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Effect of a One-Session ACT Protocol in Disrupting Repetitive Negative Thinking: A Randomized Multiple-Baseline Design

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ABSTRACT

Repetitive negative thinking (RNT) in the form of worry and rumination has been robustly identified as a transdiagnostic process implicated in the onset and maintenance of emotional disorders. Recent research suggests that both forms of RNT are particularly counterproductive experiential avoidance strategies because individuals usually engage in them as the first response when experiencing distress. This leads to the extension of relational networks and discomfort as well as to the engagement in additional experiential avoidance strategies that soon provoke meaningful life limitations. The current study analyzed the effect of a one-session Acceptance and Commitment Therapy (ACT) protocol in reducing RNT through altering the discriminative functions of the most relevant self-related thought to engage in RNT. We used a two-arm, randomized multiple-baseline design. Participants were 11 adults experiencing RNT that had interfered with their functioning for at least the last six months and were suffering from moderate emotional symptoms. Four RNT-related measures were administered: a daily RNT self-register, measures of pathological worry, rumination (brooding), and frequency of negative thoughts. Nine participants showed significant reductions in at least three out of the four RNT measures during the 6-week follow-up. Effect sizes were very large in all RNT-related measures and in emotional symptoms, experiential avoidance, cognitive fusion, and valued living. Testing an ACT version for emotional disorders specifically focused on disrupting RNT is warranted. *Key words:* ACT, RFT, Worry, Rumination, Single-case experimental design.

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Novelty and Significance

What is already known about the topic?

- Repetitive Negative Thinking (RNT) is a transdiagnostic process involved in the onset and maintenance of emotional disorders.
- Several psychological therapies are focused on reducing RNT.

What this paper adds?

- Provides the rationale for a version of acceptance and commitment therapy (ACT) focused on reducing RNT.
- Provides data of the effect of a 1-session ACT protocol to reduce RNT.

Repetitive negative thinking (RNT) has been identified as a core feature of emotional disorders (Ehring & Watkins, 2008; Harvey, Watkins, Mansell, & Shafran, 2004). For instance, individuals showing depression usually ruminate about the significance, causes, and consequences of their symptoms (Nolen-Hoeksema, 2004); in posttraumatic stress

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disorder (PTSD), individuals exhibit recurrent negative thinking about the trauma and its consequences (Michael, Halligan, Clark, & Ehlers, 2007); individuals showing social anxiety repetitively evaluate their future and past social interactions (Kashdan & Roberts, 2007); and in generalized anxiety disorder (GAD), individuals exhibit repetitive and permanent worries about uncertain and undesirable future outcomes (Borkovec, 1994). Although thought content is relatively different across disorders, the thinking process is similar and characterized by being repetitive, focused on negative content, passive and/or experienced as uncontrollable, predominantly verbal as opposed to imagery, and relatively abstract as opposed to concrete (Borkovec, Alcaine, & Behar, 2004; Ehring & Watkins, 2008; Watkins, 2008).

Most of the studies on RNT are focused on worry and rumination. Whereas worry is conceived as repetitive thoughts that are experienced as unpleasant and triggered by the perception of an uncertain and undesired future outcome (e.g., Berenbaum, 2010), rumination is viewed as repetitive and passive thinking concerning the causes, consequences, and meaning of an unattained goal (Martin & Tesser, 1996; Nolen-Hoeksema, 2004). Importantly, both RNT reactions can be used as problem-solving strategies that might have adaptive functions such as allowing individuals to anticipate future danger and be adequately prepared for its occurrence or leading to conclusions about why past events occurred and learning about them. However, frequently, this type of problem solving is not useful. This might be the case when worry and rumination are characterized by reduced concreteness (i.e., abstract level of construal) and the purpose of reducing fear, sadness, or the need for certainty (i.e., experiential avoidant functions). When this occurs, they tend to prolong negative affect, as the thinking process is focused on negative content and occurs chronically because it does not lead to pragmatic actions (Borkovec, 1994; Dickson, Ciesla, & Reilly, 2012; Eisma, Schut, Stroebe, van den Bout J, Stroebe, & Boelen, 2014; Giorgio, Sanflippo, Kleiman, *et al.*, 2010; Kingston, Watkins, & Nolen-Hoeksema, 2014; Kuehner, Huffziger, & Liebsch, 2009; Newman & Llera, 2011; Roemer & Orsillo, 2002; Segerstrom, Stanton, Alden, & Shortridge, 2003; Trapnell & Campbell, 1999; Watkins, 2008). This way, unconstructive worry and rumination have been robustly identified in prospective and experimental studies as common factors in the onset and maintenance of emotional disorders (e.g., Ehring & Watkins, 2008; Harvey *et al.*, 2004; Nolen-Hoeksema, 2000). Accordingly, some therapeutic approaches have recently emerged that are focused on the disruption of these unconstructive forms of RNT, such as metacognitive therapy (Wells, 2009) and rumination-focused cognitive-behavioral therapy for depression (Watkins, 2016).

The conceptualization of unconstructive worry and rumination as evaluative and problem-solving experiential avoidance strategies is relevant for contextual behavioral science (CBS; Hayes, Barnes-Holmes, & Wilson, 2012) because acceptance and commitment therapy (ACT; Hayes, Strosahl, & Wilson, 1999) is focused on disrupting these strategies and promoting psychological flexibility. In the current study, we suggest that both forms of RNT are especially counterproductive experiential avoidance strategies because they are typically used as the first problem solving reaction to triggers (e.g., fear, need for explanations to recover relational coherence, etc.; Luciano, Ruiz, & Törneke, 2016) and they usually prolong negative affect until engagement in other experiential avoidance

strategies (e.g., drinking alcohol, distraction, eating, etc.). Support for this suggestion comes from studies revealing the presence of meta-worry and attempts to avoid worry in individuals suffering from GAD (Wells, 2002) or the effect of rumination in increasing cravings in alcohol-dependent drinkers (Casselli *et al.*, 2013) and binge eating (Nolen-Hoeksema, Stice, Wade, & Bohon, 2007). Importantly, if such a suggestion is correct, ACT protocols primarily focused on disrupting unconstructive RNT might produce quick changes and be particularly effective for the treatment of emotional disorders.

This study constitutes an initial step forward in the abovementioned direction by implementing a one-session ACT protocol focused on disrupting RNT in the form of worry and rumination. To design the ACT protocol, we followed the relational frame theory (RFT; Hayes, Barnes-Holmes, & Roche, 2001) account of psychological flexibility (Luciano *et al.*, 2011; Luciano, Valdivia Salas, & Ruiz, 2012; Ruiz & Perete, 2015; Törneke, Luciano, Barnes-Holmes, & Bond, 2016). According to this account, psychological flexibility is the ability to frame ongoing private events in hierarchy with the deictic I, which typically reduces the derived discriminative functions of private events and allows the emergence of appetitive augmental functions (i.e., value-oriented actions) and actions connected to them. We also followed the analysis of the self by Luciano, Ruiz, and Törneke (2016). These authors suggest that triggers for engaging in RNT are built in the individual's learning history and become hierarchically related to the point that one of the strongest triggers (i.e., the thought/emotion at the top of the hierarchy or the big one) symbolically contains the remaining ones.

For instance, for one person, the fear of failing the exam next week (e.g., "I will fail the exam next week") might be part of the feeling of being a failure in her career (e.g., "I'm failing my career"). The latter trigger for engaging in RNT can be part of a more general and overarching trigger such as being a failure (e.g., "I'm a failure" or "I am not good enough"), which might also contain other branches such as not being approved by her family (e.g., "My family doesn't approve of me") or losing her boyfriend (e.g., "I don't deserve my boyfriend").

The relevant point is that, according to RFT research (Gil, Luciano, Ruiz, & Valdivia Salas, 2012, 2014), functions provided to the top of the hierarchy will be transferred to the other members of the hierarchy, whereas functions provided to one member at a lower level will not produce the same pattern of transformation of functions. This way, altering the discriminative avoidant functions to engage in RNT (i.e., promoting flexible reactions) of one of the most relevant triggers at the top of the hierarchy would most likely lead to altering the functions of triggers at lower levels of the hierarchy. In conclusion, if our rationale should be correct, directing the intervention to the trigger at the top of the hierarchy (formed of such a top-trigger and other thoughts and emotions) would strengthen its effect by facilitating the generalization of the trained ability to the contained self-content triggers.

Following the guidelines of Törneke *et al.* (2016) and Luciano *et al.* (2016), our ACT protocol to disrupt RNT attempted to: (a) establish the difference between behaving according to appetitive augmental rules (i.e., valued directions) versus according to the derived discriminative functions of ongoing private events (i.e., being entangled in counterproductive behavioral loops); (b) identify worry and rumination

as main components and causes of these loops; (c) identify participants' main triggers (i.e., the big ones or those at the top of the hierarchy) to initiate worry and rumination; (d) explore how both RNT forms usually lead to engaging in additional experiential avoidance strategies; (e) help participants to realize the counterproductive consequences of behaving in coordination with the discriminative functions of the triggers (i.e., worrying and ruminating and the other subsequent experiential avoidance strategies); (f) develop the ability of framing the ongoing triggers for RNT through a hierarchical relation with the deictic I so as to provoke a reduction of their discriminative avoidant functions; and (g) in the latter context, help participants to connect to augmental functions and specific actions in coordination with them.

The current study followed a two-arm, randomized-multiple baseline design. This unusual experimental design promotes an ideographic analysis of behavior while also permitting nomothetic analyses. This way, the likelihood of observing common processes across participants is significantly augmented in relation to typical nomothetic research where average data across participants usually hides the variability of human behavior. Eleven individuals experiencing RNT that interfered with their functioning for at least the last 6 months participated. Most participants were suffering from mild-to-moderate emotional symptoms and scored above the cut-off for emotional disorders.

METHOD

Participants

Participants were recruited through advertisements in social media beginning with the questions: "Do you spend too much time distressed about the past or future? Do you want to be more focused on the things that are important to you?" Fifty-five individuals showed interest in the study and were asked to respond to an online survey. Inclusion criteria were: (a) more than 18 years old; (b) at least 6 months entangled with thoughts, memories, and worries; and (c) significant interference in at least 2 life domains. Exclusion criteria were: (a) current psychological/psychiatric treatment, and (b) showing extremely severe scores on the depression and/or anxiety subscales of the Depression, Anxiety, and Stress Scales (see the outcome measures section).

The application of the inclusion and exclusion criteria led to the rejection of 30 potential participants: 1 individual was younger than 18 years, 5 were entangled with thoughts, memories, and worries for less than 6 months, 7 were receiving psychological/psychiatric treatment, and 17 showed extremely severe scores on depression and/or anxiety. Of the remaining 25 potential participants, 6 did not respond to telephone calls, and 8 did not attend the informative session.

The final sample consisted of 11 participants (2 men, mean age= 22.18, $SD=$ 4.4). The relative educational level of the participants was as follows: 9% mid-level study graduates, 55% undergraduate students, and 36% were college graduates. Table 1 shows demographical data of the participants and number of life domains in which worry/rumination interfered.

Table 1. Demographic Data, Time with Problem (Months), Number of Life Areas Affected, Triggers for Worry/Rumination, and Associated Experiential Avoidance Strategies.

Sex	Age	Study	Time months	Life Areas	Triggers for worry and rumination	Experiential avoidance strategies	
P1	F	19	Under-graduate	36	6	Fear of being rejected by other people; Need to be perfect	Worry/Rumination, sleeping, surfing internet, asking people, crying, and trying to convince herself
P2	F	22	Under-graduate	6	3	Fear of losing family; Why did I go back to my boyfriend?	Worry/Rumination, distracting (working, music, playing with cell phone), avoiding family
P3	M	32	Graduate	Always	3	Fear of being rejected by women, professional failure, and father's death	Worry/Rumination, distracting (TV/Internet), drinking alcohol, avoiding meetings
P4	F	25	Graduate	12	3	Fear of the death of a loved one and feelings of not being in love with her boyfriend	Worry/Rumination, distracting, rationalization, isolating herself, deep breathing
P5	F	19	Under-graduate	6	2	I will not be able to graduate; Why do I postpone everything?	Worry/Rumination, thought suppression, distracting (working, cleaning, reading, music, and hanging out with friends)
P6	M	23	Under-graduate	8	3	I will not be able to graduate; Why did I feel exhausted and quit the last career I studied?	Worry/Rumination, playing videogames (12 hours/day), drinking alcohol, smoking, hanging out with friends, and sleeping
P7	F	27	Graduate	12	2	Fear of getting blocked in her profession and consequences of moving to another country	Worry/Rumination, working too much, asking boyfriend and other people
P8	F	18	Under-graduate	36	5	Fear of other people's opinion; Why do some things happen?	Worry/Rumination, asking boyfriend, sleeping, working to distract herself
P9	F	20	Under-graduate	6	5	Fear of not having control; Why do I not use time properly?	Worry/Rumination, crying, getting angry, distraction (reading, music), and sleeping
P10	F	20	Mid-level	12	6	Fear of hurting her mother; Why life is this way?	Worry/Rumination, shutting up, getting angry, sleeping, walking, and drinking alcohol
P11	F	23	Graduate	7	6	Fear of failure at work	Worry/Rumination, shutting up, trying to convince herself and criticizing herself

Design and Variables

A two-arm, randomized multiple-baseline design across participants was implemented. Cohort 1 consisted of 6 participants who received the intervention after collecting a mean of 2 weeks of baseline and completed a 6-week follow-up. Cohort 2 (5 participants) received the intervention immediately after the collection of follow-up data for Cohort 1 (i.e., they had a 2-month baseline, on average). Within each cohort, the specific day in which participants received the protocol was also randomized within a period of 9 days. All randomizations were conducted using the web-based tool Research Randomizer (Urbaniak & Plous, 2013). The implemented randomization procedure was conducted because it significantly improves the internal validity of this multiple baseline design (Kratochwill & Levin, 2010) and, indeed, includes a small randomized clinical trial where Cohort 2 served as a wait-list control condition to control for the effects of the intervention in Cohort 1.

The independent variable of the study was the staggered introduction of a one-session ACT protocol, and dependent variables were divided into primary outcome and secondary outcome measures. As the main aim of this study was to explore the effect of the ACT protocol in disrupting RNT, primary outcomes were daily measures of worry/rumination and bi-weekly self-reports of pathological worry, rumination, and frequency of negative thoughts. Secondary outcomes were measures of psychological distress and emotional symptoms, experiential avoidance, cognitive fusion, and valued living.

Instruments

Self-monitoring of worry/rumination. At the end of each day, an email was sent to participants with a link to a website where they had to respond to the following question on a visual scale ranging from 0 to 10 and verbal descriptors at the extremes and middle numbers: "Have you been entangled with your thoughts, memories and worries about the future along the day?" (0= not at all entangled; 5= moderately entangled; 10= completely entangled).

Penn State Worry Questionnaire-11 (PSWQ-11; Meyer, Miller, Metzger, & Borkovec, 1990; Spanish version by Sandín, Chorot, Valiente, & Lostao, 2009). The PSWQ is a 16-item, 5-point Likert (5= very typical of me; 1= not at all typical of me), self-report instrument that was designed to evaluate the permanent and unspecific degree of worry that characterizes GAD. A reduced, 11-item version was used in this study, as recommended by Sandín *et al.* (2009), in view that PSWQ reverse-scored items are difficult to understand for Spanish-speaking participants, which worsens the psychometric properties of the instrument. The PSWQ-11 internal consistency is excellent and it shows good test-retest reliability and discriminant validity. Preliminary data from our laboratory indicates that the PSWQ-11 possesses excellent internal consistency in Colombia (mean Cronbach's alpha of .94). The mean score in a Colombian nonclinical sample ($N= 167$) was 27.95 ($SD= 10.1$) whereas in a clinical sample ($N= 107$), it was 35.19 ($SD= 10.1$).

Ruminative Response Scale -Short Form (RRS-SF; Treynor, Gonzalez, & Nolen-Hoeksema, 2003; Spanish version by Hervás, 2008). The RRS-SF is a 10-item, 4-point Likert scale (4= almost always; 1= almost never) self-report instrument that was designed to measure the tendency to ruminate in response to feelings of sadness and depression. It contains two subscales called Brooding and Reflection. According to Treynor *et al.* (2003), brooding is the most maladaptive form of rumination, whereas reflection could have both maladaptive and adaptive aspects. Accordingly, we only applied the 5-item Brooding subscale in this study. Preliminary data from our laboratory indicates that the Brooding subscale has acceptable internal consistency (mean Cronbach's alpha of .74). The mean score for Brooding in a Colombian nonclinical sample was 10.4 ($SD= 3.2$), whereas in a clinical sample, it was 14.27 ($SD= 3.2$).

Automatic Thoughts Questionnaire-8 (ATQ-8; Netemeyer *et al.*, 2002; Spanish version by Cano García & Rodríguez Franco, 2002). The ATQ is a measure of the frequency of negative automatic thoughts experienced during the past week. It consists of 8 negative thoughts that are rated on a 5-point Likert-type scale (5= all the time; 1= not at all). The ATQ-8 was used in this study as a RNT-related measure because individuals who worry and ruminate extend thinking about negative content, which would produce an increase of the frequency of negative automatic thoughts. The ATQ-8 has shown good psychometric properties in Colombian samples (mean Cronbach's alpha of .89; Ruiz, Suárez Falcón, & Riaño Hernández, *in press*) and a one-factor structure. The mean

score of the ATQ-8 in a Colombian nonclinical sample was 16.53 ($SD= 6.92$), whereas the score in a clinical sample was 19.75 ($SD= 7.35$).

Secondary outcomes measures

General Health Questionnaire-12 (GHQ-12, Goldberg & Williams, 1988; Spanish version by Rocha, Pérez, Rodríguez Sanz, Borrell, & Obiols, 2011). The GHQ-12 is a 12-item, 4-point Likert-type scale that is frequently used as screening for psychological disorders. Respondents are asked to indicate the degree to which they have recently experienced a range of common symptoms of distress, with higher scores reflecting greater levels of psychological distress. The Likert scoring method was used in this study, with scores ranging from 0 to 3 assigned to each of the four response options. The cutoff established for this scoring method is usually 12 points. Preliminary data from our laboratory indicate that the GHQ-12 possesses good psychometric properties in Colombia. Specifically, Cronbach's alpha in a sample of undergraduates ($N= 762$) was .88, and .90 in a clinical sample ($N= 205$). Mean scores for the nonclinical and clinical samples were 11.11 ($SD= 6.5$) and 17.84 ($SD= 7.3$), respectively.

Depression Anxiety and Stress Scales-21 (DASS-21; Antony, Bieling, Cox, Enns, & Swinson, 1998; Spanish version by Daza, Novy, Stanley, & Averill, 2002). The DASS-21 is a 21-item, 4-point Likert-type scale (3= applied to me very much, or most of the time; 0= did not apply to me at all) consisting of sentences describing negative emotional states experienced during the past week. It contains three subscales (Depression, Anxiety, and Stress) and has shown good internal consistency and convergent and discriminant validity. The usual cutoffs for the Depression subscale are: 0-4 normal, 5-6 mild, 7-10 moderate, 11-13 severe, and 14 or above extremely severe. Cutoffs for the Anxiety subscale are: 0-3 normal, 4-5 mild, 6-7 moderate, 8-9 severe, and 10 or above extremely severe. Lastly, cutoffs for the Stress subscale are: 0-7 normal, 8-9 mild, 10-12 moderate, 13-16 severe, and 17 or above extremely severe. The DASS-21 has good psychometric properties in Colombian samples and a factor structure consisting of three correlated factors corresponding to the above-mentioned subscales and a general, second-order factor (Ruiz, García Martín, Suárez Falcón, & Odriozola González, 2016).

Acceptance and Action Questionnaire-II (AAQ-II; Bond *et al.*, 2011; Spanish version by Ruiz, Langer, Luciano, Cangas, & Beltrán, 2013). The AAQ-II is a general measure of experiential avoidance. It consists of 7 items that are rated on a 7-point Likert-type scale (7= always true; 1= never true). The items reflect unwillingness to experience unwanted emotions and thoughts and the inability to be in the present moment and behave according to value-directed actions when experiencing psychological events that could undermine them. The Spanish version of the AAQ-II has shown good psychometric properties and a one-factor structure in Colombia (Cronbach's alpha of .91 in general population; Ruiz, Suárez Falcón, Cárdenas Sierra, Durán, Guerrero, & Riaño Hernández, 2016). The mean score on the AAQ-II in a Colombian nonclinical sample was 22.86 ($SD= 9.51$), whereas the score in clinical sample was 31.47 ($SD= 9.49$).

Cognitive Fusion Questionnaire (Gillanders *et al.*, 2014; Spanish version by Ruiz, Suárez Falcón, Riaño Hernández, & Gillanders, in press). The CFQ is a 7-item, 7-point Likert-type scale (7= always; 1= never true) consisting of sentences describing instances of cognitive fusion. This scale has been validated in English for a wide variety of clinical and nonclinical populations. The Spanish version by Ruiz *et al.* (2016) has shown similar psychometric properties and factor structure to the original version (alpha of .93

in general population). The mean score on the CFQ in a Colombian nonclinical sample was 23.80 ($SD= 9.51$), whereas the score in a clinical sample was 31.96 ($SD= 9.48$). *Valuing Questionnaire* (VQ; Smout, Davies, Burns, & Christie, 2014; Spanish version by Ruiz, Suárez Falcón, & Riaño Hernández, 2016). The VQ is a 10-item, 7-point Likert (6= completely true; 0= not at all true), self-report instrument designed to assess general valued living during the past week. The VQ has two subscales: Progress (i.e., enactment of values, including clear awareness of what is personally important, and perseverance) and Obstruction (i.e., disruption of valued living due to avoidance of unwanted experience and distraction from values). The Spanish version has shown good psychometric properties. Mean scores obtained on the VQ in Colombia for general population were 19.5 ($SD= 6.43$) for Progression and 11.7 ($SD= 6.88$) for Obstruction, whereas mean scores for a clinical sample were 16.28 ($SD= 7.73$) and 16.62 ($SD= 7.12$), respectively.

ACT protocol

The protocol consisted of an approximately 75-minute, individual session. It was based on the RFT definition of psychological flexibility and the formation of the self (Luciano *et al.*, 2012, 2016; Törneke *et al.*, 2016). Specifically, the protocol aimed to develop the ability to hierarchically frame the ongoing most disturbing and powerful triggers for worry/rumination with the deictic I so as to provoke a reduction of their discriminative avoidant functions and allow the derivation of augmental rules that specify probabilistic and meaningful consequences, and actions in coordination with them. In less technical words, we aimed to develop the ability to discriminate ongoing triggers for worry/rumination, distance oneself from them (i.e., defusion), and behave in that moment according to what is most meaningful for the individual in the long term (i.e., values). A depiction of the diagram constructed with one participant is presented in Figure 1. Table 2 presents the four phases of the protocol (a complete description of the protocol can be obtained upon request to the first author).

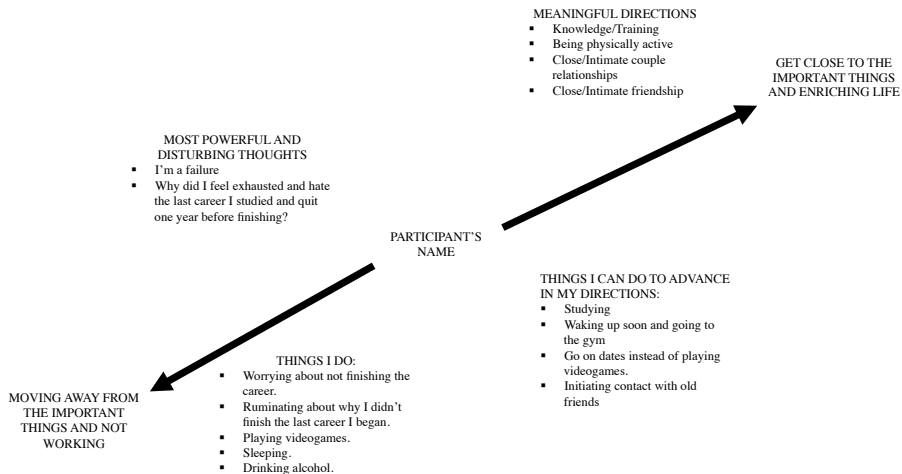


Figure 1. Example of one of the schemas developed with one of the participant.

Table 2. Summary of the ACT protocol.

Phase	Aims	Therapeutic interactions
1. Functional analysis (20 minutes approx.)	<ul style="list-style-type: none"> • Present diagram (see Figure 1). • Efficacy vs. inefficacy of worry/rumination • Identification of the main triggers to initiate worry/rumination and other experiential avoidance strategies connected to them 	<ul style="list-style-type: none"> • Explain that people often do things that go to the top-right and others to the down-left. • This can be useful when applied to things where one could make a change, but not when behaving repeatedly. • Worry begins when fear of a future event appears: “What is the fear that is the boss of all your fears?” • Rumination begins when one needs an explanation about something that happened: “What is the explanation you need that is the boss of all?” • Explore the consequences of worry/rumination and experiential avoidance strategies connected to them.
2. Creative hopelessness (15 minutes approx.)	<ul style="list-style-type: none"> ▪ Promoting the discrimination of the counterproductive effect of engaging in worry/rumination and other experiential avoidance strategies 	<ul style="list-style-type: none"> ▪ Socratic dialogue: (a) In which direction are you going when you worry/ruminate and you try to avoid/control your thoughts?; (b) Are they helpful at the short term?; (c) And at the long term?; and (d) Are the thoughts even stronger than before? ▪ Summary of the participant’s experience: It seems that the more you worry/ruminate and try to not have these thoughts, the more strength they seem to gain and the more you move away from what is important for you. It’s like by doing this, you are putting them in charge of your life. ▪ Physical metaphor: “Pushing triggers away.” The experimenter writes the participant’s triggers on a piece of paper and puts it near the participant’s face. When participants begin to push the piece of paper away with their hands, the experimenter resists. Following Ruiz and Luciano (2015), participants were asked how they felt when pushing and to compare it to the exhaustion and tension they usually feel when worrying/ruminating. ▪ Questions: (a) How much strength do your thoughts have when you push?; (b) Can you do something important while pushing?; (c) How much stronger would they be if you pushed 1 more year?; (d) And 5 more years?
3. Values clarification and committed action (20 minutes approx.)	<ul style="list-style-type: none"> • Specifying appetitive augmentals and actions in coordination with them. • Increase the feeling of creative hopelessness and the symbolic reinforcing consequences of committed action. 	<ul style="list-style-type: none"> • Garden metaphor (Wilson & Luciano, 2002): Identify the top four of a reinforcer’s hierarchy (i.e., values) as plants to take care of. • Identify one action per plant that could be done to nourish the plants instead of pushing away thoughts. • Perspective-taking questions (0-10 scale): (a) What is the state of your plants?; (b) How would they be if you spent 1 more year pushing away?; (c) And 5 more years?; (d) How would they be if you spent 1 year doing valued actions and not pushing?; (e) And 5 years?
4. Defusion training (20 minutes approx.)	<ul style="list-style-type: none"> ▪ Developing the ability to frame ongoing triggers in hierarchy with the deictic I to actualize augmental functions 	<ul style="list-style-type: none"> ▪ Errorless multiple-exemplar training (based on Luciano <i>et al.</i>, 2011): Relationally frame ongoing experiences through deictic and hierarchical relations and provide regulatory/augmental functions to that discrimination.

The aim of Phase 1 was to conduct a functional analysis by identifying the main triggers to engage in worry and rumination, the experiential avoidance strategies related to RNT, and the short- and long-term consequences. Phase 2 was dedicated to produce a creative hopelessness experience by promoting the discrimination of the counterproductive effects of RNT and the associated experiential avoidance strategies through a Socratic dialogue (i.e., the aim was to generate an intense experience as a consequence of realizing the long-term results of the experiential avoidance strategies). A physical metaphor (“pushing triggers away”) was then shaped with the participant and, following the guidelines by Ruiz and Luciano (2015) and Sierra, Ruiz, Flórez, Riaño Hernández, and Luciano (2016), the common physical properties between the participant’s daily experience when worrying/ruminating and the sensation of tiredness and tension when symbolically pushing the triggers was emphasized. In Phase 3, the participant was invited to specify appetitive augmentals (i.e., values) and actions connected to them

through the garden metaphor (Wilson & Luciano, 2002). Additionally, perspective-taking questions were used to increase the reinforcing consequences of actions connected with appetitive augmentals. Lastly, in Phase 4, a multiple-exemplar training was conducted in hierarchically framing ongoing triggers for RNT with the deictic I and connect with appetitive augmental functions.

After finishing the protocol, the participant was given a 5-minute audio file containing an exercise in order to practice what was worked on during the protocol on a daily basis. The aim of the exercise was to facilitate the identification of valued actions in which participants could engage during the day and defusing from the triggers for worrying/ruminating that could surface and to act with personal meaning.

Procedure

The study was conducted in the Clinical Psychology laboratory of a Colombian university. An external ethic committee approved the experimental-clinical procedures. All measures were taken online through Typeform (www.typeform.com). Participants who showed interest in the research and met the inclusion criteria were invited to an informative session led by the second author in which the study was presented, and all informed consents were signed. Immediately afterwards, the first administration of the self-reports was conducted, and participants were informed how to respond to the subsequent daily self-monitoring. During the following weeks (2 to 8 weeks depending on the cohort assigned to the participant), participants provided the baseline data as follows: the second author (who was not present during the protocol implementation) sent email messages daily and every two weeks to remind participants, respectively, of the self-monitoring and the self-reports.

After collecting the baseline data, the protocol was implemented in an individual format. The first author, who is an experienced ACT therapist (trained by the fourth author) and has served as therapist in other ACT studies, implemented the protocols in all cases. At the end of the session, the participant was given a 5-minute audio-file and was invited to practice with it on a daily basis and to respond to the daily self-monitoring and bi-weekly self-reports.

Data analysis

Following a bottom-up analysis of single-case experimental designs (SCED) (Parker & Vannest, 2012), the results were first graphed using the RcmdrPlugin.SCDA plug-in package for R software (Bulté & Onghena, 2013) and with the trimmed mean as a measure of central tendency with no more than 20% of observations removed (Bulté & Onghena, 2012). Subsequently, statistical analyses for SCDE were selected and computed.

Although significant advances have been produced in recent years regarding the statistical analysis of SCED, there is still no consensus about what is the most adequate statistical test for this type of data. Indeed, influential authors (e.g., Manolov, Gast, Perdices, & Evans, 2014) recommend reporting the results of several statistical procedures,

as is usual in structural equation modeling. Accordingly, we selected two different but complementary statistical methods: (a) the *JZS+AR* Bayesian hypothesis testing for single-subject designs (de Vries & Morey, 2013, 2015), and (b) the nonparametric *Tau-U* statistic (Parker, Vannest, & Davies, 2011). The two types of analysis have in common that they are designed to be useful when the data within each phase are expected to be stable around a certain true mean (i.e., there is no trend), although both methods provide procedures to control for baseline trends. We selected this approach because we expected baseline data to be stable because participants stated that their worry/rumination had interfered in their lives at least for the past 6 months, and methods to control trends within phases are controversial (e.g., Parker et al., 2011).

The *JZS+AR* Bayesian model (de Vries & Morey, 2013) is an adaptation of the *JZS t*-test (Rouder, Speckman, Sun, Morey, & Iverson, 2009) and accounts for the serial dependence typical of single-subject designs with an autorregressive (*AR*(1)) model. It provides a *Bayes factor* (B_{ar}), which quantifies the relative evidence in the data for the hypothesis of no intervention effect (i.e., the true mean in the baseline equals the true mean in the intervention phase: $B_{ar} > 1$) and for the hypothesis of intervention effect (i.e., the true means of both phases differ: $B_{ar} < 1$). In addition, this model provides an estimation of the effect size consisting of standardizing the difference in true means between phases. This standardized mean difference, termed as δ , is slightly different from the conventional Cohen's *d*, where the mean difference is standardized by the within-group standard deviation. All analyses regarding the *JZS+AR* model were conducted in the *BayesSingleSub R* package (de Vries & Morey, 2015).

Tau-U is a nonoverlap effect size that does not require meeting the assumptions of parametric methods (e.g., normality, constant variance, etc.). It was derived from Kendall's rank correlation and the Mann-Whitney-*U* between-group test. *Tau-U* scores range from -1 to 1 and can be interpreted as the percentage of data that improved between two phases of a study (Parker et al., 2011). There are still no established guidelines for the interpretation of *Tau-U*. We computed *Tau-U* values using the on-line calculator provided by Vannest, Parker, and Gonen (2011).

Data from self-report instruments were also analyzed with the *JZS+AR*. These data were not analyzed with *Tau-U* because there were few overlaps between baseline and follow-up data, so this effect size would show a ceiling effect (Parker et al., 2011). Computing the *JZS+AR* has the advantage of taking into account all information collected in the study instead of considering only one datum from the baseline and another one from the follow-up. In this sense, this computation provides a conservative effect size because it does not take into account the potential tendency of the follow-up data. Accordingly, in order to provide a Cohen's *d* estimation directly comparable to the effect size computed in group research (e.g., open trials or within-participant *d* computed in randomized clinical trials), three different within-participant *d* were computed by averaging the mean scores obtained during the baseline and the scores on each of the follow-up assessment points (i.e., the 2-, 4-, and 6-week follow-up).

Clinically significant change (CSC) for all self-report measures of RNT and emotional symptoms was computed according to Jacobson and Truax (1991) guidelines, which require: (a) a reliable change index (RCI) consisting of a minimum change in

scores from pretreatment to posttreatment, and (b) crossing a cutoff point that brings the participant closer to the mean of the functional population than to the clinical one. The RCI scores were calculated using the software provided by Morley and Dowzer (2014) and the reliability and normative data on each measure, as shown in the measures description.

Treatment integrity

Interventions were observed through the Gessell camera by two independent observers and were videotaped. The observers were undergraduates who had received training in ACT during the previous semester provided by the first and second authors. They were provided with a complete script of the protocol and were trained by the second author to review whether the experimenter addressed the points presented in Table 2. According to both observers, all interventions followed the protocol accurately and addressed the points presented in Table 2.

RESULTS

Table 3 presents the clinical description of participants according to the mean scores on the DASS-21 and GHQ-12 at baseline and the 6-week follow-up. Most of the participants' scores on the GHQ-12 and DASS-21 were within the range of clinical samples at baseline. More specifically, nine out of eleven participants (82%) scored in the GHQ-12 above the cutoff for the screening for minor mental disorders, and in the DASS-21, eight participants showed clinically significant scores both in depression and anxiety, and ten participants showed clinically significant scores in stress. Participants' mean scores at baseline in measures of RNT, experiential avoidance, cognitive fusion, and valued living measures were within the clinical range (see Table 5).

In conclusion, although no formal diagnosis interview was conducted, the results of the baseline assessment suggest that all participants met the criteria for the diagnosis of a mild to moderate emotional disorder.

Figure 2 shows the results of each participant in the RNT self-monitoring. Visual inspection reveals that most participants showed a high degree of variability in RNT at baseline. The intervention produced a level change at posttest for four participants (P2, P3, P4, and P6) and during the follow-up, for another four participants (P5, P7, P9, and P10).

Figure 2 also presents the individual effect sizes for *JZS+AR* and *Tau-U* in the self-monitoring of worry/rumination. With regard to the Bayesian model, seven out of eleven participants (64%) showed a B_{ar} lower than 1.0, which suggests that the hypothesis of intervention effect is more strongly supported by the data than the hypothesis of no effect. Eight out of eleven participants (73%) showed statistically significant improvements according to *Tau-U*. The results of both statistical procedures highly overlapped with the visual analysis.

Figure 3 shows the scores' evolution on the RNT-related self-report instruments and the effect sizes, and B_{ar} on the *JZS+AR* Bayesian model. Significant reductions in

Table 3. Clinical Description of Participants at Baseline and the 6-Week Follow-Up.

		GHQ \geq 12	DASS-21 Depression	DASS-21 Anxiety	DASS-21 Stress
P1	Baseline	Yes	Normal	Normal	Normal
	6-w FU	No	Normal	Normal	Normal
P2	Baseline	Yes	Mild	Moderate	Moderate
	6-w FU	No	Normal	Normal	Normal
P3	Baseline	Yes	Moderate	Moderate	Mild
	6-w FU	Yes	Moderate	Mild	Normal
P4	Baseline	No	Normal	Mild	Severe
	6-w FU	No	Normal	Mild	Mild
P5	Baseline	Yes	Normal	Mild	Moderate
	6-w FU	No	Normal	Normal	Normal
P6	Baseline	Yes	Moderate	Normal	Mild
	6-w FU	No	Normal	Normal	Normal
P7	Baseline	Yes	Moderate	Normal	Moderate
	6-w FU	No	Normal	Normal	Normal
P8	Baseline	No	Mild	Mild	Mild
	6-w FU	No	Normal	Normal	Moderate
P9	Baseline	Yes	Moderate	Mild	Mild
	6-w FU	No	Mild	Mild	Normal
P10	Baseline	Yes	Severe	Ext. Severe	Severe
	6-w FU	No	Moderate	Severe	Moderate
P11	Baseline	Yes	Moderate	Moderate	Moderate
	6-w FU	No	Normal	Mild	Normal
Total			Mild: 2	Mild: 4	Mild: 4
	Baseline	Yes: 9	Moderate: 5	Moderate: 3	Moderate: 4
	6-w FU	Yes: 1	Severe: 1	Ext. sev.: 1	Severe: 2
			Mild: 4	Mild: 4	Mild: 1
			Moderate: 2	Severe: 1	Moderate: 2

Notes: DASS-21= Depression, Anxiety, and Stress Scale-21; Ext. sev.= Extremely severe; GHQ= General Health Questionnaire-12.

worry, brooding, and frequency of negative thoughts were found, respectively, in seven, eight, and ten participants (see Figure 3). Overall, nine participants showed significant changes in at least half of the RNT-related measures (see Table 4).

With respect to RNT-related measures, eight out of eleven participants (73%) reached a clinically significant change at the 6-week follow-up for pathological worry (PSWQ) and frequency of negative thoughts, and four participants (36%) for brooding (RRS-SF). Results of CSC in emotional symptoms varied from 46% in the overall score of the DASS-21 to 82% in the scores of the GHQ-12.

Table 5 shows descriptive data of the complete sample at baseline and at the 2-, 4-, and 6-week follow-ups in self-report instruments. In general, effect sizes increased across time, especially between the 4-week and 6-week follow-ups. With respect to RNT-related measures, within-condition Cohen's d were very large at the 6-week follow-up for worry ($d= 2.15$), brooding ($d= 1.86$), and frequency of negative thoughts ($d= 1.61$). In emotional symptoms, the effect sizes at the 6-week follow-up were very large for the GHQ-12 ($d= 1.71$) and the total score of the DASS-21 ($d= 1.62$). With respect to the DASS-21 subscales, the effect sizes were large for anxiety ($d= .87$) and depression ($d= 1.12$), and very large for stress ($d= 2.09$). Lastly, effect sizes at the 6-week follow-up were very large for experiential avoidance ($d= 2.09$) and cognitive fusion ($d= 2.23$), whereas for valued living, the effect sizes were large for Progress ($d= .77$) and very large for Obstruction ($d= 2.35$).

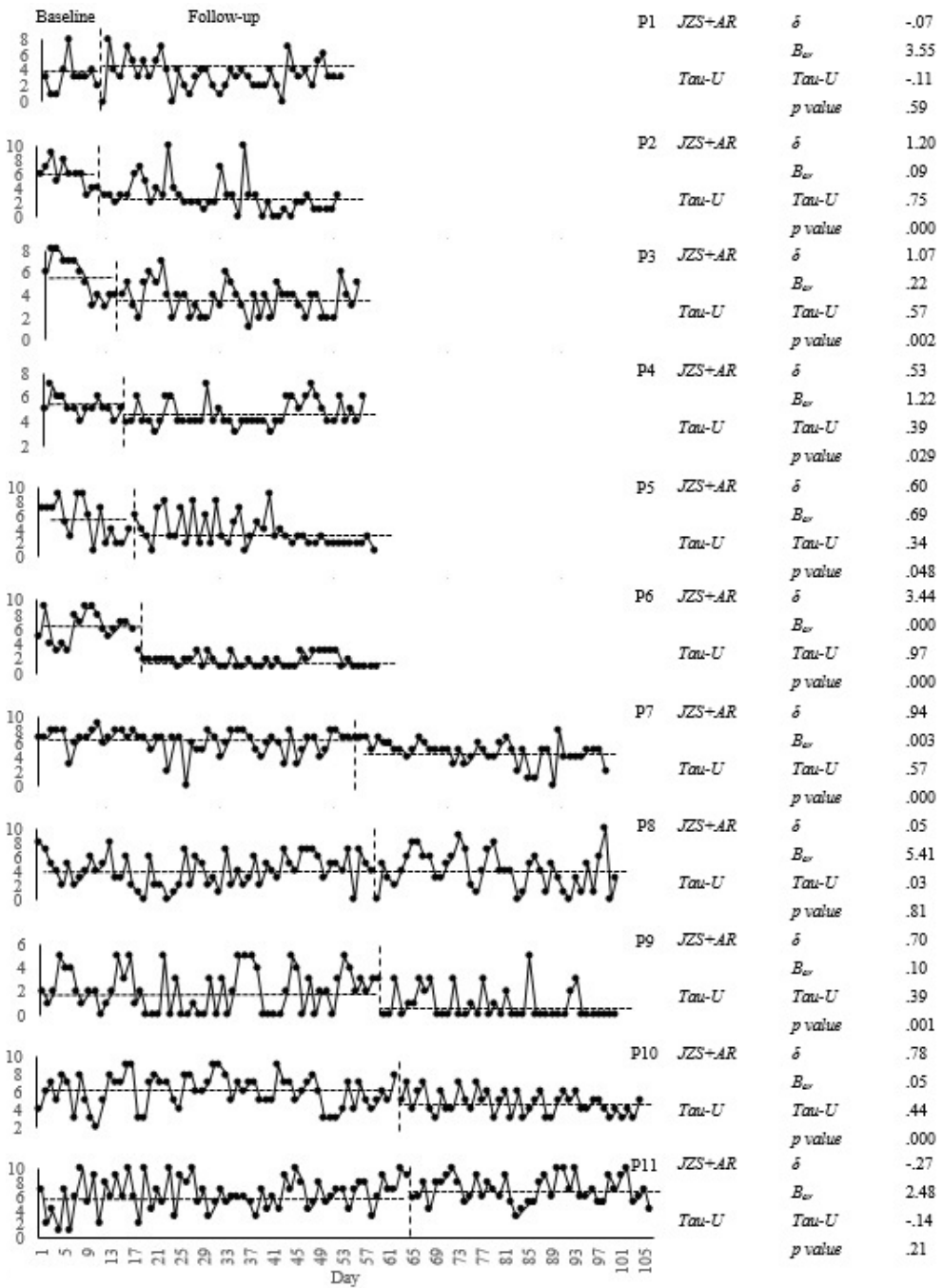


Figure 2. Results on the daily RNT self-monitoring and JZS+AR and Tau-U analyses.

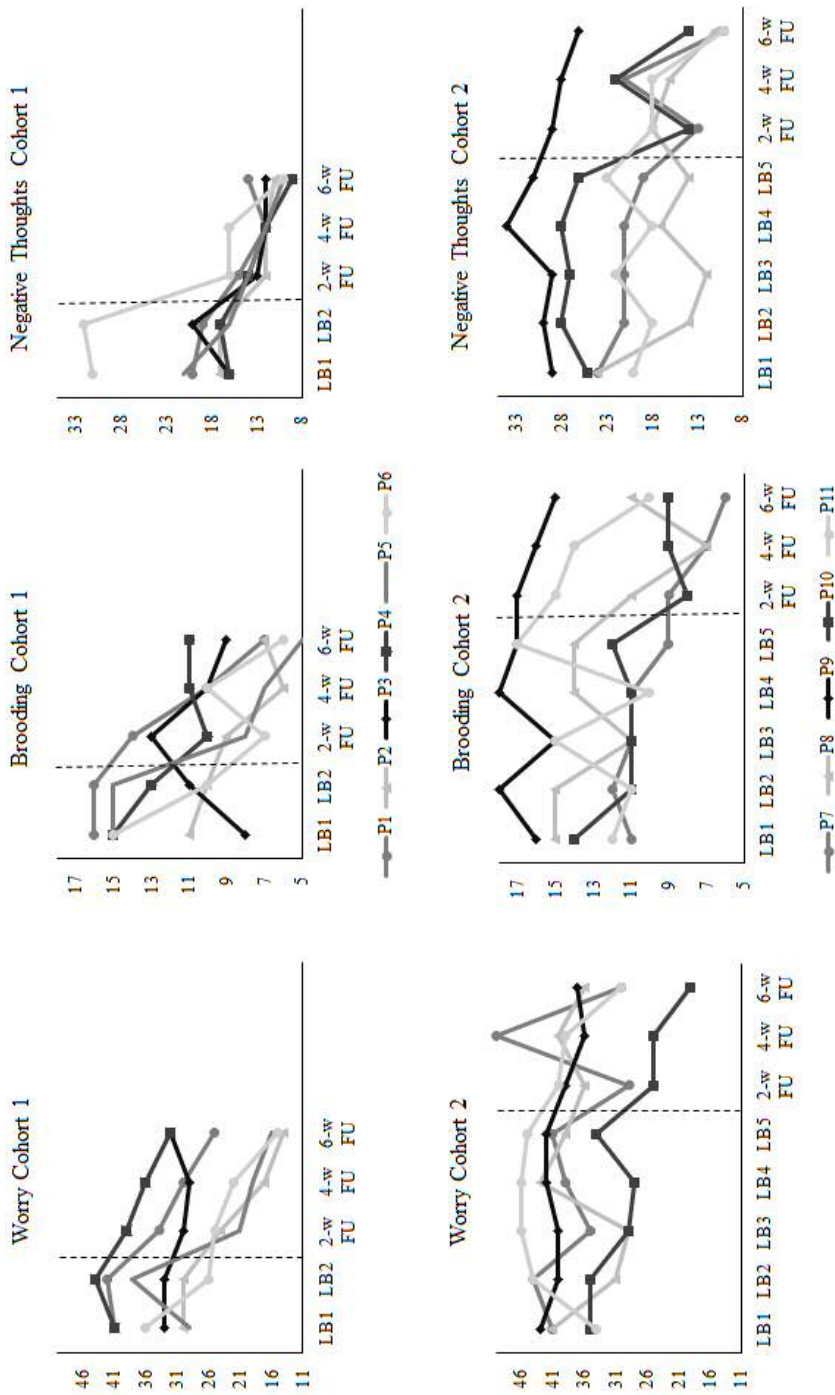


Figure 2. Results on biweekly RNT-related measures in both cohorts /ZS+AR and analyses.

Table 4. Significant Change in RNT-related Measures

	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	% SSC
Self-monitoring	X	√	√	√	√	√	√	X	√	√	X	73%
PSWQ: Pathological worry	√	√	√	√	√	X	X	X	√	√	X	64%
RRS-SF: Brooding	√	√	X	√	√	√	√	√	√	X	X	73%
ATQ-8: FNT	√	√	√	√	√	√	√	X	√	√	√	91%
Overall Significance Change	3/4	4/4	3/4	4/4	4/4	3/4	3/4	1/4	4/4	3/4	1/4	

Notes: ATQ-8= Automatic Thoughts Questionnaire-8; FNT= Frequency of negative thoughts; PSWQ= Pennsylvania State Worry Questionnaire; RRS-SF= Rumination Response Scale-Short Form; %SSC= statistically significant change; √= significant change; X= no change.

Table 5. Means and Standard Deviations of the Complete Sample in each Self-Report Measure at Baseline and Follow-Ups, and Within-Condition Effect Size

	Baseline	2-week FU	4-week FU	6-week FU	Cohen's <i>d</i>		
	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	2-w FU	4-w FU	6-w FU
PRIMARY OUTCOMES							
PSWQ: Pathological worry	36.79 (5.01)	31.09 (6.85)	31.18 (10.09)	26.00 (8.60)	1.14	1.12	2.15
RRS-SF: Brooding	13.06 (2.33)	11.00 (3.29)	9.73 (3.10)	8.73 (2.94)	.89	1.43	1.86
ATQ-8: Frequency negative thoughts	21.45 (5.58)	16.00 (4.73)	16.45 (5.35)	12.45 (4.78)	.98	.90	1.61
SECONDARY OUTCOMES							
GHQ-12: Psychological distress	15.29 (4.96)	6.82 (5.12)	9.36 (4.88)	6.82 (4.40)	1.71	1.20	1.71
DASS-Total: Emotional symptoms	23.07 (6.90)	16.27 (9.67)	16.73 (8.79)	11.91 (8.77)	.99	.92	1.62
DASS-Depression	6.85 (3.11)	4.45 (3.08)	4.55 (3.27)	3.36 (2.98)	.77	.74	1.12
DASS-Anxiety	5.51 (3.08)	3.64 (3.83)	4.18 (3.25)	2.82 (3.09)	.61	.43	.87
DASS- Stress	10.71 (2.38)	8.18 (3.84)	8.00 (3.49)	5.73 (3.98)	1.06	1.14	2.09
AAQ-II: Experiential avoidance	29.65 (5.18)	24.64 (5.33)	22.45 (6.02)	18.82 (6.57)	.97	1.39	2.09
CFQ: Cognitive fusion	32.03 (5.67)	27.18 (6.19)	22.91 (8.51)	19.36 (7.63)	.85	1.61	2.23
VQ (valued living)-Progress	16.18 (5.77)	19.00 (5.22)	18.82 (5.69)	20.64 (4.95)	.49	.46	.77
VQ (valued living)-Obstruction	15.89 (3.83)	10.55 (3.50)	9.91 (4.01)	6.91 (4.61)	1.40	1.56	2.35

Notes: AAQ-II= Acceptance and Action Questionnaire-II; ATQ-8= Automatic Thoughts Questionnaire-8; CFQ= Cognitive Fusion Questionnaire; DASS= Depression, Anxiety, and Stress Scales-21; GHQ-12= General Health Questionnaire-12; PSWQ= Pen State Worry Questionnaire; RRS-SF= Rumination Response Scale-Short Form; VQ= Valuing Questionnaire.

DISCUSSION

In the current study, we have suggested that unconstructive worry and rumination are especially maladaptive, problem-solving experiential avoidance strategies that tend to be the first reactions to fear and incoherence. They typically prolong negative affect while leading to engagement in subsequent additional experiential avoidance strategies (Casselli *et al.*, 2013; Nolen-Hoeksema *et al.*, 2007; Wells, 2002) to the point of generating an inflexible repertoire. We have also suggested that triggers for worrying/ ruminating are hierarchically organized so that directing efforts to the trigger at the top of the hierarchy would strengthen the intervention effect (Luciano *et al.*, 2016).

This study constituted an initial step in testing the effect of ACT protocols focused on disrupting RNT for the treatment of emotional disorders. Specifically, we

explored whether a one-session ACT protocol based on the RFT account of psychological flexibility and formation of the self (Luciano *et al.*, 2011, 2012, 2016; Törneke *et al.*, 2016) would be sufficient to significantly disrupt RNT. A randomized multiple-baseline design was conducted with eleven participants experiencing RNT that had interfered with their functioning for at least the past 6 months. Moreover, most of them suffered from moderate emotional symptoms and scored above the cutoff in a screening for emotional disorders (i.e., the GHQ-12).

The results of the study were very promising considering that all participants showed improvement according to SCED analyses in at least one of the four RNT-related measures, with nine out of eleven participants improving in at least three of them. The effect of the intervention increased across time, especially between the 4-week and the 6-week follow-up. Within-participant effect sizes were very large for all RNT-related measures at the 6-week follow-up. Importantly, these effect sizes are comparable to the effect of complete psychological interventions in these measures (e.g., Hanrahan, Field, Jones, & Davey, 2012). Effect sizes were also very large in emotional symptoms and ACT-related measures (experiential avoidance, cognitive fusion, and valued living).

The experimental design cannot respond to why the ACT protocol reached these unusually large effect sizes. However, according to our previous RFT analysis, we suggest that it could be due to three main reasons. Firstly, in spite of its brevity, the protocol addressed the three angles to promote psychological flexibility according to Törneke *et al.* (2016): (a) helping participants to discriminate the inflexible repertoire in response to some private events, (b) helping them to discriminate their own behavior and to frame it through a hierarchical relation with the deictic I and, in that context, (c) helping to specify augmental functions and related actions. Secondly, the protocol was focused on disrupting the first and most pervasive reaction to triggers (i.e., worry/rumination), which extends discomfort and supports further experiential avoidance strategies. This way, the intervention would have been directed toward the root of the problem. Thirdly, the protocol emphasized identifying and working with the trigger for RNT at the top of the self-hierarchy. This might be especially relevant because, following the example of the introduction, the effect of promoting flexible reactions to the trigger at the top of the hierarchy (i.e., “I’m a failure”) would generalize to the remaining triggers according to how transformations of functions through hierarchical relations works (Gil *et al.*, 2012, 2014). Conversely, working with a trigger at a lower level of the hierarchy (e.g., “I will fail the exam next week”) would not necessarily lead to the generalization of the ability to the trigger at the top of the hierarchy or to the triggers at other branches of the hierarchy (e.g., “They don’t want to be with me,” “My boyfriend can do better”). Additionally, the fact that the intervention effects were larger at the 6-week follow-up could be due to participants’ increasing practice in disrupting the RNT process. This is consistent with most of the participants’ comments at the end of the study in the sense that they experienced that their ability to disengage from RNT increased across time.

The strengths and limitations of this study are worth mentioning. A relevant strength resides in the experimental design: a two-arm, randomized multiple-baseline design across participants. The randomization procedure conducted significantly increases the internal validity of the experimental design (Kratzschwill & Levin, 2010).

Importantly, the experimental design combined the strengths of SCED (i.e., repeated measures during baseline and individual analysis of the clinical relevance of outcomes) and group design, as Cohort 2 served as a wait-list control condition for the intervention effects of Cohort 1. However, the current study also presents several limitations. Firstly, although the number of participants is sufficient for a SCED methodology, the sample size was small, so that the comparison of the effect sizes and CSC data with other studies with greater sample sizes may be premature. Secondly, no diagnostic interview was conducted, although most participants scored above the cut-off of the GHQ-12 and showed moderate emotional symptoms. Thirdly, the follow-up was short and could be seen as the equivalent to the posttreatment data of a clinical study with 6- to 8-session treatments. Fourthly, only one therapist implemented the protocols, which reduces the external validity of the findings. According to the above-mentioned limitations, further studies might recruit a larger sample, include diagnostic interviews, increase the follow-up period, and use several therapists to implement the intervention.

In conclusion, brief ACT protocols seem to be effective in disrupting RNT. Developing and testing an ACT version for emotional disorders primarily focused on disrupting RNT is a worthwhile direction to improve the efficacy of ACT in these disorders.

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