Confirmatory Factor Analysis and Temporal Invariance of the Positive and Negative Affect Schedule (PANAS)

Análise Fatorial Confirmatória e Invariância Temporal da Positive and Negative Affect Schedule (PANAS)

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Abstract
This paper analyzes the structure and the temporal invariance of the Portuguese version of the Positive and Negative Affect Schedule. Previous studies are not consensual whether PANAS measures two or three affect factors and whether such factors are independent or correlated. In order to fill in this gap, we compared the original PANAS, as an independent bi-dimensional structure, with several other alternative structures. Two hundred forty five university students and professional trainees answered the questionnaire in two distinct moments with a two month interval. The model of PANAS with a structure of two independent factors, Positive Affect (PA) and Negative Affect (NA), as proposed by the authors of the scale, was tested. However, the best model consisted of two independent factors, PA and NA, with the cross-loading of the item "excited" between PA and NA, and specified error correlations between the same categories of emotions. Another gap in the literature is the temporal invariance analysis of the PANAS. This paper assesses the temporal invariance of the scale, using the structural equation modeling analysis. Although it was used in its state form version, the PANAS scale showed temporal stability in a two month interval.
Keywords: PANAS, Positive and Negative Affect, confirmatory factor analysis, temporal invariance.

Resumo
O artigo analisa a estrutura e a invariância temporal da versão portuguesa da *Positive and Negative Affect Schedule*. A investigação científica anterior não é consensual acerca da estrutura da PANAS, se é constituída por dois ou três fatores e se esses fatores são independentes ou correlacionados. De forma a colmatar esta lacuna, procedemos à comparação da estrutura da PANAS como tendo duas dimensões independentes com várias outras estruturas alternativas. Duzentos e quarenta e cinco estudantes universitários e de cursos de formação profissional responderam ao questionário em dois momentos, com dois meses de intervalo. Foi testado o modelo da PANAS que representa uma estrutura de dois fatores independentes, Afeto Positivo (AP) e Afeto Negativo (AN), tal como definida pelos autores da escala. Contudo, o melhor modelo foi o que representa uma estrutura de dois fatores independentes, com a ponderação dupla do item "excitado" entre o AP e o AN e especificando correlações entre os erros dos itens que pertencem às mesmas categorias de emoções. Outra lacuna na investigação é a análise da invariância temporal da PANAS. Este artigo analisa a invariância temporal da escala, utilizando a análise de modelos de equações estruturais. Embora a escala tenha sido aplicada na sua versão afeto estado, a PANAS revelou invariância temporal num intervalo de dois meses.
Palavras-chave: PANAS, Afeto Positivo e Negativo, análise fatorial confirmatória, invariância temporal.

The PANAS is a well known and widely used self report measure of Positive Affect (PA) and Negative Affect (NA), developed by Watson, Clark and Tellegen (1988). PA and NA are defined as general dimensions that describe affective experience. High NA reflects subjective distress and unpleasurable engagement, including emotions like being upset, fear, and nervousness. High PA reflects pleasurable engagement with the environment, including emotions like enthusiasm, inspiration, and determination. PA and NA can also designate Positive Activation and Negative Activation to reflect the activated nature of the constructs, i.e., the higher end of each dimension is characterized by its presence, while the lower end is characterized by its absence (Tellegen, Watson, & Clark, 1999).

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The wide interest in PANAS is related to the fact that it is a quick and easy application scale that measures important basic human emotions. Depending on the time frame used, the PANAS can assess affective states, mood, and trait affect. For this reason the study of PANAS has been associated to other constructs such as anxiety, depression and personality (Watson & Clark, 1997). PANAS is also frequently used as a measure of the emotional dimension of the psychological and subjective well-being constructs (Diener & Ryan, 2009). The use of PANAS is adequate to measure subtle changes in emotional experience for general and clinical samples. Therefore, it is pertinent to be used as a measure of mental health or to evaluate the impact of intervention programs. The development of PANAS was based on a previous study about categories of emotions (see Zevon & Tellegen, 1982). This study found that 60 human emotions can be gathered in 20 categories of emotions. PANAS includes 20 emotions that belong to nine of these categories. The structure of Affect has been represented through circumplex models. The emotions are distributed in a circumference and the similarity and difference between the emotions are represented by the proximity or distance between them in the circumference. The correlation between two emotions is not significant when they are 90º distant from each other. The correlation between two emotions is negative when they are 180º distant (see Tellegen et al., 1999).

The PANAS has been validated all over the world and generally shows good psychometric properties, construct, convergent, and discriminant validity (e.g., Terracciano, McCrae, & Costa, 2003). However, previous studies are not consensual about the factorial structure of the PANAS and about the association between PA and NA. Moreover, in the literature about the PANAS we have not found data about the temporal invariance of the scale using structural equation modelling with latent variables. In order to fill these gaps, in this paper we will test the structure of the PANAS, the relationship between PA and NA, and analyse the temporal invariance of the scale.

Factorial Structure of the PANAS

The structure of PANAS, as proposed by the authors, is bi-dimensional, as PA and NA are separate and highly, but not absolutely, independent dimensions (Tellegen et al., 1999; Watson & Clark, 1997). Several studies supported this two-factor structure. For instance, Crocker (1997) observed that the oblique two-factor model represented a good fit to the data. However, the model fit improved significantly when the errors of the items of the same content categories of emotions were correlated, such as afraid and scared (see also Zevon & Tellegen, 1982). The two-factor model was also the best fitting model in the study of Terracciano et al. (2003), where PA and NA scales remained substantially independent after accounting for measurement error. In the studies of Crawford and Henry (2004) and Tuccitto, Giacobbi and Leite (2010), the best fitting model was also a two-factor model, specifying correlations according to the mood content categories of Zevon and Tellegen (1982). However, while the relationship between PA and NA was independent in the study of Tuccitto et al. (2010) it was not completely independent in the study of Crawford and Henry (2004).

Alternative *three-factor structures* with good fit indices have also been proposed and tested by Gaudreau, Sanchez, and Blondin (2006), Killgore (2000) and Mehrabian (1997). Mehrabian (1997) tested a model where PA was maintained as one factor and NA was divided into two conceptually meaningful factors: Afraid (scared, nervous, afraid, guilty, ashamed, and jittery) and Upset (distressed, irritated, hostile, and upset). Although both the two-factor and the three-factor models were sustainable, the three--factor model provided better fit to the data. In the same line, Killgore (2000) tested the two-factor and the three--factor models and showed the tenability of both. The three-factor model was slightly different from the one used by Mehrabian (1997). The PA factor was maintained and the NA factor was divided into Afraid (scared, nervous, afraid, and jittery) and Upset (distressed, irritated, hostile, upset, guilty, and ashamed). In the study of Gaudreau et al. (2006) the three-factor model yielded the best fit indices. Additionally, however, the authors allowed cross--loadings of the items excited and active between the PA and the Afraid scales. The authors argued that some people perceive anxiety descriptors as facilitative while others perceive them as debilitative. In the study of Mackinnon et al. (1999) the item excited also shown to cross-load between PA and NA.

In sum, research has provided no consistent results about the PANAS's factorial structure. Both two-factor (Crawford & Henry, 2004; Crocker, 1997; Terracciano et al., 2003; Tuccitto et al., 2010; Watson & Clark, 1997) and three-factor models (Gaudreau et al., 2006; Killgore, 2000; Mehrabian, 1997) yield good fit indices. In this paper, we intent to contribute to the literature by testing both two--factor and three-factor models of the PANAS and report which one best fits our data.

Relationship Between PA and NA

Watson et al. (1988) found minor significant correlations ($\leq .20$) between the PA and NA scales, concluding that they are highly but not absolutely independent. Some authors found evidences of independence between the scales of Affect (Billings, Folkman, Acree, & Moskowitz, 2000; Crocker, 1997; Kercher, 1992) and others found evidences of bipolarity (Green & Salovey, 1999). Other authors obtained mixed results and suggested several possible explanations. For example, Russell and Carroll (1999) suggested that the relationship between PA and NA varies according to time, answering options, items chosen to define PA and NA, and measurement errors. Bagozzi, Wong, and Yi (1999) found independence in collectivistic cultures and bipolarity in individualistic cultures. Reich, Zautra, and Potter (2001) found independence in individuals with higher cognitive complexity and bipolarity in individuals with lower cognitive complexity. Finally, Billings et al. (2000) found that it is possible to

simultaneously experience very high negative and very high positive emotions.

In sum, although the majority of the studies observed an independent relationship between the scales of Affect, others found a correlated relationship or even mixed results. In this study we will test both the independent and the correlated models of the PANAS and identify which model best fits the data.

Temporal Stability of the PANAS

Watson et al. (1988) tested the temporal stability of the several answering time frames of the PANAS (moment, today, past few days, past few weeks, last year and in general), over a two month interval, in a small sample (n=101). Results showed correlations between Time 1 and Time 2, from .39 to .71. The trait version and the wider temporal frames of the scale showed the higher temporal stability as expected. However, the PANAS scale exhibits a significant level of stability in every time frame, even in the moment ratings. These results are consistent with earlier findings (Watson & Clark, 1984) and suggest the strong dispositional component of affect. According to the authors, even momentary moods are reflections of the general affective level of the individual (Watson et al., 1988).

Terracciano et al. (2003) also investigated the stability of the PANAS through test-retest correlations in a small sample (n=60) over a three month interval. They found that PA in Time 1 correlated with PA in Time 2 (r = .65, p < .001), while NA in Time 1 correlated with NA in Time 2 (r = .52, p < .001). The test-retest of the trait PANAS over the same period yielded, as expected, higher correlations, between .73 and .76.

Importantly, as far as we know, there are no studies addressing the temporal invariance of the PANAS specifying PA and NA as latent variables, which we believe is a better procedure to address the reliability of the PANAS. We further analyse the PANAS's temporal stability, using structural equation modelling with latent variables.

In the present study we will start by analysing the factorial structure of the PANAS: (a) to identify which of the two-factor or three-factor models best fit our data; and (b) to identify the relationship between the positive dimension and the negative dimension of the concept. Our starting hypothesis states that the PANAS measures two independent factors, as proposed by the authors of the PANAS (Watson et al., 1988). In a third step, we will analyse the temporal invariance of the PANAS over a two-month interval, using the factor structure with the best fit to the data.

Materials and Method

Participants

Of the 303 adults who participated, 39.2% were professional trainees and 60.8% were university students in Portugal. They answered the PANAS twice, the second time after a two-month interval. At Time 2, 245 questionnaires were collected. Participants were aged between 20 and 58 years old, 81.1% were young adults (20 to 40 years old), and 67% were women. In terms of years of education, 25.5% of the participants had completed 4 to 9 years, 25.2% had completed 10 to 12 years, and 49.3% had further education. In terms of marital status, 45.8% were single, 43.8% were married or living with a partner, and 10.4% were divorced or widowed. An informed consent was communicated to the participants by the researcher in oral and written forms (the first page of the questionnaire). According to the ethics standards of the American Psychological Association, the participants were informed of the anonymity of their answers and that they were free to answer only to the questions that they wished. Participants volunteered and there was no gratification to participate in the study.

Materials

We used the Portuguese version of the PANAS (Galinha & Pais-Ribeiro, 2005). This version was built from the original 60 items of the study by Zevon and Tellegen (1982) and the process of selection of items used by Watson et al. (1988) was replicated. The Portuguese version consists of 20 emotions representing all the content categories of PA and NA as the original version. Participants were asked the extent to which they felt each emotion, at the moment (1 = *Very slightly or not at al*; 5 = *Extremely*). The Portuguese version yielded an internal consistency of α = .86 for the PA and α = .89 for the NA, similar to the original scale.

Procedure

With the institutions' and the teachers' permission we approached participants in classrooms at the end of lessons. We invited the students to participate in a study about people's emotions and subjective well-being. The global questionnaire included several measures of affect, subjective well-being and life events and lasted on average 30 minutes to answer. The students who volunteered answered the questionnaires in the classroom. The researcher was present to answer any questions from the students and supplied an e-mail address to give further information requested by the participants. Time 2 of data collection was carried out two months later. In order to match the questionnaires from Time 1 and Time 2, we requested participants to write a password on a separate sheet in the number of the questionnaire that they filled out at Time 1. At Time 2 participants answered the same questions and consulted the passwords to attribute the same number (as in Time 1) to the questionnaire filled out at Time 2.

Results and Discussion

We used a variance-covariance matrix of the PANAS's items using pairwise deletion for missing data. Parameters were estimated using the maximum likelihood algorithm. We adopted a model comparison approach to evaluate the quality of the models tested. Table 1 shows the goodness-of-fit indices of the models tested.

Table 1
Comparison of the Goodness-Of-Fit Indices for the Hypothesized and the Alternative Models for the Structure of the PANAS

Models	X2	*df*	CFI	RMSEA	SRMR	Δχ2	Δ*df*
Hypothesized PA and NA independent (Watson et al., 1988)	408.5	170	.86	.08	.08		
Alternative 1 PA and NA correlated	408.4	169	.86	.08	.08	.1 n.s.	1
Alternative 2 Three-factor (Mehrabian, 1997)	398.4	168	.87	.08	.08	9.9*	2
Alternative 3 Three-factor (Killgore, 2000)	404.1	167	.86	.08	.08	4.4 n.s.	2
Alternative 4 Three-factor (Gaudreau et al., 2006) cross-loading excited and active	364.1	165	.89	.07	.06	44.4**	5
Alternative 5 Two-factor model specifying error correlations of Zevon and Tellegens's (1982) content categories (Crawford & Henry, 2004; Tuccitto et al., 2010)	314.2	161	.91	.06	.08	94.3**	9
Alternative 6 Two-factor model with cross-loading of excited between PA and NA (Mackinnon et al., 1999)	374.4	168	.88	.07	.06	34.1**	2
Alternative 7 Two-factor model specifying error correlations of Zevon and Tellegens's (1982) content categories (Crawford & Henry, 2004; Tuccitto et al., 2010) and the cross-loading of excited between PA and NA (Mackinnon et al., 1999)	277.9	160	.93	.06	.06	130.6**	10
Alternative 8 Three-factor model (Mehrabian, 1997) specifying error correlations of Zevon and Tellegens's (1982) content categories (Crawford & Henry, 2004; Tuccitto et al., 2010) and the cross-loading of excited between PA and NA (Mackinnon et al., 1999)	277.9	160	.93	.06	.06	130.6**	10

** $p<.001$; * $p<.05$; n.s $p\geq.05$.

We started our analysis by testing the two-factor independent model originally proposed by Watson et al. (1988). We specified a measurement model predicting that the 20 items of the full version loaded on two uncorrelated latent variables PA and NA. The model represents the expected tendency for orthogonality, as defended by the authors of the scale and supported by part of the empirical studies (Billings et al., 2000; Crocker, 1997; Kercher, 1992). Then we tested the dependent model (Alternative 1), also specifying two latent variables, but allowing a correlation between them. We compared both independent and dependent models and found no significant differences between them, $\Delta\chi2_1= .1$, $p = .32$ (see Table 1). We then opted for the more parsimonious model, which is the

hypothesized model (see Table 1). Thus, in the analysis of the data collected at Time 1, Confirmatory Factorial Analysis (CFA) results support the independent model as defended by the majority of the studies. However, in previous literature the authors of the scale have found small significant correlations between PA and NA and higher correlations were found by other researchers (Green & Salovey, 1999; Russell & Carroll, 1999).

Results show that PA and NA are independent at Time 1 (r_{210}= -.02, p = .78) and inversely correlated at Time 2, although weakly (r_{210}= -.14, p< .001). The results corroborate the proposal that PA and NA are highly but not absolutely independent (Watson et al., 1988). The fact that our results are mixed is, however, important, as it allows us to eliminate some of the hypotheses raised by previous researchers. Since the present study was replicated with the same participants and using the same questionnaire we can say that the variation in the relationship between PA and NA, over a two-month interval, was not due to (a) the different answering options of the questionnaire, the items chosen to define PA and NA, or the measurement errors (Russell & Carroll, 1999); (b) the differences in the cultural backgrounds of the participants (Bagozzi et al., 1999); or (c) the cognitive complexity of the participants (Reich et al., 2001). Several hypotheses about the differences in the relationship between PA and NA over a two-month interval remain to be explored. It may be due to time, as suggested by Russell and Carroll (1999), or to the conditions of the participants when answering the questionnaire. It would be interesting to analyse in future studies what are the conditions that influence the relationship between the PA and NA. Indeed, Diener and Emmons (1985) found that when the intensity of emotions is higher and the temporal frame of the answers is narrower, the relationship between PA and NA tends to be inversely correlated.

We continued our analysis by comparing the two--factor model proposed by Watson et al. (1988) with other two-factor and three-factor models proposed by previous research. We tested the three-factor models of the PANAS structure proposed by Mehrabian (1997) – alternative model 2 (A2) – and by Killgore (2000) – alternative model 3 (A3) – where the NA scale was divided into two latent factors: Afraid and Upset. In order to guarantee the statistical identification of the model, it was necessary to constrain to zero the error variance of the Upset factor to avoid negative error variances (see Bollen, 1989). According to our results, only the A2 model tested by Mehrabian (1997) was significantly better than the hypothesized model (Table 1). This model separates NA into two latent factors: Afraid (scared, nervous, afraid, guilty, ashamed, and jittery) and Upset (distressed, irritable, hostile, and upset). The separation of the items is semantically coherent according to the Zevon and Tellegen (1982) categorization of emotions, except for the items of guilty and ashamed that belong to a different category.

Gaudreau et al. (2006) also tested a three-factor model and they also allowed cross-loadings of two items (excited and active) between the Afraid NA scale and the PA scale. Again, we guaranteed the statistical identification of the model by constraining to zero the error variance of the Upset factor. We replicated this Alternative Model 4 (A4) and it proved to be the best of the three-factor models and significantly better than the hypothesized model $\Delta\chi2_6$= 44.4, p< .001 (Table 1). According to our results, distinguishing two categories of negative emotions (Afraid and Upset) and cross-loading the excited and active items between the PA scale and the Afraid subscale promotes the fitness of the model. This modification also allows us to be more specific about the analysis of the negative emotionality of an individual, being able to determine whether it is due to fear or to being upset. However, analysing the estimates of the model we see that the cross-loading of excited has a significant loading on Afraid (.37) while the loading of active is not significant (-.02). We consider that the improvement of the model is due to the cross-loading of excited and not of active. The cross-loading of the item excited represents a certain degree of overlap between PA and NA, meaning that this emotion may have a double meaning (positive and negative). This result has also been shown in previous studies, although not consistently. In fact, according to the dictionary definitions, in both Portuguese and English languages, excited may have a positive meaning (eagerness and happiness) or a negative meaning (nervousness and agitation). In both languages we also find the reference to a sexual arousal meaning of the word. Future studies of PANAS should consider the development of shorter versions of the scale and the elimination of the potentially ambiguous items like excited. We continued the CFA analysis by testing the *two-factor models* proposed in the literature about the structure of the PANAS. We tested a fifth alternative model (A5), where we correlated the errors of the items that belong to the same semantic content categories, following Crawford and Henry (2004) and Tuccitto et al. (2010). Then, a sixth alternative model (A6) was tested, which was exactly the same as the previous but with the cross-loading of the item excited between PA and NA scales, following the proposal of Mackinnon et al. (1999). Results show that the A5 model fits significantly better to the data than the hypothesized model $\Delta\chi2_9$= 94.3, p< .001 and the A4 model $\Delta\chi2_3$= 49.5, p< .001. The A6 model, in its turn, yielded better goodness-of-fit indices than the hypothesized model $\Delta\chi2_2$= 34.1, p<.001 but not better than the previous A5 model $\Delta\chi2_7$= 60.2, p< .001 (Table 1).

Finally, we explored two models that integrate characteristics of the previous models that showed signifi- cant improvements to the fitness of the scale. We explored a seventh alternative model (A7) of the structure of the PANAS, which integrates the two-factor model, specifying error correlations according to the Zevon and Tellegen (1982) content categories and the cross-loading of the item excited between PA and NA (Figure 1). The A7 model yielded the best goodness-of-fit indices for the PANAS factor structure so far, in comparison with all the

previous models and the hypothesized model $\Delta\chi2_{10}$= 130.6, p< .001 (Table 1). We also explored an eighth alternative model (A8), the model is similar to model A7, except that instead of a two-factor model we tested the three-factor model proposed by Mehrabian (1997). It was necessary to constrain to zero the error variance of Upset and Afraid to avoid negative error variances (Figure 2). Results showed a $\Delta\chi2_{10}$= 130.6, p< .001 (Table 1). A7 and A8 models are both better than the hypothesized model but not statistically different from each other. This result probably means that after correlating the errors of the items that belong to the same categories of emotions, dividing NA in afraid and upset categories may be redundant. Not finding a statistical difference between both A7 and A8 models we chose the most parsimonious model (see West, Taylor, & Wu, 2012). Results suggest that the best structure of the PANAS is the one that represents two independent dimensions of PA and NA correlating the errors of the items that belong to the same content categories (see Zevon & Tellegen, 1982) and the double valence of the item excited.

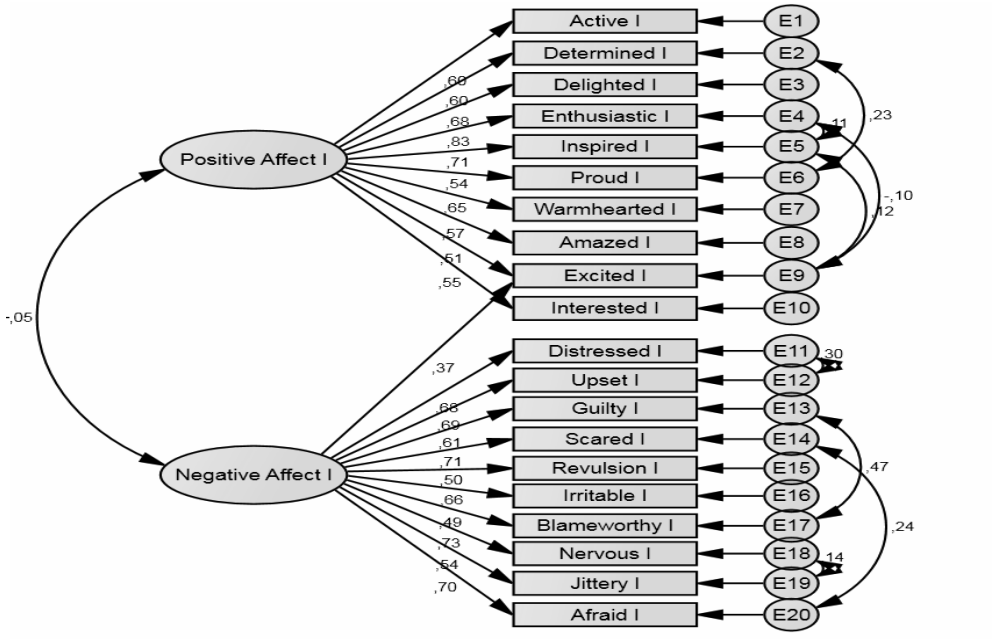

Figure 1. Factor Structure of the PANAS. Alternative Model 7 (A7).

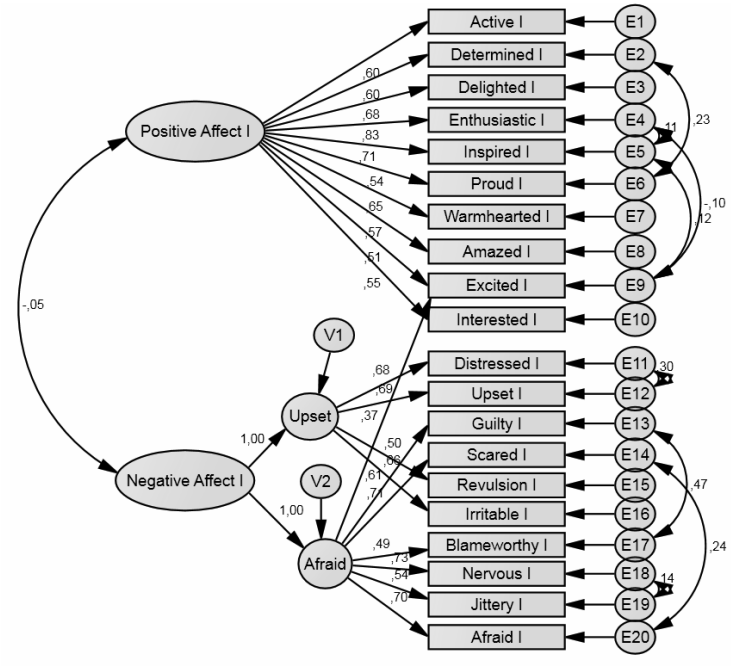

Figure 2. Factor Structure of the PANAS. Alternative Model 8 (A8).

Results also support the construct validity of the PANAS. The analysis of the estimated parameters in Time 1 indicates that all of the observed variables load on the latent variables above (β = .48), indicating good construct validity. The best five indicators for the PA scale are: enthusiastic; inspired; delighted; warmhearted; and determined. The best five indicators for NA scale are: scared; afraid; distressed; upset; and nervous. Moreover, the parameter estimates are feasible, with appropriate standards of error and statistical significance.

The PANAS's Temporal Invariance

In our third step we aimed to address the temporal stability of the PA and NA scales over a two-month interval (Figure 3). Specifically, we tested the invariance of the regression weights at both data collection times. First we tested the stability of the independent two-factor model. Results for the baseline model (i.e., a model allowing cross-time loading to be freely estimated) showed a $\chi2_{716}$ =1435.5, p<.001 (CFI = .85; RSMEA = .07; SRMS = .09). We then estimated a constrained model (i.e., cross--time loadings constrained to equality), yielding a $\chi2_{734}$ = 1464.3, p<.001 (CFI = .85; RSMEA = .07; SRMS = .09). Importantly, the difference between the baseline and the constrained models is not significant ($\Delta\chi2_{18}$= 28.8, p = .05), supporting the temporal stability of the estimated parameters.

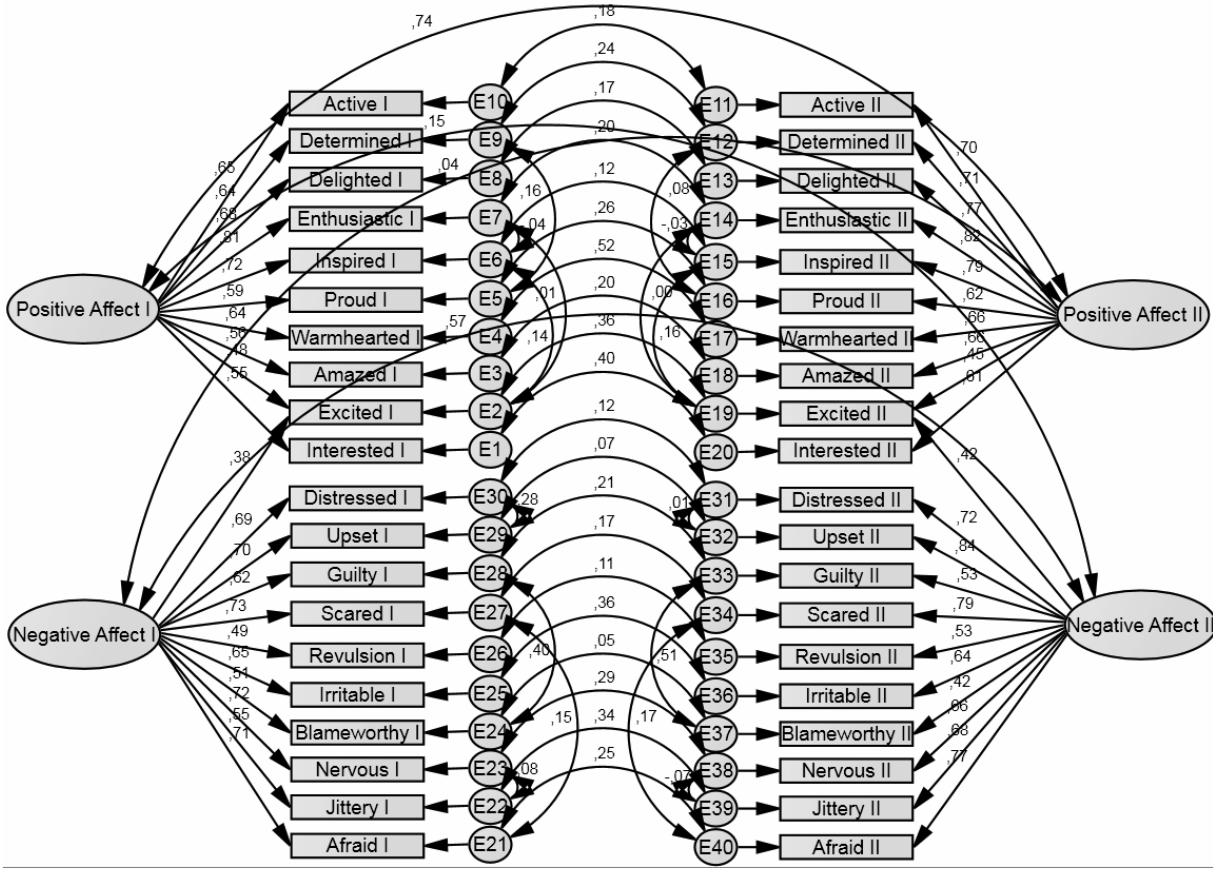

Figure 3. Temporal Stability of the PANAS.

After this, we tested the stability of the best fitting model (i.e., two factor independent model with the cross loading of excited between PA and NA and the correlation of the errors of the items of the same categories of emotions). The difference between the baseline $\chi2_{698}$=1217.9, p<.001 (CFI = .89; RSMEA = .06; SRMR=.08) and the constrained model $\chi2_{717}$ = 1246.6, p<.001 (CFI = .89; RSMEA = .07; SRMR=.08) is also not significant $\Delta\chi2_{19}$ = 28.7, p = .07, confirming the stability of the measure. Although it is a state measure, results strongly support the temporal stability of the PANAS over a two-month interval. This is an important contribution to the literature about the PANAS, as the temporal stability of the PA and NA using latent variables has not been addressed. It is therefore not possible to compare our data with the previous studies of the temporal reliability of the scale because they result from two different statistical procedures. However, the results from the several studies are consensual in demonstrating satisfactory temporal reliability of PANAS, even in the state versions of the scale. As Watson et al. (1988) point

out, these results suggest the influence of the trait like characteristics in the state mood of the individuals. Moreover, as argued by other authors, there is a dynamic equilibrium that places individuals in a homeostatic level of subjective well-being to where they return after the influence of life events (Cummins, Gullone, & Lau, 2002; Headey, 2006).

Conclusion

This research analysed the factorial validity of the independent two-factor structure of the PANAS as proposed by Watson et al. (1988). First, using CFA, we showed that this structure shows better fit to the data than the correlated two-factor model. After testing this model with several alternative factorial structures, the one that yielded the best results was the independent two-factor model with the cross-loading of the item excited between PA and NA, suggesting some ambiguity of the item, and the correlation of the errors of the items from the same content categories. The scale also yields good construct validity. Second, specifying PA and NA as latent variables, we demonstrated the temporal invariance of the PA and NA scales over a two-month interval.

As limitations of the study we point out that it was a convenience sample and that women and highly educated individuals constituted majorities in the sample, which could have contributed to the results. Furthermore, the fact that the questionnaires were filled in the same ecological setting twice may contribute to the invariance of the scale. Finally, the fact that the PANAS was answered at the same time with other measures may have influenced the answering of the scales. However, the results obtained are sufficiently strong to conclude that the PANAS features adequate psychometric parameters to be used in the measurement of Positive and Negative Affect not only in cross-sectional but also in longitudinal study designs.

We suggest that further study continue to analyse the structure of the PANAS. Longitudinal design studies may provide answers to the remaining inconsistencies in the literature about the structure of PANAS. We also suggest the development of short versions of the Portuguese PANAS that eliminate some of the double meaning items. Finally, we suggest that temporal reliability of the state PANAS may be analysed in wider time intervals, in order to analyse the stability of state affect through time.

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