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How are triggers for repetitive negative thinking organized? A relational frame analysis

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Abstract

Background: Repetitive negative thinking (RNT) has been identified as an important transdiagnostic process. However, little empirical research has been conducted into how triggers for RNT are organized. This study tested the hypothesis that these triggers are usually hierarchically related.

Method: One-hundred undergraduates underwent several evaluation phases. Firstly, a diagnostic interview was administered. Secondly, participants responded to several questionnaires measuring emotional symptoms and the tendency to engage in RNT. Thirdly, participants were presented with a list of thoughts that typically serve as triggers for RNT. They were asked to select the thoughts they usually experienced and to rate how much they became entangled in those thoughts. Fourthly, three types of diagrams were explained that showed ways in which the triggers could be organized: COORDINATION, COMPARISON, and HIERARCHY. Participants were asked to select the diagram that best described them.

Results: Seventy-nine participants organized their triggers for RNT in hierarchies, 19 participants in relationships of comparison, and 2 in coordination. Participants who selected HIERARCHY exhibited higher scores in RNT than those who selected the comparison diagram.

Conclusions: Psychological interventions aimed at disrupting RNT should take into account how triggers are organized.

Keywords: Repetitive negative thinking, rumination, worry, relational frame theory, hierarchical relations, acceptance and commitment therapy

Resumen

Análisis de la organización de los disparadores del pensamiento negativo repetitivo desde la teoría del marco relacional. **Antecedentes:** el pensamiento negativo repetitivo (PNR) ha sido identificado como un proceso transdiagnóstico relevante. Sin embargo, se ha realizado escasa investigación acerca de cómo se relacionan sus disparadores. Este estudio evaluó la hipótesis de que los disparadores suelen relacionarse jerárquicamente. **Método:** se evaluó a 100 universitarios. Primero, se administró una entrevista diagnóstica. Segundo, los participantes completaron medidas de síntomas emocionales y la tendencia a implicarse en PNR. Tercero, se les presentó un listado de pensamientos que suelen funcionar como disparadores de PNR, seleccionaron los que suelen experimentar y evaluaron el grado en que se quedan enredados con ellos. Cuarto, se les explicó tres diagramas que representaban formas en que los disparadores pueden organizarse: COORDINACIÓN, COMPARACIÓN y JERARQUÍA. Finalmente, se les pidió que seleccionaran el que mejor se les ajustaba. **Resultados:** setenta y nueve participantes organizaron los disparadores en jerarquías, 19 en relaciones de comparación y 2 en coordinación. Los participantes que seleccionaron JERARQUÍA obtuvieron mayores puntuaciones en PNR que los que eligieron el diagrama de comparación. **Conclusiones:** las intervenciones psicológicas que buscan alterar PNR deberían tener en cuenta cómo se organizan los disparadores.

Palabras clave: pensamiento negativo repetitivo, rumia, preocupación, Teoría del Marco Relacional, relaciones jerárquicas, terapia de aceptación y compromiso

From an evolutionary perspective, the activity of thinking and solving problems has allowed human beings to attain monumental achievements. From an ontogenetic perspective, however, thinking and problem-solving can also lead to unpleasant consequences, especially when the activity is triggered by and focused on negative content and becomes recurrent without leading to the desired goals (Ehring & Watkins, 2008). This thinking and problem-solving pattern has been called repetitive negative thinking (RNT) and is

a common behavioral pattern across many psychological disorders (e.g., Harvey, Watkins, Mansell, & Shafran, 2004).

Different forms of RNT have been identified, with rumination and worry being the most studied ones (Watkins, 2008). Rumination has been conceptualized as repetitive and passive thinking about the causes, consequences, and meaning of unattained goals (Martin & Tesser, 1996), and worry as repetitive thoughts focused on issues that generate uncertainty or possible negative future outcomes (Berenbaum, 2010). Although the literature about worry and rumination has been largely developed separately and under the umbrella of different approaches (e.g., Watkins, 2016), both reactions are triggered by thoughts concerning the nonattainment of personal goals and values, with the main difference being that rumination is past-oriented and worry is future-oriented.

Research on RNT has advanced in different areas, such as its identification as a central process across psychopathology (Harvey et al., 2004), the distinction of RNT from other forms of recurrent cognition such as obsessions and intrusive memories (Ehring & Watkins, 2008), the identification of the metacognitive beliefs that support RNT (e.g., “I must worry in order to cope”) (Wells, 2009), the maladaptive role of engaging in an abstract-level of RNT (Watkins, 2008), or its conceptualization as an experiential avoidance strategy (e.g., Newman & Llera, 2011).

One topic that has been scarcely analyzed, however, is the relationship among the triggers (e.g., negative thoughts) for engaging in RNT. This might be related to the aims of the therapeutic approaches derived from research on RNT, such as metacognitive therapy (Wells, 2009) and rumination-focused cognitive-behavioral therapy (Watkins, 2016), which focus on disrupting the RNT process and consider that negative thoughts or dysfunctional cognitive schemas are not problematic *per se*.

The most related conceptualization of the relationships among triggers for RNT come from traditional cognitive approaches such as cognitive therapy (Beck, Rush, Shaw, & Emery, 1979) or schema therapy (Young, 1994). In these cases, negative thoughts that could trigger RNT are suggested to be generated by cognitive schemas. Although the conceptualization of schemas varies across these approaches, one common notion seems to be that there are schemas that are more nuclear than others (i.e., schemas are hierarchically organized). However, to our knowledge, there is no empirical research supporting this claim.

An alternative view of this topic has recently appeared from a contextual approach to human language and cognition called relational frame theory (RFT; Hayes, Barnes-Holmes, & Roche, 2001). Briefly, RFT suggests that relational framing underlies human language and cognition. Relational framing is an operant behavior consisting of relating two or more events based on arbitrary relational cues, which permits responding to one stimulus based on its relation with another stimulus. There are different types of framing such as relating in coordination (“is,” “same as,” etc.), opposition (“opposite to”), comparison (“more than” “less than”),

hierarchy (“belongs to” “includes” “part of”), causal (“if... then”), deictic (I-You, Here-There, Now-Then), etc. From this perspective, thoughts are relational networks consisting of stimuli that are framed through several relational cues and they might function as triggers for engaging in RNT when involving the transformation of aversive functions (e.g., “I have failed a physics exam for the first time in my life”).

Recently, it has been suggested that triggers for RNT usually become related in hierarchical networks across the individual’s learning history (Luciano, 2017; Luciano, Ruiz, Gil-Luciano, Barbero-Rubio, & Alonso, in press; Ruiz, Flórez et al., 2018; Ruiz, Riaño-Hernández, Suárez-Falcón, & Luciano, 2016). This way, some thoughts would acquire aversive functions because of being part of an overarching trigger signaling an abstract negative reinforcer at the top of a hierarchical network of negative reinforcers. This conceptualization of triggers for RNT points to the idea that they might arbitrarily become the other “side of the coin” of personal values, which in RFT terms are established as personal abstract verbally positive reinforcers at the top of a hierarchical relational network including other positive goals and actions (Barnes-Holmes, Barnes-Holmes, McHugh, & Hayes, 2004). Figure 1 depicts an example of hierarchies of positive and negative verbally established reinforcers that might be related in opposition for personal relevant actions. In this example, the thought “I’m a failure” is the overarching trigger that provides aversive functions to new or old triggers that are experienced in a given moment. For instance, the thought “Can I trust her?” can be derived for the first time when the person perceives that his couple is not interested in his problems and would have an aversive function when it becomes related in opposition to not having the desired couple relationship (i.e., failing in the area of couple relationships), engaging in RNT and, consequently, failing to some extent in this life area.

This hierarchical functional analysis of the relationships among triggers for RNT would have an important clinical implication, according to RFT research, in transformation of functions through hierarchical relations (e.g., Gil, Luciano, Ruiz, & Valdivia-Salas,

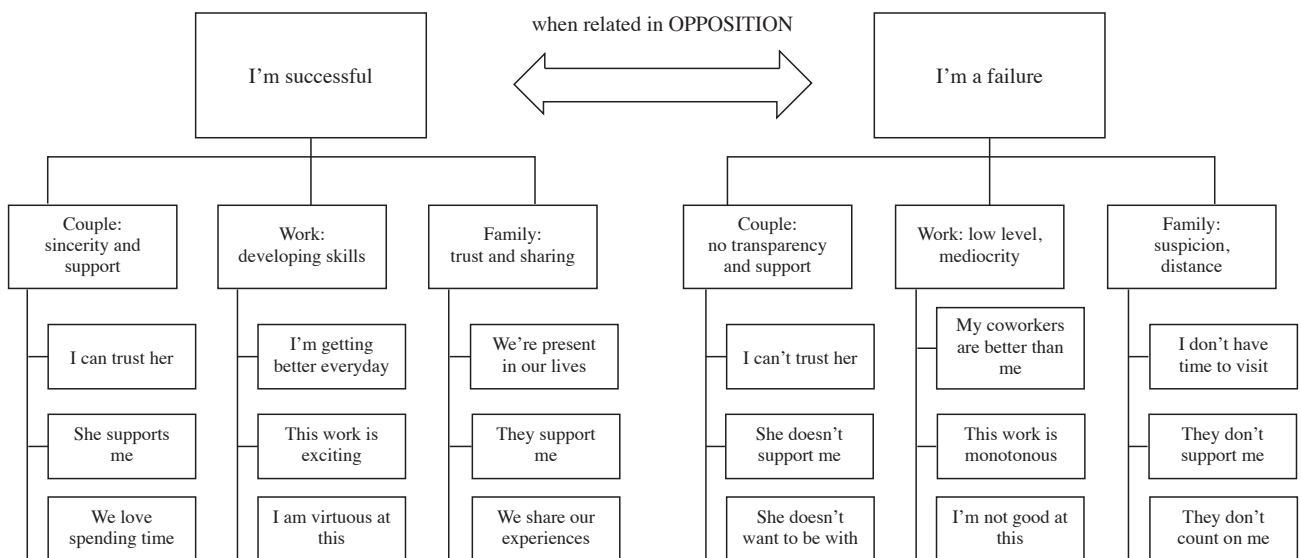


Figure 1. Example of a hierarchical functional organization of positive verbal reinforcers (left) and thoughts that might become triggers for engaging in RNT (right)

2012). If this rationale is correct, altering the discriminative functions of the trigger at the top of the hierarchy (i.e., learning to notice the thought, but not engage in RNT) should also alter the functions of old and new triggers at lower levels of the hierarchy. Accordingly, directing the intervention to the trigger at the top of the hierarchy would strengthen its effect by facilitating the generalization of the trained ability to contained triggers (see further details in Ruiz et al., 2016).

The aim of this study is to initiate an empirical analysis of the relationships among triggers for RNT. Specifically, we assessed the triggers in a large pool of participants and asked them to select one of three suggested models in which their triggers might be related: relations of coordination, comparison, and hierarchy.

Method

Participants

One-hundred undergraduates (71 women, age range = 18 to 32; $M = 20.33$, $SD = 1.77$) participated in this study. None of them had previous experience with the procedures or the theory (i.e., RFT) involved in this study. Participants were recruited through class advertisements and were rewarded with 20,000 Colombian pesos (approximately 6 euros) for their participation. Seventy-five participants were studying Psychology, 8 International Business Studies, 7 Engineering, 2 Mathematics, 2 Law. The remaining participants were studying different careers such as Marketing, Physical Education, Philosophy, and Arts.

Instruments

Mini International Neuropsychiatric Interview (MINI; Sheehan et al., 1998). The MINI is a brief, structured clinical interview that assesses the main psychological disorders contained in Axis I of the DSM-IV-TR criteria. The administration of the MINI takes approximately 15 minutes and it has shown similar reliability to other longer diagnostic interviews.

Personal Health Questionnaire - 9 (PHQ-9; Kroenke, Spitzer, & Williams, 2001). The PHQ-9 is a 9-item, 4-point Likert-type scale (3 = *nearly every day*; 0 = *not at all*), self-report instrument that was designed as a diagnostic and severity measure of depression. It contains the nine diagnostic criteria of unipolar depression according to the DSM-IV-TR. We used the Spanish translation of the PHQ-9 for Colombia distributed by Pfizer, which has shown good psychometric properties in initial studies in our laboratory with clinical ($\alpha = .86$) and nonclinical samples ($\alpha = .89$), and a one-factor structure. Cronbach's alpha of the PHQ-9 in this study was .85.

Generalized Anxiety Disorder - 7 (GAD-7; Spitzer, Kroenke, Williams, & Löwe, 2006). The GAD-7 is a 7-item, 4-point Likert-type scale (3 = *nearly every day*; 0 = *not at all*), self-report instrument that was designed as a diagnostic and severity measure of GAD according to the diagnostic criteria of the DSM-IV-TR. We used the Spanish translation of the GAD-7 for Colombia, distributed by Pfizer, which has shown good psychometric properties in initial studies in our laboratory with clinical ($\alpha = .87$) and nonclinical samples ($\alpha = .90$), and a one-factor structure. Cronbach's alpha of the GAD-7 in this study was .88.

Depression Anxiety and Stress Scales-21 (DASS-21; Lovibond & Lovibond, 1995). 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 last week. It contains three subscales (Depression, Anxiety, and Stress) and has shown good internal consistency and convergent and discriminant validity. 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, 2017). Cronbach's alpha of the DASS-21 in this study was .94.

Perseverative Thinking Questionnaire (PTQ; Ehring et al., 2011). The PTQ is a 15-item, 5-point Likert (4 = *almost always*; 0 = *never*), self-report instrument that was designed to evaluate the tendency to engage in RNT when facing negative experiences or problems. Unlike other measures, the PTQ is a content-independent self-report of RNT. The PTQ has shown excellent internal consistency, high test-retest reliability, and convergent and predictive validity. As there is no Spanish translation of the PTQ, we back-translated it, following the guidelines of Muñiz, Elosua, and Hambleton (2013). Preliminary data from our laboratory indicate that the PTQ possesses excellent internal consistency in Colombia. Cronbach's alpha of the PTQ in this study was .96.

Penn State Worry Questionnaire - 11 (PSWQ-11; Meyer, Miller, Metzger, & Borkovec, 1990). 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 because PSWQ reverse-scored items are difficult to understand for Spanish-speaking participants, which worsens the psychometric properties of the instrument. The PSWQ-11's internal consistency is excellent and it shows good test-retest reliability and discriminant validity. The PSWQ-11 has excellent internal consistency in Colombia (Ruiz, Monroy-Cifuentes, & Suárez-Falcón, 2018). Cronbach's alpha of the PSWQ-11 in this study was .94.

List of triggers for RNT (LT-RNT). The LT-RNT is a list of 70 items consisting of thoughts that usually have avoidance discriminative functions for people, which was designed for the current study. Examples of items are: "I am not strong enough," "I do not want to age," and "I am a loser." The list assesses whether participants usually have those thoughts and, if so, the level of entanglement with them. Respondents mark each thought with YES or NO, depending on whether they usually experience it. If an item was marked with YES, respondents indicate the degree of entanglement they usually have with the thought on a 5-point Likert-type scale (4 = *completely*; 0 = *not at all*). The LT-RNT can be seen at https://osf.io/pv4ye/?view_only=fb8175c1bb3b46e79389e9047c4e1629

Diagrams representing the relationships among triggers for RNT. Three diagrams were designed for the current study, which depicted the ways in which triggers for RNT could be organized. Triggers were represented as circles and pictures of gangsters. The first diagram (COORDINATION) presented the circles and pictures of gangsters of the same size (see Figure 2). The second diagram (COMPARISON) presented the circles and gangsters with increasing sizes (see Figure 3). Lastly, the third diagram (HIERARCHY) presented a central circle with other smaller circles orbiting it and miniatures of gangsters at the top, middle,

or bottom of a hierarchy (see Figure 4). Each diagram was first presented in a general way and then three hypothetical examples were provided to enhance understanding. These examples are shown below, and the complete script of the presentation of the diagrams can be seen at: https://osf.io/pv4ye/?view_only=fb8175c1bb3b46e79389e9047c4e1629

Procedure

The study was conducted in the Laboratory of Clinical Psychology of a Colombian university. All participants were provided with detailed information of the study and then signed the informed consent. Afterwards, the MINI interview was administered. Subsequently, participants completed the PHQ-9, GAD-7, DASS-21, PTQ, and PSWQ-11, in this order. Then, participants were administered the LT-RNT and the three diagrams that depicted the ways in which the triggers for RNT could be organized were explained. Participants were then asked to select the diagram that best described them. The interviewer asked participants to justify their selection to ensure that they had understood the diagrams and also asked them to depict the selected diagram with their six more problematic thoughts. Lastly, participants were fully debriefed about the aims of the study.

Mary gets **equally** entangled in each of these thoughts:



Figure 2. Diagram example of an organization of triggers in Coordination

Carlos gets **more** entangled in some thoughts than in others:

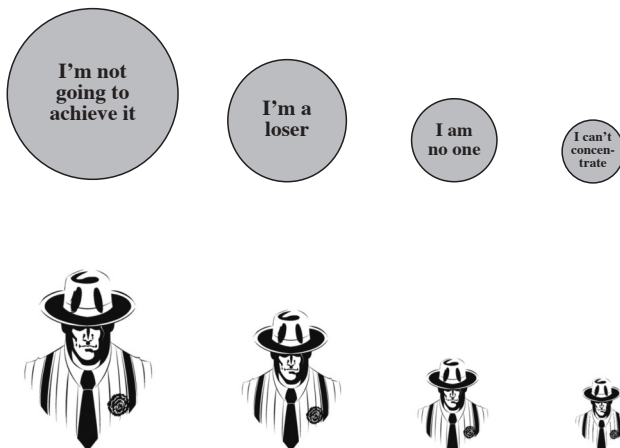


Figure 3. Diagram example of an organization of triggers in Comparison

Participants who were experiencing psychological difficulties according to the MINI, PHQ-9, or GAD-7 were offered to participate in a clinical study or alternatives for inexpensive psychological services.

Data analysis

Data analyses were computed with the free software JASP 0.8.6 (<https://jasp-stats.org/>). Firstly, we computed the descriptive data of the study. Secondly, we conducted a Multinomial Test to analyze whether participants selected some of the three types of diagrams (i.e., COORDINATION, COMPARISON, or HIERARCHY) more or less frequently than expected by chance (33.33% of selections). We computed the 95% confidence intervals (CI) for the selected proportion of each type of diagram and the p-value calibration introduced by Sellke, Bayarri, and Berger (2001), also known as the “Vovk-Sellke maximum p-ratio” (VS-MPR). The VS-MPR is interpreted as the maximum possible odds in favor of the alternative hypothesis over the null hypothesis (i.e., a type of Bayes Factor). The VS-MPR has shown better performance than the p-value in simulation studies (Ruiz-Ruano & López-Puga, 2018). Thirdly, because the variables did not follow a normal distribution, one-tailed Mann-Whitney U-tests were computed to test the hypothesis that participants who selected HIERARCHY would show higher scores on measures of RNT (i.e., the PTQ and PSWQ-11) than participants who selected COMPARISON. We excluded COORDINATION from this analysis because only two participants selected it. Lastly, we categorized the content of the triggers for RNT to explore the main topics across participants. Accordingly, two authors observed all the diagrams depicted by the participants and independently produced categories of topics for RNT. Then, they agreed about the name and number of topics presented in the diagrams. Subsequently, two independent raters classified each diagram to one of the categories. In case of discordance in the categorization, which only occurred in 17.17% of the cases, the raters were asked to agree on selecting only one category for each diagram depicted.

Results

One participant discontinued participation in the study after administering the MINI due to a personal emergency. Therefore, 99 participants completed the whole study. Table 1 shows the descriptive data of the self-report instruments. Participants showed mean scores within the range of nonclinical samples in other studies conducted in our laboratory.

Figure 5 presents the percentage of participants who selected COORDINATION (2.02%, 95% CI [0.2%, 7.1%]), COMPARISON (18.18%, 95% CI [11.1%, 27.2%]), and HIERARCHY (79.80%, 95% CI [70.5%, 87.2%]). The Multinomial Test showed statistically significant results ($\chi^2(2) = 100.06, p < .001$). The VS-MPR value was 3.93×10^{19} , which indicates that the observed data provide overwhelming evidence in favor of the alternative hypothesis of a different percentage of diagram selection from the 33.33% that would be expected by chance.

Table 2 shows the scores on the PTQ and PSWQ-11 of participants who selected COMPARISON and HIERARCHY. Participants who selected HIERARCHY showed statistically significantly higher scores on the PSWQ-11 ($W = 466, p = .012, d = 0.46$) and the PTQ ($W = 427.5, p = .004, d = 0.63$) than

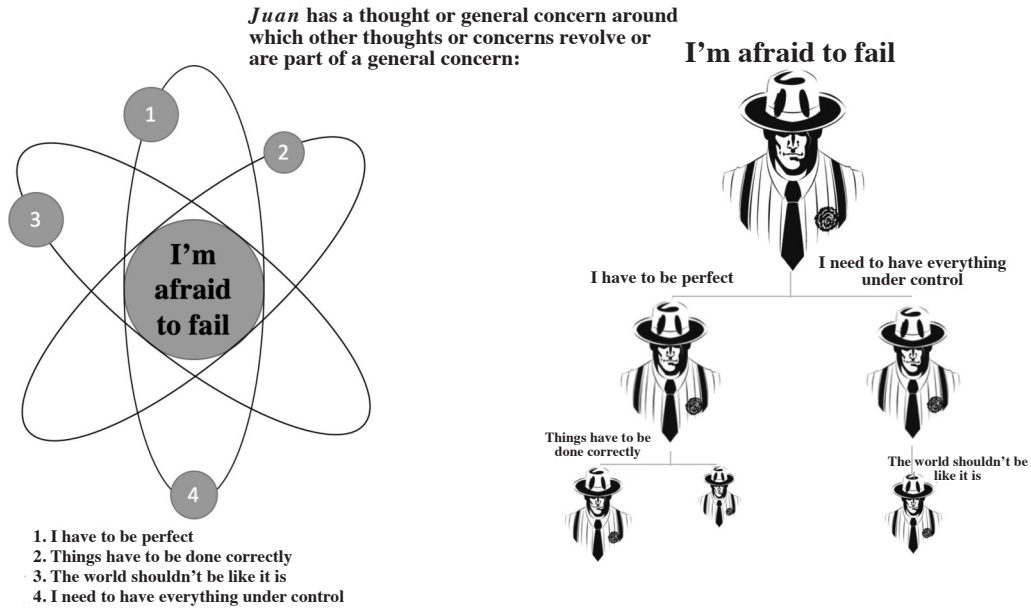


Figure 4. Diagram example of an organization of triggers in Hierarchy

Table 1
Descriptive data on self-report instruments

	PHQ-9	GAD-7	DASS-21	PTQ	PSWQ-11
<i>M</i>	7.75	6.73	15.86	22.37	26.50
<i>SD</i>	5.45	4.74	12.14	14.65	10.75

Note: DASS-21 = Depression, Anxiety, and Stress Scale – 21; GAD-7 = Generalized Anxiety Disorder – 7; PHQ-9 = Personal Health Questionnaire – 9; PSWQ-11 = Penn State Worry Questionnaire – 11; PTQ = Perseverative Thinking Questionnaire

those who selected COMPARISON, with medium effect sizes. The VS-MPR values were 7.13 and 15.68 for the PSWQ-11 and PTQ, respectively. These values indicate that the observed data moderately (PSWQ-11) and strongly (PTQ) support the alternative hypothesis that participants who selected HIERARCHY would show a higher tendency to engage in RNT than participants who selected COMPARISON.

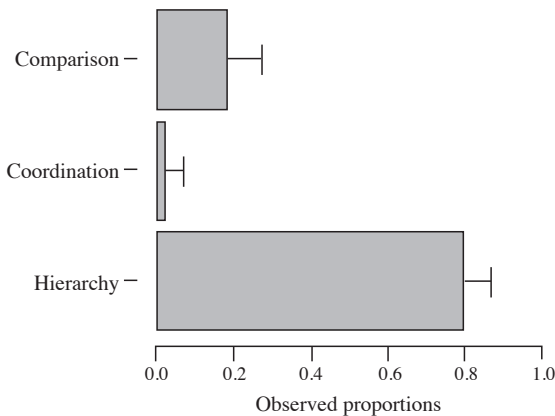


Figure 5. Percentages of selections of each diagram. Error bars represent the 95% confidence intervals

Table 3 shows the 6 main topics for RNT that were found in the diagrams and the percentage of participants that presented them.

Discussion

Recent RFT conceptualizations of RNT have suggested that triggers (or self-contents) usually become hierarchically organized across the individual's learning history (Luciano et al., in press; Luciano, 2017; Ruiz et al., 2016). All types of relational framing are involved in deriving contents about oneself, but deictic and, particularly, hierarchical framing seem key aspects in the development, fluency, and expansion of self-contents (Luciano, 2017). As the individual develops fluency in hierarchical framing, many actions are hierarchically related to goals, and these goals to more abstract positive reinforcers that are called values (Barnes-Holmes et al., 2004; see Figure 1). The individual then begins to derive thoughts and feelings with appetitive functions when framing in coordination the deictic "I" with the achievement of or advancement in those goals linked to values. Simultaneously, the individual also learns to derive aversive thoughts when the deictic "I" is framed in opposition to those goals and values. These private experiences can then function as triggers for engaging in

Table 2
Descriptive data on RNT measures of participants who selected Comparison and Hierarchy

	Diagram selected	M	SD
PSWQ-11	Comparison	22.44	12.47
	Hierarchy	27.30	10.10
PTQ	Comparison	14.78	16.82
	Hierarchy	23.85	13.76

Note: PSWQ-11 = Penn State Worry Questionnaire – 11; PTQ = Perseverative Thinking Questionnaire

Table 3
Categories of topics for RNT and percentage of participants showing them

Category	Meaning	% of participants
Failure	Fear of failing in important goals, feelings of being a failure, not having confidence in oneself, blaming oneself for committing errors	56.6%
Loneliness/Social criticism	Fear of being alone, feelings of being alone, fear of criticisms, thinking about what others think about one	19.2%
World/Life is unfair	Feeling that things should be or work differently, feeling of being mistreated or hurt by others	8.1%
Fear of thoughts/emotions/madness	Fear of some feelings and thoughts, fear of losing control and going mad	12.1%
Need to control/perfection	Needing to have everything under control, intolerance of uncertainty, needing to be perfect or everything to be perfect	9.1%
Fear of death/illness	Fear of one's own or a beloved one's death or illness	8.1%

RNT. In conclusion, this analysis presents thoughts with appetitive and aversive functions as the two sides of the same coin: one side constituted by a hierarchical network of appetitive thoughts linked to personal values and the other side formed by a hierarchical network of thoughts that acquired aversive functions due to framing them in opposition to the other network (see an example in Figure 1).

The present study aimed to be a first attempt to initiate an empirical analysis of the relationships among triggers for RNT. After conducting an assessment procedure that included selecting the individuals' most frequent triggers for RNT, ninety-nine participants were presented with three diagrams that depicted the ways in which triggers for RNT could be organized (COORDINATION, COMPARISON, or HIERARCHY). Most of participants selected HIERARCHY (79.80%) as the diagram that best described them, whereas COMPARISON was selected by 18.18% and COORDINATION by only 2.02%. Participants who selected HIERARCHY obtained higher scores on RNT than those who selected COMPARISON. The latter indicates that an overwhelming majority of participants showing at least an average level of RNT selected the HIERARCHY diagram.

The diagrams depicted by the participants were grouped in 6 main categories: failure, loneliness/social criticism, world or life as unfair, fear of thoughts/emotions/madness, need to control/perfection, and fear of death/illness. Failure and loneliness/social criticism were the two main topics of RNT. The high prevalence of RNT about failure (56.6%) is consistent with the conceptualization of triggers of RNT being the reverse side of the coin of values. Further research might analyze in more detail whether other topics such as world or life as unfair, fear of thoughts/emotions/madness, and need to control/perfection could be even subsumed into failure or loneliness/social criticism for some individuals.

Some limitations of this study are worth mentioning. Firstly, this study is an initial step towards analyzing how triggers for

RNT might be related. However, this study is only descriptive, and further studies should analyze experimentally how triggers of RNT are built in the learning history (e.g., recreating an analogue of a multiple-exemplar training procedure that could lead to the emergence of this repertoire). Secondly, all participants in this study were undergraduates. Further studies might replicate these findings with a more diverse sample in terms of age and educational level. Lastly, the procedure used in this study relies on the participants' ability to provide functional descriptions of their behavior. Further studies might develop alternative ways to analyze this topic that depends less on this ability (e.g., analyzing the differential impact of triggers on the participants' consequent behavior).

In conclusion, the preliminary results obtained in this study are consistent with the RFT conceptualization of triggers of RNT being hierarchically organized around an overarching trigger that sustains the remaining ones. These results might have relevant clinical implications. If triggers of RNT are hierarchically related, interventions directed to alter the discriminative functions of the trigger at the top of the hierarchy should also alter the functions of trigger at lower levels of the hierarchy (Gil et al., 2012), which might strengthen the effect of the intervention. This idea is present in two recent clinical studies that have shown that very brief protocols based on acceptance and commitment therapy can have very large effect sizes in treating emotional disorders (Ruiz et al., 2016; Ruiz, Flórez et al., 2018).

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