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Original Article

Psychometric Evaluation of the Swedish Version of the Types of Positive Affect Scale

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Abstract: Differentiating between various types of positive affect (PA), such as excitement, relaxation, safeness, and contentment, is important when assessing mental health. However, validated instruments measuring these types of PA are scarce, and in a Swedish context, they are nonexisting. Thus, the present study assesses the psychometric properties of the translated Swedish version of the Types of PA Scale (TPAS) using a sample of 440 Swedish adults. Corroborating previous research, confirmatory factor analyses supported a modified three-factor model (Activated PA, Relaxed PA, Safe/Content PA), showing good reliability, good convergent validity, and satisfactory discriminant validity of the factors. Furthermore, the TPAS demonstrates measurement invariance across demographics (age, gender, and education) and exhibits satisfactory construct validity by distinguishing between PA, NA and State–Trait Anxiety. Hence, the Swedish TPAS is a valid tool for measuring types of PA in the adult population of Sweden, with potential areas for improvement being discussed.

Keywords: positive affect, the types of positive affect scale, psychometric properties, confirmatory factor analysis, measurement invariance

Positive affect (PA) generally refers to the individual's subjective evaluation of affective states with positive valance (Russell, 1980; Watson et al., 1995). However, it has been argued (compare McManus et al., 2019, 2024) that research has mainly focused on and conceptualized PA as energizing (i.e., active, excited, enthusiastic, and inspired), evident in a predominance of instruments that capture this kind of PA, such as the Positive and Negative Affect Schedule (PANAS; Watson et al., 1988). However, PA that can be conceptualized as less energizing, such as relaxation, safeness, and contentment, is scarcely studied (e.g., Gilbert et al, 2008; McManus et al., 2019).

This lack of research is problematic because different types of PA could play different roles in a clinical setting, considering that emotional disorders can be accounted for by common higher order dimensions, such as PA (Brown & Barlow, 2009; Clark et al., 1995; Díaz-García et al., 2021). For instance, individuals with anxiety characterized by excessive worrying and hypervigilance (Zsido et al., 2020) may have reduced capacity to experiencing relaxation, safeness, and contentment (Gilbert et al., 2008). Hence, interventions that only target energizing PA may less likely effectively help these individuals (compare Gilbert, 2020). However, compassion-focused interventions (e.g., soothing voice tones and breathing) have shown promise in increasing relaxed, safeness, and content PA, but having less impact on energizing PA (Matos et al., 2017; Petrocchi et al., 2017). To feel relaxed, safeness, and content has also emerged as a stronger predictor of trait-anxiety levels compared to energizing PA, as measured by the PANAS (McManus et al., 2019).

However, despite growing emphasis on differentiating between different types of PA in clinical settings (e.g., Gilbert, 2020) and in intervention research (e.g., Díaz-García et al., 2021), a limitation in this body of research is the lack of validated psychometric instruments measuring these types of PA. Thus, research is needed to validate instruments that measure different types of PA and comparing them to well-established instruments, such as PANAS and Anxiety measures, to provide a more reliable assessment when examining intervention effects.

The *Types of Positive Affect Scale* (TPAS; Gilbert et al., 2008) is a promising instrument based on the *Tripartite Model of Affect Regulation* (Gilbert, 2009, 2015, 2020, 2024). This model postulates that affect in general is serving at least three basic motivations: (1) threat detection/protection, (2) resource acquisition, and (3) rest/digesting. The stimuli involved in activating these motivational states are processes by different systems with different evolutionary origins (for a review, see Gilbert, 2020, 2024) and can be briefly described as follows. *The*

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Threat System mainly involves the amygdala and hypothalamic–pituitary–adrenal axis (HPA) and is activated in the presence of treat to be confronted or avoided (e.g., fight or flight), eliciting negative affect (NA), such as anxiousness (Gilbert, 2024; LeDoux, 1998). *The Drive System* involves sympathetic activity and the dopamine system, and activates resources necessary for survival (e.g., finding food), eliciting energized PA such as excitement (Depue & Morrone-Strupinsky, 2005). *The Soothing/Safeness System* involves parasympathetic vagal activity, opioids, and hormones (such as oxytocin), and it activates in the absence of threat and in the presence of safeness signals (e.g., supportive others) downregulating the Threat-and-Drive systems and eliciting PA, such as safeness, relaxation, and contentment (Gilbert, 2024; Heinrichs et al. 2003; Porges, 2003; Rockliff et al., 2011). In other words, these systems are constantly interacting and coregulating each other. Thus, PA should be considered to entail parallel, dimensional processes rather than distinct categories (see, for example, Armstrong et al., 2021).

Gilbert et al. (2008) initially hypothesized that there are at least two types of PA with different evolutionary origins (i.e., one energizing PA linked to the Drive system and another PA linked to the Soothing/Safeness system). However, unexpectedly, a factor analysis of the TPAS revealed a three-factor structure: *Activated PA* (e.g., feeling energetic and excited), *Relaxed PA* (e.g., feeling tranquil and peaceful), and *Safe/Content PA* (e.g., feeling safe and content). Thus, Safe/Content PA emerged as a distinct factor separated from Relaxed PA, likely due to that feeling safeness, especially within social contexts, can bring forth a sense of contentment (compare Gilbert, 2020), whereas relaxation is more closely linked to nonsocial situations in solitary and low arousal states (Gilbert et al., 2009). In other words, feeling safeness and contentment in the presence of others does not necessarily indicate a relaxed low-arousal body state, as it can equally foster social engagement, such as playfulness and curiosity (Gilbert, 2020; Morton et al., 2022; Porges, 2007). Similarly, different types of PAs, originating from, for example, feeling energized by taking on a challenging task are likely to be different from when feeling energized by going to a party.

Empirical evidence supports the assumption that Relaxed PA is related to Safe/Content PA, but also distinct as demonstrated by moderate correlations between Relaxed PA and Safe/Content PA, whereas Activated PA correlates more weakly with Relaxed PA compared with Safe/Content PA (Gilbert et al., 2008). Safe/Content PA has also shown stronger negative correlation with trait-anxiety compared to relaxed and activating PA (Gilbert et al., 2008; Richter et al., 2009). Furthermore, Safe/Content PA has showed significant relationship with heart rate variability, which was not the case for Relaxed and Activated PA (Duarte & Pinto-Gouveia, 2017), again pointing to the distinctiveness of Safe/Content PA. Safe/Content has also been shown to be distinct from PANAS, as evidenced by factor analysis, regression, and correlational analyses (Armstrong et al., 2021; Kelly et al., 2012).

Although this research and theorizing have contributed a great deal to our understanding of measuring different types of PA, there are still reasons for continued validity assessment of the TPAS. First, as the original intent of the TPAS mainly was to explore energizing and less energizing PAs, Gilbert et al. (2008) raised concerns due to the Safe/Content factor eigenvalue being marginally below 1, indicating it explains less variance than a single variable. Nevertheless, TPAS and/or its subscales have been used in numerous studies (Armstrong et al., 2021; Duarte & Pinto-Gouveia, 2017; McManus et al., 2019; Petrocchi et al., 2017; Richter et al., 2009). However, to the best of our knowledge, no study has yet comprehensively re-examined the psychometric properties of the TPAS, as originally developed by Gilbert et al. (2008), but rather have modified the TPAS (or not employed all the subscales) for their research purposes. For example, McManus et al. (2019) used the subscales Safe/Content PA and Relaxed PA, but omitted the subscale Activated PA. Furthermore, they removed several items (due to items expected to be difficult to interpretate within certain demographics) from the subscale Relaxed PA ("Tranquil," "Serene," "Laid back") and one item from the Safe/Content subscale ("Warm"). Therefore, these alterations complicate the direct comparison of factor structures, which highlights the necessity for re-examining the psychometric properties of the TPAS. Second, although the construct validity of the TPAS has been assessed in previous studies (e.g., Gilbert et al., 2008, 2009), these results have mainly been based on English-speaking homogeneous populations with respect to gender and age. Hence, there is need to test the factor structure of the TPAS in a more diverse sample (i.e., including larger variations in gender and age) and in a different language to inform us on the generalizability of previous findings and strengthening the construct validity of the TPAS.

Accordingly, the aim of this study was three-fold. First, we aimed to evaluate the psychometric properties of the newly translated Swedish version of TPAS using confirmatory factor analysis (CFA) to assess both the two-factor and three-factor structures. Second, we aimed to evaluate TPAS' factorial structure to assess measurement invariance for gender, age, and educational levels. Finally, we aimed to evaluate the construct validity of TPAS by examining correlations with PANAS and State–Trait anxiety.

In line with Gilbert et al. (2008) work, we expected a three-factor structure for the TPAS (i.e., Activated PA,

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Relaxed PA, and Safe/Content PA). Second, for convergent validity, we expected medium to strong correlations between the TPAS and PANAS-PA, with Activated PA showing the strongest correlation given their shared energizing dimension. Third, for divergent validity, we expected small to medium negative correlations between the TPAS and its subscales and PANAS-NA. Finally, we expected that the TPAS would be negatively related, but distinct from State–Trait Anxiety Inventory (STAI) due to its negative valance and link with high NA (Watson et al. 1988).

Method

Sample and Procedure

The participants were recruited during March 2023. To obtain a balanced sample with respect to gender and age, we utilized a quota sampling from an online panel-service provided by Qualtrics (see https://www.qualtrics.com), which distributed the survey via e-mail invitation and social media. A total of 519 participants accessed the Qualtrics survey with an 85% completion rate. Following a complete case approach, we excluded cases with any missing data on the TPAS resulting in a final sample size ($N = 440$) consisted of men (51.2%) and women (48.9%), ranging between 18 and 84 years ($M = 46.09$, $SD = 16.90$); most of them had finished high school (27.5%), with an average education of 13.05 years ($SD = 2.73$), and were in a relationship (64%).

This study was performed in line with the principles of the Declaration of Helsinki, and informed consent was obtained from all individual participants included in the study. Before the participants gave active digital informed consent, they were informed about the research aims, with emphasis on anonymity, confidentiality, and their rights to opt out of the study at any given time. Pilot testing was performed in a smaller sample ($N = 43$) to detect possible issues with the programming of the survey and completion time of the survey (median completion time in pilot testing took 11 min) before the rest of the data were collected. For the final sample, the survey took approximately 15 min to complete. To establish high data quality, validity checks were implemented to identify inattentive responses, but none of the participants were excluded for these reasons.

Material

The survey consisted of demographic questions, followed by a series of questionnaires (TPAS, PANAS, STAI) described in more detail below. Additionally, the survey included other questionnaires (measuring psychological safety, body/interoceptive sensations, loneliness, and mindfulness) that were not a part of the present study (and thus not reported in this study).

The Swedish version of TPAS was created using a forward-backward translation procedure (see, for example, Grunwald & Goldfarb, 2006; Sarling et al., 2021) adhering to the International Test Commission guidelines for translating and adapting tests (International Test Commission, 2017). Independent forward-translations of the English version to Swedish were conducted by one of the authors (JL) and a research assistant (Emma Frivold), both bilingual in Swedish and English, who then compared the translations and agreed upon one translation (e.g., by discussion synonyms that convey the meaning of the items). Then, two native Swedish speakers, living in English-speaking countries without psychological backgrounds and not part of the study, back-translated the TPAS into English. Thereafter, both versions (forward and backward translations) were reviewed by authors (BJ and MP) both fluent in English and Swedish. Differences in translations were handled by discussing the translations within the entire author group (e.g., one back-translator translated "Rofylld" into "Serene" and the other into "Calm"). The author group reached consensus on the translations when they agreed upon that the item intended meaning of the original English version was appropriate culturally in Swedish language.

Types of Positive Affect Scale (TPAS; Gilbert et al., 2008)

TPAS consists of 18 items divided into three subscales: Activated PA, Relaxed PA, and Safe/Content PA. Participants indicated on a 5-point Likert scale (1 = *not at all*; 5 = *very much*) the extent to which they agree with affective states in the present moment: *Activated PA* (e.g., excitement), *Relaxed PA* (e.g., calm), and *Safe/Content PA* (e.g., safe). Higher scores on each subscale indicated higher levels of currently experienced PA. In the present study, TPAS total scale showed excellent internal consistency ($\alpha = .931$), in line with current conventions for classifying reliability (see, for example, Hair et al., 2014). Internal consistency was also high for the Activated PA ($\alpha = .919$) and Relaxed PA subscales ($\alpha = .946$), and satisfactory for Safe/Content PA ($\alpha = .863$). Moreover, the TPAS showed high split-half reliability (Spearman–Brown coefficient) for all the factors (calculated by comparing the first half of the items with the second half in each factor): Activated PA ($r = .889$), Relaxed PA subscales ($r = .932$), and Safe/Content PA ($r = .844$).

Positive and Negative Affect Schedule Short Form (PANAS-SF; Watson et al., 1988)

In the present study, the Swedish PANAS-SF was used, which has previously demonstrated good psychometric properties (Garcia et al., 2016). It consists of 10 items and

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provides a brief measure of *Positive Affect* (PA) and *Negative Affect* (NA). Participants indicated on a 5-point Likert scale (1 = *not at all*; 5 = *very much*) the extent to which they agree with experiencing specific affective states in the present moment for both PA (e.g., alert) and NA (e.g., upset). Higher scores on each subscale indicate higher levels of currently experienced affective state. In the present study, both PA (α = .880) and NA (α = .873) showed satisfactory internal consistency.

State–Trait Anxiety Inventory Short Form (STAI; Spielberger et al., 1970; Zsido et al., 2020)

We used the Swedish version of the short (10-item) STAI, which has previously shown good psychometric properties (Zsido et al., 2020). Participants indicated on a 4-point Likert scale (1 = *not at all*; 4 = *very much*) the extent to which they agree with statements on how they currently feel (*State-Anxiety,* e.g., "I feel nervous.") and generally feel (*Trait-Anxiety*, e.g., "I worry too much over something that really doesn't matter."). Higher scores on each subscale indicate higher levels of anxiety. In the present study, State-Anxiety demonstrated excellent internal consistency (α = .906), as did Trait-Anxiety (α = .897).

Data Analytic Procedure

As a Shapiro–Wilk Test was significant ($p < .001$), we utilized a robust maximum likelihood estimator with a Satorra–Bentler scaled test statistic for the CFA (Satorra & Bentler, 2001) to account for small deviations from normality. We tested the TPAS correlated first-order two-factor model (Activated PA items loading on one factor, and Relaxed, Safe/Content PA items loading on another). Then, we tested the correlated first-order three-factor model (Activated, Relaxed, Safe/Content PA) compared to the two-factor model. A priori assumptions guided the analyses: (1) each item loading on its factor and (2) minimal modifications (by examine modification indices) based on statistical and theoretical considerations.

The CFA models were evaluated using several widely recognized criteria (Hu & Bentler, 1999): χ^2 values, the relative χ^2 statistic (χ^2/df), comparative fit index (CFI), Tucker–Lewis index (TLI), root-mean-square error of approximation (RMSEA), standardized root-mean-square residual (SRMR), and Akaike information criterion (AIC), where the smallest AIC indicates the best fitting model. Acceptable relative χ^2 values were indicated by $\chi^2/df < 3$ (Schermelleh-Engel et al., 2003). CFI and TLI values > .950 indicate good fit, while values > .900 indicate adequate fit. SRMR values around .08 or lower indicate good fit, and RMSEA values < .060 indicate good fit, with values < .080 indicating adequate fit (Hu & Bentler, 1999).

For the best fitting model, we used a sequential strategy (i.e., invariance was confirmed if the fit was not substantially worse compared to the previous model) to assess measurement invariance (configural, metric, scalar, and strict) across gender (male = 0, female = 1), age groups (median split; ≤ 45 years [$n = 221$], ≥ 46 years [$n = 219$]), and education level (median split; = lower ≤ 13 years, higher > 14). To establish equivalence in factor structure across the groups (configural) model, all parameters were freely estimated across groups. Second, a *metric* (weak) invariance model was tested by constraining factor loadings to be equal across groups compared to the configural model (i.e., the strength of the relationship between the items and factors was equivalent across groups). Third, a *scalar* (strong) invariance model was tested by constraining factor loadings and item intercepts to be equal compared to the metric model. Although configural, metric, and scalar invariance is usually sufficient for examining mean differences or differential relations in latent factors across groups (van de Schoot et al., 2012), we tested a *residual* (strict) invariance model, where factor loadings, intercepts, and residual variances were constrained to be equal across groups and compared it to the scalar model (Vandenberg & Lance, 2000) for a more comprehensive evaluation of TPAS validity.

To evaluate each model fit, we relied on changes in fit indices CFI and RMSEA over scaled χ^2 difference tests because the latter may be dependent on our sample size and could lead to the rejection of well-fitting models for larger samples ($N > 300$; van de Schoot et al., 2012). According to Chen's criteria (2007), a decrease in CFI of ≥ −.010 in addition to an increase in RMSEA of ≥ .015 or SRMR ≥ .030 (≥ .010 for intercept or residuals) was used to indicate an adequate decrement in fit between models for sample sizes > 300.

For the best fitting model, composite reliability (CR) – a measure of internal consistency of the factors – was estimated from the squared sum of factor loadings and error variances for the latent variable (values > .700 indicate good reliability).

Following Hair et al. (2014), convergent validity was indicated using average variance extracted (AVE), with AVE ≥ .500 and lower than CR (i.e., variance explained by the construct should be greater than measurement error and greater than cross-loadings). The AVE is calculated as the mean variance extracted for item loadings on the latent variables, representing the mean percentage of variation explained among the items of a construct. Discriminant validity was indicated by comparing AVE with maximum shared squared variance (MSV) and established if AVE is higher than MSV.

CFAs were performed using R (version 4.2.3, R Core Team, 2023) and package *lavaan* (version 0.6-15; Rosseel, 2012). For all other analyses, we used JASP (version 0.17.3; JASP Team, 2023).

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Results

The goodness-of-fit indices for the models and the relative χ^2 difference tests of the CFAs are presented in Table 1. Confidence intervals for the RSMEA showed no overlapping values between the models, indicating that they are statistically distinct. While fit indices for the two-factor suggested poor fit, the three-factor model had adequate fit (CFI and TLI > .900, RMSEA and SRMR < .080, and smaller AIC) but unacceptable relative χ^2 statistic.

However, modification indices suggested inclusion of correlated error terms for Item 7 ("Exited") and Item 8 ("Eager") would substantially improve the model fit (MI = 79.295). Thus, a modified 3-factor model was tested, where fit indices suggested adequate fit (RMSEA < .080) and all other fit indices fell within good ranges (see Table 2 for standardized factor loadings for the modified 3-factor model).

The measurement invariance tests on the modified three-factor model (see Table 3) supported configural invariance for gender, age, and education (i.e., a similar factor structure across respective groups). No substantial decrease of model fit in the metric model, indicating that full metric invariance was achieved, or for the scalar invariance model, indicated full scalar invariance (i.e., the item intercepts were equivalent across groups). However, regarding strict invariance for age, the invariance exceeded the criteria based on change in CFI, but not the change in RMSEA and SRMR. Inspection of the residuals indicated that releasing the constraints for Item 14 ("Serene"), with the highest variability across groups, would

Table 1. Estimates of confirmatory factor analyses: model-fit indices for a two-factor model, a three-factor model, and a modified three-factor model

Models	χ^2 (*df*)	χ^2/df	CFI	TLI	SRMR	RMSEA (90% CI)	AIC
2-factor	712.139 (134)	5.314	.885	.869	.089	.109 (.101–.116)	19,272.524
3-factor	435.545 (132)	3.299	.940	.930	.063	.079 (.071–.088)	18,943.584
3-factor[a]	369.536 (131)	2.820	.953	.945	.060	.070 (.062–.079)	18,865.786

Note. 2-factor = Activated PA items loading on one factor, and Relaxed and Safe/Content PA items loading on another factor; 3-factor = Activated PA, Relaxed, and Safe/Content PA items each loading on respective factors; χ^2 = Satorra–Bentler scaled chi-square (*df* = degrees of freedom); CFI = comparative fit index; SRMR = standardized root-mean-square residual; RMSEA = root-mean-square error of approximation; AIC = Akaike information criterion; [a] = Modified 3-factor model with error terms for Item 7 and Item 8 for the activated subscale correlated.

Table 2. Item characteristic and standardized factor loadings of TPAS items for CFA of the modified three-factor model

				Factor loadings		
Items	*M*	*SD*	CITC	Activated	Relaxed	Safe/Content
1. Energetic	2.661	1.074	.754	.811		
2. Lively	2.530	1.092	.772	.821		
3. Adventurous	2.452	1.191	.706	.729		
4. Active	2.964	1.165	.737	.780		
5. Enthusiastic	2.877	1.062	.762	.813		
6. Dynamic	2.636	1.035	.700	.740		
7. Excited	2.330	1.123	.749	.740		
8. Eager	2.384	1.097	.671	.654		
9. Relaxed	3.141	1.174	.774		.786	
10. Peaceful	3.100	1.205	.824		.850	
11. Calm	3.270	1.156	.836		.857	
12. Tranquil	3.011	1.236	.868		.903	
13. Laid back	2.968	1.169	.849		.882	
14. Serene	2.923	1.216	.856		.893	
15. Safe	3.520	1.209	.737			.819
16. Content	3.041	1.182	.747			.846
17. Secure	3.402	1.171	.805			.853
18. Warm	3.382	1.069	.562			.621

Note. *M* = mean; *SD* = standard deviation; CITC = corrected item-total correlation within each subscale all factor loadings were statistically significant at $p < .001$ (two-tailed).

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Table 3. Results of the multigroup CFA of invariance between age, gender, and education for the modified 3-factor model

Model	$\Delta\chi^2$ (*df*)	CFI	ΔCFI	RMSEA	ΔRMSEA	SRMR	ΔSRMR
Gender							
Configural	—	.951	—	.072	—	.061	—
Metric	12.874 (15)	.952	.001	.069	−.003	.063	.002
Scalar	41.508 (15)	.947	−.005	.071	.001	.065	.002
Strict	30.196 (18)	.944	−.003	.071	.000	.067	.002
Age							
Configural	—	.955	—	.069	—	.058	—
Metric	40.507 (15)	.951	−.004	.070	.001	.067	.009
Scalar	54.955 (15)	.944	−.007	.073	.003	.070	.003
Strict	150.467 (18)	.919	−.025	.085	.012	.075	.006
Education							
Configural	—	.952	—	.071	—	.062	—
Metric	17.950 (15)	.952	.000	.069	−.002	.066	.004
Scalar	23.951 (15)	.951	−.001	.068	−.001	.067	.001
Strict	5.268 (18)	.953	.002	.065	−.003	.067	.000

Note. Estimates based on Satorra–Bentler scaled chi-square statistics; $\Delta\chi^2$ = changes in measurement invariance relative to the previous model; CFI = comparative fit index; RMSEA = root-mean-square error of approximation; SRMR = standardized root-mean-square residual; gender: female (*n* = 215), male (*n* = 225); age: ≤ 45 years (*n* = 221), > 46 years (*n* = 219); education: ≤ 13 years (*n* = 258), > 14 years (*n* = 182).

only marginally improve the CFI (> .001). Additionally, as CFI and RMSEA and SRMR were in good ranges, no attempts to remove equality constraint were made.

Regarding the reliability and the factorial validity (i.e., convergent and discriminant) of the modified 3-factor model, Table 4 shows that CR estimates indicated good reliability for all factors (> .800). All factors indicated convergent validity since AVE were higher than .500 and lower than CR. However, there were some discriminant validity concerns, as the Safe/Content factor estimates of AVE were not markedly higher than MSV.

Table 5 shows correlations between the TPAS total scores and its subscales (Activated, Relaxed, and Safe/Content PA) and convergent and divergent measures. As expected, moderate-to-strong positive correlations were found between the TPAS total score (and its subscales) and PANAS-PA, and the strongest correlation was found between Activated PA and PANAS-PA.

In terms of divergent validity (see Table 5), small-to-medium negative correlations were found between the TPAS (and its subscales) and PANAS-NA, indicating that the TPAS is less related to a more distinct construct such as NA in comparison to PANAS-PA.

Finally, the TPAS showed significant medium negative correlations with both State and Trait Anxiety. Particularly, small negative correlations were found between Activated PA and State–Trait Anxiety. Conversely, strong negative correlations were found between Relaxed PA and State–Trait Anxiety as well as between Safe/Content PA and State-Anxiety, whereas a moderate correlation was found with Trait-Anxiety.

Table 4. Indicators of internal consistency and validity (and factor correlations) for the modified three-factor model

Factors	CR	AVE	MSV	Activated	Relaxed
Activated	.904	.580	.294	—	
Relaxed	.945	.746	.625	.370	—
Safe/Content	.877	.637	.625	.543	.791

Note. CR = composite reliability alpha; AVE = average variance extracted; MSV = maximum shared squared variance.

Discussion

In summary, CFAs indicate good model fit for the modified three-factor TPAS model (Activated PA, Relaxed PA, Safe/Content PA). Regarding the internal consistency, the TPAS showed excellent to adequate reliability and good convergent validity and satisfactory discriminant validity with some concerns regarding Safe/Content PA and Relaxed PA. As for the multigroup model, the results show applicability across gender, age, and education groups. Convergent validity was confirmed with positive correlations with PANAS-PA, and satisfactory divergent validity confirmed with negative correlations with PANAS-NA and STAI. Jointly, our findings contribute to evaluating the TPAS in a Swedish adult population, providing insights into generalizability and psychometric properties.

The CFAs results support Gilbert's tripartite model of affect regulation (Gilbert et al., 2008), with respect to three factors: Activated PA, Relaxed PA, and Safe/Content PA. Also, our

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Table 5. Pearson's correlations (and means) between factors of the TPAS, PANAS, and STAI

Variables	Activated	Relaxed	Safe/Content	PA	NA	SA	TA	*M* (*SD*)
Activated	—							2.604 (.884)
Relaxed	.312***	—						3.069 (1.058)
Safe/Content	.477***	.722***	—					3.336 (.976)
PA	.689***	.418***	.520***	—				2.939 (.919)
NA	−.098*	−.434***	−.455***	−.096	—			1.820 (.870)
SA	−.175***	−.554***	−.510***	−.252***	.795***	—		1.647 (.734)
TA	−.216***	−.505***	−.440***	−.317***	.617***	.716***	—	2.124 (.799)
TPAS	.780***	.813***	.848***	.682***	−.374***	−.483***	−.461***	2.922 (.777)

Note. PA = PANAS-PA; NA = PANAS-NA; SA = State-Anxiety; TA = Trait-Anxiety; TPAS = total scale; *M* = mean; *SD* = standard deviation.
* = $p < .05$. ***$p < .001$.

sample size ($N = 440$) was large enough for validating a three-factor model with 18 items (compare Wolf et al., 2013).

As for modifications in the three-factor model, the shared error variance between Item 7 ("Exited") and Item 8 ("Eager") indicates systematic variations between these items that are not accounted for by the latent construct they represent. One potential reason causing the shared error variance might be due to a unique characteristic Item 7 and Item 8 share (i.e., state of anticipation or enthusiasm), which may not be equally shared with the rest of the items.

The results for the multigroup CFAs supported measurement invariance for the modified three-factor TPAS model across gender, age, and educational groups. While small deviations from strict invariance emerged regarding age (changes in CFI exceeding the acceptable threshold), SRMR and RMSEA remained within threshold, suggesting full factorial invariance. These findings are important for at least two reasons. First, they suggest that mean group differences stem from distinctions in the latent underlying construct (i.e., since configural, metric, and scalar invariance was reached), rather than specific item differences (Putnick & Bornstein, 2016). Second, they address previous concerns (compare McManus et al., 2019) about the interpretation difficulties for some of the TPAS items across diverse populations (at least in Swedish sample). Hence, these results could, for example, be informative for research using the TPAS to assess interventions aimed at increasing feelings of safety, contentment, and relaxation (Matos et al., 2017; Rockliff et al., 2011).

In terms of internal consistency, the TPAS demonstrated excellent to adequate reliability, corroborating previous research (e.g., Duarte & Pinto-Gouveia, 2017; Gilbert et al. 2008). Factorial validity was supported by good composite reliability and convergent validity (with AVE > .500 and < CR). However, indices of discriminant validity still point to some validity concerns for the Safe/Content factor as estimates of AVE were not markedly higher than MSV, which indicates nonindependence between Safe/Content and Relaxed factors in the model.

In evaluating the construct validity of TPAS, our study showed both similarities and differences in comparison to previous research (Armstrong et al., 2021; Gilbert et al., 2008, 2009). For convergent validity, we found moderate-to-strong positive correlations between the TPAS (and its subscales) and the related construct PANAS-PA. Notably, while both Relaxed PA and Safe/Content PA converged with PANAS-PA, Activated PA showed the strongest convergence, indicating it captures the energizing dimension of PA. These findings again challenge the notion of PANAS-PA (see also McManus et al., 2019) as a general measure of PA often used in research (compare Schiffrin, 2014). These results could be informative for future research not solely aiming to capture PA in general, for example, research aiming to distinguish specific intervention effects on PA, such as compassion-focused interventions, that is more aligned with a relaxed and safe/content state of PA (see, e.g., Petrocchi et al., 2017).

As for divergent validity, weak-to-medium negative correlations between the TPAS (and its subscales) and PANAS-NA were found. This corroborates previous findings by showing that safe/content PA is distinct from NA (Armstrong et al., 2021) but also extends previous research by showing that Activated PA and Relaxed PA had a similar pattern. Regarding TPAS' relationship with Anxiety measures, stronger divergence with Trait-Anxiety compared to State-Anxiety, which could be explained by the fact that the TPAS and State-Anxiety, but not Trait-Anxiety measure current emotional states. However, strong correlations do not necessarily indicate a divergent validity problem if it is expected based on empirical observations or theories (compare Rönkkö & Cho, 2022). Notably, experiencing PA, especially in the terms of higher levels of safeness, contentment, and relaxation, was linked with decreased levels of Anxiety. Thus, these results indicate satisfactory divergent validity with respect to Trait-Anxiety, but not with State-Anxiety.

Our initial evaluation of the Swedish TPAS suggests that the instrument is psychometrically sound, but with some

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limitations to address. First, although our study supported a modified three-factor model of the TPAS with only one modification, correlated error terms (in general) tend to increase model complexity potentially driven by sample characteristics (MacCallum et al., 1992). Replication with probability sampling technique is warranted to further validate the TPAS generalizability. Second, our findings raise some concerns regarding construct validity as the TPAS showed relatively strong negative correlations with State-Anxiety, but also with Trait-Anxiety compared to previous research (e.g., Gilbert et al., 2008). It is possible that differences in sample sizes underlie the contrasting results. Our sample was more heterogeneous with respect to gender and age, but also more adequately powered compared to previous research (Gilbert et al., 2008, 2009), which may have increased the variance and strengthened the relationships between constructs. We suggest that future research should include additional instruments (e.g., interviews or physiological measures) to establish concurrent validity of TPAS. Finally, we encourage future research to assess the predictive validity of the TPAS, which could inform research aiming to identify interventions that increase specific subtypes and their relationship to mental health.

In conclusion, this study supports the use of our Swedish-translated version of the TPAS as a valid tool for measuring types of PA, addressing the previous need for lacking validated instrument. The results from the CFAs not only support a modified three-factor model in line with the original TPAS but also measurement invariance across gender, age, and education groups. As no previous study tested for invariance, our findings are an important first indication that TPAS is a valid scale across different groups.

References

Armstrong, I. B. F., Nitschke, J. P., Bilash, U., & Zuroff, D. C. (2021). An affect in its own right: Investigating the relationship of social safeness with positive and negative affect. *Personality and Individual Differences*, *168*(4), Article 109670. https://doi.org/10.1016/j.paid.2019.109670

Brown, T. A., & Barlow, D. H. (2009). A proposal for a dimensional classification system based on the shared features of the *DSM-IV* anxiety and mood disorders: Implications for assessment and treatment. *Psychological Assessment*, *21*(3), 256–271. https://doi.org/10.1037/a0016608

Chen, F. F. (2007). Sensitivity of goodness of fit indexes to lack of measurement invariance. *Structural Equation Modeling: A Multidisciplinary Journal*, *14*(3), 464–504. https://doi.org/10.1080/10705510701301834

Clark, L. A., Watson, D., & Mineka, S. (1994). Temperament, personality, and the mood and anxiety disorders. *Journal of Abnormal Psychology*, *103*(1), 103–116. https://doi.org/10.1037//0021-843x.103.1.103

Díaz-Garcia, A., Gonzalez-Robles, A., Garcia-Palacios, A., Fernandez-Alvarez, J., Castilla, D., Breton, J. M., Banos, R. M., Quero, S., & Botella, C. (2021). Negative and Positive affect regulation in a transdiagnostic internet-based protocol for emotional disorders: Randomized controlled trial. *Journal of Medical Internet Research*, *23*(2), Article e21335. https://doi.org/10.2196/21335

Depue, R. A., & Morrone-Strupinsky, J. V. (2005). A neurobehavioral model of affiliative bonding: Implications for conceptualizing a human trait of affiliation. *Behavioral Brain Science*, *28*(3), 313–350. https://doi.org/10.1017/s0140525x05000063

Duarte, J., & Pinto-Gouveia, J. (2017). Positive affect and parasympathetic activity: Evidence for a quadratic relationship between feeling safe and content and heart rate variability. *Psychiatry Research*, *257*, 284–289. https://doi.org/10.1016/j.psychres.2017.07.077

Garcia, D., Nima, A., & Lindskär, A. (2016). Time perspective and well-being: Swedish survey questionnaires and data. *Data in Brief*, *9*(C), 183–193. https://doi.org/10.1016/j.dib.2016.08.057

Gilbert, P. (2015). An evolutionary approach to emotion in mental health with a focus on affiliative emotions. *Emotion Review*, *7*(3), 230–237. https://doi.org/10.1177/1754073915576552

Gilbert, P. (2020). Compassion: From its evolution to a psychotherapy. *Frontiers in Psychology*, *11*, Article 586161. https://doi.org/10.3389/fpsyg.2020.586161

Gilbert, P. (2024). Threat, safety, safeness and social safeness 30 years on: Fundamental dimensions and distinctions for mental health and well-being. *British Journal of Clinical Psychology*. Advance online publication. https://doi.org/10.1111/bjc.12466

Gilbert, P., McEwan, K., Mitra, R., Franks, L., Richter, A., & Rockliff, H. (2008). Feeling safe and content: A specific affect regulation system? Relationship to depression, anxiety, stress, and self-criticism. *The Journal of Positive Psychology*, *3*(3), 182–191. https://doi.org/10.1080/17439760801999461

Gilbert, P., McEwan, K., Mitra, R., Richter, A., Franks, J., & Mills, A. (2009). An exploration of different types of positive affect in students and patients with bipolar disorder. *Clinical Neuropsychiatry*, *6*(4), 135–143. https://doi.org/10.1080/17439760801999461

Grunwald, D., & Goldfarb, N. M. (2006). Back translation for quality control of informed consent forms. *Journal of Clinical Research Best Practices*, *2*(2), 1–6.

Hair, J., Black, W., Babin, B., and Anderson, R. (2014). *Multivariate data analysis* (7th ed.). Prentice-Hall.

Heinrichs, M., Baumgartner, T., Kirschbaum, C., and Ehlert, U. (2003). Social support and oxytocin interact to suppress cortisol and subjective responses to psychosocial stress. *Biological Psychiatry*, *54*(12), 1389–1398. https://doi.org/10.1016/s0006-3223(03)00465-7

Hu, L., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling: A Multidisciplinary Journal*, *6*(1), 1–55. https://doi.org/10.1080/10705519909540118

International Test Commission. (2017). *The ITC guidelines for translating and adapting tests* (2nd ed.). https://www.InTestCom.org

JASP Team. (2023). *JASP* (Version 0.17.3) [Computer software].

Kelly, A. C., Zuroff, D. C., Leybman, M. J., & Gilbert, P. (2012). Social safeness, received social support, and maladjustment: Testing a tripartite model of affect regulation. *Cognitive Therapy and Research*, *36*(6), 815–826. https://doi.org/10.1007/s10608-011-9432-5

LeDoux, J. (1998). *The emotional brain*. Weidenfeld and Nicolson.

Lehmivaara, J. (2024). *Psychometric evaluation of the Swedish version of the Types of Positive Affect Scale (TPAS)* [Data set]. https://osf.io/th643/

MacCallum, R. C., Roznowski, M., & Necowitz, L. B. (1992). Model modifications in covariance structure analysis: The problem of capitalization on chance. *Psychological Bulletin*, *111*(3), 490–504. https://doi.org/10.1037//0033-2909.111.3.490

Matos, M., Duarte, C., Duarte, J., Pinto-Gouveia, J., Petrocchi, N., Basran, J., & Gilbert, P. (2017). Psychological and physiological effects of compassionate mind training: A pilot randomised controlled study. *Mindfulness*, *8*(6), 1699–1712. https://doi.org/10.1007/s12671-017-0745-7

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McManus, M. D., Nakamura, J., & Siegel, J. T. (2024). Hiding in plain sight: The distinct importance of low-arousal positive affect. *Motivation and Emotion*. Advance online publication. https://doi.org/10.1007/s11031-024-10062-5

McManus, M. D., Siegel, J. T., & Nakamura, J. (2019). The predictive power of low-arousal positive affect. *Motivation and Emotion*, *43*(1), 130–144.https://doi.org/10.1007/s11031-018-9719-x

Morton, L., Cogan, N., Kolacz, J., Calderwood, C., Nikolic, M., Bacon, T., Pathe, E., Williams, D., & Porges, S. W. (2022). A new measure of feeling safe: Developing psychometric properties of the Neuroception of Psychological Safety Scale (NPSS) [Correction]. *Psychological Trauma: Theory, Research, Practice, and Policy*, *16*(4), 701–708. https://doi.org/10.1037/tra0001313

Petrocchi, N., Ottaviani, C., & Couyoumdjian, A. (2017). Compassion at the mirror: Exposure to a mirror increases the efficacy of a self-compassion manipulation in enhancing soothing positive affect and heart rate variability. *The Journal of Positive Psychology*, *12*(6), 525–536. https://doi.org/10.1080/17439760.2016.1209544

Porges, S. W. (2003). The polyvagal theory: Phylogenetic contributions to social behavior. *Physiology & Behavior*, *79*(3), 503–513. https://doi.org/10.1016/s0031-9384(03)00156-2

Porges, S. W. (2007). The polyvagal perspective. *Biological Psychology*, *74*(2),116–143. https://doi.org/10.1016/j.biopsycho.2006.06.009

Putnick, D. L., & Bornstein, M. H. (2016). Measurement invariance conventions and reporting: The state of the art and future directions for psychological research. *Developmental Review*, *41*, 71–90. https://doi.org/10.1016/j.dr.2016.06.004

R Core Team. (2023). *R: A language and environment for statistical computing*. R Foundation for Statistical Computing.

Rönkkö, M., & Cho, E. (2022). An updated guideline for assessing discriminant validity. *Organizational Research Methods*, *25*(1), 6–14. https://doi.org/10.1177/1094428120968614

Richter, A., Gilbert, P., & McEwan, K. (2009). Development of an early memories of warmth and safeness scale and its relationship to psychopathology. *Psychology and Psychotherapy*, *82*(2), 171–184. https://doi.org/10.1348/147608308x395213

Rockliff, H., Karl, A., McEwan, K., Gilbert, J., Matos, M., & Gilbert, P. (2011). Effects of intranasal oxytocin on 'compassion focused imagery'. *Emotion*, *11*(6), 1388–1396. https://doi.org/10.1037/a0023861

Rosseel, Y. (2012). Lavaan: An R package for structural equation modeling. *Journal of Statistical Software*, *48*(2), 1–36. https://doi.org/10.18637/jss.v048.i02

Russell, J. A. (1980). A circumplex model of affect. *Journal of Personality and Social Psychology*, *39*(6), 1161–1178. https://doi.org/10.1037/h0077714

Sarling, A., Jansson, B., Englén, M., Bjärtå, A., Rondung, E., & Sundin, Ö. (2021). Psychometric properties of the Swedish version of the Experiences in Close Relationships – Relationship Structures Questionnaire (ECR-RS global nine-item version). *Cogent Psychology*, *8*(1), Article 1926080. https://doi.org/10.1080/23311908.2021.1926080

Satorra, A., & Bentler, P. M. (2001). A scaled difference chi-square test statistic for moment structure analysis. *Psychometrika*, *66*(4), 507–514. https://doi.org/10.1007/bf02296192

Schermelleh-Engel, K., Moosbrugger, H., & Müller, H. (2003). Evaluating the fit of structural equation models: Tests of significance and descriptive goodness-of-fit measures. *Methods of Psychological Research Online*, *8*(2), 23–74.

Schiffrin, H. H. (2014). Positive Psychology and attachment: Positive affect as a mediator of developmental outcomes. *Journal of Child and Family Studies*, *23*(6), 1062–1072. https://doi.org/10.1007/s10826-013-9763-9

Spielberger, C. D., Gorusch, R. L., & Lushene, R. E. (1970). *Manual for the State–Trait Anxiety Inventory*. Consulting Psychologist Press.

van de Schoot, R., Lugtig, P., & Hox, J. (2012). A checklist for testing measurement invariance. *European Journal of Developmental Psychology*, *9*(4), 486–492. https://doi.org/10.1080/17405629.2012.686740

Vandenberg, R. J., & Lance, C. E. (2000). A review and synthesis of the measurement invariance literature: Suggestions, practices, and recommendations for organizational research. *Organizational Research Methods*, *3*(1), 4–70. https://doi.org/10.1177/109442810031002

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

Watson, D., Clark, L. A., Weber, K., Assenheimer, J. S., et al, M. E., & McCormick, R. A. (1995). Testing a tripartite model: II. Exploring the symptom structure of anxiety and depression in student, adult, and patient samples. *Journal of Abnormal Psychology*, *104*(1), 15–25. https://doi.org/10.1037//0021-843x.104.1.15

Wolf, E. J., Harrington, K. M., Clark, S. L., & Miller, M. W. (2013). Sample size requirements for structural equation models. *Educational and Psychological Measurement*, *73*(6), 913–934. https://doi.org/10.1177/0013164413495237

Zsido, A. N., Teleki, S. A., Csokasi, K., Rozsa, S., & Bandi, S. A. (2020). Development of the short version of the Spielberger State–Trait Anxiety Inventory. *Psychiatry Research*, *291*, Article 113223. https://doi.org/10.1016/j.psychres.2020.113223

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