



# Predicting and Moderating the Response to the Unified Protocol: Do Baseline Personality and Affective Profiles Matter?

J. Osma<sup>1,2</sup> · O. Peris-Baquero<sup>1,2</sup> · C. Suso-Ribera<sup>3</sup> · S. Sauer-Zavala<sup>4</sup> · D. H. Barlow<sup>5</sup>

Accepted: 9 January 2021

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## Abstract

**Background** Neuroticism (N), extraversion (E), and negative/positive affect (NA/PA) are personality/affective characteristics highly related to the etiology and maintenance of emotional disorders (EDs). This study aims at exploring the moderating role of baseline personality/ and affectivity profiles in the response to a transdiagnostic psychological treatment for EDs.

**Methods** Outcomes were N, E, NA, PA, depression, and anxiety. These were assessed at baseline, post-treatment, and 3-month follow-up in 157 participants with EDs who received the Unified Protocol (UP) in group format in the Spanish Health System. A linear mixed model analysis was carried out to investigate different recovery trajectories as a function of baseline personality and affective profiles

**Results** Significant changes occurred in all variables after the UP. Medium and high baseline scores in N and NA moderate the largest changes on N, NA and E while lower baseline scores in PA and E moderate the largest changes on E and PA. Changes over time on depression and anxiety symptoms were not predicted from personality/affect baseline scores.

**Conclusion** The study results support the short-medium term utility of the UP to address all study outcomes. Moreover, personalizing interventions according to baseline personality/affect might be a sensible strategy to enhance the UP effectiveness. Trial registration number NCT03064477 (March 10, 2017).

**Keywords** Emotional disorders · Neuroticism · Extraversion · Affect · Unified protocol · Moderation analysis

## Introduction

Emotional disorders (ED), which include depression, anxiety, and related conditions (e.g., obsessive–compulsive disorders, trauma- and stressor-related disorders; Bullis et al.

2019), are the most prevalent and disabling psychiatric disorders globally (World Health Organization 2017). Traditionally, these disorders have been conceptualized as relatively independent diagnostic syndromes (American Psychiatric Association 2013). However, contemporary psychopathology research has reported evidence for the existence of two genetically-based, temperamental dimensions of personality that can account for the etiology, course, and maintenance of the full range of EDs. Specifically, these dimensions include neuroticism (N), negative affectivity (NA), extraversion (E) and positive affectivity (PA) (Brown et al. 1998; Brown and Barlow 2009).

Although many researchers have addressed N and NA and E and PA as similar personality constructs due their close conceptual and empirical overlap, they present differences. Following the description by Carl et al. (2014a, b), N is defined as the tendency to experience frequent and strong negative emotional responses (e.g., anxiety, fear, anger). N is usually accompanied by beliefs of uncontrollability and unpredictability. NA represents the affective component of personality and is associated with all EDs. E is defined as

**Supplementary Information** The online version contains supplementary material available at <https://doi.org/10.1007/s10608-021-10208-6>.

✉ J. Osma  
osma@unizar.es

<sup>1</sup> Facultad de Ciencias Sociales y Humanas, Departamento de Psicología y Sociología, Universidad de Zaragoza, C/ Atarazanas, 4, 44003 Teruel, España

<sup>2</sup> Instituto de Investigación Sanitaria de Aragón, Zaragoza, Spain

<sup>3</sup> Universitat Jaume I, Castellón, Spain

<sup>4</sup> University of Kentucky (EEUU), Kentucky, USA

<sup>5</sup> Center for Anxiety and Related Disorders, Boston University, Boston, USA

the tendency to interact with one's environment with energy, cheerfulness, sociability, and confidence. Similar to NA, PA represents an affective component of personality and is inversely associated with unipolar depression and NA.

The existence of certain personality profiles shared by individuals with EDs (i.e., high N and NA and low E and PA) has been argued to explain the high comorbidity rates in this population. The previous helps understand the increasing interest in transdiagnostic treatments that can simultaneously address co-occurring conditions by directly targeting these shared vulnerabilities (Brown et al. 2001; Brown 2007; Brown and Barlow 2009).

Despite the interest in transdiagnostic treatments that address shared vulnerability factors across EDs, it has been traditionally hypothesized that personality characteristics are likely to remain relatively stable due to their strong genetic nature (APA 2000). This is especially important for N, because this temperamental characteristic has been shown to negatively impact the maintenance and chronicity of symptoms over time (Chow and Roberts 2014; van Eeden et al. 2019), as well as individuals' perceptions of wellbeing and life satisfaction (Gale et al. 2013).

To date, there is still mixed evidence on the effectiveness of psychological interventions for the reduction of N and NA and increase in E and PA (Sauer-Zavala et al. 2017; Tirpak et al. 2019). Some studies show positive changes following a cognitive-behavioral intervention (Carl et al. 2014a, b; Roberts et al. 2017; Tirpak et al. 2019), while others report reductions in N only (Brown 2007). Others have indicated no changes in personality after psychological treatment (Davennport et al. 2010).

Various explanations have been given for the inconsistent results about the malleability of N, NA, E, and PA. These include differences in the measurement tools used (Brown 2007) or the utilization of psychological interventions that were not specifically designed to focus on personality dimensions (Carl et al. 2014a, b; Sauer-Zavala et al. 2017). In this sense, Sauer-Zavala et al. (2017) described that more consistent and encouraging results have been obtained when studies have utilized interventions specifically addressed to target this construct, such as the Unified Protocol for the Transdiagnostic Treatment of Emotional Disorders (UP; Barlow et al. 2018). One example is the randomized clinical trial conducted by Farchione et al. (2012), where 37 patients with principal diagnosis of anxiety disorders received the UP in individual format. The results indicated significant changes after 6-month follow-up in both NA and PA.

Another possible explanation for the discrepancies between investigations is that baseline personality characteristics may influence the degree to which changes on these constructs are possible. For example, Brown (2007) indicated that individuals scoring high in N were less responsive to interventions addressing anxiety—but not

depressive—symptoms. This would support the idea that more adaptive personality profiles would facilitate response to treatment. Contrary to this idea, however, Eskildsen et al. (2020) found that individuals with higher levels of baseline PA showed a reduced response to treatment, as if there was more room for improvement in individuals with a less adaptive personality profile (i.e., lower PA). Similar findings were reported by Ellard et al. (2017). Specifically, they indicated that individuals with greater emotional regulation abilities (lower N and greater emotional lability) responded poorly to the treatment, which contradicts the findings by Brown (2007). What these results suggest is that further research is needed to investigate the moderating role of baseline personality dispositions in the response to psychological interventions addressing personality changes. The present study is a step in this direction.

In the current investigation, the psychological treatment implemented to address personality changes was the UP. As noted earlier, the UP is a cognitive-behavioral treatment (CBT) specifically designed to target N and NA (Barlow et al. 2014). In addition, the UP has also been argued to have some potential utility to address E and PA due its focus on a comprehensive range of emotions, including positive ones (Tirpak et al. 2019). The UP consists of 8 treatment modules which aim at cultivating an approach-oriented stance toward emotional experiences. By doing this, reliance on emotionally-avoidant coping strategies is reduced. This approach has previously shown to effectively reduce N (Sauer-Zavala et al. 2020) and NA (Carl et al. 2014a, b), with effect sizes ranging from 0.32 to up to 0.51. Importantly, results favor the UP even when compared with active controls (i.e., traditional forms of CBT). In contrast to N and NA, mixed results have been obtained with regard to the ability of the UP to increase E and PA (Carl et al. 2014a, b; Farchione et al. 2012; Tirpak et al. 2019).

A review of the literature has revealed some threats to the external validity of existing UP trials addressing personality changes. For example, sample sizes so far have been small ( $11 \leq n \leq 47$ ), with the exception of the recent study conducted by Sauer-Zavala et al. (2020) with  $n = 223$ . In general, small sample sizes compromises the reliability and generalizability of the findings. In addition to small sample sizes, it is important to note that most interventions to date have been conducted in an individual format, in clinical samples with a primary diagnosis of an anxiety disorder, and in the same country and clinical setting (i.e., private clinical institution in the United States of America). To the best of our knowledge, only four studies have explored changes in personality/affect with the UP outside the United States of America in a group format, which limits the cross-cultural generalizability of the findings. These include three investigations in which pre-to-post treatment changes were tested (Grill et al. 2017; Laposa et al. 2017; Reinholt et al. 2017)

and a single study including a 12-month follow-up evaluation (Osma et al. 2015). Again, similar to most research conducted in the United States, these investigations included relatively small sample sizes ( $11 \leq n \leq 47$ ) and anxiety problems were overrepresented. Encouragingly, though, moderate-to-large effect sizes in N, NA, E, and PA following an UP intervention have been generally reported in these studies conducted outside the United States of America (from 0.41 to up to 1.31).

In the present investigation, we will extend research in exploring N, NA, E, and PA changes after the UP by using a larger clinical sample of patients with mixed EDs as a principal diagnosis (thus, including not only anxiety but also depressive disorders). Also different to the majority of past research, the study will be conducted in Spain, in public mental health settings, and in a group format. In fact, the use of a group format could be a relevant factor for the changes in E and PA, given the benefits that have been attributed to group interventions (i.e., the opportunity to learn from others with vicarious learning and the possibility to receive feedback and support from others thanks to social positive reinforcement) (Burlingame et al. 2013). An additional contribution of the study is that baseline personality/affective characteristics will be considered in the analysis of treatment effectiveness to investigate the predicting and moderating role of baseline personality and affective characteristics on the response to the UP treatment. Based on the literature (Bentley et al. 2020; Roberts et al. 2017), we hypothesize that moderate-to-large changes on N, NA, E, PA, depression, and anxiety will be observed after completing the UP treatment, including the follow-up. The extent to which these changes are predicted and/or moderated by personality/affect baseline characteristics will be investigated in an exploratory manner due to the aforementioned inconsistencies in the current literature (Brown 2007; Ellard et al. 2017; Eskildsen et al. 2020).

## Method

### Participants

The sample was recruited from different centers collaborating in an ongoing trial (for more detail see the published study protocol in: Osma et al. 2018). The study inclusion criteria were: (a) having a principal (most interfering and severe) ED diagnosis, (b) being over the age of 18, (c) being fluent in the language in which therapy is conducted (Spanish or Catalan in the present study), (d) being able to attend to the evaluation and treatment sessions, (e) having the ability to provide informed consent to participate in the study, and (f) maintaining the same dosages and type of pharmacological medications for at least 3 months prior to

enrolling in the study and during the whole treatment. Exclusion criteria included: (a) presenting a severe condition that would require immediate treatment, so that an interaction between both interventions could not be ruled out (i.e., a severe mental disorder such as bipolar disorder, schizophrenia, or an organic mental disorder, suicide risk at the time of assessment, or substance use in the last three months) and (b) having received 8 or more sessions of psychological treatment with clear and identifiable CBT principles in the past 5 years.

In total, 157 participants consented to treatment. Participants were, on average, 43.89 years of age ( $SD = 11.91$ ). Of these, 80.3% ( $n = 126$ ) were women. The participants' flow chart can be found in Fig. 1. Thirteen participants (8.28%) dropped out before starting the treatment, 19 (12.10%) did not complete a sufficient number of treatment sessions ( $< 8$  sessions), and 18 (11.46%) did not fill out all the required questionnaires. These drop out percentages are similar to those obtained by CBT interventions when applied individually (20%–40%) (Cooper and Conklin 2015) or in a group format (25.6%–37.84%) (Grill et al. 2017).

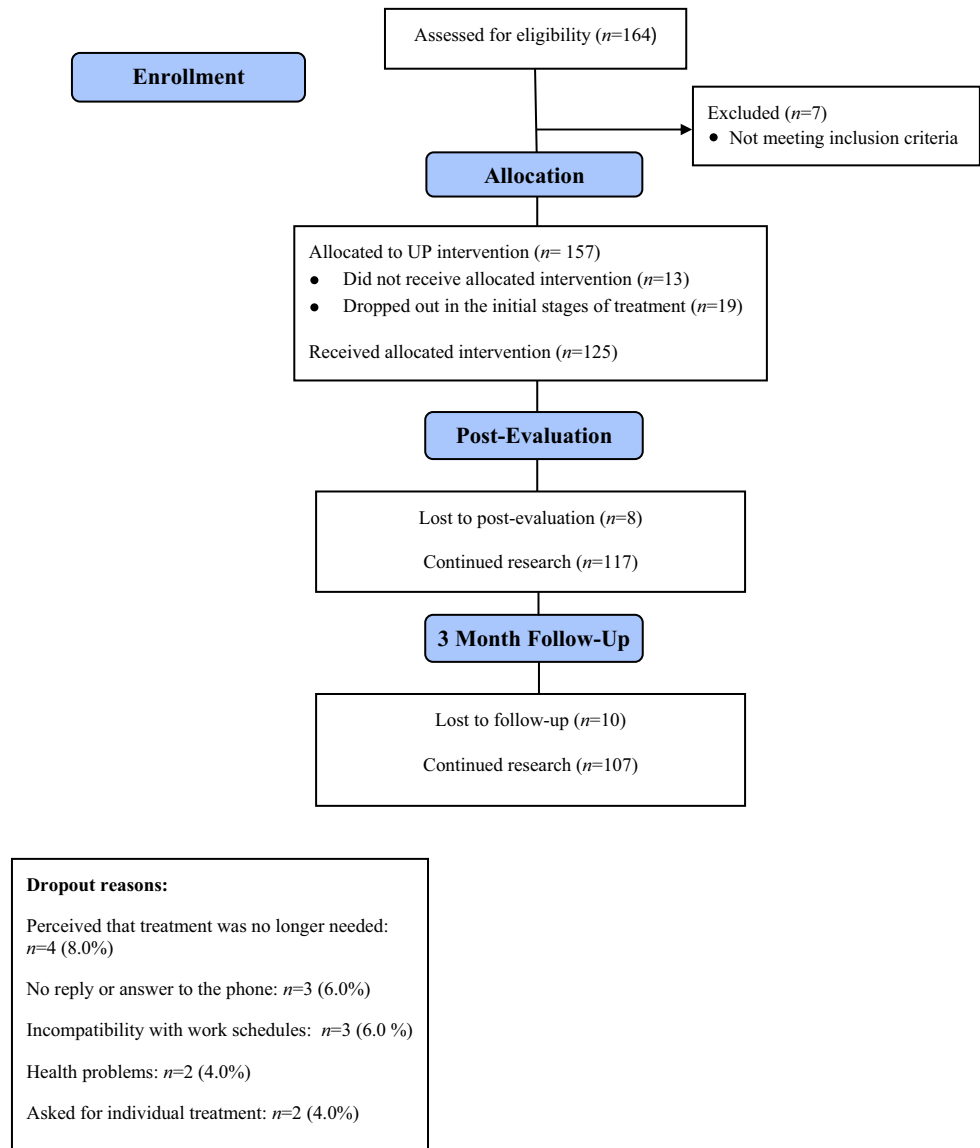
The remaining sociodemographic characteristics can be found in Table 1. The main and comorbid ED diagnosis are displayed in Table 2. The majority of participants ( $n = 121$ , 77.1%) were taking psychopharmacological treatment at the time of enrollment. Because the number of medications, their dosages, and their names were not remembered with sufficient detail by some participants, this information is not reported and is not included in the analyses.

### Measures

All the measures were obtained for administered at all assessment points (i.e., pre-treatment, post-treatment, and three-month follow-up). These included:

Anxiety Disorders Interview Schedule for DSM-IV-Lifetime Version (ADIS-IV-L; Di Nardo et al. 1994; Botella and Ballester 1997). The ADIS-IV-L is a semi-structured diagnostic clinical interview designed to assess anxiety, mood, somatoform, and substance use disorders according to the criteria of the diagnostic and statistical manual of mental disorders 4th ed. (DSM-IV; APA 1994). In this study, we used the anxiety and mood disorder sections. The ADIS-5 was not available in Spanish at the time the present investigation was conducted. Test–retest reliability of this interview is good and varies, depending on the study, from 0.68 to 1.00.

Positive and Negative Affect Schedule (PANAS; Watson et al. 1988; Sandín et al. 1999). The PANAS has 20 items measuring the frequency of positive and negative affect, with 10 items per dimension. Participants are asked to rate how much they have usually experienced a number of feelings and emotions (e.g., “Interested” for positive affect and

**Fig. 1** Flow chart of the participants in the study*Flow chart of the participants in the study*

“Distressed” for negative affect). Items use a 5-point Likert scale ranging from 1 (very slightly or not at all) to 5 (extremely). Internal consistency estimates for the Spanish version of the PANAS have been high both for men (0.89 [PA] and 0.91 [NA]) and women (0.87 [PA] and 0.89 [NA]). The internal consistency of the PANAS in the present sample was good for both scales ( $\alpha=0.88$  for PA and  $\alpha=0.89$  for NA).

NEO Five-Factor Inventory (NEO-FFI; Costa and McCrae 1999). The NEO-FFI is a self-report inventory that offers a rapid and general measure of the Big Five personality factors: Neuroticism, Extraversion, Openness to experience, Agreeableness, and Conscientiousness. This questionnaire consists of 60 items, 12 for each personality

dimension. Responses are obtained using a 5-point Likert scale ranging from 0 (totally disagree) to 4 (totally agree). The internal consistency and factor structure of the Spanish version have been satisfactory (Costa & McCrae 1999). Internal consistency estimates in the present sample were  $\alpha=0.76$  for N and  $\alpha=0.78$  for E.

The severity of depressive symptoms was measured with the Beck Depression Inventory (BDI-II; Beck et al. 1996), which was validated into Spanish by Sanz et al. (2003). Anxiety symptoms were evaluated with the Beck Anxiety Inventory (BAI; Beck and Steer 1993), which was validated into Spanish by Sanz et al. (2012). Both questionnaires were also administered at all assessment points. The BDI-II and the BAI consist of 21 items that measure the severity of

**Table 1** Socio-demographic characteristics of participants (N = 157)

Educational level	<i>n</i> (%)
<b>Less than 12 years of education</b>	52 (33.1)
Primary studies or less	27 (17.2)
Secondary studies	25 (15.9)
<b>More than 12 years of education</b>	105 (66.9)
Vocational training	50 (31.8)
University studies	42 (26.8)
High school	13 (8.3)
<b>Marital status</b>	
<b>Married/living with partner</b>	74 (47.1)
<b>Not Married/not living with partner</b>	83 (52.9)
Single	44 (28.0)
Separated/Divorced	34 (21.7)
Widowed	5 (3.2)
<b>Job status</b>	
<b>Working</b>	55 (35.0)
<b>Not working</b>	102 (65.0)
Sick leave	37 (23.6)
Unemployed	37 (23.6)
Home-maker	13 (8.3)
Student	8 (5.1)
Retired	7 (4.5)

depressive and anxiety symptoms, respectively. The scales have a 0-to-63 range. Responses are rated from 0 “absence of depressive or anxiety symptoms” to 3 “severe levels of depression or anxiety”. The internal consistency of the BDI-II and the BAI in the present sample was good ( $\alpha=0.91$  and  $\alpha=0.91$ , respectively).

**Table 2** Primary and secondary diagnoses (N = 157)

	Primary diagnosis <i>n</i> (%)	Secondary diagnosis <i>n</i> (%)
<b>Anxiety disorders</b>	78 (49.7)	27 (17.2)
Generalized anxiety disorder	18 (11.5)	4 (2.5)
Panic disorder with agoraphobia	18 (11.5)	2 (1.3)
Non-specific anxiety disorder	10 (6.4)	8 (5.1)
Panic disorder without agoraphobia	10 (6.4)	2 (1.3)
Agoraphobia	9 (5.7)	0 (0.0)
Obsessive–compulsive disorder	5 (3.2)	3 (1.9)
Hypochondria	4 (2.5)	2 (1.3)
Posttraumatic stress disorder	2 (1.3)	0 (0.0)
Social phobia	2 (1.3)	6 (3.8)
<b>Mood disorders</b>	40 (25.5)	10 (6.4)
Major depressive disorder	26 (16.6)	5 (3.2)
Dysthymia	9 (5.7)	5 (3.2)
Unspecified mood disorder	5 (3.2)	0 (0.0)
<b>Mixed disorders</b>	39 (24.8)	3 (1.9)
Adjustment disorder	39 (24.8)	3 (1.9)

## Procedure

The UP was administered according to the first edition of the Spanish manual (Barlow et al. 2011a). The 8 treatment modules of the UP were adapted to be implemented in a group format in public mental health settings in Spain. This adaptation consisted on 12, 2-h treatment sessions, at a rate of one session per week (for more detail see Osma et al. 2018). In each group, there were between 8 and 10 participants and 2 clinicians (therapist and co-therapist). All therapists in the UP group received a UP training course prior to treating participants in the study, which consisted of a 10- to 20-h group workshop divided into 2–3 sessions. All study therapists received a comparable training irrespective of the number of hours included in the training. These differences in training hours were due to the heterogeneity of the characteristics of the collaborating centers (availability of training hours due to assistance-pressure and regulations). In addition to the aforementioned preparation, all therapists received an individual training during 12 therapy sessions. Depending on the therapist’s availability, this individual training consisted of an online supervision before sessions or it involved acting as a co-therapist with a therapist with UP expertise. In both cases, the training was conducted by the lead author (replaced by J.O.), who has been certified as a UP Researcher/Trainer by the Unified Protocol Institute. All participants in the study received the workbook (Barlow et al. 2011b). Overall, the therapists participating in the study included licensed psychologists with between 8 and 20 years of experience and clinical psychology residents with 2 to 4 years of experience in delivering CBT



interventions. Fidelity was assessed during the weekly videoconferences and was clearly facilitated by the fact that the treatment was completely manualized.

This investigation has been approved by the ethical and research committees of all collaborating centers (for more detail see the published protocol in: blind citation to guarantee the author's anonymity).

## Data Analysis

Analyses were carried out using the statistical package IBM SPSS Statistics version 22.0 for Windows (IBM Corp 2013). First, sociodemographic characteristics of the sample were analyzed ( $N = 157$ ). Next, we performed a Pearson's Correlation analysis including baseline personality and affective characteristics.

Next, we performed a linear mixed model analysis with compound symmetry as a covariance structure (AL-Marshadi 2014). This analysis is appropriate to reduce bias when there is missing data (Stroup 2012). Main effects of time were used to assess if there were improvements in the study outcomes throughout the study period over time. We also compared the mean and standard deviation of each at each point in time (i.e., pre-treatment, post-treatment, and 3 months follow-up), as well as their effect sizes. Analysis of variance (Anova) was conducted to analyze whether changes were maintained from post-treatment to the 3 months follow-up. In the analyses, effect size indices will be the widely used Cohen's  $d$ . Cohen's  $d$  estimates are usually interpreted as small ( $d \approx 0.2$ ), medium ( $d \approx 0.5$ ), or large ( $d \approx 0.8$ ).

In addition to the main effects of time, we also included the main effects of baseline personality characteristics (covariates). This was done to calculate an interaction effect (baseline personality/affect \* time) to respond to the main study goal (i.e., whether baseline personality/affect predicts differential response to the UP). The results of the main effect of time will be reported both with and without the effects of the covariates and the interactions to show the extent to which the results changed with the inclusion of the covariates and the interactions.

To end, we conducted a post hoc analysis based on the results of the linear mixed models. Similar to past research (Kerig et al. 2011), to do this we categorized the baseline personality scores (i.e., N, NA, E, and PA) into low, medium, and high using a half standard deviation below and above our sample mean for each personality/affect variable that showed a statistically significant interaction effect. By doing this, we expected to distinguish subgroups of patients who presented a different evolution in study variables according to their baseline personality and affective characteristics (moderation).

## Results

### Pearson's Correlation Coefficient Between Baseline N, E and NA, PA

Pearson's Correlation analyses showed a statistically significant moderate positive correlation between N and NA ( $r = 0.63$ ,  $p < 0.001$ ) and a milder negative correlation with E ( $r = -0.19$ ,  $p = 0.016$ ) and PA ( $r = -0.26$ ,  $p = 0.001$ ). E showed a moderate positive correlation with PA ( $r = 0.48$ ,  $p < 0.001$ ) and a non-significant correlation with NA ( $r = -0.09$ ,  $p = 0.257$ ). The moderate correlation between N and NA, as well as between E and PA, suggests some conceptual overlap between variables, yet sufficient differences for these variables to be analyzed separately.

### Changes in Personality, Affect, Depression, and Anxiety after the UP Implementation

As reported in Table 3 (see "Main effect of time without covariates"), the linear mixed model analyses showed a statistically significant main effect of time on all outcomes, namely N ( $F = 39.15$ ,  $p < 0.001$ ,  $dof = 228.38$ , pre-treatment to 3-month follow-up Cohen's  $d = 0.57$ ), NA ( $F = 51.52$ ,  $p < 0.001$ ,  $dof = 234.29$ , Cohen's  $d = 0.89$ ), E ( $F = 5.47$ ,  $p = 0.005$ ,  $dof = 234.37$ , pre-treatment to 3-month follow-up Cohen's  $d = -0.29$ ), PA ( $F = 19.19$ ,  $p < 0.001$ ,  $dof = 251.39$ , pre-treatment to 3-month follow-up Cohen's  $d = -0.55$ ), depression ( $F = 99.25$ ,  $p < 0.001$ ,  $dof = 234.15$ , pre-treatment to 3-month follow-up Cohen's  $d = 0.96$ ), and anxiety ( $F = 56.31$ ,  $p < 0.001$ ,  $dof = 238.33$ , pre-treatment to 3-month follow-up Cohen's  $d = 0.79$ ). In all these cases, effect sizes were between moderate and large and the scores improved after the UP application. Changes were maintained from the post-treatment to the 3-month follow-up in all variables ( $p > 0.05$ ), except in the case of NA which slightly continued to improve (post-treatment to 3-month follow-up Cohen's  $d = 0.28$ ).

### Changes in Personality, Affect, Depression, and Anxiety after the UP Implementation when Controlling for the Covariates and their Interaction with Time.

When controlling for baseline personality and affect and their interaction with time, the effect of time on outcomes became non-significant for NA and anxiety (see "Main effect of time with covariates" on Table 3). Table 3 also shows the main effects of the covariates (baseline N, NA,

**Table 3** Main effects of the linear mixed models (N = 157)

Dependent variable	Pre-T M (SD)	Post-T M (SD)	3-MFU M (SD)	Cohen's d	Main effect of time						Main effect of the covariates							
					Without covariates			With covariates			Pre N		Pre NA		Pre E		Pre PA	
					F	p	Pre-3 MFU	F	p	Post-3 MFU	F	p	F	p	F	p	F	p
N	31.35 (7.70)	25.83 (7.23)	26.64 (8.76)	0.74	-0.10	0.57	39.15	<.001	4.31	.014	168.66	<.001	1.20	.275	0.34	.561	0.03	.856
NA	28.01 (8.78)	22.91 (8.11)	20.77 (7.34)	0.60	0.28	0.89	51.52	<.001	1.86	.157	8.49	.004	151.71	<.001	5.58	.019	4.91	.028
E	22.97 (8.05)	23.53 (5.30)	25.31 (7.97)	-0.08	-0.26	-0.29	5.47	.005	8.85	<.001	0.55	.459	0.25	.615	242.41	<.001	1.82	.179
PA	20.76 (6.43)	24.09 (8.17)	24.72 (7.79)	-0.45	-0.08	-0.55	19.19	<.001	9.10	<.001	2.16	.143	2.11	.148	0.56	.456	110.02	<.001
BDI	27.07 (12.10)	17.55 (12.97)	15.25 (12.47)	0.76	0.18	0.96	99.25	<.001	3.46	.033	1.34	.249	16.26	<.001	3.77	.054	5.54	.020
BAI	27.13 (12.95)	18.51 (13.70)	16.53 (13.85)	0.65	0.14	0.79	56.31	<.001	0.68	.509	1.54	.217	26.82	<.001	0.49	.487	0.01	.934

N neuroticism, NA negative affect, E extraversion, PA positive affect, BDI depressive symptoms, BAI anxiety symptoms, Pre Pretreatment

E, and PA), while the interaction effects of the covariates with time are reported in Table 4.

In the complete model with the covariates and their interaction with time, baseline N was associated with higher N ( $F = 168.66, p = <0.001, dof = 187.12$ ) and NA ( $F = 8.49, p = 0.004, dof = 182.18$ ) scores across the study (i.e., participants with a baseline profile characterized by high N indicated having higher N and NA at all assessment points). Similarly, those with high baseline NA reported experiencing higher NA ( $F = 151.71, p = <0.001, dof = 166.83$ ), depression ( $F = 16.26, p = <0.001, dof = 162.37$ ), and anxiety ( $F = 26.82, p = <0.001, dof = 159.39$ ) at all assessment points. Baseline E was associated with lower NA ( $F = 5.58, p = 0.019, dof = 181.05$ ) and higher E ( $F = 242.41, p = <0.001, dof = 185.10$ ) across the study. Finally, those with high baseline PA indicated experiencing lower NA ( $F = 4.91, p = 0.028, dof = 160.94$ ), higher PA ( $F = 110.02, p = <0.001, dof = 163.19$ ), and lower depression ( $F = 5.54, p = 0.020, dof = 156.63$ ) across the study.

As noted in the previous lines, the results of the interaction effects between baseline N, NA, E, and PA with time can be found in Table 4. The post hoc analyses to facilitate the interpretation of these interactions are reported in Table 5. An interaction effect of baseline N\*time ( $F = 24.01, p < 0.001, dof = 275.30$ ), NA\*time ( $F = 3.91, p = 0.021, dof = 263.88$ ) and baseline E\*time ( $F = 3.82, p = 0.023, dof = 274.03$ ) was found in the evolution of N. This means that the participants' baseline levels of N, NA, and E predicted changes in N during the course of treatment. The post hoc analyses (Table 5) helped interpret these moderation results. For N, the effect of time was not significant when patients presented a baseline profile characterized by low N ( $F = 0.83, p = 0.442, dof = 55.70$ , pre-treatment to 3-month follow-up Cohen's  $d = 0.01$ ) or low NA ( $F = 2.51, p = 0.089, dof = 64.50$ , pre-treatment to 3-month follow-up Cohen's  $d = 0.12$ ). Conversely, large reductions in N from baseline to the 3-month follow-up emerged for the remaining levels of baseline N or NA (i.e., Cohen's  $d \geq 0.86$  when baseline N and NA were medium or high). Reductions in N were more modest at certain levels of baseline E (i.e., low E;  $F = 21.12, p < 0.001, dof = 59.32$ , pre-treatment to 3-month follow-up Cohen's  $d = 0.35$ , representing a small effect). Reductions in N were doubled when participants reported lower (i.e., medium or high) baseline scores in E (Cohen's  $d$  between 0.67 and 0.72).

Interaction effects of baseline N\*time ( $F = 6.34, p = 0.002, dof = 277.13$ ) and baseline NA\*time ( $F = 49.99, p < 0.001, dof = 268.51$ ) were then observed in the prediction of NA, which should be interpreted as indicating that the participants' baseline scores in N and NA predicted a differential evolution of NA after the UP treatment. Similar to N, when the participants presented low N ( $F = 4.69, p = 0.013, dof = 59.79$ , pre-treatment to 3-month follow-up Cohen's

**Table 4** Interaction effects of the linear mixed models (N = 157)

Dependent variable	Pre N*time		Pre NA*time		Pre E*time		Pre PA*time	
	<i>F</i>	<i>p</i>	<i>F</i>	<i>p</i>	<i>F</i>	<i>p</i>	<i>F</i>	<i>p</i>
Neuroticism	24.01	<.001	3.91	0.021	3.82	0.023	2.67	0.071
Negative Affect	6.34	.002	49.99	<.001	2.55	0.080	2.20	.113
Extraversion	4.65	.010	5.21	0.006	74.95	<.001	3.43	.034
Positive Affect	1.04	0.355	1.10	0.336	0.36	0.700	18.29	<.001
Depression	0.97	0.381	1.32	0.268	0.22	0.805	2.50	0.084
Anxiety	1.14	0.323	1.77	0.172	0.35	0.706	0.29	0.748

*N* neuroticism, *NA* negative affect, *E* extraversion, *PA* positive affect, *Pre* Pretreatment

$d=0.55$ ) or low NA baseline scores ( $F=0.14$ ,  $p=0.869$ ,  $dof=76.75$ , pre-treatment to 3-month follow-up Cohen's  $d=0.09$ ) reductions in NA were either non-significant or much smaller in size compared with participants presenting medium or high baseline N or NA (Table 5). When baseline N or NA were medium or high, changes in NA were significant and large in size (Cohen's  $d$  over 1.13 in all cases).

An interaction effect of baseline N\*time ( $F=4.65$ ,  $p=0.010$ ,  $dof=276.01$ ), NA\*time ( $F=5.21$ ,  $p=0.006$ ,  $dof=264.89$ ), E\*time ( $F=74.95$ ,  $p<0.001$ ,  $dof=274.80$ ), and baseline PA\*time ( $F=3.43$ ,  $p=0.034$ ,  $dof=262.03$ ) were observed in the prediction of E. This means that changes in E over time were dependent on the participants' baseline levels of N, NA, E, and PA. Specifically, as reported in Table 5, changes in E were non-significant when participants reported low levels of baseline N ( $F=3.62$ ,  $p=0.034$ ,  $dof=47.36$ , pre-treatment to 3-month follow-up Cohen's  $d=-0.01$ ) or NA ( $F=0.14$ ,  $p=0.866$ ,  $dof=66.21$ , pre-treatment to 3-month follow-up Cohen's  $d=-0.04$ ). Conversely, increases in E were significant, yet small when baseline N and NA were medium or high (Cohen's  $d$  between  $-0.33$  and  $-0.43$ ). Changes in E were also dependent on baseline E and PA levels. Particularly, effect sizes were small and in the opposite direction (i.e., reductions in E) in participants with high levels of baseline E ( $F=38.91$ ,  $p<0.001$ ,  $dof=78.97$ , pre-treatment to 3-month follow-up Cohen's  $d=0.23$ ) and non-significant in persons with high baseline PA ( $F=3.21$ ,  $p=0.046$ ,  $dof=68.64$ , pre-treatment to 3-month follow-up Cohen's  $d<0.01$ ). Changes in E were all significant, larger, and in the expected direction (i.e., increase in E) when baseline E and PA were medium or small (Cohen's  $d$  between  $-0.40$  and  $-0.95$ ).

Finally, an interaction effect of baseline PA\*time ( $F=18.29$ ,  $p<0.001$ ,  $dof=264.71$ ) emerged in the prediction of changes in PA, thus showing that the evolution of PA across the study was dependent on baseline PA scores. As indicated in Table 5, changes in PA were not significant at high baseline levels of PA ( $F=0.54$ ,  $p=0.586$ ,  $dof=78.81$ , pre-treatment to 3-month follow-up Cohen's  $d=0.14$ ). On the contrary, increases in PA were significant and large in size when baseline PA was medium or low (medium positive

affect:  $F=6.92$ ,  $p=0.002$ ,  $dof=42.60$ , pre-treatment to 3-month follow-up Cohen's  $d=-1.18$ ; low PA:  $F=32.27$ ,  $p<0.001$ ,  $dof=32.27$  pre-treatment to 3-month follow-up Cohen's  $d=-1.05$ ).

No interaction effects between baseline personality/affect scores and time were revealed for depression and anxiety, which means that changes in depression and anxiety during the course of the study were not dependent on baseline personality/affect scores.

The parameters of the moderation models can be seen in detail in the supplementary material.

## Discussion

The aim of this study was to examine whether changes in N, NA, E, PA, depressive and anxiety symptoms in a sample of patients with mixed principal ED diagnosis following a UP treatment delivered in a group format were dependent on baseline personality/affect characteristics. Overall, the study results support the short-to-mid term utility of the UP to address all study outcomes (i.e., changes were occurred at post-treatment and were maintained three months after treatment termination). The moderation analyses suggested that changes in N, NA, E, and PA after the UP intervention might be larger, in general, when participants present higher baseline scores in N and NA and lower baseline scores in E and PA. Conversely, the results support the idea that individuals with EDs presented comparable improvements in depressive and anxiety symptomatology irrespective of their baseline personality/affective profile.

In the present study, we hypothesized that the UP would have moderate-to-large effects on N, NA, E, PA, depressive and anxiety symptoms, including the follow-up. Overall, the present study findings are in line with past research in showing that the UP is more effective in changing NA compared to PA in both, studies applying the UP in group format (Grill et al. 2017; Laposa et al. 2017; Reinholt et al. 2017) and through Internet (González-Robles et al. 2019). In the pilot study by González-Robles et al. (2019) a positive affect regulation component was added to the UP in one of



**Table 5** Post hoc analyses of the interactions from the linear mixed models (N=157)

Dependent variable	Moderator	Pre-T	Post-T	3-MFU	<i>F</i>	<i>p</i>	<i>Cohen's d</i>		
		M (SD)	M (SD)	M (SD)			Pre-to-post-T	Post-T to 3-MFU	Pre-T to 3-MFU
N	Pre N								
	Low	21.45 (5.53)	22.14 (8.07)	21.37 (8.32)	0.83	.442	-0.10	0.10	0.01
	Medium	31.17 (2.18)	25.70 (6.49)	24.81 (7.49)	30.25	<.001	1.13	0.13	1.15
	High	39.87 (2.70)	29.28 (6.19)	33.61 (7.10)	51.71	<.001	2.22	-0.65	1.16
	Pre NA								
	Low	24.91 (7.81)	22.09 (7.34)	23.88 (8.55)	2.51	.089	0.37	-0.22	0.12
	Medium	32.12 (5.80)	25.31 (5.54)	25.55 (8.03)	30.98	<.001	1.20	-0.03	0.94
	High	36.57 (4.82)	30.17 (6.86)	30.42 (8.89)	16.29	<.001	1.08	-0.03	0.86
	Pre E								
Low	32.89 (7.81)	24.74 (6.00)	30.07 (8.41)	21.12	<.001	1.17	-0.73	0.35	
Medium	32.16 (6.01)	27.61 (7.68)	26.78 (8.60)	16.20	<.001	1.07	0.14	0.72	
High	29.00 (8.86)	24.63 (7.33)	23.23 (8.26)	10.29	<.001	0.54	0.18	0.67	
NA	Pre N								
	Low	20.40 (6.38)	19.00 (6.20)	16.72 (6.90)	4.69	.013	0.22	0.35	0.55
	Medium	28.82 (8.35)	22.86 (8.55)	20.30 (6.12)	29.88	<.001	0.70	0.34	1.16
	High	33.21 (6.57)	26.41 (7.36)	25.10 (7.71)	22.64	<.001	0.97	0.17	1.13
	Pre NA								
	Low	17.70 (3.66)	17.38 (4.77)	17.23 (6.58)	0.14	.869	0.07	0.03	0.09
	Medium	27.65 (2.58)	22.31 (7.59)	20.27 (6.55)	29.31	<.001	0.94	0.29	1.48
	High	38.37 (3.94)	29.09 (7.24)	25.03 (7.24)	62.23	<.001	1.59	0.56	2.29
	Pre E								
Low	25.00 (8.70)	22.75 (5.63)	25.05 (8.48)	3.62	.034	0.31	-0.32	-0.01	
Medium	23.70 (7.73)	23.26 (5.54)	26.88 (8.21)	7.25	.001	0.06	-0.52	-0.40	
High	20.25 (7.35)	24.69 (4.47)	22.57 (6.53)	7.22	.001	-0.73	0.38	-0.33	
E	Pre NA								
	Low	23.48 (8.68)	23.09 (5.89)	23.85 (9.08)	0.14	.866	0.05	-0.10	-0.04
	Medium	23.03 (8.20)	24.02 (3.35)	25.95 (7.39)	3.27	.043	-0.16	-0.34	-0.37
	High	22.43 (7.35)	23.29 (6.79)	25.68 (7.84)	3.76	.028	-0.12	-0.32	-0.43
	Pre E								
	Low	13.33 (3.75)	22.16 (4.58)	19.32 (8.04)	34.61	<.001	-2.11	0.43	-0.95
	Medium	22.99 (1.94)	23.30 (6.14)	25.56 (5.88)	5.24	.007	-0.07	-0.37	-0.59
	High	31.85 (4.16)	24.85 (4.54)	30.57 (6.59)	38.91	<.001	1.61	-1.01	0.23
	Pre PA								
Low	19.76 (7.24)	22.44 (5.84)	22.80 (7.74)	5.32	.006	-0.41	-0.05	-0.40	
Medium	24.73 (7.10)	23.56 (4.83)	29.75 (6.04)	7.26	.002	0.19	-1.13	-0.76	
High	27.58 (7.43)	25.41 (3.93)	27.55 (7.78)	3.21	.046	0.36	-0.35	0.00	
PA	Pre PA								
	Low	15.85 (3.13)	21.23 (7.14)	22.14 (7.89)	32.27	<.001	-0.97	-0.12	-1.05
	Medium	22.15 (0.75)	27.38 (8.27)	27.59 (6.47)	6.92	.002	-0.89	-0.03	-1.18
	High	28.50 (3.88)	27.62 (8.10)	27.70 (6.79)	0.54	.586	0.14	-0.01	0.14

N neuroticism, NA negative affect, E extraversion, PA positive affect, Pre Pretreatment

the conditions and they found increased pre-to-post-treatment effect sizes on PA (Hedge's  $g$  with the PA component  $g = -1.34$ ; Hedge's  $g$  without the PA component  $= -0.77$ ). However, results still indicated that effect sizes were larger for NA in both conditions (Hedge's  $g$  between 1.80 and 1.96). In contrast to the previous results, Farchione et al.

(2012) found larger effects of individual UP on PA (Hedges  $g = -0.77$ ) than on NA (Hedges  $g = 0.40$ ) when applying the UP in individual format. Interestingly, though, the present investigation evidenced effect sizes for PA similar to those obtained for N, which supports some previous research indicating that the UP not only leads to changes in "negative"

personality/affect characteristics, but also might promote the enhancement of positive affect states (Osma et al. 2015; Reinholt et al. 2017). In general, these findings suggest that more work is still needed if we want the benefits on PA to be comparable to those on NA in persons with EDs following cognitive-behavioral interventions, including the transdiagnostic treatment (Carl et al. 2013, 2014a, b).

Two important findings of the present study in relation to the effectiveness of group UP included the reduction in N and NA, the increase in E and PA, and the maintenance of the changes three months after treatment completion. With the exception of the investigation by Osma et al. (2015), past research had only explored the ability of a group UP intervention to change NA/PA at post-treatment (Grill et al. 2017; Laposa et al. 2017; Reinholt et al. 2017). Thus, the inclusion of temperamental characteristics (i.e., N/E) and the exploration of the durability of changes after treatment completion are strong points of the current study. Consistent with the study by Osma et al. (2015) and in line with the idea that personality characteristics might be more malleable than initially assumed (Barlow et al. 2014), the present investigation results revealed significant changes in N (Cohen's  $d=0.57$ ) and also, in E (Cohen's  $d=-0.26$ ) from pre-treatment to 3 months after treatment completion. These findings suggest that the treatment components included in the UP might tap into key psychological mechanisms associated with how individuals perceive and react to daily emotional experiences (i.e., emotion regulation), as anticipated by the developers of the UP (Barlow et al. 2014). Also importantly, effect sizes were similar to those obtained in studies exploring more short-term changes after a group UP intervention (i.e., post-treatment changes only; Grill et al. 2017; Laposa et al. 2017; Reinholt et al. 2017). The fact that changes occur after a group UP intervention and are maintained at least three months after treatment completion might be important for our societies, specially in the case of N, due its direct and indirect related costs (Cuijpers et al. 2010).

Another important finding was that significant reductions in depressive and anxiety symptoms occurred and were maintained after a group UP intervention in persons with EDs. While less novel, this results adds to the body of research on the effectiveness of the UP in a group format (Cassello-Robbins et al. 2020), but also shows that these changes can be obtained in public health settings. Again, taking the economic and emotional burden associated with depressive/anxiety symptomatology (OECD/EU 2018) and the cost-effective benefits of using group interventions in public health settings (Norton 2012), these results are likely to be important for our societies and the individuals.

One of the key study contributions was the exploration of the moderating role of baseline personality/affect characteristics in the response to a group UP intervention, which was argued to be important for personalized treatments. As

noted earlier, contradictory findings had been reported in the literature exploring the moderating role baseline personality/affect when predicting the response to psychological treatment for EDs. The present study findings revealed that changes in personality and affect were more modest or non-significant when individuals presented a baseline profile characterized by low N and NA and high E and PA. These results are consistent with the findings obtained by Ellard et al. (2017) and Eskildsen et al. (2020), but contradict the findings of Brown (2007). What our results and those by Ellard et al. (2017) and Eskildsen et al. (2020) suggest is that there might be more room for improvement in personality/affect outcomes in individuals with a more maladaptive personality/affective profile (i.e., high N/NA and low PA). It is important to note that the present study is, to the best of our knowledge, the first to focus on the moderating role of personality/affect in the ability to change personality/affect – past research has focused on symptomatology (i.e., anxiety/depressive symptoms). Additionally, due to the exploratory nature of the work,  $p$  values were not adjusted even though numerous comparisons were made. Therefore, the replicability of these findings should be addressed in further research. Once the direction of the moderations becomes clear with sufficient replication studies, appropriate theoretical explanations for these findings will be feasible (i.e., room for change vs barrier for change hypotheses with respect to high N/NA and low E/PA).

Ultimately, these results might be important for personalized treatments, a key line of research to maximize the efficiency of current interventions for EDs. According to these findings, the UP in a group format might be a cost-effective psychological treatment for patients with a baseline personality/affect profile characterized by high or medium N and NA and medium or low E and PA. Conversely, it is possible that individuals with EDs reporting low N and NA and high E and PA profiles require fewer demanding interventions (e.g., online treatments or bibliotherapy) because of their arguably favorable baseline personality/affect. This suggestion (i.e., applying less intensive interventions for less severe patients) is consistent with stepped-care interventions, which are being effectively applied in different settings (Meuldijk and Wuthrich 2019). The present study findings are novel in the sense that they support the idea that baseline personality/affect characteristics might be used to make such decisions when applying the UP in a group format. Note, however, that these practices might not be necessary for all outcomes (i.e., depression or anxiety), as indicated in our moderation analyses. Again, however, these findings are in line with treatment personalization in the sense that different treatment plans might be recommendable as a function of the individuals' needs.

Strengths of the study include the implementation of a 3-month follow-up assessment to explore the stability and

change of scores after treatment completion, the recruitment of a sufficiently powered sample, the analysis of change as a function of baseline personality and affective characteristics, and the implementation of the study in a naturalistic setting (Spanish public mental health system). This study certainly has some limitations. The first one refers to the exploratory nature of the work and the fact that the alpha level was not adjusted despite the large number of comparisons, again due to the exploratory nature of the investigation. In this sense, while the study findings might be informative and promising, replication is needed. Another limitation refers to the number of implemented UP sessions, that is, 12 weekly sessions of 2 h each (Osma et al. 2018). While this adaptation of a pre-established number of sessions and content is a frequent practice in group therapy, most research on the UP has implemented individual treatments that take into account the primary diagnosis in accordance with published guidelines to offer a variable number of UP sessions (Steele et al. 2018). Another shortcoming refers to the possible influence of the clinicians' mastery or experience in the application of the UP. While the results are encouraging and suggest that the desired goals were generally met, it is possible that the homogeneity in the UP training and type of supervision of the clinicians would have yielded even better results. Also importantly, the findings reported here do not include an active comparator treatment, so changes cannot be unequivocally attributed to the UP and could also be explained by uncontrolled factors (i.e., natural evolution). Other limitations are the imposition of categories (low, medium, and high) in the post hoc analyses based on standard deviations and sample means. Even though this is a frequent practice to interpret the moderation analyses, the use of relatively arbitrary cutoffs (e.g., Campbell et al. 2017) and categories (e.g., Nielsen et al. 2010) can make the generalization of the results more challenging. While acknowledging this, the fact that the results and effect sizes obtained are similar to previous investigations is encouraging. Another aspect to take into account is that most of the sample was represented by female participants (77%). This is line with scientific studies that mention that the prevalence rate of EDs is higher in women (i.e., depression is more common among females (5.1%) than males (3.6%); World Health Organization 2017), so the results should be generalizable to the population with EDs attending public health settings in Spain. Finally, this study took place in public mental health settings in Spain, so the conclusions might not be generalizable to other contexts such as community or social services.

In addition to the aforementioned limitations, future lines of research should also be considered in the light of the present study findings. For example, research that includes an active treatment condition and longer follow-ups are needed to better establish the effectiveness of the UP. Additionally, more information is required to determine how the severity

of the initial anxiety and/or depressive symptomatology interacts with personality/affect baseline scores, as well as how these interactions are related to the recovery trajectories and the evolution of comorbidity. It is also important to note that studies with longer follow-up times are needed to investigate whether more time is required to observe changes in E/PA compared to N/NA. It would also be interesting to explore whether baseline personality and affectivity differences exist across main diagnoses and whether these are important predictors of the response to the UP. Similarly, it would be interesting to explore whether a personalized UP intervention based on baseline personality and affectivity profiles indeed enhances the effectiveness of the intervention.

## Conclusion

While acknowledging some study limitations and required future studies, this study has made a number of significant contributions to the literature into the effectiveness of the UP to change personality and affective characteristics. In line with existing research, our results suggest that the UP administered in group format is likely to be effective to reduce N and NA, and increase E and PA. Our results also indicated that the UP might be effective in producing stable changes in all study outcomes (i.e., maintained at 3-month follow-up), which might be important in terms of societal costs and personal emotional suffering. These findings are also important as they contradict some traditional beliefs about the inalterability of temperamental characteristics and support the idea that these might change in response to an appropriate treatment (i.e., UP). Finally, the study revealed that there might be more room for improvement in some personality/affective factors when baseline personality/affective characteristics are less favorable (i.e., high/moderate N and NA and low/moderate E and PA). This might help maximize the cost-effectiveness ratio of UP interventions in a group format (e.g., stepped-care).

**Acknowledgements** We would like to thank all collaborating centers, all healthcare professionals, and all volunteers and participants that made this study possible.

**Funding** The study was funded by Gobierno de Aragón and cofinanced by FEDER 2014-2020 "Construyendo Europa desde Aragón" Grant No: (S31\_20D), Funding for the study was provided by the PI17/00320 project integrated in Plan Estatal de I+D+I 2013-2016 and co-funded by the "ISCIII-Subdirección General de Evaluación y Fomento de la investigación del Fondo Europeo de Desarrollo Regional (FEDER). Otra manera de hacer Europa Grant No: (PI17/00320)

**Data Availability** The datasets generated during and/or analysed during the current study are available from the corresponding author on reasonable request.

## Compliance with Ethical Standards

**Ethical Approval** This research was conducted with the approval of the ethics committee of all collaborating centers and all participants signed an informed consent prior to participation. All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. This article does not contain any studies with animals performed by any of the authors.

**Consent to Participate** Informed consent was obtained from all participants included in the study.

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