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Research paper

Worry, rumination and negative metacognitive beliefs as moderators of outcomes of Transdiagnostic group cognitive-behavioural therapy in emotional disorders

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ABSTRACT

Background: Despite the relevance of cognitive processes such as rumination, worry, negative metacognitive beliefs in emotional disorders, the existing literature about how these cognitive processes moderate the effect of treatment in treatment outcomes is limited. The aim of the present study was to explore the potential moderator effect of baseline cognitive processes—worry, rumination and negative metacognitive beliefs—on the relationship between treatment allocation (transdiagnostic cognitive-behavioural therapy —TD-CBT plus treatment as usual—TAU vs. TAU alone) and treatment outcomes (anxiety and depressive symptoms, quality of life [QoL], and functioning) in primary care patients with emotional disorders.

Methods: A total of 631 participants completed scales to evaluate worry, rumination, negative metacognitive beliefs, QoL, functioning, and anxiety and depressive symptoms.

Results: Worry and rumination acted as moderators on the effect of treatment for anxiety (b = −1.25, $p = .003$; b = −0.98, $p = .048$ respectively) and depressive symptoms (b = −1.21, $p = .017$; b = −1.34, $p = .024$ respectively). Individuals with higher baseline levels of worry and rumination obtained a greater reduction in emotional symptoms from the addition TD-CBT to TAU. Negative metacognitive beliefs were not a significant moderator of any treatment outcome.

Limitations: The study assesses cognitive processes over a relatively short period of time and uses self-reported instruments. In addition, it only includes individuals with mild or moderate anxiety or depressive disorders, which limits generalization to other populations.

Conclusions: These results underscore the generalization of the TD-CBT to individuals with emotional disorders in primary care with different cognitive profiles, especially those with high levels of worry and rumination.

1. Introduction

Anxiety and depressive disorders are two of the most common mental disorders worldwide (Steel et al., 2014). These mental disorders are often first identified in the primary care setting. Consequently, the general practitioner (GP) plays a vital role in correctly diagnosing and

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treating these disorders. The prevalence rates of mood and anxiety disorders in primary care is estimated at 13.4 % and 18.5 %, respectively (Serrano-Blanco et al., 2010). These disorders are highly prevalent in the primary care setting (Roca et al., 2009) and both are associated with a substantial functional impairment (Alonso et al., 2004) and poor quality of life (QoL) (Hansson, 2002; Mendlowicz and Stein, 2000).

The National Institute for Health and Care Excellence guidelines recommend cognitive-behavioural therapy (CBT), an empirically-validated treatment, for the management of depression and anxiety (Murray and Cartwright-Hatton, 2006). Hofmann et al. (2012) concluded in their review of meta-analyses that the evidence-base of the efficacy of CBT for treating emotional disorders is very strong, being highly cost-effective. In the same line, a study conducted in the primary care setting in Spain—the PsicAP clinical trial—demonstrated the efficacy of adding transdiagnostic CBT (TD-CBT) to treatment as usual (TAU) in patients with emotional disorders. The results of that trial revealed a significant improvement in anxiety and depressive symptoms, functioning, and QoL in the experimental group, which were maintained over the 12-month follow-up period (Cano-Vindel et al., 2021). Despite the high prevalence of these emotional disorders, and the wide availability of empirically-validated treatments, a significant proportion of people do not respond adequately to treatment (Hofmann et al., 2012; Hofmann and Smits, 2008; Loerinc et al., 2015; Norris and Kendall, 2020). For this reason, it is vitally important to achieve a better understanding of the processes that determine treatment response (Hofmann and Hayes, 2019). In this regard, it would be key to identify the moderators of treatment outcomes in patients with these disorders, which would permit the development of more personalized and effective treatments. In turn, this would also help to identify the individuals most likely to benefit from a given treatment. In short, a better understanding of all these factors would likely improve treatment outcomes and potentially reduce costs.

To our knowledge, the study of moderators in anxiety and depressive disorders has received only limited attention in the published literature (Norris and Kendall, 2020; Sørheim Nilsen et al., 2012). However, the available studies in patients with anxiety and depression have shown that symptom severity at baseline has a moderating effect on treatment outcomes (Driessen et al., 2010; González-Blanch et al., 2021; Schneider et al., 2015). Other studies have shown that other factors, such as experiential avoidance (Wolitzky-Taylor et al., 2012) and medication use (González-Blanch et al., 2021) moderate the relationship between treatment and emotional symptoms. Interestingly, most studies have found that sociodemographic variables have no moderating effect on treatment outcomes (Nilsen et al., 2013; Schneider et al., 2015), with the notable exception of the study by González-Blanch et al. (2021), in which marital and employment status were found to moderate short-term treatment outcomes.

In a wide range of mental disorders, it has been well-established that cognitive style is one of the main causes underlying the development and maintenance of symptoms (Beck et al., 1987; Beck et al., 2005; Ryum et al., 2017). Although many different cognitive processes are involved in emotional disorders, three of the most important processes are worry, metacognition and rumination. Worry refers to a series of uncontrollable, negative affect-laden thoughts and/or images intended to provide a mental solution to a problem, the outcome of which is unknown (Borkovec et al., 1983). Rumination refers to a series of repeated thoughts about negative emotions and symptoms (i.e., disturbing events, personal worries, etc.) (Nolen-Hoeksema and Morrow, 1991; Watkins, 2004). Worry is usually focused on problem solving and more future-oriented while rumination usually concerns issues of loss, commonly focusing on past problems (Olatunji et al., 2013). Metacognition refers to the awareness of one's own thought processes; in other words, the ability to monitor and control one's own cognitive processes (Dunlosky and Metcalfe, 2008). Studies show that these cognitive processes are significant and positive predictors of anxiety and depressive symptoms (Capobianco et al., 2020; Huntley and Fisher, 2016; Olatunji et al., 2013; Ryum et al., 2017). Bredemeier et al. (2020) found that the baseline rumination level was a predictor of posttreatment QoL outcomes, although the predictive power of this variable waned over time. In a recently published study, worry, rumination and negative metacognition had a mediating role on the effect of TD-CBT on emotional disorders (Muñoz-Navarro et al., 2022), and negative metacognitive beliefs was also a mediator between TD-CBT and QoL.

Our understanding of how these cognitive processes moderate treatment outcomes is limited. Some studies have shown that the severity of worry moderates CBT outcomes in patients with anxiety (Schneider et al., 2015; Westra et al., 2009). Similarly, Liao and Wei (2011) and Dar et al. (2017) found that both rumination and worry acted as moderators between intolerance to uncertainty and emotional symptoms. Another study found that negative metacognitive beliefs moderated the relationship between anxiety and stress (Ryum et al., 2017). In another study (Barrio-Martínez et al., 2022) we found that emotion regulation strategies (specifically expressive suppression and cognitive reappraisal) moderate the effects of TD-CBT on treatment outcomes. More specifically, we found that individuals with higher levels of expressive suppression and cognitive reappraisal at baseline experienced a greater benefit (improved QoL) from TD-CBT + TAU and that a higher level of expressive suppression was associated with a greater improvement in emotional symptoms with the addition of TD-CBT to TAU. In line with meta-analytic evidence suggesting separate underlying factors for different emotion regulation strategies (Naragon-Gainey et al., 2017), we analysed the moderating effect of two dimensions from the Emotion Regulation Questionnaire (ERQ) (i.e., cognitive reappraisal and expressive suppression) in a previous study (Barrio-Martínez et al., 2022), and in the present study we focused on maladaptive, cognitive, emotion regulation strategies related to repetitive negative thinking (worry and rumination) and negative metacognitive beliefs regarding repetitive thinking all known to contribute to psychopathology.

The studies conducted to date in this area of research have reported inconsistent results, in part due to the limitations of those studies, especially the small sample sizes, which limits the power to detect true moderating effects. In addition, most of those studies did not evaluate key outcome measures such as QoL or functioning, which are often more relevant to patients than clinical symptoms (Lam et al., 2011; Zimmerman et al., 2006). In addition, there is a notable lack of data with regard to the moderating effects of cognitive processes in patients with emotional disorders in the primary care setting.

In this context, we conducted the present study to overcome the limitations of previous studies and to fill the knowledge gaps not addressed by those studies. To achieve this, the present study has a longitudinal design and large sample size. We also took into account key clinical variables and other variables such as QoL and functioning, which are highly relevant to patients in terms of recovery. In addition, we evaluated three different cognitive processes—worry, rumination, and negative metacognitive beliefs—in order to compare the moderating effects of different cognitive processes on treatment outcomes in the same sample.

The aim of the present study was to examine the potential moderating effects of baseline levels of worry, rumination and negative metacognitive beliefs on anxiety and depressive symptoms, QoL, and functioning in primary care patients with emotional disorders. Given the existing association of these cognitive processes with the development and maintenance of emotional symptoms, their mediating effect observed in other studies (Muñoz-Navarro et al., 2022) suggesting that the benefits of CBT may rely on the changes achieved in these cognitive processes, and the moderating effect of emotion regulation in the relationship between CBT and anxiety and depression symptoms (Barrio-Martínez et al., 2022), we hypothesized that baseline levels of worry, rumination and negative metacognitive beliefs would moderate the effects of treatment allocation on treatment outcomes. We expected that individuals who received TD-CBT + TAU and had higher basal levels of

these cognitive processes would benefit most in terms of a greater reduction in emotional symptoms and larger improvement in functioning and QoL.

2. Methods

2.1. Participants

The PsicAP trial included a total of 1061 participants randomized into two groups: experimental (n = 527) and control (n = 534). The present study includes only those participants (n = 631) who completed both the baseline and posttreatment assessments, with 315 individuals in the experimental group (TD-CBT + TAU) and 316 in the control group (TAU alone).

2.2. Procedure

All of the data in this study were obtained from the PsicAP trial (Cano-Vindel et al., 2021), a multicentre RCT carried out at 22 primary care centres within the Spanish National Health System. The PsicAP trial was conducted to evaluate the efficacy of adding TD-CBT to TAU in adult patients (age 18 to 65) with emotional disorders in the primary care setting. That trial enrolled individuals referred by their GP for a suspected emotional disorder (mainly anxiety, depression and somatoform disorder). All participants completed a series of screening measures and those that scored above the cut-off points (Generalized Anxiety Disorders scale-7 [GAD-7] ≥ 10; Patient Health Questionnaire-9 [PHQ-9] ≥ 10; Patient Health Questionnaire-15 [PHQ-15] ≥ 10 plus a score of 2 in three or more somatic symptoms) on one or more of the scales were invited to participate in the trial. In certain cases—in patients with difficulties in understanding Spanish, with severe mood disorders (PHQ > 20), or a high level of disability (Sheehan Disability Scale [SDS] > 25)— a semi-structured interview with a clinical psychologist was conducted to rule out the presence of a severe clinical disorder. Patients with a confirmed severe mental disorder (e.g., bipolar disorder, schizophrenia, eating disorder, substance dependence, personality disorders, etc.) were excluded from the trial. Also, individuals with a recent history of suicidal behaviour were also excluded. All of the excluded patients were referred to their GP for treatment.

Patients who met all inclusion criteria were enrolled in the study and randomized to receive TD-CBT + TAU (experimental group) or TAU alone (controls). The experimental treatment consisted of seven, 90-minute sessions of TD-CBT in groups of 8 to 10 delivered over a 3–4 month period. The treatment included relaxation techniques (based on Jacobson's progressive muscle relaxation), psychoeducation (in which participants received information about emotions and their function), cognitive restructuring (designed to help identify maladaptive thinking styles and to foster the development of adaptive thinking), behavioural modification (based on elements such as exposure, problem solving, stimulus control, reinforced behavioural training, etc.) and relapse prevention (in which the strategies learned in previous sessions are reviewed and reinforced, and prevention techniques are taught and practiced). A detailed description is available elsewhere (González-Blanch et al., 2018). TAU involved regular consultations with the treating GP, who evaluated the patient's physical and psychological symptoms. GPs were instructed to treat patients according to their professional judgement and were blind to the treatment allocation. In general, the treatment involved psychopharmacological prescriptions (anxiolytics, antidepressants or hypnotics) and/or informal counselling/support provided during consultations lasting approximately 10 min (Cano-Vindel et al., 2016; González-Blanch et al., 2018). Participants in both treatments were allowed to make appointments with their GPs during or after TD-CBT. For a more detailed description of the study design see Cano-Vindel et al. (2021).

2.2.1. Ethical considerations

All participants were provided with an information sheet describing the study protocol and aims. Written informed consent was obtained from all participants. The Spanish National Ethics Committee and the Spanish Agency of Medicines and Medical Devices (AEMPS) approved the study protocol (code: ISRCTN58437086). All procedures contributing to this work comply with the Helsinki Declaration of 1975, as revised in 2008.

2.3. Instruments

The study data were obtained from a series of questionnaires administered at the pre and posttreatment assessments, as follows:

Worry was assessed through the abbreviated version of the Penn State Worry Questionnaire (PSWQ-A), which has eight self-rated items (Hopko et al., 2003; Spanish version by Sandín et al., 2009). Rumination (the "brooding" domain) was assessed with abbreviated version of the Ruminative Response Scale - Brooding (RRS-B) (Nolen-Hoeksema and Morrow, 1991; Spanish version by Hervás, 2008). Metacognition (the "negative beliefs" subscale) was evaluated through six-item abbreviated version of the Metacognitive Questionnaire - Negative Beliefs (MCQ-NB) (Wells and Cartwright-Hatton, 2004; Spanish version by Ramos-Cejudo et al., 2013).

Anxiety symptoms were assessed with the Generalized Anxiety Disorder scale (GAD-7) (García-Campayo et al., 2010), a seven-item, self-report instrument based on DSM-IV criteria. Depression symptoms were assessed with the nine-item Patient Health Questionnaire-9 (PHQ-9) (Kroenke et al., 2001; Muñoz-Navarro et al., 2017a).

QoL was assessed with the abbreviated version of the World Health Organization Quality of Life scale (WHOQOL-BREF) (World Health Organization. Division of Mental, 1996), which consists of two general and 24 specific self-reported items that measure perceived QoL on four domains: physical health, psychological health, social relationships, and environmental health. For the present study, we considered only the 24 specific items. We converted each domain score into Z scores, and then summed and normalized these scores to create a single global score for this measure. The composite score correlated strongly (range: 0.74 to 0.85) with each QoL domain at the posttreatment assessment. Functioning was assessed using the five-item Sheehan Disability Scale (SDS) (Luciano et al., 2010). For the present study, a total score was obtained following the SDS scoring procedure (work, family and social functioning); however, the two optional items, which are not directly related to functioning, were excluded (Luciano et al., 2010).

We considered the following demographic variables: sex; age; marital status; education level; employment status; income level; and medications. Based on clinical experience and to facilitate data interpretation, we dichotomised all variables (except for age) as follows: (a) educational level: basic (≤ secondary education) versus higher education (university studies, Master's degree, or PhD) (b) marital status: having a partner vs. not having a partner; (c) employment status: currently working vs. not working (temporary or permanent leave, unemployed, and retired); (d) income level: moderate/high (>€24,000/year) versus low income (<€24,000/year); (e) medication use (hypnotics, anxiolytics, and antidepressant): current use vs. no current use.

2.4. Data analysis

We tested whether a set of cognitive processes (worry, rumination and negative metacognitive beliefs) were moderators of the association between treatment allocation (TD-CBT + TAU vs. TAU alone) and treatment outcomes (anxiety, depression, QoL, and functioning) at the posttreatment assessment. Moderating effects were examined using the SPSS PROCESS macro 3.5 (Hayes, 2017), which applies a listwise deletion procedure for missing data. The software uses 5000 bootstrapped samples and provides bias-corrected 95 % confidence intervals (CI) for the indices using bootstrap calculation. The time interval

between the pre and posttreatment assessments ranged from 3 to 4 months in both groups. In each model, we included the potential moderator (score on the PSWQ, RRS and MCQ scales), an independent variable (treatment allocation), and the posttreatment outcome as dependent variables. We adjusted for baseline scores of the corresponding outcome variables (covariates) to minimize variance in the outcomes (Tabachnick et al., 2007). If the interaction was significant, the variable was considered to be a moderator. If the interaction was not significant, but the main effect was significant, the variable was then considered a non-specific predictor. Sociodemographic variables were not included as covariates given their weak correlation ($r < 0.10$) with the cognitive processes analysed in this study. If a significant moderating effect was detected, we used the pick-a-point to test the interaction. This strategy allows for visualization of the relationship between the predictor (treatment allocation) and the outcome variables (anxiety and depressive symptoms, QoL, and functioning) at different points of the moderator (one standard deviation above and below the mean). All measures were treated as continuous variables.

Descriptive statistics were calculated for the sociodemographic variables. The mean baseline scores for the scales were calculated for all participants who met the inclusion criteria. These same data were also calculated separately for the experimental and control groups. Student's *t*-test for independent samples was used to examine baseline differences in the study variables between the participants included in the study (i.e., who completed both the pre- and posttreatment assessments) and those who did not. G*Power 3.1 software (Faul et al., 2007) was used to perform the power analysis, which showed that, given the number of predictors ($n = 4$) and the sample size ($N = 631$), the study was sufficiently powered to detect medium effect sizes ($\alpha = 0.05$; $f^2 = 0.15$; so $\beta = 1$). All statistical analyses were performed with the IBM-SPSS statistical software program, v. 19 (IBM Corp., Armonk, N.Y., USA).

3. Results

Descriptive data for the sample are shown in Table 1. The mean age of the participants was 44.7 years (SD, 11.4). Most participants were females (81.1 %), currently working (52.1 %), living with a partner (68.3 %), with a basic educational level (72.6 %), and an annual income below €24,000 (72.6 %). The use of psychiatric medications was as follows: hypnotics (19.8 % of the sample), antidepressants (25.8 %), and anxiolytics (37.9 %), without significant differences between control and experimental group in terms of medication or dosage, and visits to the GPs according to the original study (Cano-Vindel et al., 2021). Table 1 shows the mean baseline scores for the scales.

3.1. Preliminary analysis

We compared baseline differences in worry, rumination, negative metacognitive beliefs, symptoms of anxiety and depression, QoL, and functioning between participants included ($n = 631$, 59.5 %) and excluded ($n = 430$, 40.5 %) from the analysis. For this comparison, we used the Student's t-test for independent samples. No significant ($p > .05$) between-group differences were observed for any of the pretreatment variables (Table 2).

3.2. Moderation analysis

Worry and rumination had a moderating effect between treatment allocation and treatment outcomes for depressive and anxiety symptoms, but did not significantly moderate QoL or functioning. No moderating effect of negative metacognitive beliefs on any of the treatment outcomes was observed (Table 3).

To better illustrate the moderating analysis, we created a figure (using data provided by the SPSS PROCESS macro) to visualize the moderating effect of the different cognitive processes (Figs. 1, 2, 3 and 4). We include only the variables that had a significant effect on the moderation analysis. The effect of psychological treatment on symptoms of anxiety and depression was greater among individuals with higher baseline levels of rumination and worry than in those with lower baseline levels of those cognitive processes. In addition, we found significant differences in depressive and anxiety symptoms among participants with low, medium, and high baseline levels of worry and rumination when comparing participants who received TAU alone versus those included in the TD-CBT + TAU group. In short, even when a moderating effect was detected, adding TD-CBT to TAU led to a greater reduction in anxiety and depressive symptoms than TAU alone in all participants, even those with low levels of worry or rumination (Table 3; Figs. 1, 2, 3 and 4).

The analysis of the moderating effect of the variables described above showed that some baseline cognitive processes can be considered non-specific predictors (i.e., regardless of the treatment group assignation). Rumination was a non-specific predictor of posttreatment functioning (Table 3), indicating that individuals with higher rumination at treatment initiation were more likely to have worse functioning at the posttreatment assessment. Negative metacognitive beliefs were also a non-specific predictor of anxiety symptoms; that is, individuals with higher scores on the metacognitive scale had greater anxiety symptoms at the posttreatment evaluation.

Table 1
Sociodemographic description and mean scores of the participants at baseline.

	Baseline (N = 631)	Baseline TD-CBT group (N = 315)	Baseline TAU group (N = 316)
Sex, N (%)			
Female	512 (81.1)	251 (79.7)	261 (82.6)
Male	119 (18.9)	64 (20.3)	55 (17.4)
Age, mean (SD)	44.7 (11.4)	44.56 (10.9)	44.82 (11.8)
Marital status, N (%)			
With a partner	431 (68.3)	220 (69.8)	211 (66.8)
Without a partner	200 (31.7)	95 (30.2)	105 (33.2)
Education level, N (%)			
Basic studies	458 (72.6)	221 (70.2)	237 (75.0)
Higher studies	173 (27.4)	94 (29.8)	79 (25.0)
Employment status, N (%)			
Working	329 (52.1)	163 (51.7)	166 (52.5)
Not working	302 (47.9)	152 (48.3)	150 (47.5)
Income level, N (%)			
<24,000€	484 (76.7)	237 (75.2)	247 (78.2)
>24,000€	147 (23.3)	78 (24.8)	69 (21.8)
Hypnotics, N (%)			
Yes	125 (19.8)	55 (17.5)	70 (22.2)
No	506 (80.2)	260 (82.5)	246 (77.8)
Anxiolytics, N (%)			
Yes	239 (37.9)	122 (38.7)	117 (37.0)
No	392 (62.1)	193 (61.3)	199 (63.0)
Antidepressants, N (%)			
Yes	163 (25.8)	74 (23.5)	89 (28.2)
No	468 (74.2)	241 (76.5)	227 (71.8)
PSWQ	3.7 (0.9)	3.8 (0.9)	3.8 (0.8)
RRS	2.7 (0.7)	2.7 (0.7)	2.7 (0.7)
MCQ	2.7 (0.7)	2.7 (0.7)	2.7 (0.7)
GAD-7	12.3 (4.6)	12.5 (4.6)	12.1 (4.7)
PHQ-9	13.6 (5.3)	13.7 (5.3)	13.5 (5.4)
WHOQOL	4.49 (1.32)	4.5 (1.4)	4.5 (1.4)
SDS	12.8 (7.5)	13 (7.6)	12.8 (7.6)

Abbreviations: SD, standard deviation; PSWQ = Penn State Worry Questionnaire. *RRS* = Rumination Response Scale. *MCQ* = Metacognition Questionnaire. *GAD-7* = Generalized Anxiety Disorder-7. *PHQ-9* = Patient Health Questionnaire-9. *WHOQOL* = World Health Organization Quality of Life. *SDS* = Sheehan Disability Scale. *TD-CBT* = Transdiagnostic cognitive-behavioural therapy. *TAU* = Treatment as usual.

Table 2
Comparison of baseline scores between participants included in the study versus those who were excluded.

Scale	Included[1] (N = 631)	Excluded[1] (N = 430)	95 % CI Difference[2]	*t*	*p*-value	Effect sizes
PSWQ	3.73 (0.85)	3.81 (0.85)	−0.028, 0.179	1.424	0.155	*d* = 0.094
RRS	2.68 (0.72)	2.76 (0.70)	−0.008, 0.167	1.790	0.074	*d* = 0.112
MCQ	2.72 (0.68)	2.74 (0.70)	−0.067, 0.103	0.417	0.677	*d* = 0.029
PHQ-9	13.58 (5.27)	13.67 (5.52)	−0.577, 0.741	0.244	0.807	*d* = 0.017
GAD-7	12.33 (4.62)	12.22 (4.69)	−0.675, 0.465	−0.361	0.718	*d* = −0.024
SDS	12.83 (7.51)	12.99 (7.70)	−0.776, 1.086	0.326	0.744	*d* = 0.021
WHOQOL	4.47 (1.35)	4.47 (1.49)	−0.175, 0.170	−0.260	0.979	*d* = 0

Abbreviations: PSWQ = Penn State Worry Questionnaire. *RRS* = Rumination Response Scale. *MCQ* = Metacognition Questionnaire. *GAD-7* = Generalized Anxiety Disorder-7. *PHQ-9* = Patient Health Questionnaire-9. *WHOQOL* = World Health Organization Quality of Life. *SDS* = Sheehan Disability Scale. *d* = Cohen's d.
[1] Mean (SD).
[2] *CI*= Confident interval.

Table 3
Baseline clinical variables evaluated as potential moderators at the posttreatment evaluation.

	Posttreatment evaluation (N = 631) B (95 % CI), *p-value*	
	Predictor (main effect)	Moderation (interaction)
PSWQ		
GAD-7	0.912 (0.440 to 1.384), >0.001**	−1.246 (−2.067 to −0.425), 0.003**
PHQ-9	0.641 (0.125 to 1.158), 0.015*	−1.207 (−2.193 to −0.220), 0.017*
WHOQOL	−0.130 (−0.274 to 0.014), 0.077	0.025 (−0.0260 to 0.309), 0.864
SDS	0.508 (−0.176 to 1.191), 0.145	−1.140 (−2.479 to 0.198), 0.095
RRS		
GAD-7	1.095 (0.564 to 1.625), >0.001**	−0.980 (−1.948 to −0.011), 0.048*
PHQ-9	0.989 (0.367 to 1.611), 0.002**	−1.339 (−2.500 to −0.181), 0.024*
WHOQOL	−0.154 (−0.328 to 0.019), 0.081	0.095 (−0.239 to 0.429), 0.576
SDS	−992 (0.175 to 1.809), 0.017*	−0.101 (−1.673 to 1.470), 0.899
MCQ		
GAD-7	0.911 (0.360 to 1.463), 0.001**	−0.822 (−1.843 to 0.200), 0.115
PHQ-9	0.499 (−0.143 to 1.141), 0.128	−0.411 (−1.640 to 0.819), 0.512
WHOQOL	−0.070 (−0.250 to 0.109), 0.442	−0.214 (−0.566 to 0.138), 0.234
SDS	0.746 (−0.117 to 1.608), 0.090	0.319 (−1.335 to 1.972), 0.705

Abbreviations*:* covariate adjustment for baseline corresponding symptoms (PHQ-9 baseline, GAD-7 baseline, SDS baseline and WHOQOL baseline). *PSWQ* = Penn State Worry Questionnaire. *RRS* = Rumination Response Scale. *MCQ* = Metacognition Questionnaire. *GAD-7* = Generalized Anxiety Disorder-7. *PHQ-9* = Patient Health Questionnaire-9. *WHOQOL* = World Health Organization Quality of Life. *SDS* = Sheehan Disability Scale. *B* = regression coefficient. *CI* = Confident interval.
* $p < .05$.
** $p < .01$.

4. Discussion

The present study was performed to examine the role of baseline levels of three cognitive processes—worry, rumination and negative metacognitive beliefs—as potential moderators of treatment outcomes in primary care patients with anxiety and depressive symptoms allocated to two different treatments (TD-CBT + TAU or TAU alone). As expected, based on data from previous studies, worry and rumination had a moderating effect on the relationship between treatment and anxiety and depression symptoms. More specifically, individuals who received TD-CBT + TAU achieved a greater decrease in emotional symptoms, although this treatment effect was more pronounced in patients with higher baseline levels of rumination and worry. Contrary to our initial hypothesis, negative metacognitive beliefs did not moderate the effect of either treatment on clinical symptoms. None of the cognitive processes moderated the relationship between treatment allocation and QoL or functioning. Nevertheless, rumination and negative metacognitive beliefs had a marginal effect. More specifically, baseline rumination predicted worse functioning at the posttreatment evaluation, regardless of treatment assignation. In addition, higher negative metacognitive beliefs predicted greater anxiety symptoms after treatment.

To our knowledge, our study is the first to evaluate at the same time the potential moderating effects of worry, rumination, and negative metacognitive beliefs between psychological treatment and treatment outcomes (including QoL and functioning) in primary care patients with emotional symptoms. We found that individuals with higher levels of worry and rumination at the start of treatment obtained a greater benefit from TD-CBT + TAU (reduction in clinical symptoms) than individuals with lower baseline levels of worry and rumination. This finding is consistent with data from previous studies showing that both cognitive processes are forms of repetitive negative thinking, a factor common to most emotional disorders (including depressive and anxiety disorders), meaning that this is a transdiagnostic phenomenon (McEvoy et al., 2013). Repetitive negative thinking refers to a way of thinking about one's own problems or negative experiences that is repetitive, intrusive, and difficult to eliminate (Ehring and Watkins, 2008). In fact, this thought process has been shown to increase the likelihood of developing multiple emotional disorders, and can thus be considered a common risk factor for these disorders. In fact, the presence of elevated levels of repetitive negative thinking is a predictor of higher comorbidity levels in individuals with emotional disorders (Brown et al., 2001; Ruscio et al., 2011). Our findings regarding the role of these processes are consistent with previous studies that have demonstrated a causal relationship between worry and rumination and symptoms of anxiety and depression. Topper et al. found that both of these cognitive processes trigger emotional symptoms and predict the development and maintenance of emotional disorders over time (Topper et al., 2010). Given this association, together with evidence showing that CBT can effectively reduce both rumination and worry by modifying cognitive bias through cognitive restructuring (Querstret and Cropley, 2013; Watkins, 2015), it is reasonable to expect that individuals with higher pretreatment levels of worry and rumination are likely to achieve a greater benefit (i.e., a greater reduction rumination and worry) from therapy than those with lower baseline levels of those two processes.

In contrast to the significant impact of rumination and worry, negative metacognitive beliefs were not a significant moderator of the relationship between clinical symptoms and treatment allocation. This suggests that all patients—regardless of their baseline level of negative metacognitive beliefs—will benefit equally from the addition of psychological treatment to TAU, as evidenced by our finding that outcome measures were better in all patients who received the TD-CBT. In this study, metacognitive beliefs did not have a moderating effect, perhaps because we only evaluated negative beliefs domain. However, we found that negative metacognitive beliefs positively predicted anxiety symptoms, regardless of the treatment individuals attended. A previous study already reported that negative metacognitive beliefs positively predicted emotional symptoms (Capobianco et al., 2020). The fact that negative metacognitive beliefs act as a non-specific predictor and not as a moderator may be because, although TD-CBT + TAU includes cognitive restructuring, it does not target specifically on the metacognitive beliefs of patients. In this line, Johnson and Hoffart (2018) established

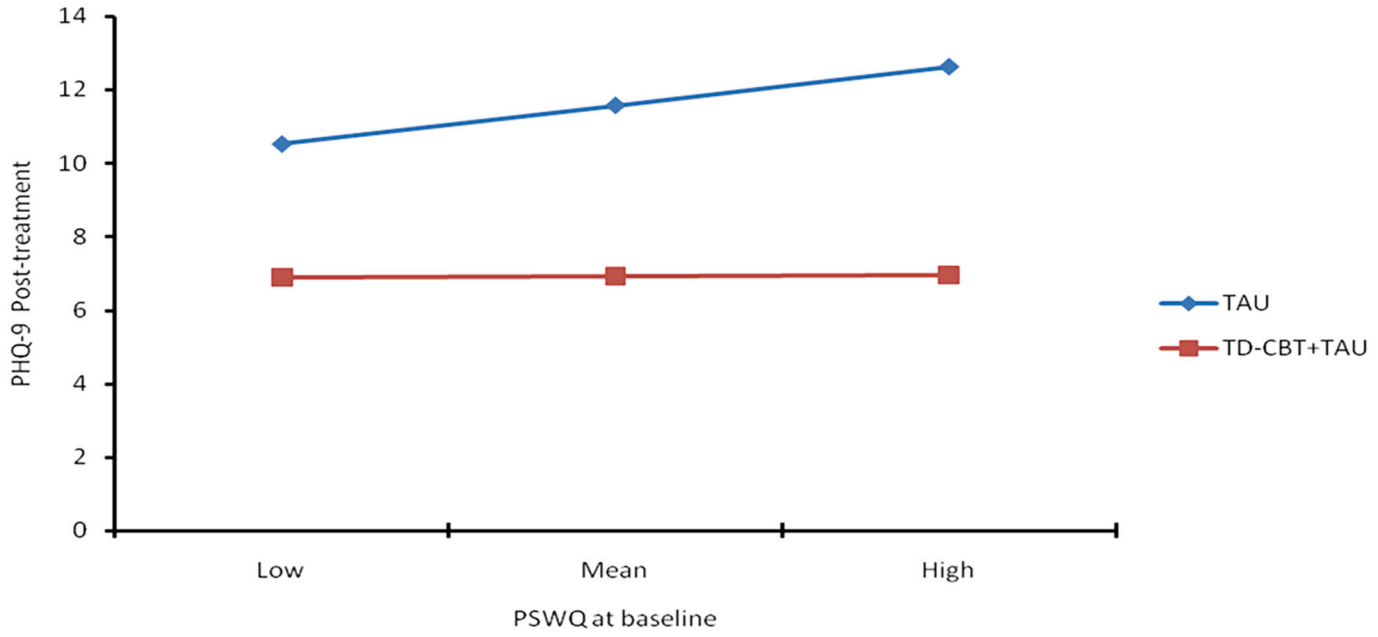

Fig. 1. Moderator effect of baseline worry (PSWQ) scores for the intervention (TD-CBT + TAU vs. TAU) on depressive symptoms at posttreatment. Low and high baseline PSWQ levels were defined as the mean −1 SD (low) or mean +1 SD (high).
Note: TD-CBT = Transdiagnostic cognitive-behavioural therapy. *TAU* = Treatment as usual. *SD* = Standard deviation. *PSWQ* = Penn State Worry Questionnaire. *PHQ-9* = Patient Health Questionnaire-9. Covariate adjustment for corresponding baseline symptoms (PHQ-9 baseline).

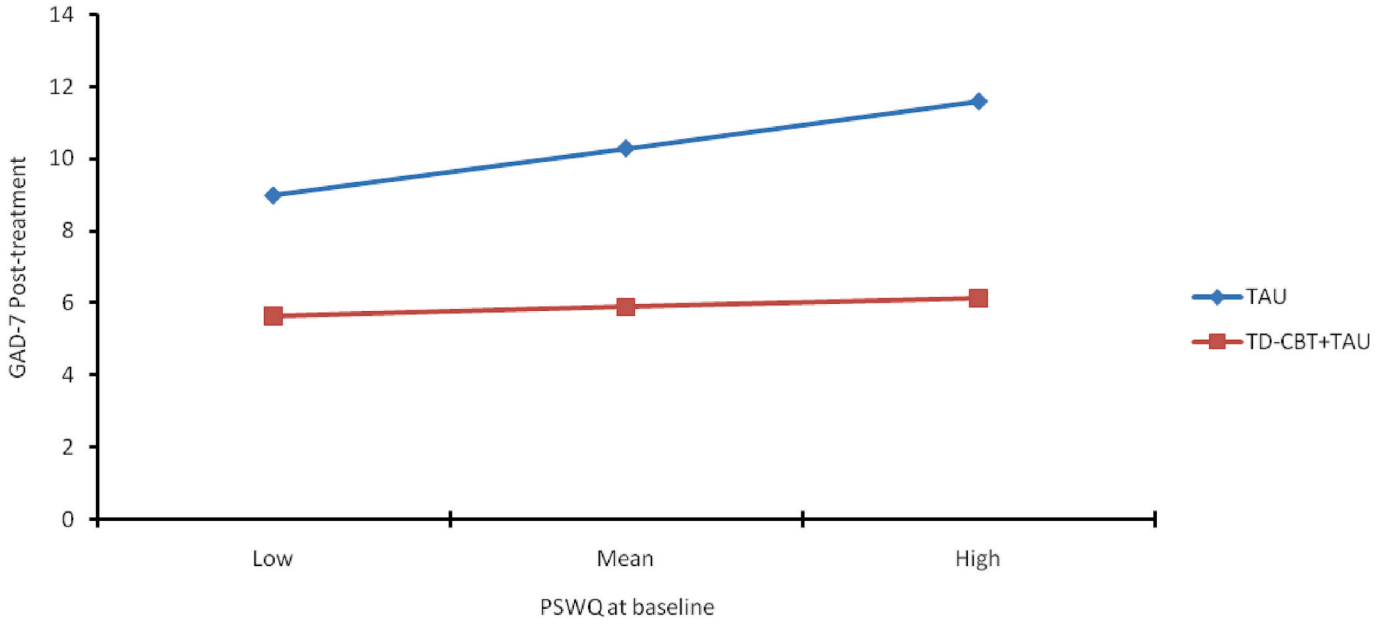

Fig. 2. Moderator effect of baseline worry (PSWQ) scores for the intervention (TD-CBT + TAU vs. TAU) on anxiety symptoms at posttreatment. Low and high baseline PSWQ levels were defined as the mean −1 SD (low) or mean +1 SD (high).
Note: TD-CBT = Transdiagnostic cognitive-behavioural therapy. *TAU* = Treatment as usual. *SD* = Standard deviation. *PSWQ* = Penn State Worry Questionnaire. *GAD-7* = Generalized Anxiety Disorder-7. Covariate adjustment for corresponding baseline symptoms (GAD-7 baseline).

that only cognitions would be one of the central nodes in CBT, and not metacognitions, since it focuses on changing the content of thoughts. This metacognitive process would be one of the central targets in metacognitive therapy, since it focuses on changing the way patients respond to thoughts. In another study, Hoffart et al. (2018) go further and stated that only metacognitive therapy aims to modify metacognitive beliefs.

To our knowledge, no studies have previously evaluated the moderating role of these cognitive processes on functioning or QoL in patients undergoing psychological treatment. None of the cognitive processes evaluated in the present study appeared to moderate the effect of treatment on QoL and functioning, a finding that suggests that TD-CBT was equally effective in all of the study participants, regardless of the basal level of worry or rumination. Nevertheless, we found that a higher level of rumination at baseline was a non-specific predictor of worse posttreatment functioning, a finding that is consistent with the study by Zvolensky et al. (2016), who found that rumination was a risk factor for worse functioning in primary care patients with emotional

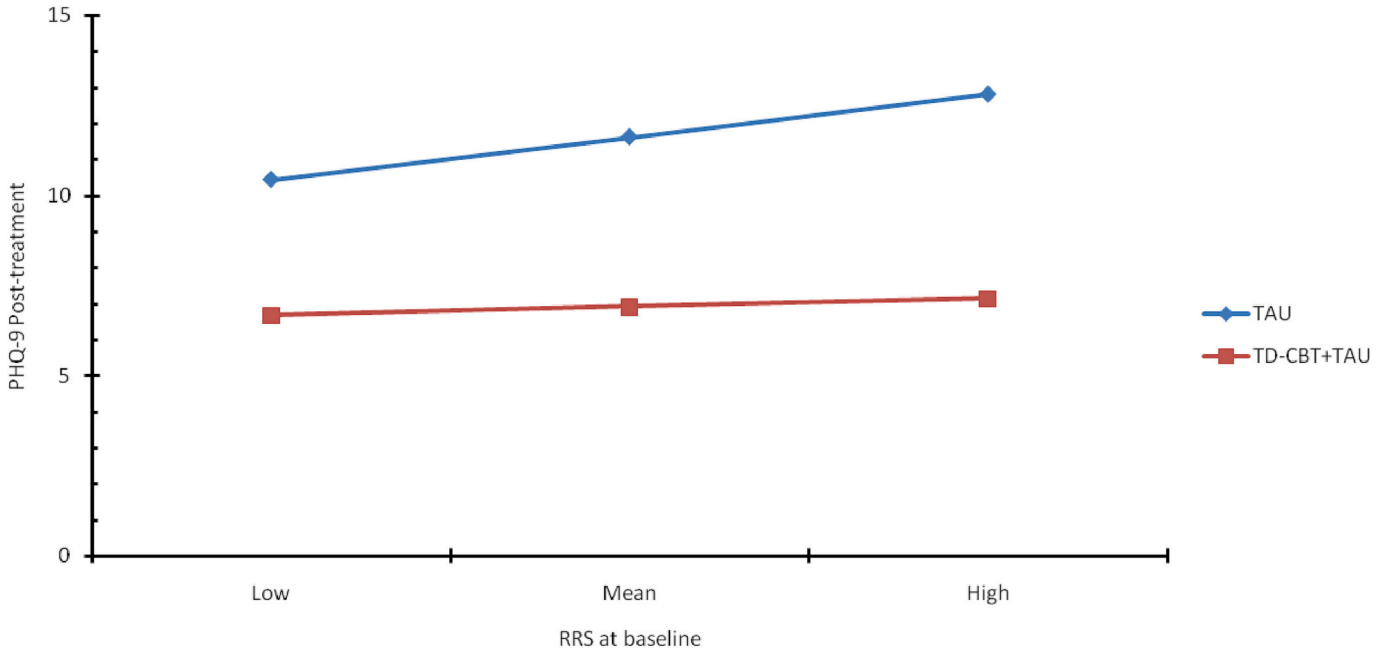

Fig. 3. Moderator effect of baseline rumination (RRS) scores for the intervention (TD-CBT + TAU vs. TAU) on depressive symptoms at posttreatment. Low and high baseline RRS levels were defined as the mean −1 SD (low) or mean +1 SD (high).
Note: TD-CBT = Transdiagnostic cognitive-behavioural therapy. *TAU* = Treatment as usual. *SD* = Standard deviation. *RRS* = Rumination Response Scale. *PHQ-9* = Patient Health Questionnaire-9. Covariate adjustment for corresponding baseline symptoms (PHQ-9 baseline).

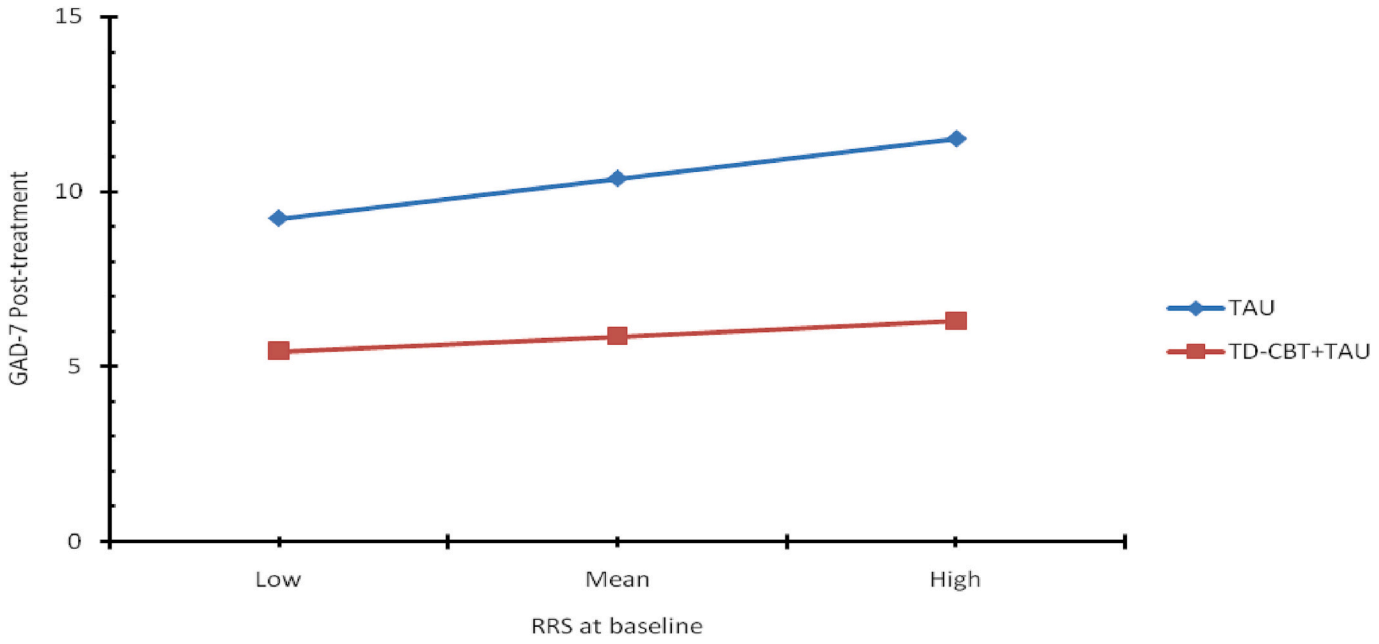

Fig. 4. Moderator effect of baseline rumination (RRS) scores for the intervention (TD-CBT + TAU vs. TAU) on anxiety symptoms at posttreatment. Low and high baseline RRS levels were defined as the mean −1 SD (low) or mean +1 SD (high).
Note: TD-CBT = Transdiagnostic cognitive-behavioural therapy. *TAU* = Treatment as usual. *SD* = Standard deviation. *RRS* = Rumination Response Scale. *GAD-7* = Generalized Anxiety Disorder-7. Covariate adjustment for corresponding baseline symptoms (GAD-7 baseline).

disorders.

The absence of moderating and main effects in QoL could be attributable to the fact that QoL assessments measure certain aspects (e.g., social relationships and environmental health) that tend to change only gradually over time, another plausible explanation for the lack of moderating and main effects on QoL could be that changes in QoL require more time to take root than changes in emotional symptoms or functioning (Katschnig, 2006). Finally, it is more difficult to detect differences in QoL among participants with mild to moderate emotional disorders, as treatment is unlikely to have as large an impact on QoL as in patients with more severe emotional disorders (Gao et al., 2019).

This study has several limitations. First, we only assessed the moderating effects of cognitive processes over a relatively short period of time (3–4 months), and it is quite possible that these observed effects could change over longer periods of time, especially the effects on QoL and functioning. Second, the study only included patients with mild or

moderate anxiety or depressive disorders, which limits our ability to generalize these findings to other clinical profiles, such as patients with more severe symptoms. Another limitation was the use of self-report instruments to assess cognitive processes and treatment outcomes. Such instruments are inherently subjective and could have influenced the reliability of our findings. Nevertheless, it is worth emphasizing that all of the scales used in this study have been fully validated and are considered reliable measures for the evaluation clinical symptoms (Muñoz-Navarro et al., 2017a; Muñoz-Navarro et al., 2017b), cognitive processes (Muñoz-Navarro et al., 2021), QoL (Lucas-Carrasco, 2012) and functioning (Luciano et al., 2010).

Despite the aforementioned limitations, we believe these results support the generalization of TD-CBT to individuals with different cognitive profiles, as the beneficial effects of adding TD-CBT remained even for those patients with lower rumination and worry scores at baseline. This finding allows the development of more personalized treatments focused especially on the reduction of these cognitive processes, in order to obtain a more pronounced improvement at the emotional level in these individuals. However, and although our data suggest that TD-CBT may be particularly useful, especially when compared to TAU alone, in individuals with greater use of maladaptive cognitive strategies (higher baseline levels of rumination and worry), our results show that all individuals, regardless of their baseline cognitive profile, obtain significant benefits from TD-CBT. Therefore, our findings support largely the generalization of the TD-CBT to different subgroups of primary care patients with emotional disorders.

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CRediT authorship contribution statement

Sara Barrio-Martínez: Conceptualization, Methodology, Validation, Formal analysis, Investigation, Writing – original draft, Writing – review & editing. **Antonio Cano-Vindel:** Validation, Investigation, Resources, Writing – review & editing, Supervision, Project administration, Funding acquisition. **Amador Priede:** Conceptualization, Validation, Writing – review & editing. **Leonardo Adrián Medrano:** Validation, Writing – review & editing. **Roger Muñoz-Navarro:** Validation, Writing – review & editing. **Juan Antonio Moriana:** Validation, Writing – review & editing. **María Carpallo-González:** Data curation, Validation, Writing – review & editing. **Maider Prieto-Vila:** Validation, Writing – review & editing. **Paloma Ruiz-Rodríguez:** Validation, Writing – review & editing. **César González-Blanch:** Conceptualization, Methodology, Validation, Investigation, Resources, Writing – review & editing, Supervision, Project administration, Funding acquisition.

Declaration of competing interest

None.

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