# Positive Affect/Negative Affect Scale for Mexicans (PANA-M): Evidences of Validity and Reliability

## Escala de Afecto Positivo/Afecto Negativo en México (APAN-M): Evidencias de Validez y Confiabilidad

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## Abstract

The affective component of Subjective Well Being refers to the emotional evaluations people make regarding day-to-day life events. These emotional responses can be categorized into two: Positive affect and Negative affect. Positive affect usually indicate that life is going well, and everything is as expected; negative affect indicates the opposite. Despite the immense number of instruments and scales that currently exist around this topic, there's still room for improvement regarding psychometric properties. To minimize some of the recent challenges, a new Affect scale was developed instead of adopting or adapting an existing one. Three independent studies use several techniques (Exploratory Factor Analysis, Confirmatory Factor Analysis, Convergent validity, Cronbach's Alpha, McDonald's Omega, Tucker's congruence coefficient) to show adequate validity and reliability properties. The final product, a Positive Affect/Negative Affect Scale -originally developed for Mexico-, shows adequate properties and even suggest proper functioning in an Argentinian sample. Strengths for this new scale are discussed and the relationship between positive/negative affect with other psychological variables is discussed as well.

*Keywords:* Positive affect, Negative affect, Alfa, Omega, Psychometry

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## Resumen

El componente afectivo del bienestar subjetivo se refiere a evaluaciones emocionales que la gente hace sobre lo que le sucede día a día. Dichas emociones pueden ser clasificadas en dos rubros (afecto positivo y afecto negativo), e incluyen: Tristeza, enojo, ira, alegría, felicidad, entre muchas otras. En general, las emociones positivas son indicativas de que todo está saliendo como se espera, y que las cosas van bien; mientras que el afecto negativo suele indicar lo contrario. A pesar de la inmensa cantidad de instrumentos que existen para medir variables como el afecto, la felicidad, o bienestar, aún hay grandes oportunidades de mejora en el campo. Para contrarrestar algunos de los cuestionamientos recientes a los instrumentos existentes, se construyó (en vez de adoptar o adaptar) una escala de afecto basada en investigaciones exploratorias recientes. El estudio uno (n = 390 mexicanos, $M_{edad}$ = 23.44; $DE_{edad}$ = 8.06) del presente trabajo detalla la depuración del conjunto inicial de reactivos y cómo, a través de un Análisis Factorial Exploratorio se obtuvo una configuración de dos factores. Con el propósito de brindar indicadores adicionales de validez, se llevó a cabo una red nomológica utilizando Satisfacción con la vida, Auto-identidad, Felicidad y Autoestima. La confiabilidad de esta escala fue evaluada a través de dos indicadores: Alfa de Cronbach y omega de McDonald. El segundo estudio (n = 323, $M_{edad}$ = 23.88; $DE_{edad}$ = 9.15) corroboró la estructura factorial a través de un Análisis Factorial Confirmatorio. La validez concurrente se evaluó con Adaptación sociocultural, Satisfacción con la vida y el modelo HEXACO. Nuevamente, aspectos de confiabilidad se evaluaron a través de alfa de Cronbach y omega de McDonald. Finalmente, el tercer estudio (n = 274 mexicanos con $M_{edad}$ = 29.33; $DE_{edad}$ = 3.44, n = 345 argentinos con $M_{edad}$ = 28.96; $DE_{edad}$ = 2.87) puso a prueba la equivalencia de la estructura factorial utilizando dos muestras. El coeficiente phi de Tucker demostró que la escala de afecto es equivalente para una muestra argentina y una mexicana. Nuevamente se utilizaron alfa de Cronbach y omega de McDonald para aspectos de confiabilidad. Se discuten las fortalezas de las evidencias de validez y confiabilidad de la nueva escala de afecto a la luz de literatura relevante, sus aportaciones al estado del arte actual y la equivalencia entre culturas.

*Palabras Clave:* Afecto positivo, Afecto negativo, Alfa, Omega, Psicometría

Subjective Well-Being (SWB) is the personal perception and experience of positive and negative emotional responses and global and specific (domain) cognitive evaluations of satisfactions with life (Diener, 2006; Diener, Lucas, & Oishi, 2018; Proctor, 2014). It has also been defined as a person's cognitive and affective evaluations of his or her life (Diener, Lucas, & Oishi, 2002). The term (SWB) was first introduced by Diener (1984) as a way to understand how people evaluate their lives, including both the affective and cognitive reactions, and has been used interchangeably with happiness. SWB has three main components: Life satisfaction, Positive Affect, and Negative Affect (Diener, 2006, 2009a; Proctor, 2014; Velasco-Matus, Rivera-Aragón, Díaz-Loving, Bonilla-Teoyotl, González-Jimarez, & Domínguez Espinosa, 2020).

As a topic, Subjective Well-Being has been the focus of various empirical and theoretical developments. As shown by Diener et al. (2018), the last few years have shown a huge growth in research regarding SWB. Recent research has shown important contributions about physical, psychological, and even social health (e.g., Cloniger, 2004; Diener et al., 2009; Diener et al., 2018; Eid & Larsen, 2008; INEGI, 2012, 2014; Lyubomirsky, 2008; Nima, Cloninger, Persson, Sikström, & Garcia, 2020; OECD, 2013).

Recent research (Helliwell, Layard, Sachs, & De Neve, 2020, 2021; Helliwell, Layard, & Sachs, 2019; INEGI, 2012, 2014; OECD, 2013) have emphasized the need to quantify life evaluations as a primary indicator of good lives, with some particular focus on the monitoring of affect. As shown by previous research (Diener, 2009; Diener, Pressman, Hunter, & Delga-

dillo-Chase, 2017; Diener et al., 2018; Diener, Suh, Lucas, & Smith, 1999; Kozma, Stones, & McNeil, 1991; Lucas & Diener, 2009; Pavot, 2018; Velasco & Bonilla, 2021; Velasco, Rivera, Díaz, & Reyes, 2015; Velasco et al., 2020; Wilson, 1967, among many others), various manifestations of affect and measures of wellbeing have been linked to sociodemographic factors, life events, involvement in different activities, stress, personality, culture, gender, coping, self-esteem, mental health, family, friends, work, intelligence, income, interpersonal relationships, discrimination, sexual risk behavior, alcohol consumption, impression management, among many other variables.

The affective component of SWB is understood as affective evaluations of the emotions people experience throughout their daily lives. Such emotions include sadness, fear, anger, joy, happiness, among others (Watson et al., 1988), and have conceptually been distinguished into two categories: Positive affect (positive emotions) and Negative Affect (negative emotions). On the other hand, the cognitive aspect is conceptualized as how people evaluate their life as a whole (Diener et al., 1985). These components (affect, life satisfaction) are separable constructs, and researchers may wish to evaluate them separately, despite having equal importance (Gilman, Huebner, & Laughlin, 2000). As mentioned before, affect includes feelings and emotions of various types. Positive affect includes the feelings people experience when thing seem to be going well, and negative affect are those feelings when things are not going well. Positive affect can include momentary emotions such as enjoyment, and more long-term moods such as feelings of contentment. Negative affect also includes momentary emotions s anger or sadness, while also considering longer-lasting moods such as depression (Diener et al., 2017).

Despite some debates regarding how to best conceptualize and measure the affective component of SWB (how frequent or how intensive positive and negative emotions are experienced), most researchers agree that the frequency of emotions, rather than how intensive emotions are experienced, is a better measure of the affective component (Diener et al., 2018; Velasco-Matus, Villanueva-Orozco, Rive-

ra-Aragón, & Díaz Loving, 2016). Also, congruent with Veenhoven's categorization of happiness, wellbeing, and life satisfaction (2005), the fact that wellbeing is understood and assessed as the frequency of favorable, positive, pleasurable moments, functions as an optimal metric. The definition of wellbeing and happiness as momentary or stable moments across time, allow researchers to determine if a live event can produce true wellbeing or if it just a mere, quick, ephemeral sensation.

Veenhoven (2017) has developed a highly informative database of wellbeing research: The World Database of Happiness. We encourage the author to take a look at the database (http://worlddatabaseofhappiness.eur.nl) to fully understand the scope and impact of such measures, however, as a manner of abstract, the instruments can be categorized into single item measures, multi-item measures, domain specific measures, and measures of constructs related to wellbeing. As pointed out by Díaz-García, González-Robles, Mor, Mira, Quero, García Palacios, Baños, and Botella (2020), without adequate and reliable measurements of affect, it is impossible to conduct proper research and provide useful data to the field.

As shown by Veenhoven (2017), the field of wellbeing and happiness research has been quite prolific, and Mexico has not been exempted from this. In past years, Velasco (2015) presented a review in which he detailed some of the most cited instruments to measure wellbeing, affect, life satisfaction, and happiness in Mexico, a country that has constantly been portrayed as a happy and in constant-positive development (Helliwell et al., 2020; OECD, 2017, 2020); he later developed a two-factor scale (positive affect, negative affect) built from scratch using Mexican's views on wellbeing. Since then, other authors (e.g., Calleja & Mason, 2020; Castaños-Cervantes, Turnbull, & Aguilar, 2016; Merino, Privado, & Gracia, 2015; Millán & Castellanos, 2018) have made their own efforts presenting proper, valid, reliable measures in order to understand as much as we can the full scope of wellbeing.

As pointed out by Pavot (2018), the assessment of SWB (all of it or only one of its components) could be

accomplished by a single item/question at any given point in time. This approach could be very useful despite its simplicity, and could facilitate comparisons across countries, such as the efforts made by the OECD (2017, 2020) and the World Happiness Report (Helliwell et al., 2019, 2020). However, as presented in Millán and Castellanos's compilation (2018), Chen, Gully, & Eden (2001), Johnson & Van de Vijver (2003) and Díaz-Loving, Saldívar, Armenta, Reyes, et al. (2015), several cultural characteristics could determine the behavior of psychological variables, leading to differential outcomes despite trying to evaluate the same construct (Merino et al., 2015).

Despite the usefulness of single-item measures, the lack of specificity and detail in these measures represents a challenge. An additional level of complexity can be presented in a more precise assessment, departing from single-item measures and choosing multi-item evaluations. The sum of additional variables is another fine consideration, providing a system of benchmarks that prove the convergence of divergence of the measures (Pavot, 2018). An additional system for instrument choice is presented in He and Van de Vijver (2012). Adoption, adaptation and assembly are the three strategies presented as ways to choose a proper instrument. Contrary to adoption (close translations of an instrument in a target language) and adaptation (the combination of close translation and changes in other stimuli whenever translation becomes inadequate), assembly involves the compilation of a new instrument. It is the best choice whenever the adoption or adaptation of an instrument do not produce satisfactory linguistic, cultural and psychometric accuracy. This final option maximizes the cultural suitability of an instrument, although He and Van de Vijver say it will lack the ability of future comparisons of scores across cultures.

Recent trends in research try to address and improve the psychometric properties assessed using traditional criteria. Research using sophisticated methods is needed to fully understand the extent to which psychometric properties are responsible for observed data. As an effort to provide a conceptual and empirical framework that addresses some of the current concerns regarding the psychometric properties of existing instruments, and due to the similarities of terms used as conceptual basis (see Diener et al., 2018 for a detailed list of key concepts used in most research) in Mexico (Calleja & Mason, 2020; Castaños-Cervantes et al., 2016; Garduño, Salinas, Rojas, 2005; Merino et al., 2015; Millán & Castellanos, 2018), the purpose of this research was to assemble a new instrument that could, in turn, provide the following: 1) A solid, grounded conceptual framework that could be equivalent to those in state of the art research; 2) A culturally-specific and relevant framework; 3) A multi-item approach, to address issues of detail and specificity; 4) A relevant and adequate response style; 5) Traditional criteria to assess concerns of validity and reliability; 6) Alternative criteria to assess validity and reliability; 7) An indicator for future numerical comparisons despite the assembly of a new instrument.

## Study 1. Assembly of the scale, initial psychometric properties

### Participants

A total non-probabilistic sample of 390 Mexicans (33.3% men, 66.7% women) with ages between 18 and 57 (M=23.44, SD=8.06) participated in this study. Most part of the sample was single (85%), heterosexual (87.4%), did not have a job (66%), reported not having a religion (47.4%), and were currently involved mainly in academic activities (undergraduate students) (76%). All participation was voluntary, anonymous, confidential, and no monetary compensation was offered.

### Instruments

*Positive Affect/Negative Affect*. As part of an exploratory study, Velasco (2015) asked Mexicans "What is wellbeing?" to adults with ages between 18 and 50+. Using the Natural Semantic Network Technique (Reyes Lagunes, 1993; Valdez Medina, 1996), a proper social representation of wellbeing, happiness,

and affect was obtained. It is worth mentioning that this technique maps information in memory specific to specific stimuli – in this case "wellbeing"- that reflect shared subjective meanings within a group. For further information on the technique, see Reyes Lagunes (1993) and Domínguez & Van de Vijver (2014), since they provide a more in-depth explanation. After processing the information regarding the stimulus, the top 10 words from each group (18-24 years, 25-30 years, 31-40 years, 41-50 years, 50+ years) were compared to the content of previous research regarding Affect (for example, Bradburn, 1969; Moral de la Rubia, 2011; Watson, Clark, & Tellegen, 1998). A total of 96 words were obtained (see Velasco, 2015 for the full list), which were evenly distributed in two hypothetical dimensions: Positive affect and negative affect. An Exploratory Factor Analysis produced a 46-item scale, that accounted for 52% of the total variance, with a Cronbach's Alpha of 0.94. Later on, as part of the final stages of his doctoral dissertation, as a way of dealing with multicollinearity issues, Velasco used a second order factor analysis in order to bring various dimensions under a common higher-level factor. Results showed a two-factor solution that was called Positive Affect and Negative Affect. Preliminary psychometric properties showed 80% of total variance and 0.92 for Cronbach's Alpha. Based on such previous research and given the current state of psychometrics (Pavot, 2018), the need for a more precise scale was evident. Not only for Mexican population, but also with enough characteristics to make it appealing for the rest of the World. A 30-item pool was developed to measure both positive and negative affect, as two dimensions of Affect Balance (Bradburn, 1969; Diener, 2009; Watson et al., 1998). Items were selected based mainly on two principles: 1) Items available on previous published instruments; and 2) Items with highest factor loadings in Velasco's (2015) previous research. Participants were asked to answer how often do they experience each of the emotions on a 5-point Likert scale (1-Never, 5-Always). Positive affect items included (items were presented in Spanish; names are shown in italics), for example: Wellbeing (*bienestar*), satisfaction (*satisfacción*), love (*amor*), happiness (*felicidad*), pleasure (*placer*), joy

(*alegría*), among others. Negative affect items (names in Spanish also presented in italics) included: Suffering (*sufrimiento*), despair (*desesperación*), frustration (*frustración*), guilt (*culpa*), anger (*enojo*), and sadness (*tristeza*), among others. All items were presented in random order.

Singelis' (1994) *Self-Construal Scale* (SCS) was presented on a 7-point Likert scale (1-I don't agree at all, 7-I fully agree). This scale measures two dimensions: interdependence (thoughts and feelings regarding one's relationship to others) and independence (one's distinctiveness from others).

*The Interdependent Happiness Scale* (IHS) (Hitokoto & Uchida, 2015) is a measure of one's happiness based on interpersonal harmony, ordinariness, and quiescence. A total of 9 items describes the individual and he/she must decide if he/she agrees on a 7-point Likert scale (1-Strongly disagree, 7-Strongly agree).

*The Satisfaction with Life Scale* (SWLS) (Diener et al., 1985) is a short 5-item instrument designed to measure global cognitive judgments of satisfaction with one's life. Items were presented on a 7-point Likert scale (1-Strongly disagree, 7-Strongly agree).

*The Rosenberg Self-Esteem Scale* (SE) (Rosenberg, 1965) is a 10-item scale that measures global self-worth by measuring both positive and negative feelings about the self. The scale is often used as uni-dimensional. Items were also presented on a 7-point Likert scale (1-Strongly disagree, 7-Strongly agree).

The Self-construal scale, the Interdependent Happiness Scale, the Satisfaction with Life Scale, and the Rosenberg Self-Esteem Scale have shown adequate psychometric properties in several countries around the world, including Mexico (Krys et al., 2019b; Velasco, 2015; Velasco et al., 2020).

## Procedure and statistical analysis

The data collection was carried out through online survey software such as Google Forms ® and Surveymonkey ®. All participants received information regarding the general purpose of the research, and after acknowledging such information agreed to be

part of the research. In all cases, the participants individually completed the instruments during working and/or school hours. No incentives were offered in return for participation. The administration of the online forms was carried out in accordance with the ethical guidelines established by the American Psychological Association (APA, 2010) and the Mexican Society of Psychology (SMP, 2009). The exploratory factor analysis and Pearson's correlation were carried out using IBM SPSS for Windows, version 23. Cronbach's Alpha and McDonald's ω were obtained using the open statistical platform called Jamovi Project, version 1.6 for Windows. This sample was collected through August 2018-May 2019.

## Results

An exploratory factor analysis showed the following: Barltlett's Test of Sphericity: $X^2$ = 3271.57, $df$ = 325, $p$ < .000; and KMO = .927. We then used the scree plot to determine how many factors could be retained, and the advised number of dimensions was two, which was parsimonious and theoretically adequate. We established 3 as the minimum number of items per factor, and the absolute value of .3 as the minimum threshold for each item loading. Only 20 of the initial 30 items were retained, and they were distributed in two dimensions, accounting for 56.9% of the total variance. All psychometric properties can be seen on Table 1.

Positive affect refers to pleasant emotions. They reflect an individual's reaction to life events and are usually an indicator that their life is going favorably. Negative affect includes unpleasant emotions, and reflect evaluations of life events that indicate things not going favorably. The two-factor solution is both parsimonious and theoretically adequate. Each of the factors has strong item loadings and is conceptually consistent within the dimension, yielding a psychometrically adequate two-factor scale. Cronbach's Alpha and McDonald's ω show very adequate values as evidence of reliability.

The correlation between Positive Affect and Negative Affect resulted negative, moderate and significant (r = - .552; p < 0.05). To provide further evidence of

**Table 1**
*Exploratory factor analysis*

| Item | 1 | 2 | Total |
|---|---|---|---|
| Suffering (*Sufrimiento*) | **.813** | -.154 | |
| Pain (*Dolor*) | **.799** | .059 | |
| Sadness (*Tristeza*) | **.797** | -.164 | |
| Disappointment (*Desilusión*) | **.738** | -.136 | |
| Misfortune (*Desdicha*) | **.734** | -.203 | |
| Melancholy (*Melancolía*) | **.732** | -.098 | |
| Solitude/loneliness (*Soledad*) | **.712** | -.074 | |
| Fear (*Miedo*) | **.710** | -.136 | |
| Uncertainty (*Incertidumbre*) | **.689** | -.181 | |
| Irritation (*Irritación*) | **.675** | -.222 | |
| Happiness (*Felicidad*) | -.190 | **.830** | |
| Joy (*Alegría*) | -.154 | **.814** | |
| Plenitude (*Plenitud*) | -.210 | **.808** | |
| Satisfaction (*Satisfacción*) | -.115 | **.807** | |
| Calmness (*Calma*) | -.089 | **.784** | |
| Wellbeing (*Bienestar*) | -.254 | **.767** | |
| Peace (*Paz*) | -.226 | **.764** | |
| Bliss (*Dicha*) | -.114 | **.734** | |
| Tranquility (*Tranquilidad*) | -.224 | **.732** | |
| Pleasure (*Placer*) | .038 | **.705** | |
| Number of items | 10 | 10 | 20 |
| % Variance | 30.37% | 26.54% | 59.91% |
| Cronbach's Alpha | .93 | .93 | .83 |
| McDonald's ω | .92 | .90 | .87 |

Note: Original item names (in Spanish) are shown in italics.

the validity of scores on the Affect scale we examined its convergent validity using well-known scales used in research surrounding the topic. Correlations among the factors are presented for Positive (P-Aff) and Negative (N-Aff) affect. Results show that Negative affect correlates negatively with Life satisfaction, Happiness, Self-definition (self-construction, viewed as a whole), Independence (one of Singelis' dimensions), and Self-esteem; having just one positive, significant correlation with Interdependence. On the other hand, Positive affect correlates positively with all factors, except with Interdependence. All other correlations, means and standard deviations are shown on Table 2.

**Table 2**
*Correlations between variables*

|         | SWLS     | IHS      | SCS      | SCSINTER | SCINDEP  | SE       | M    | SD  |
|---------|----------|----------|----------|----------|----------|----------|------|-----|
| N-Aff   | -.437**  | -.466**  | -.289**  | .211**   | -.227**  | -.393**  | 2.76 | .81 |
| P-Aff   | .647**   | .632**   | .320**   | -.085*   | .448**   | .163**   | 3.68 | .73 |
| M       | 3.69     | 5.01     | 2.66     | 3.13     | 5.80     | 4.29     |      |     |
| SD      | .85      | 1.02     | 1.62     | 1.22     | .92      | .59      |      |     |

Note: SWLS – Satisfaction with life scale; IHS – Interdependent Happiness Scale; SCS – Self construal scale; SCSINTER – Self construal scale – Interdependence; SCINDEP – Self construal scale – Independence; SE – Self Esteem.

## Study 2. Confirmatory Factor Analysis, psychometric properties

Once the factor structure of the Affect Scale was established, and its relationship was established with other variables, the purpose was to further explore the psychometric evidence using a Confirmatory Factor Analysis, as well as convergent validity with other relevant variables.

### Participants

A total sample of 323 Mexicans (42.8% men, 57.2% women) with ages between 18 and 63 (M = 23.88, SD = 9.15) participated in this study. Most part of the sample had a couple relationship (58%), single (45%), heterosexual (51.4%), did not have a job (67%), reported not having a religion (57.4%), and were currently involved mainly in academic activities (undergraduate students) (77.3%). All participation was voluntary, anonymous, confidential, and no monetary compensation was offered.

### Instruments

The 20-item version of *Positive-Negative Affect Scale*, developed earlier in this paper, was administered. Participants were asked to answer how often do they experience each of the emotions on a 5-point Likert scale (1-Never, 5-Always). Items were presented in random order.

*Satisfaction with Life* (SWLS) was evaluated using the Scale developed by Diener et al. (1985) presented in previous sections of this paper.

*Personality*. Ashton and Lee's (2009) HEXACO 60 item personality inventory was used. The total of 60 items were presented in a 5-point Likert format (1- Strongly Disagree, 5- Strongly Agree). Items are distributed among six factors: Honesty-Humility (H), Emotionality (E), Extraversion (X), Agreeableness (A), Conscientiousness (C), and Openness to Experience (O). According to the authors, the HEXACO Inventory has adequate psychometric properties.

*Sociocultural Adaptation*. The Sociocultural Adaptation Scale-Revised (Wilson, 2013; Wilson et al., 2017) is a 5-point Likert Scale (1-Not at all competent, 5- Extremely competent), that measures the individual's capability for acquiring culturally competent abilities. It consists of 21 items distributed in five factors: Interpersonal Communication (IC), Academic/Work Performance (AWP), Personal Interests and Community Involvement (PICI), Ecological Adaptation (EA), and Language Proficiency (LP). The Scale has adequate evidences of construct validity and Cronbach's Alphas between .71 and .92.

### Procedure and statistical analysis

The data collection was carried out through online survey software such as Google Forms ® and SurveyMonkey ®. All participants received information regarding the general purpose of the research, and

after acknowledging such information agreed to be part of the research. In all cases, the participants individually completed the instruments during working and/or school hours. No incentives were offered in return for participation. The administration of the online forms was carried out in accordance with the ethical guidelines established by the American Psychological Association (APA, 2010) and the Mexican Society of Psychology (SMP, 2009). The confirmatory factor analysis was executed using IBM AMOS for Windows, version 23. Pearson's correlations, Cronbach's Alpha, and McDonald's w were obtained using the open statistical platform called Jamovi Project, version 1.6 for Windows. This sample was collected through August 2019-March 2020.

## Results

After conducting the CFA, the chi-square goodness of fit suggested a poor fit (p < 0.01). However, all other statistics showed good fit: CMIN/df = 1.708, NFI (Normed Fit Index) = .916, RFI (Relative Fit Index) = .904, TLI (Tucker Lewis Index) = .958, CFI (Comparative Fit Index) = .963, RMSEA (Root Mean Square Error of Approximation) = .050, PCLOSE = .428, and AIC (Akaike Information Criterion) = 411.247. In summary, the results showed that the two-factor model adequately represents Positive and Negative Affect, distributed in two independent but complementary factors, with 10 items each. The final structure can be seen in Figure 1.

In terms of reliability, Cronbach's Alpha showed .92, .88, and .91 for Positive Affect, Negative Affect, and Total Scale, respectively. Also, McDonald's ω showed .92, .88, and .92 for Positive Affect, Negative Affect, and Total Scale, respectively.

Again, the correlation between the two types of affect resulted negative and statistically significant (r = -0.482; p < 0.001). Positive affect correlated positively with Satisfaction with life, Interpersonal communication, Academic/work performance, Personal interests and community involvement, Ecological adaptation, Honesty/humility, Extroversion, Agreeableness, and Conscientiousness; and correlated negatively with

Language proficiency. On the other hand, Negative affect correlated negatively with Satisfaction with life, Interpersonal Communication, Academic/Work Performance, Personal Interests and Community Involvement, Ecological Adaptation, Honesty/humility, Extroversion, Agreeableness, Conscientiousness; and correlated positively with Language proficiency and Emotionality. Openness to Experience did not correlate with either affect. These data can be seen on Table 3.

**Table 3**
*Pearson correlations between variables*

|  | P-Aff |  | N-Aff |  | M. | S.D. |
|---|---|---|---|---|---|---|
| P-Aff | -- |  | -- |  | 3.59 | 2.68 |
| N-Aff | -.482 | *** | -- |  | 2.68 | .73 |
| SWLS | .623 | *** | -.395 | *** | 3.40 | .90 |
| IC | .455 | *** | -.312 | *** | 3.71 | .64 |
| AWP | .470 | *** | -.310 | *** | 3.81 | .75 |
| PICI | .427 | *** | -.276 | *** | 3.41 | .75 |
| EA | .418 | *** | -.282 | *** | 3.67 | .75 |
| LP | -.128 | * | .190 | ** | 1.36 | .69 |
| H | .150 | * | -.157 | ** | 3.53 | .65 |
| E | -.031 |  | .195 | ** | 3.01 | .47 |
| X | .592 | *** | -.486 | *** | 3.11 | .66 |
| A | .343 | *** | -.382 | *** | 3.15 | .57 |
| C | .256 | *** | -.216 | *** | 3.37 | .63 |
| O | .099 |  | .029 |  | 3.61 | .55 |

Note: SWLS – Satisfaction with Life Scale. Sociocultural Adaptation consists of: Interpersonal Communication (IC), Academic/Work Performance (AWP), Personal Interests and Community Involvement (PICI), Ecological Adaptation (EA), and Language Proficiency (LP). Personality consists of: Honesty-Humility (H), Emotionality (E), Extraversion (X), Agreeableness (A), Conscientiousness (C), and Openness to Experience (O). * p < 0.05; ** p < 0.01; *** p < 0.001

## Study 3. Structural equivalence

Once the factor structure of the Affect Scale was confirmed, and its relationship was established with other variables, the purpose was to assess whether the scale could be used in a different context than the one originally used for its assembly. Tucker's phi (congruence coefficient) was chosen as means to test structural equivalence of the Affect Scale in two samples: Mexico and Argentina.
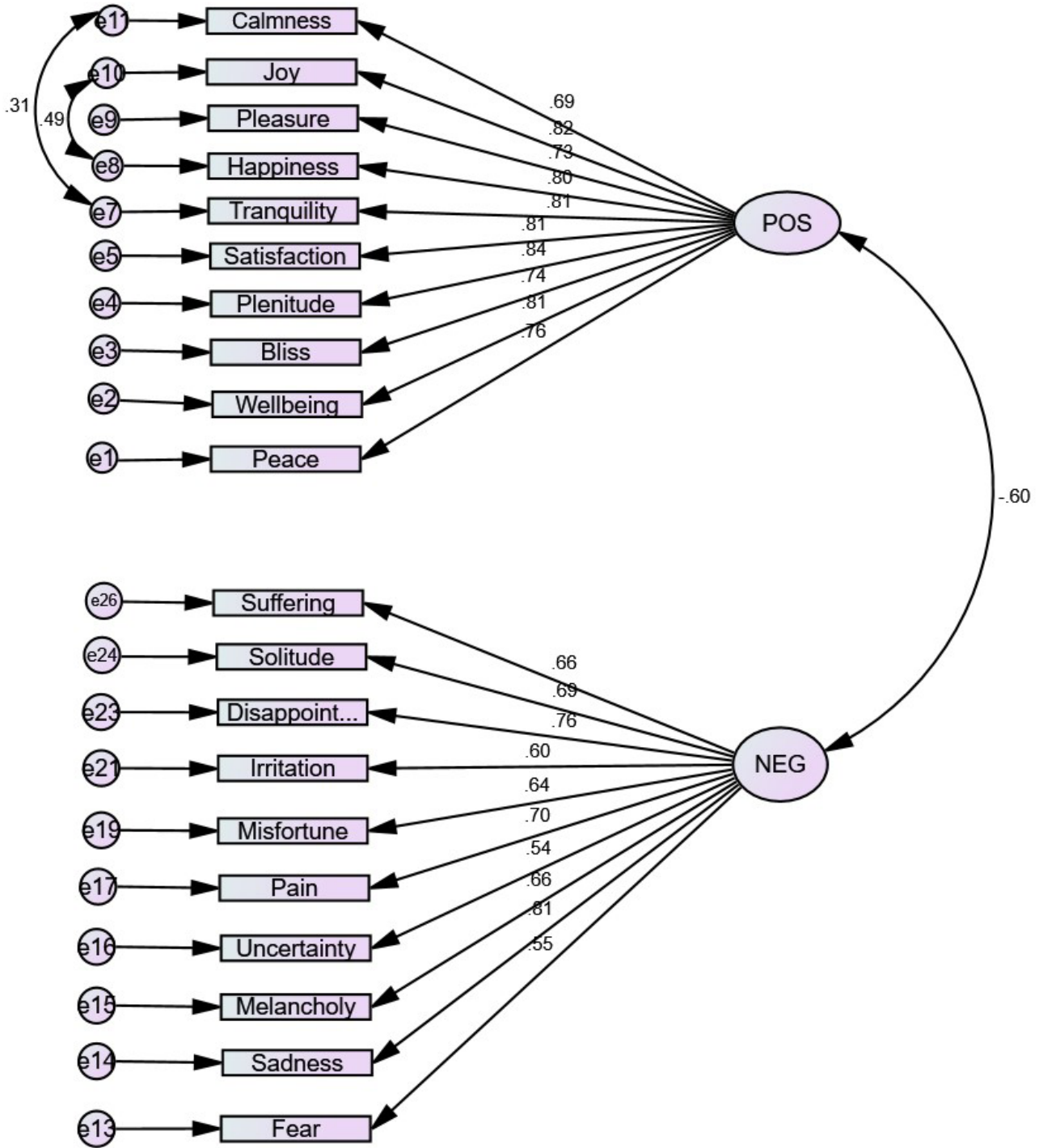
Figure 1. Two-factor structure for the Positive Affect/Negative Affect Scale

## Participants

The sample consisted of 274 Mexicans (M age = 29.23, SD = 3.44) and 345 Argentinians (M age = 28.96; SD = 2.87). The Mexican Sample consisted of 96 men, 178 women, which were mainly single (74%) (although most had a relationship), undergrad students (69%), workers (54.7%), and catholic (61%). The Argentinian sample consisted of 121 men, 224 women, which were mainly single (80%) (although most had a relationship), undergrad students (78%), workers (58%), and catholic (48%).

## Instruments

The 20-item version of Positive-Negative Affect Scale, developed earlier in this paper, was administered. Participants were asked to answer how often do they experience each of the emotions on a 5-point Likert scale (1-Never, 5-Always). Items were presented in random order. Both samples were presented with items in their original language (Spanish). Two full time professors, both with a Ph.D., and one Undergrad Psychology student (native Argentinian), all experts in Wellbeing and in Psychometrics, supervised aspects related to grammar, spelling, instructions, and items in order to guarantee high face validity.

## Procedure and statistical analysis

The data collection was carried out through online survey software such as Google Forms® and SurveyMonkey®. All participants received information regarding the general purpose of the research, and after acknowledging such information agreed to be part of the research. In all cases, the participants individually completed the instruments during working and/or school hours. No incentives were offered in return for participation. The administration of the online forms was carried out in accordance with the ethical guidelines established by the American Psychological Association (APA, 2010) and the Mexican

Society of Psychology (SMP, 2009). Analyses were conducted using IBM SPSS for Windows, version 23. The descriptive statistics and reliability were calculated in order to gain insights regarding the components of the instrument. As for assessing structural equivalence, Exploratory Factor analyses (EFA) and Tucker's congruence coefficient were conducted. Structures found in the factorial matrices were target rotated and Tucker's congruence coefficient per scale and per factor were carried out to evaluate their similarity by pairwise comparisons. Cronbach's Alpha and McDonald's ω were obtained using the open statistical platform called Jamovi Project, version 1.6 for Windows. This sample was collected through December 2019-February 2020.

## Results

Table 4 shows factor loadings for the EFA, which was fixed to look for a two-factor solution, since it has already been proven that such is the structure of Affect. The group's factor analyses also need to have the same number of factors in order to be target rotated and subjected to Tucker's congruence test. Values for Tucker's phi were 0.98 in both cases, indicating factor similarity (Lorenzo-Seva & ten Berge, 2005). This suggests that the analysis provides strong evidence of structural equivalence for the Affect Scale. Descriptive statistics, Cronbach's Alpha, McDonald's ω, and other psychometric information can also be read on Table 4. As it can be seen, percentages for explained variance were above 50% (total) for both samples, and all factor loadings suggest and adequate two-factor solution. Cronbach's Alpha and McDonald's ω both show more than adequate reliability.

An independent samples t-test was conducted to test the differences between the groups' means and its results showed a statistically significant difference only for Positive Affect [t (617) = 5.68; p < 0.001; CI 95% (.27, .56); d = .45] but not for Negative Affect [t (617) = -0.46; p > 0.05; CI 95% (-.16, .10); d = -0.03]; means show that Mexico ranks higher in Positive Affect and lower in Negative Affect.

**Table 4**
*Tucker's congruence coefficient*

| | MEXICO | | ARGENTINA | | TOTAL | | Tucker's phi Coefficient |
|---|---|---|---|---|---|---|---|
| | P-Aff | N-Aff | P-Aff | N-Aff | MX | ARG | |
| Suffering (*Sufrimiento*) | -0.29 | **0.59** | -0.32 | **0.64** | | | |
| Peace (*Paz*) | **0.69** | -0.32 | **0.68** | -0.22 | | | |
| Wellbeing (*Bienestar*) | **0.79** | -0.30 | **0.74** | -0.21 | | | |
| Solitude/loneliness (*Soledad*) | -0.39 | **0.59** | -0.31 | **0.46** | | | |
| Bliss (*Dicha*) | **0.68** | -0.32 | **0.56** | -0.18 | | | |
| Disappointment (*Desilusión*) | -0.44 | **0.64** | -0.19 | **0.66** | | | |
| Plenitude (*Plenitud*) | **0.76** | -0.32 | **0.78** | -0.19 | | | |
| Satisfaction (*Satisfacción*) | **0.79** | -0.20 | **0.78** | -0.17 | | | |
| Irritation (*Irritación*) | -0.14 | **0.71** | -0.14 | **0.52** | | | |
| Tranquility (*Tranquilidad*) | **0.76** | -0.30 | **0.69** | -0.21 | | | |
| Misfortune (*Desdicha*) | -0.26 | **0.66** | -0.34 | **0.55** | | | |
| Happiness (*Felicidad*) | **0.82** | -0.30 | **0.71** | -0.27 | | | |
| Pleasure (*Placer*) | **0.77** | -0.11 | **0.65** | -0.12 | | | |
| Pain (*Dolor*) | -0.24 | **0.67** | -0.04 | **0.62** | | | |
| Joy (*Alegría*) | **0.82** | -0.25 | **0.75** | -0.23 | | | |
| Uncertainty (*Incertidumbre*) | -0.18 | **0.55** | -0.10 | **0.64** | | | |
| Calmness (*Calma*) | **0.68** | -0.18 | **0.67** | -0.17 | | | |
| Melancholy (*Melancolía*) | -0.29 | **0.60** | -0.08 | **0.59** | | | |
| Sadness (*Tristeza*) | -0.35 | **0.72** | -0.28 | **0.70** | | | |
| Fear (*Miedo*) | -0.14 | **0.61** | -0.12 | **0.62** | | | |
| % Explained Variance | 27.46 | **27.20** | 29.20 | **28.37** | 54.66 | 57.58 | |
| Cronbach's α | .94 | .88 | .94 | .90 | .93 | .92 | |
| McDonald's ω | .94 | .88 | .94 | .90 | .93 | .92 | |
| Mean | 3.80 | 2.53 | 3.38 | 2.56 | | | |
| S.D. | .76 | .76 | .90 | 1.01 | | | |
| | | | | | | | **Positive Affect** .98 |
| | | | | | | | **Negative Affect** .98 |

Note: Items belonging to each factor are presented in bold text. Original item names (in Spanish) are shown in italics. Source: Own data.

## General Discussion

As it has been widely established (Diener, 2009; Diener, Lucas & Oishi, 2002; Diener, Lucas, Helliwell, & Schimmack, 2009; Diener, Wirtz, Tov, Kim-Prieto, Choi, Oishi, & Biswas-Diener, 2009; Diener et al., 1999; Diener et al., 2017; Diener et al., 2018), positive and negative affect are two of the three components of Subjective Well-Being, and due to the fact that they evaluate the emotional component (contrary to the cognitive element that is evaluated with life satisfaction), these components can be assessed independently. Despite the premise that culture could be determinant to the expression of traits, norms, behavior patterns, and emotional expressions (Díaz-Loving, 2018; Domínguez & Van de Vijver, 2014), it is worth noting that derived from Velasco's (2015) work, the development of an exhaustive list of positive and negative emotions proved fruitful in the

configuration of a proper measure for positive and negative affect. It all started with 96 items, and the list was later shortened to thirty, and even though ten items were eliminated, the resulting twenty proved to be theoretically adequate, are consistent within the factor they belong to, possess strong factor loadings, and are similar to those developed previously in Mexico (e.g., Calleja & Mason, 2020; Garduño et al., 2005; Moral de la Rubia, 2011) while still remaining similar to those developed around the world (e.g., Carmona-Halty & Villegas-Robertson, 2018; Diener, Wirtz, et al., 2009; Diener, Wirtz, Kim-Prieto, Choi, Oishi, & Biswas-Diener, 2010; Nima et al., 2020; Puente-Martínez, Páez, Ubillos-Landa, & Da Costa-Dutra, 2018), providing a conceptual and empirical framework that could be considered "glocal" (global+local), relevant, and pertinent.

Despite the existence of multiple instruments to evaluate affect (e.g., SPANE by Diener et al., 2010; PANAS by Watson et al., 1988), the assembly of a new scale from scratch allowed an ethnopsychological (Díaz Loving, 2018) approach, that also allowed the decision to use several items (instead of only one) and a response style (frequency) that has been proved to be useful (Velasco et al., 2016). The amount of detail and finesse of this new scale cannot be denied, since the EFA produced a list of emotions that kind of mirror one another (sadness-happiness, irritation-tranquility, suffering-pleasure, etc.), and the response properly reflects Veenhoven's (2005) temporal categorization of emotions that will further allow to properly link the frequency of emotions to other relevant measures, allowing for a proper metric.

The EFA produced two factors, which not only represents the amount suggested by the data to properly represent the construct, but is also consistent with literature (Diener et al., 2018). Two separate, well-identified factors were obtained, with factor loadings that confirm clear distinctions between both affects. In terms of construct validity, as presented by Peterson's (2000) meta-analysis, factor loading almost doubled those found in common literature, and the two-factor solution presented here exceeds the threshold of 50% of Total Explained Variance commonly used. Even more, considering that this paper is rooted in the field of social sciences, factor solutions that account close to 60% of the total variance are considered satisfactory (Hair, 2006).

As for the CFA, it is considered a more strict and restrictive procedure to confirm a number of factors that can explain an observed variable. Compared to the EFA, CFA is theory driven (hence the relevance of the glocal approach mentioned earlier) and aims to determine the ability of a predefined factor model to fit an observed set. Research suggests (Bandalos, 2018; Hu & Bentler, 1995; Mâţă, Clipa, & Tzafilkou, 2020; Muthén, L.K. & Muthén, B.O., 2012; Shek & Yu, 2014) the CFI, TLI and NFI should be above 0.90 to indicate a satisfactory model fit, with values close to 1 suggesting a very good fit, which was the case in this paper. Also, as suggested by the same authors, RMSEA values equal or below 0.05 indicate good model fit. The Akaike Information Criterion (AIC) also indicates fit and parsimony (Eaton & Willoughby, 2018).

In terms of reliability, Taber (2018) and Tavakol & Dennick (2011) suggest that values above 0.9 are excellent, which is also indicative that the number of items is adequate and good inter-relatedness between items can be observed. Values presented in this paper are not excessively high, which does not suggest that items should be revised or discarded because of redundancy (values close to .90 are recommended).

For this paper, as suggested by Pavot (2018), additional indicators were considered in order to address some of the concerns regarding current psychometric trends. Conbach's Alpha assumes unidimensionality and equal variances of and covariances between items (called the tau equivalent model). This model assumes that all items measure the same underlying variable, that they do so on the same scale, and that they are equally strongly associated to the underlying variable. Despite the fact that some research (Dunn et al., 2013; Graham, 2006; Revelle & Zinbarg, 2009; Sijtsma, 2009) suggests that these assumptions are almost always violated, we considered the inclusion of omega as an additional indicator and not as a substitution for alpha, thus providing the reader a wider scope. Omega is presented as an alternative to alpha under the premise that a congeneric model

(used in omega) is less restrictive, and therefore is less probability of a researcher violating its assumptions. The congeneric model allows item variances to differ/vary (not assumed to be constant), and omega has been shown to be a more sensible index of internal consistency (Dunn et al., 2013). The results presented here are consistent with parameters in recent research (Nájera Catalán, 2018), in which values above .80 are considered very adequate.

To go beyond traditional indexes, and in order to establish the accuracy of the new Affect Scale, one alternative is to rely on established benchmarks. One type of benchmark is provided by previously established indices that measure similar constructs to the one we are interested in (affect). Logic would suggest that these measures would correlate with our scale to demonstrate convergent validity. As suggested by Pavot (2018), more than one such measure should be included, and then measure the correlations between them with our scale. For the first part, convergent validity was established using similar measurements to those used by Krys et al. (2019a; 2019b). Satisfaction with life was chosen because it corresponds to the third nuclear component of Subjective Well-Being (Diener, 2009a; Diener et al., 1985), while Self-definition (Self-construal), Happiness, and Self-esteem were considered under Krys et al.'s premise that individual wellbeing can correlate to societal (collectivist-themed) types of wellbeing. Typically portrayed as a collectivist country (Hofstede, 2001; Hofstede et al., 2010), Mexico puts special attention to social relationships, established first and foremost with family members, then a partner, friends, and even coworkers.

To no one's surprise, correlations with Satisfaction with life proved to be strong, and conceptually adequate (Diener et al., 2018), and the association between the two types of affect showed positive relationships between happiness, self-identity, and self-esteem with positive affect, and the contrary to negative affect. As mentioned before, the collectivist nature of Mexicans promotes being agreeable, funny, sociable, and as Domínguez & Velasco (2017) mention, it seems that Mexican favor personality traits that emphasize and promote social harmony (valuing, expressing, and promoting peace, respect, generosity,

and equity upon other people in any given social context). However, the correlations between affects and Self-Construal-Independence and Self-Construal-Dependence suggest a dilemma in which the individual struggles to belong to the group and still remain independent and have an individual identity. As suggested by Velasco (2015), Mexico (being one of the most collectivist countries in the world) makes its population extremely susceptible to social pressure, in which social relationships tend to be desired and even coerced/forced. Still, the correlations with overall Self-construal index, Happiness, Satisfaction with life, and Self-esteem suggest parsimonious, conceptually sound, strong links between these variables and Affect (Krys et al., 2019a, 2019b).

A second nomological network was presented as further evidence of validity after the CFA. Again, Satisfaction with life was included since it constitutes a nuclear part of SWB; and again, as expected, correlations were conceptually consistent having positive affect correlate directly with satisfaction and negative affect correlating inversely with satisfaction. This time, as suggested by Pavot (2018), one key indicator on any individual was considered: Personality traits. Previous research (González & Velasco, 2019) suggests a strong relationship between the HEXACO personality factors and Positive-negative Affect. Honesty, Extroversion, Agreeableness, and Conscientiousness emerge as the prominent correlates (positive correlates) for Positive Affect, which brings back Hofstede's (2001; Hofstede et al., 2010) and Domínguez & Velasco (2017) premise of interpersonal harmony in collectivist cultures. This is consistent with observed inverse correlates with Negative affect. As mentioned before, the link between these variables has been explored before in a Mexican sample, and personality traits have even been used to predict positive affect (Extroversion, Agreeableness) and negative affect (Extroversion, Agreeableness, Emotionality, Openness to experience), which demonstrates the key role these variables play in an individual's wellbeing (González & Velasco, 2019). On the other hand, sociocultural adaptation refers to the ability to manage day-to-day life in any cultural context, reflecting the degree of ease at navigating one's daily

life. Being about daily life, sociocultural adaptation includes the dimensions of living environment, social morality, social service, social support, and interaction. Correlates in this paper address and prove the importance of sociocultural adaptation (SCA) as a key component in life, as the maladjustment of SCA leads to psychological distress, social withdrawal, poor life performance, among other factors (An & Chiang, 2015; Chen, Liu, & Mao, 2019).

He & Van de Vijver (2012) suggest that opting for the assembly of a new instrument maximizes the cultural suitability of such instrument, but will preclude any numerical comparison of scores across countries. Tucker's congruence coefficient has proven to be a useful indicator of structural equivalence in two or more countries involving Mexico (Aguilera, Domínguez, & Velasco, 2016; Domínguez et al., 2018), allowing comparisons within several countries despite using an instrument that was originally created for a specific sample (Mexico). Obtained values (.98 for both affects), are located within the range (above .95) needed to be considered adequate and indicate factorial similarity (Lorenzo-Seva & ten Berge, 2005; Van de Vijver & Poortinga, 1994). This means the analyses' results provide strong evidence of structural equivalence for the Affect Scale. In consequence, it is safe to assume that construct bias is minimal within these two countries, since the construct is likely understood identical across Mexico and Argentina. In other words, relevant emotions associated with the construct are present and properly sampled in each country. Further cross-cultural comparisons are encouraged in order to fully understand the extent to which these assumptions are valid, and to test for item bias and guarantee metric equivalence (He & Van de Vijver, 2012). Results also showed statistically significant differences for positive affect, in line with recent research (Helliwell et al., 2019, 2020, 2021) that tends to focus heavily in positive measures of well-being (satisfaction, wellbeing, positive affect). Results are consistent in showing here that Mexico is indeed a "happier" country in comparison to Argentina.

The Positive Affect/Negative Affect Scale for Mexicans (PANA-M) (*Escala de Afecto Positivo/Afecto Negativo en México* – APAN-M) was developed having in mind some key aspects that could, in turn, make such scale a referent in current psychological studies. The scale was developed having a solid conceptual framework from Mexico and the rest of the world, making it culturally specific, relevant, and pertinent, while still allowing for content comparisons with other existing measurements. As for the "bone structure" of the scale, the approach consisted in using multiple items to favor specificity and enough detail, complementing with a response format (frequency of emotions) that has been proven to work. This allowed for stable, apt measures of positive and negative affect. In terms of validity, construct validity was demonstrated through EFA and CFA, obtaining robust factor loadings and two conceptually distinct factors, which was consistent with existing literature. Cronbach's Alpha showed very promising features, since values were consistently located around the .90 threshold, suggesting adequate consistency without over-reaching for redundancy. McDonald's omega was included as an additional psychometric feature, since it is usually omitted in Mexican literature, and to provide the reader an insight into how much different can results be with alternative methods. Evidences of convergent validity were demonstrated by a series of Pearson correlations with other relevant variables, showing how big and important is the link between Affect and other domains of people's lives. Finally, although assembling a new instrument seems to guarantee some properties, comparisons across countries/samples is heavily compromised, which led us to use Tucker's congruence coefficient as a way to facilitate direct comparisons. Psychometry is a field filled with opportunities and room for improvement, and this work should not be considered final and absolute. Further test are encouraged in order to test validity and reliability evidences.

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## Conflict of interest

The authors have no conflicts of interests to declare.

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**Annex**
**Positive Affect/Negative Affect Scale for Mexicans (PANA-M)**
*Escala de Afecto Positivo/Afecto Negativo en México (APAN-M)*

| | Never (1) *Nunca* | Almost never (2) *Casi Nunca* | Sometimes (3) *A Veces* | Frequently (4) *Frecuentemente* | Always (5) *Siempre* |
|---|---|---|---|---|---|
| Happiness (*Felicidad*) | | | | | |
| Joy (*Alegría*) | | | | | |
| Plenitude (*Plenitud*) | | | | | |
| Satisfaction (*Satisfacción*) | | | | | |
| Calmness (*Calma*) | | | | | |
| Wellbeing (*Bienestar*) | | | | | |
| Peace (*Paz*) | | | | | |
| Bliss (*Dicha*) | | | | | |
| Tranquility (*Tranquilidad*) | | | | | |
| Pleasure (*Placer*) | | | | | |
| Suffering (*Sufrimiento*) | | | | | |
| Pain (*Dolor*) | | | | | |
| Sadness (*Tristeza*) | | | | | |
| Disappointment (*Desilusión*) | | | | | |
| Misfortune (*Desdicha*) | | | | | |
| Melancholy (*Melancolía*) | | | | | |
| Solitude/loneliness (*Soledad*) | | | | | |
| Fear (*Miedo*) | | | | | |
| Uncertainty (*Incertidumbre*) | | | | | |
| Irritation (*Irritación*) | | | | | |

*Note from the authors:* Items 1 through 10 belong to Positive Affect. Items 11 through 20 belong to Negative Affect. Text in italics show the original version (in Spanish) of the scale. Items must be presented in random order; they're shown in bulk only for illustrative purposes.