	**.483***		**.78**
P06	**.728***	.05	**.735***	.055	.047		**.772**
P07	**.831***	−.008	**.842***	.004	**−.115***		**.853**
P08	**.735***	.013	**.708***	.008	**.330***		**.733**
P11	**.787***	−.022	**.731***	−.034	**.473***		**.778**
P13	**.761***	.181*	**.772***	**.190***	−.017		**.785**
P15	**.786***	.015	**.797***	.025	−.062		**.799**
P18	**.730***	−.067*	**.738***	**−.060***	−.01		**.74**
P20	**.841***	−.027	**.856***	−.015	**−.146***		**.842**

Note. The significance of bold formatted values and * is $p \leq .05$. EFA = exploratory factor analysis; CFA = confirmatory factor analysis.

(eigenvalues > 1; Hu & Bentler, 1999). However, the RMSEA values were higher than .06 for both models, although these may be considered adequate according to the criteria provided by Leach et al. (2008).

The three-factor solution separates the NA into two factors: one with NAs related to the upset and another to those related to afraid.

A comparison of the two- and three-factor solutions revealed that the indices of fit for both solutions indicated significant improvements in the three-factor model over the two-factor model, $\chi^2(18) = 230.041$, $p < .001$. However, the three-factor solution was not consistent with the theoretical solution and had items with factor loads over .4 (Table 2); therefore, the decision was made to use the two-factor solution. In addition, all the two-factor solution items presented factor loads over .3, which is why it was decided not to eliminate items. The correlation between the two factors

Table 3. Exploratory and Confirmatory Factor Analyses (Study 2).

	EFA					CFA	
	Two Factors		Three Factors			Two Factors	
Item	1	2	1	2	3	1	2
P01	**.401***	−.009	**.425***	−.108*	.101*	**.315**	
P03	**.717***	.038	**.694***	.05	−.132*	**.787**	
P05	**.720***	−.041	**.687***	.006	−.212*	**.758**	
P09	**.748***	−.021	**.734***	−.031	−.111	**.787**	
P10	**.588***	−.092*	**.602***	−.163*	.004	**.385**	
P12	**.663***	.097*	**.675***	.01	.061	**.669**	
P14	**.597***	.07	**.606***	−.006	.048	**.632**	
P16	**.580***	.100*	**.620***	−.056	.196*	**.598**	
P17	**.651***	.024	**.652***	−.027	−.017	**.613**	
P19	**.756***	−.025	**.717***	.051	−.262*	**.781**	
P02	−.201*	**.554***	−.164*	.379*	**.462***		**.55**
P04	.04	**.624***	.094*	.390*	**.538***		**.595**
P06	.027	**.668***	.021	**.603***	.253*		**.651**
P07	−.011	**.696***	−.066	**.769***	.002		**.778**
P08	−.107*	**.567***	−.062	.369*	**.488***		**.488**
P11	−.075	**.656***	−.002	.362*	**.688***		**.692**
P13	.044	**.633***	−.001	**.684***	.021		**.681**
P15	.019	**.653***	.008	**.604***	.221*		**.604**
P18	.082	**.496***	.077	**.443***	.186*		**.501**
P20	−.098*	**.674***	−.168*	**.783***	−.041		**.77**

Note. The significance of bold formatted values and * is $p \leq .05$. EFA= exploratory factor analysis; CFA= confirmatory factor analysis.

found (two-factor solution) was close to 0 and not significant ($r = -.042$, $p > .05$).

CFA. The indices of fit of this model were adequate. The goodness-of-fit indicators of both the EFA and CFA are given in Table 1.

The factor loads of both factors were good with values between .315 and .781 for PA and between .488 and .778 for NA (see Table 3). It is worth noting that Item 1 (interested), Item 8 (hostile), and Item 10 (proud) presented the lowest factor loads, but all were over .3. Consistent with Hypothesis 2, the correlation between the two factors found (two-factor solution) was close to 0 and not significant ($r = .034$, $p > .05$).

Reliability. In the total adolescent sample ($N = 1{,}044$), the reliability on both the PA and NA scales achieved a Cronbach's $\alpha = .85$ and $\alpha = .83$, respectively.

Study 3

Convergent and divergent validity. With the aim of studying convergent and divergent validity, the PA and NA scales were correlated with questionnaires that evaluate depression, anxiety, neuroticism, and extroversion, which were completed by 964 respondents. The correlations between NA and these variables were all significant ($ps < .01$). For depression, the correlation was $r = .56$, and for state and trait anxiety, it was $r = .63$ and $r = .59$, respectively. Variables related to personality, namely, neuroticism and extroversion, showed significant correlations with an NA of $r = .50$ and $r = -.16$, respectively. The PA scale was also related significantly to these variables ($ps < .01$) including depression ($r = -.43$), state anxiety ($r = -.57$), trait anxiety ($r = -.51$), neuroticism ($r = -.35$), and extroversion ($r = .42$).

Study 4

EFA. Following the previous analyses, an EFA for categorical variables and polychoric correlation was performed with one half of the sample ($n = 154$), using WLSMV and oblimin rotation. The results are similar to the two previous studies and show two solutions with good indices of fit (see Table 1) and Cattell's scree test (eigenvalues > 1; Hu & Bentler, 1999). The results also show that the RMSEA values were higher than .06 for both models, although they may be considered adequate according to the criteria provided by Leach et al. (2008).

Although the three-factor solution showed better indices of fit than the two-factor solution, $\chi^2(18) = 61.737$, $p < .001$, the former was not theoretically coherent. In the latter, all the items presented factor loads from .351 to .827; therefore, the decision was made not to eliminate items (see Table 4).

The correlation between the two factors found (two-factor solution) was significant, indirect but low ($r = -.298$, $p < .05$). This result is different from the correlation found in Studies 1 and 2, suggesting that in the clinical sample, two factors are correlated instead of there being two uncorrelated factors.

CFA. Given that in the two previous studies and EFA in Study 4 showed the optimal two-factor solution of the PANAS, a CFA of this model was

Table 4. Exploratory and Confirmatory Factor Analyses (Study 4).

	EFA					CFA	
	Two Factors		Three Factors			Two Factors	
Item	1	2	1	2	3	1	2
P01	**.412***	−.167*	**.494***	−.176*	.017	**.456**	
P03	**.691***	−.164	**.701***	.001	−.122	**.723**	
P05	**.755***	−.126	**.681***	.256*	−.302*	**.699**	
P09	**.844***	.047	**.805***	.183*	−.027	**.888**	
P10	**.351***	−.101	**.279***	.168	−.244*	**.493**	
P12	**.626***	.107	**.696***	−.032	.250*	**.655**	
P14	**.649***	−.012	**.693***	−.025	.086	**.515**	
P16	**.563***	−.209*	**.572***	−.024	−.168*	**.782**	
P17	**.492***	−.032	**.527***	−.034	.049	**.626**	
P19	**.827***	.106	**.853***	.079	.146	**.644**	
P02	−.119	**.599***	−.161	.259*	**.460***		**.806**
P04	−.018	**.464***	−.225	**.562***	−.005		**.649**
P06	.197*	**.759***	.042	**.582***	.371*		**.71**
P07	−.022	**.826***	−.069	.342*	**.657***		**.802**
P08	.236*	**.528***	.043	**.620***	.06		**.552**
P11	.145	**.662***	−.071	**.710***	.128		**.695**
P13	−.01	**.609***	−.019	.206	**.534***		**.615**
P15	−.052	**.561***	.037	−.015	**.701***		**.74**
P18	−.006	**.563***	.012	.141	**.544***		**.817**
P20	.004	**.974***	.008	.294*	**.889***		**.897**

Note. The significance of bold formatted values and * is $p \leq .05$. EFA = exploratory factor analysis; CFA = confirmatory factor analysis.

performed on a second subsample ($n = 153$) using the estimated WLSMV, since the variables were not distributed normally and had negative and positive asymmetries.

First, the indices of fit of the bifactor model (see Table 1) were good according to the criteria provided by Hu and Bentler (1999): the $\chi^2/df = 1.81$ index was below the cutoff criterion of 3.8. The RMSEA indicator (RMSEA = .073), however, was adequate but low being close to .07 (Leach et al., 2008). The comparative fit index (.945) and the Tucker–Lewis index (.938) also had adequate values close to .95. On both scales, the factor loads were over .4. The loads for PA were between .456 and .888, whereas for NA, they were between .552 and .897. The lowest factor load was the item "interested" from the PA scale. Consistent with previous EFA performed,

the correlation of the two factors was low, indirect but significant ($r = -.347$, $p < .001$); Hypothesis 4 was not confirmed.

Reliability. The reliability on the PA and NA scales obtained a Cronbach's $\alpha = .85$ and $\alpha = .87$, respectively.

PANAS in patients with different degrees of depressive symptomatology. In order to assess Hypothesis 4, an MANOVA was performed to compare the means of the PA and NA together according to the degrees of depressive symptoms, gender, and age.

Using Pillai's trace test, a significant effect was found of the different degrees of depressive symptomatology and the PA and NA, $F(4, 590) = 46.840$, $p < .001$. However, neither gender, $F(2, 294) = 1.540$, $p > .05$, nor age, $F(2, 294) = 0.180$, $p > .05$, had any significant effect on the PA and NA together.

Taking the previous results into account, an analysis of variance was performed between the degrees of depressive symptomatology and the PA and NA separately.

The results of this analysis indicated that there were significant differences in PA level for the three groups, $F(2, 301) = 15.804$, $p < .001$, partial $\eta^2 = .09$.

The post hoc comparisons using Tukey's honest significant difference (HSD) test indicated that those people with symptoms of a major depressive disorder on average had lower PA levels ($M = 31.2$, $SD = 6.53$) than those who did not exhibit depressive symptoms ($M = 35.16$, $SD = 4.97$, $p < .001$). By contrast, the patients with symptoms of other types of depression presented on average higher PA levels ($M = 35.23$, $SD = 5.97$) than patients with symptoms of a major depressive disorder ($p < .001$). Finally, the patients without depression and those with another depressive symptomatology did not differ significantly ($p > .05$) in the average of the PA.

Also, significant differences in the NA were found in the three groups, $F(2, 304) = 120.9$, $p < .001$, partial $\eta^2 = 0.4$. The post hoc comparisons using Tukey's HSD test indicated the patients who reported symptoms of major depression as having higher NA levels ($M = 28.19$, $SD = 6.78$) than those with no depressive disorder ($M = 22.45$, $SD = 6.56$, $p < .001$). Likewise, patients with symptoms of another depressive disorder had on average higher NA levels than those with no depression ($p < .001$), depression ($M = 15.69$, $SD = 3.22$), or with depressive symptoms ($M = 22.45$, $SD = 6.56$, $p < .001$). In the same way, the patients with symptoms of

another depressive disorder had on average higher NA levels than those with no depression ($p < .001$).

Discussion

The aim of this study was to evaluate the psychometric properties of the PANAS questionnaire in the Chilean population. At the same time, the current study endeavored to confirm the factor structure of the instrument. This was done bearing in mind the paucity of studies into the use of the PANAS with Spanish-speaking subjects.

It can therefore be concluded that the results described are similar to those reported by studies in various cultures (English- and Spanish-speaking) with respect to level of reliability (Crawford & Henry, 2004; Gargurevich & Matos, 2012; Leune & Beauducel, 2011; Lim et al., 2010; Pandey & Srivastava, 2008; Robles & Páez, 2003; Sandín et al., 1999; Terracciano et al., 2003; Tuccitto, Giacobbi, & Leite, 2010). In the three studies, the Cronbach's α of the two subscales was over .80.

The hypothesis of a two-factor structure has been verified in both the EFA and CFA. Suitable indicators of fit of the questionnaire to this factor solution have been reported (Watson et al., 1988). However, in the sample with patients from the university clinic, the two-factor solution shows that the PA is correlated with the NA; a correlation which can be explained by the fact that in the clinical sample, these constructs are measured at state level, whereas in the general adult and adolescent populations, they are measured at trait level. Other studies show that the PA is independent of the NA at trait level, but not at state level (Lim et al., 2010; Schmukle, Egloff, & Burns, 2002). Additionally, the results obtained are consistent with the factor structures found in validations of the instrument conducted on clinical samples; for example, in adult women with fibromyalgia (Estévez-López et al., 2016), in patients with substance abuse (Serafini et al., 2016), and in patients with psychiatric pathologies (Lim et al., 2010), where the structure with two correlated factors showed better fit indices.

Furthermore, certain evidence was found of the existence of a three-factor solution different from the one found in other studies (Gaudreau et al., 2006; Killgore, 2000), which may indicate an alternative distribution of items in the dimensions of afraid and upset, both for healthy people and patients with mood disorders. For example, in the sample of patients from the university health centers, the dimension of afraid is made up of affects related to stress, scared, shame, nervousness, jittery, and afraid; however, for the sample of adolescents, the dimension of afraid includes feelings of

guilt, scare, shame, nervousness, jittery, and afraid. This result is particularly interesting to understand better the affectivity of young people who attend mental health centers and who have some degree of depressive symptomatology because it could aid in the design of adequate intervention strategies. Moreover, this provides an understanding that the PANAS scale has different suitable solutions depending on the study population (clinical vs. healthy; adults vs. young people; countries), which is not inconceivable in that this merely reflects the complexity and variety of NA that people can experience in stressful situations (Gaudreau et al. 2006).

As for convergent and divergent validity, adequate and significant correlations were found with depression, anxiety, neuroticism, and extroversion. This is consistent with the theory and empirical studies (Crawford & Henry, 2004; Larsen & Ketelaar, 1991; Philipp, Washington, Raouf, & Norton, 2008; Tuccitto et al., 2010) in a wide age range. The instrument was able to discriminate between subjects with and without depressive symptomatology, particularly in terms of the presence of NA. Although the low correlation between extroversion and NA is striking, this is expected, since it is the presence of a high NA index that has been related to experiences of NA, while the dimension of PA is closely related to the hedonic and allows the subject to feel alert, participatory, and satisfied (Grimaldo, 2015).

The results show adequate psychometric properties for the PANAS, as well as providing evidence about its capacity to differentiate people with and without symptoms of depression in PA and NA. Although no differences were found between those who did not present symptoms and those with another depressive symptomatology, we believe this to be due to the cutoff point to establish the categories perhaps not discriminating effectively when there is little symptomatology present or to the possible existence of NA in a population without symptoms; however, there are significant differences when compared to a population with a higher presence of symptoms.

With respect to the limitations of the study, one limitation is mainly the type of sampling since it is not representative of the population. Nevertheless, it contributes evidence to the factor structure of the PANAS in different populations in Chile, which was the objective here.

In the case of the sample with depressive symptomatology, the main limitation is its sole inclusion of young patients from a university health centers. In this sense, it is proposed that this study be replicated in future studies as a broader clinical sample that includes an adult and senior population.

Furthermore, it would be interesting to conduct larger studies where the three-factor structure found in this study is tested through EFA and CFA, which could better identify how people experience emotions in stressful situations.

Another challenge that arises from this research is the need to conduct studies that can generate population normative data, which could provide more information not only to public policy makers in the field (prevention, promotion, and treatment) but also to clinical practice, where this scale could be used as a measure of a population's health status.

Finally, this is the first study to confirm the factor structure of the PANAS for the general population in Chile. In addition, it gives empirical evidence as to the usefulness of the instrument in distinguishing between individuals with and without depression. Therefore, the results reported here are of use to research, because they confirm that it is possible to have a suitable and reliable instrument to evaluate the construct being studied, making it applicable to different populations in Chile. Additionally, it contributes relevant information for the application of the instrument in professional contexts, since it affords an effective tool to assess people's emotional experience, knowledge of which has been emphasized as fundamental when performing, for example, effective clinical interventions for such issues as mood disorders.

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