Positive and Negative Affect Schedule (PANAS)

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Abstract

The Positive and Negative Affect Schedule (PANAS) is a widely used measure for assessing levels of positive and negative affect. Its excellent psychometric properties make it a popular tool among researchers. This chapter provides an overview of the PANAS, outlining its theoretical background and describing its initial development and validation. It presents the results of factor analysis and reliability statistics, as well as evidence for its construct validity. It is important to note that affective measures such as the PANAS are particularly valuable in mindfulness research. The ability to regulate one's affective states is a crucial component of mindfulness, and the PANAS can help researchers assess how mindfulness interventions impact affective states. This chapter also highlights more recent studies that support the psychometric properties of the PANAS and its usefulness in mindfulness research. The PANAS has been used in many languages and has demonstrated adequate reliability and validity across different cultures. Overall, the PANAS is an important tool for assessing affective states in research, particularly in the context of mindfulness interventions.

KeywordsPositive affect -Negative affect -Well-being -Distress -Mindfulness

Introduction

Subjective well-being is a topic of interest to psychologists, counsellors, and clinicians alike and has attracted a lot of attention and research interest for many years. Discussions around what constitutes happiness took place throughout centuries, with figures such as Aristotle, Confucius, and Buddha contemplating on what characterizes a life well lived (Diener et al., *2018*). When researchers started to address this question empirically, they discovered that subjective well-being incorporates positive as well as negative mood, also called positive affect (PA) and negative affect (NA) (Watson et al., *1988*). Therefore, an emotional state is a critical part of happiness, and it needs a precise evaluation of both its favorable and unfavorable components. When someone has a high positive emotional state, they feel lively, attentive, and involved. In contrast, a high negative emotional state is

associated with distress and experiencing negative feelings, like anger or fear. However, individuals with low levels of NA may feel calm and serene (Watson et al., *1988*).

Initially, researchers believed that positive and negative affect were opposites on a single spectrum. However, further studies revealed that these dimensions are separate entities (Watson et al., *1988*). Intense emotions can even weaken the negative correlation between PA and NA over time (Diener & Emmons, *1985*). Before the Positive and Negative Affect Schedule (PANAS; Watson et al., *1988*) was developed, other measurement tools were employed to assess PA and NA, but these tools were found to be lacking in psychometric strength. For example, McAdams and Constantian (*1983*) created items to measure affect without properly evaluating their internal consistency or construct validity. As the focus on subjective well-being research expanded (Diener & Emmons, *1985*), there was a growing need for a scale that was scientifically based and featured robust psychometric properties. This need led to the development of the PANAS. The following sections will provide an overview of the initial development and validation of this scale, as well as touch on related research advancements.

Initial Development and Validation

The major aim of Watson et al. (*1988*) was to develop a short, economic scale that measures pure markers of PA and NA. They sampled 60 mood terms as used and reported in previous research (Zevon & Tellegen, *1982*) and formed 20 content categories (for example, different terms that describe "guilt" would form one category) as identified through a principal component analysis conducted with six large datasets of university students. The PANAS items were given to the participants with different temporal instructions. Participants were instructed to assess their current feelings using the "moment instructions" option, rate their feelings "today" using the second option, and use the following options to rate their feelings over different time periods: "past few days," "past week," "past few weeks," "past year," and "in general/on average." Each temporal instruction had different sample sizes: (a) *moment* (n = 660), (b) *today* (n = 657), (c) *past few days* (n = 1002), (d) *past few weeks* (n = 586), (e) *year* (n = 649), and (g) *general* (n = 663). The PANAS items can be rated on a 5-point Likert scale (*very slightly or not at all, a little, moderately, quite a bit, extremely*). A subsample of these subjects (n = 101) completed scales with all temporal instructions for retest purposes. Watson et al. (*1988*) subjected the originally developed 60 mood terms (Zevon & Tellegen, *1982*) to a principal factor analysis using their full dataset, which emerged a solution with two factors, indicating that items represent two different forms of affect. Items that had an average factor loading of 0.40 or greater and that had no secondary loadings of 0.25 or greater were selected for further analysis. This procedure resulted in 12 terms for PA and 25 terms for NA. Ten terms per scale were the target, and Watson et al. (*1988*) therefore removed two items from the PA category that had relatively high secondary loadings. The number of terms for the NA scale was reduced by creating a preliminary 14-item scale that included two terms of each remaining category. Items that did not seem salient to respondents and did not significantly enhance the reliability of the scale were removed, which resulted in the final 10 items for the NA scale. The 20 finalized PANAS items were then put into a separate principal factor analysis, which also showed a two-factor solution, explaining between 84% and 96% of variance for each temporal prompt and strong primary factor loadings (>0.50). This serves as good evidence for the factorial validity of the PANAS (Watson et al., *1988*). To establish the psychometric properties of the 10 PA and 10 NA items, the researchers used the same datasets of university students and employees. It is noteworthy to mention that these

analyses were conducted using the full set of items that had been generated, not only the previously 20 finalized PANAS items (Watson et al., *1988*).

The PA and NA scales showed good internal consistency with Cronbach's alpha ranging from 0.86 to 0.90 for PA and from 0.84 to 0.87 for NA. The correlations between the PA and NA scales ranged from −0.12 to −0.23 across samples collected using different temporal instructions. The test-retest correlations over a period of 8 weeks ranged from 0.47 to 0.68 for PA and from 0.39 to 0.71 for NA. Similar internal consistency, test-retest, and intercorrelation results for PA and NA were found with a sample of psychiatric patients (n = 61) (Watson et al., *1988*).

External validity was established by correlating the PANAS scales with the Hopkins Symptoms Checklist (HSCL; Derogatis et al., *1974*), the Beck Depression Inventory (BDI; Beck et al., *1961*), and the STAI State Anxiety Scale (A-State; Spielberger et al., *1970*). The HSCL correlated highly with NA (0.74 for "past few weeks" prompt and 0.65 for "today" prompt). The HSCL only had small negative correlations with PA (−0.19 and −0.29). The BDI showed high positive correlations with NA (0.56 for "past few days" prompt and 0.58 for "past few weeks" prompt) and moderate negative correlation with PA (−0.35 and −0.36). A similar result was obtained for the A-State with a positive correlation with NA (0.51) and a negative correlation with PA (−0.35) using the "past few weeks" prompt. These results provided evidence for the external validity of the PANAS. Measures of distress and psychopathology correlated positively with the NA scale and negatively with the PA scale as expected (Watson et al., *1988*).

Subsequent Evidence for Psychometric Properties

With more than 48,000 citations on Google Scholar, the PANAS is an extensively used and cited scale. Its 2-factor structure and good internal consistencies of the two subscales have been replicated in many different samples and contexts (Crawford & Henry, *2004*; Pelled & Xin, *1999*; Serafini et al., *2016*). While many studies replicated the 2-factor structure, some studies questioned this 2-factor of the PANAS (Gaudreau et al., *2006*; Leue & Beauducel, *2011*; Seib-Pfeifer et al., *2017*). Seib-Pfeifer et al. (*2017*) provide a review of research that examined the factor structure of the PANAS, outlining 2-factor models with correlated and uncorrelated factors, as well as a 3-factor and bi-factor model. The three-factor model had been presented by Gaudreau et al. (*2006*) and suggests two distinctive NA factors alongside PA, namely NA-Upset and NA-Afraid, which had a better CFA fit than a 2-factor model. The bi-factor model had been presented by Leue and Beauducel (*2011*) and suggest PA and NA as uncorrelated factors alongside affective polarity as a more general third factor, which incorporates a fundamental approach or withdrawal tendencies. After their review of suggested factor structures for the PANAS, Seib-Pfeifer et al. (*2017*) performed a replication study using CFA examining those four previously suggested factor structures. They found only poor evidence for the correlated and uncorrelated two-factor structure. The 3-factor and bi-factor models provided a better fit, with the bi-factor model being the most appropriate one. For example, the items strong, proud, angry, and irritable loaded on the affective polarity factor. This implies that a person can feel strong but also has the tendency to be angrier (Seib-Pfeifer et al., *2017*).

Overall, the empirical evidence suggests that the factor structure of the PANAS may be more complex than the originally proposed 2-factor structure. This issue deserves more attention, and more research is warranted to examine and replicate these analyses with other versions of the PANAS. Moreover, Seib-Pfeifer et al. (*2017*) conducted their replication study in German, and it would be interesting to also investigate the suggested bi-factor model in other cultures and languages.

Scale Versions

The PANAS is available in various different versions, such as an extended version (PANAS-X; Watson & Clark, *1994*), an international short form (I-PANAS-SF; Thompson, *2007*), and a scale for children (PANAS-C; Laurent et al., *1999*). The PANAS-X contains 60 items, which allows researchers to not only assess the primary dimensions of PA and NA but also specific forms of affect, for example fear, guilt, shyness, joviality, and serenity. The two main dimensions of PA and NA have good internal consistency ranging from 0.83 to 0.90 (Watson & Clark, *1994*) for different temporal prompts conducted with different samples. The subscales also showed good internal consistency with Cronbach's alphas ranging from 0.70 to 0.93. Furthermore, the test-retest reliabilities were moderately stable for the higher-order (PA and NA) and lower-order scales (fear, hostility, guilt, sadness, shyness, fatigue, surprise, joviality, self-assurance, attentiveness, and serenity), but results show that they are generally higher when using general temporal instructions rather than temporal instructions that refer to the past week (Watson & Clark, *1994*).

The I-PANAS-SF is a shortened, 10-item version of the PANAS in English consisting of 5 PA and 5 NA items. The scale was found to have acceptable psychometric properties. The scale was validated with multiple samples of participants originating from 66 countries. Factorial equivalence was found between English native and non-native speakers, indicating that the I-PANAS-SF can be used across different cultures (Thompson, *2007*).

Furthermore, the PANAS-C for use with children (4–8 graders in the USA) was developed by Laurent et al. (*1999*). After testing the items from the PANAS-X scales, 12 PA and 15 NA items were identified as suitable candidates of the PANAS-C. The scales perform similarly to the original PANAS scales with good internal consistency. Furthermore, depression and anxiety show strong positive correlations with NA and moderately negative correlations with PA (Laurent et al., *1999*).

In addition to the different scale versions, the PANAS has been translated and validated in different languages and cultures. For example, the PANAS has been validated and is available in Italian (Terracciano et al., *2003*), Spanish (Díaz-García et al., *2020*), Portuguese (de Carvalho et al., *2013*), Hungarian (Gyollai et al., *2011*), and Chinese (Huang et al., *2003*). This makes the PANAS an excellent measure for cross-cultural research .

Rasch Analysis

As outlined in the previous section, the PANAS has been used widely and it has been validated in many other languages and cultures. However, most validation studies used the principles of classical test theory for scale validation purposes. This means that scale's responses are measured on an ordinal level, which technically does not allow the application of many parametric statistics. A way to address this limitation is the application of Rasch analysis. Rasch analysis can enhance measurement precision by enabling to convert ordinal-level scores into interval-level (metric) scores (Medvedev et al., *2023*).

Multiple studies applied Rasch analysis to the PANAS (Medvedev et al., *2023*; Peter et al., *2016*; Pires et al., *2013*). Pires et al. (*2013*) applied the Rasch model to the Brazilian Portuguese version of the PANAS and found a good fit. A different study using a clinical sample also used Rasch analysis with the PANAS (Peter et al., *2016*). While a good unidimensional fit was evident for the NA scale, their analyses suggested that a bidimensional structure was a better fit for the PA scale. Considering these two studies, it becomes clear that they have a few limitations. First, Pires et al. (*2013*) used the Brazilian version of the PANAS. It would be beneficial to apply the Rasch model to the English

version so that the results can serve researchers in English-speaking countries. Second, Peter et al. (*2016*) collected data using a clinical sample, and there is therefore the need to apply Rasch analysis for the PANAS using a nonclinical sample for wider applicability. Last, none of these studies provided ordinal-to-interval conversion tables, which is a major advantage of Rasch methodology. This is a significant weakness as these allow researchers to easily convert ordinal-level scores to metric scores without changing the scale itself, which is the final outcome of Rasch analysis and enhances the precision of measurement (Leung et al., *2014*). Medvedev et al. (*2023*) addressed all these weaknesses by applying the Rasch model to an English-speaking sample from New Zealand. By combining locally dependent items into super-items, they achieved a good fit to the Rasch model with excellent reliability and strict unidimensionality. The conversion tables can be found in Medvedev et al. (*2023*) and in Table 1.**Table 1**

Conversion table for the PA and the NA subscales of the PANAS

	Positive affect measure		Negative affect measure	
Ordinal scores	**Interval (logits)**	**Interval scale**	**Interval (logits)**	**Interval scale**
10	−4.66	10.00	−5.45	10.00
11	−3.81	14.26	−4.60	14.33
12	−3.22	17.25	−4.01	17.30
13	−2.80	19.36	−3.60	19.35
14	−2.47	21.03	−3.27	20.93
15	−2.19	22.45	−2.99	22.23
16	−1.94	23.69	−2.73	23.33
17	−1.72	24.81	−2.50	24.30

18	−1.52	25.83	−2.29	25.16
19	−1.33	26.77	−2.09	25.94
20	−1.16	27.65	−1.90	26.65
21	−1.00	28.46	−1.71	27.31
22	−0.84	29.22	−1.53	27.91
23	−0.70	29.93	−1.36	28.48
24	−0.57	30.60	−1.19	29.02
25	−0.44	31.24	−1.02	29.54
26	−0.32	31.86	−0.85	30.03
27	−0.20	32.47	−0.68	30.50
28	−0.08	33.08	−0.52	30.95
29	0.05	33.71	−0.35	31.39
30	0.18	34.36	−0.18	31.82
31	0.32	35.06	0.00	32.25

32	0.47	35.82	0.18	32.66
33	0.64	36.68	0.36	33.08
34	0.83	37.67	0.55	33.49
35	1.07	38.84	0.74	33.91
36	1.35	40.27	0.95	34.33
37	1.70	42.03	1.15	34.76
38	2.14	44.23	1.37	35.22
39	2.84	47.76	1.60	35.68
40	2.90	48.07	1.84	36.19
41	2.95	48.33	2.09	36.73
42	2.98	48.50	2.35	37.33
43	3.01	48.65	2.62	37.99
44	3.02	48.67	2.91	38.74
45	3.09	49.03	3.22	39.62

46	3.11	49.15	3.56	40.65
47	3.15	49.36	3.94	41.93
48	3.19	49.55	4.40	43.62
49	3.23	49.76	5.03	46.17
50	3.28	50.00	5.87	50.00

Note: This table is only applicable to respondents with no missing data

Limitations and Future Directions

The PANAS is a very well validated and widely used measure with sound psychometric properties across different languages and cultures and in different samples. However, there are a few limitations that need to be considered and that could direct future research of the PANAS. While the PANAS was shown to have good construct validity in different languages, there might be cultural differences across samples. It might depend on the participants' cultural context how items are perceived, which means that some items might have a higher threshold for endorsement compared to others. For example, Medvedev et al. (*2023*) found that the different PANAS items had different levels of difficulty in a sample from New Zealand. The PA item "proud," for instance, requires a higher level of the trait to be endorsed in that sample than the PA item "interested." It can only be speculated why that is, but a possible explanation might be the New Zealand culture, where importance is placed on being humble, which could make "proud" a difficult item (Medvedev et al., *2023*). However, these assumptions need to be further investigated in future research that analyses whether item difficulty differs between samples from different cultures.

Application of the PANAS in Mindfulness Research

Mindfulness practice has many positive outcomes, with positive and negative well-being outcomes the most researched ones (Krägeloh et al., *2019*). Assessing PA and NA alongside mindfulness and in conjunction with interventions is essential to validate mindfulness scales and to evaluate the effectiveness of mindfulness-based interventions (MBIs). Mindfulness research that used the PANAS has mostly used it for exactly those two reasons. For example, PA and NA were assessed to validate the French version of the Freiburg Mindfulness Inventory (FMI; Walach et al., *2006*). It was found that the full mindfulness scale correlated positively with PA and negatively with NA, which aligns with predictions and provides evidence for the validity of this scale (Trousselard et al., *2010*). Similarly, the PANAS assisted validation of the Chinese version (Deng et al., *2012*) of the Mindful Attention and Awareness Scale (Brown & Ryan, *2003*). It was shown that the scale was negatively associated with NA and positively associated with PA (Deng et al., *2012*).

Furthermore, the PANAS appeared as a useful tool to assess the effectiveness of MBIs. For example, the PANAS was administered to a sample of participants who were either assigned to a 2-week treatment or a waitlist control group participating in a web-based MBI. It was found that participants who took part in the intervention for a minimum of 6 days showed decreased negative affect and increased positive affect (Glück & Maercker, *2011*). Another study examined the effect of yoga-based meditation in college students. Using a pretest and posttest experimental design, it was found that the intervention enhanced PA and reduced NA, which indicates that yoga-based meditation may have positive well-being outcomes (Patel et al., *2018*). However, the PANAS is not only useful to assist scale validation and intervention evaluation, but it has also been administered in a study that applied network analysis to understand the complex relationship between mindfulness, NA, PA, compassion, depression, anxiety, and stress (Medvedev et al., *2021*).

Conclusion

The PANAS was developed to provide a psychometrically sound measure for aspects of PA and NA. With only 20 items, the PANAS is a reliable measure that can be applied in many different contexts. Moreover, due to its widespread usability, it has been translated into many languages and can be applied across cultures. An extended as well as a shortened version are available as well to provide researchers scale versions that meet their needs and study aims. The PANAS can not only be applied to adults but also to children, which enables researchers to study PA and NA in younger samples. The PANAS has also been analyzed using Rasch analysis, which resulted in the development of tables that enable researchers to convert ordinal-level scores into metric scores for more precise measurement. The PANAS has been demonstrated to be valuable in mindfulness research for purposes of scale validation and intervention evaluation. Research consistently shows that higher levels of mindfulness are related to higher levels of PA and lower levels of NA. Due to its extensive validation and versatility, the PANAS is a valuable tool for mindfulness researchers.

Appendix 1

Positive and Negative Affect Schedule (PANAS)

Watson, D., Clark, L. A., & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: The PANAS scales. *Journal of Personality and Social Psychology*, *54*(6), 1063–1070. https://doi.org/10.1037/0022-3514.54.6.1063.

This scale consists of a number of words that describe different feelings and emotions. Read each item and then mark the appropriate answer in the space next to that word. Indicate to what extent [INSERT APPROPRIATE TIME INSTRUCTIONS HERE]. Use the following scale to record your answers.

1	2	3	4	5
Very slightly or not at all	A little	Moderately	Quite a bit	Extremely

Interested (1)	Irritable (11)
Distressed (2)	Alert (12)
Excited (3)	Ashamed (13)
Upset (4)	Inspired (14)
Strong (5)	Nervous (15)
Guilty (6)	Determined (16)
Scared (7)	Attentive (17)
Hostile (8)	Jittery (18)

Enthusiastic (9)	Active (19)
Proud (10)	Afraid (20)

The PANAS can be used with the following time instructions:

- Moment (you feel this way right now, that is, at the present moment)
- Today (you have felt this way today)
- Past few days (you have felt this way during the past few days)
- Week (you have felt this way during the past week)
- Past few weeks (you have felt this way during the past few weeks)
- Year (you have felt this way during the past year)
- General (you generally feel this way, that is, how you feel on the average)

Scoring instructions:

- Positive affect (sum up items): 1, 3, 5, 9, 10, 12, 14, 16, 17, and 19
- Negative affect (sum up items): 2, 4, 6, 7, 8, 11, 13, 15, 18, and 20

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