

## Exploring repetitive negative thinking (RNT) in the Brazilian population: a correlational analysis\*

### Explorando pensamentos negativos repetitivos (PNR) na população brasileira: uma análise correlacional

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**Resumo:** Repetitive Negative Thinking (RNT) is a maladaptive experiential avoidance strategy triggered by recurrent, aversive, and intrusive thoughts, present in the processes of rumination and worry. Studies in Acceptance and Commitment Therapy (ACT) suggest that high levels of Psychological Inflexibility (PI) intensify RNT patterns and increase psychological distress. However, there are no studies evaluating the application of this assumption in the Brazilian population. This study aims to (1) explore the relationships between RNT, PI, cognitive fusion (CF), and psychological distress (PD); and (2) assess if PI levels influence RNT levels and if CF is a significant mediator between them. Measures of CF, RNT, and PI were filled out by 225 participants, and 187 participants answered a measure of PD. The results indicate that RNT is significantly and positively correlated with all assessed variables, although the correlation strength with PD was weaker compared to other populations. Furthermore, mediation analysis revealed that PI had a significant impact in RNT levels, especially when mediated by CF.

**Palavras-chave:** Repetitive Negative Thinking; Worry; Rumination; Psychological Flexibility; Mediation Analysis.

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**Abstract:** Pensamentos Negativos Repetitivos (PNR) são uma estratégia mal adaptativa de esquiva experiencial desencadeada por pensamentos recorrentes, aversivos e intrusivos; presentes nos processos de ruminação e preocupação. Pesquisas em Terapia de Aceitação e Compromisso (ACT) apontam que altos níveis de inflexibilidade psicológica (IP) intensificam os padrões de PNR e aumentam o sofrimento psicológico, contudo não existem estudos que avaliem a aplicação dessa premissa na população brasileira. Os objetivos dessa pesquisa são (1) explorar as relações entre PNR com inflexibilidade psicológica (IP), fusão cognitiva (FC), e sofrimento psicológico (SP); e, (2) avaliar se os níveis de IP influenciam nos níveis de PNR e se FC é um mediador relevante nessa relação. Duzentos e vinte e cinco participantes completaram medidas de FC, PNR, IP e 187 participantes responderam a uma medida de SP. Os resultados indicam que o PNR está significativamente relacionado positivamente com todas as variáveis, apesar da força da correlação com SP ter se mostrado mais fraca do que em outras populações. Além disso, a análise de mediação constatou que o IP desempenha um papel importante nos níveis de PNR, especialmente quando mediado pela FC.

**Keywords:** Pensamentos Negativos Repetitivos; Preocupação; Ruminação; Flexibilidade Psicológica; Análise de Mediação.

Acceptance and Commitment Therapy (ACT; Hayes et al., 1999) is a transdiagnostic psychological therapeutic model that aims to develop Psychological Flexibility (PF; Hayes et al., 2011). PF can be defined as “the ability to contact the present moment more fully as a conscious human being and, based on what the situation affords, to change or persist in behaviour in order to serve valued ends” (Luoma et al., 2017, p. 24). On the other hand, Psychological Inflexibility (PI) is characterized by inflexible attention, rigid verbal control (cognitive fusion and self-as-content), avoidance of unpleasant private experiences (i.e., experiential avoidance; EA), and lack of clarity and disengagement from personal values (Hayes et al., 1999; Hayes et al., 2006).

From ACT’s perspective, Repetitive Negative Thinking (RNT) is an experiential avoidance (EA) strategy characterized by recurrent, aversive, and intrusive thoughts, including the processes of rumination and worry (Ruiz et al., 2016). This pattern has three main functions. The first is EA: avoiding unpleasant internal experiences such as painful thoughts, emotions, physical discomfort, and distressing memories (Salters-Pedneault et al., 2004). Ironically, rigidly engaging in EA strategies often lead to increased psychological distress, such as increased frequency and intensity of RNT (Hayes et al., 1999; Kashdan et al., 2006; Ruiz et al., 2018). This pattern may also serve as an emotion regulation strategy, the second function of RNT (Ruiz et al., 2018; Salgueiro et al., 2013). The third function of RNT is problem-solving, which enables individuals to anticipate problems and prevent potential harm, thus having an important adaptive evolutionary function (Nolen-Hoeksema et al., 2008; Ruiz et al., 2016; Watkins, 2008).

Like all operant behaviours, RNT is not inherently problematic. However, it becomes an issue when it causes clinically undesirable outcomes, such as interfering with actions aligned with the patient’s chosen goals and values or significantly reducing their quality of life (Gil-Luciano et al., 2019).

Cognitive fusion (CF) is another component of PI that influences counterproductive RNT patterns (Ruiz et al., 2016; Ruiz et al., 2018). CF is understood as the state in which verbally acquired stimulus functions exert more control over a person’s behaviour than other functions (such as those established

through direct learning processes; Assaz et al., 2023). In other words, when individuals are *fused*, they behave as if their thoughts (covert verbal constructs) were the absolute truth in a given situation. Excessive CF can become a clinical issue when it leads to rigid behavioural patterns, potentially reducing a person’s quality of life (Hayes et al., 2006; Gillanders et al., 2014). Individuals with high levels of RNT are often fused with their thoughts’ distressing content (Ruiz et al., 2018; Watkins, 2008) in an effort to avoid them, regardless of if they are real or not. Furthermore, CF significantly mediates the relationship between PF, psychological distress, EA, rumination, depressive symptoms, and chronic pain, for example (Bardeen & Fergus, 2016; Basharpour et al., 2020; Carvalho et al., 2019; Gillanders et al., 2014; Lucena-Santos et al., 2017; Zucchelli & White, 2019).

RNT is a formal diagnostic criterion for various DSM-5 disorders, including depression, anxiety, obsessive-compulsive disorder (OCD), phobias, eating disorders, suicidal ideation, and alcohol abuse (Aldao et al., 2010; Dickson et al., 2019; Nolen-Hoeksema et al., 2008; Perestelo-Perez et al., 2017; Rogers & Joiner, 2018; Spinhoven et al., 2018). Additionally, RNT is associated with increased negative affect (Newman & Llera, 2011; Salters-Pedneault et al., 2004) and strongly correlated with depression and anxiety vulnerability (Gil-Luciano et al., 2018). According to the latest WHO census, anxiety and depression affect 11% of the global population (WHO, 2017). In Brazil, a low- and middle-income country (LMIC), 15.1% of the population, or approximately 30.2 million people, are diagnosed with these disorders (Eaton et al., 2011; WHO, 2017).

Research on RNT and ACT have been conducted with Spanish-speaking populations (Ruiz et al., 2016; Ruiz et al., 2018; Ruiz et al., 2019; Ruiz et al., 2020; Salazar et al., 2019). However, we weren’t able to find studies that evaluate the correlations between RNT and aspects of PI in the Brazilian population. Considering these points, this study has two objectives. First, to analyse the relationships between RNT and measures of PI, CF, and psychological distress (PD) in a Brazilian sample. Second, to explore if the relationship between levels of psychological inflexibility and repetitive negative thinking is mediated by cognitive fusion.

## Method

### Participants

Participants were Brazilian adults (at least 18 years old) recruited via social media platforms (i.e., Facebook, Instagram) and WhatsApp, in which they could voluntarily access the survey through a link. No active participant recruitment was conducted beyond these posts in social media and WhatsApp groups. Participants were encouraged to divulge the survey if they wanted. Data collection occurring during June of 2020.

### Procedure

The questionnaires were hosted by Qualtrics software. It included an informed consent form, sociodemographic questions, and questionnaires designed to assess psychological inflexibility/experiential avoidance (AAQ-II), psychological distress (DASS-21), repetitive negative thinking (PTQ), and cognitive fusion (CFQ-7). To ensure participants were of legal age—and, thus, eligible—a multiple-choice question was included for age verification. If a participant selected the option “under 18 years old,” the questionnaire was automatically terminated. Since the survey was anonymous, participants that did not complete the full questionnaire.

### Measures

**Acceptance and Action Questionnaire – II (AAQ-II;** Barbosa & Murta, 2015). Designed to measure Psychological Flexibility, the AAQ-II is a 7-item Likert scale ranging from (1) “never true” to (7) “always true.” It is a one-factor measure in which higher scores indicate greater levels of Psychological Inflexibility. This questionnaire evaluates experiential avoidance patterns, exploring processes such as escape/avoidance of feelings and thoughts and the ability to act in the presence of aversive private events (Bond et al., 2011). The validation for the Brazilian population has demonstrated strong internal consistency and the same was found in this study (Cronbach’s  $\alpha = 0.936$ ). Despite notable psychometric issues (Tyndall & Wolgast, 2019; Wolgast, 2014), the AAQ-II was considered the

best validated option for the Brazilian population when the research was conducted. Moreover, this questionnaire is widely used for assessing PI, allowing comparisons with other studies, including those that inspired this study.

**Depression, Anxiety, and Stress Scale – 21 (DASS-21;** Antony et al., 1998). Designed to measure emotional distress states using a 21-item Likert scale ranging from (0) “never” to (3) “almost always”. The Brazilian version was validated (Vignola & Tucci, 2014) and demonstrated strong internal consistency in this study (Cronbach’s  $\alpha = 0.96$ ). Its subscales have also shown strong internal consistency, with Cronbach’s  $\alpha$  as follows: Depression = 0.911, Anxiety = 0.898, and Stress = 0.906.

**Cognitive Fusion Questionnaire (CFQ-7).** This 7-item scale that measures levels of cognitive fusion. For each item, the given answer ranges from (1) “completely untrue” to (7) “completely true” (Gillanders et al., 2014). The scale has undergone cross-cultural validation for the Brazilian population (de Paula et al., 2018). In the present study, the Brazilian version of the questionnaire demonstrated strong internal consistency (Cronbach’s  $\alpha = 0.935$ ).

**Perseverative Thinking Questionnaire (PTQ;** Ehring et al., 2011). Designed to assess the presumed processes of Repetitive Negative Thinking (e.g., thought repetition, difficulty disengaging from them, unproductivity, and mental capacity), it is a 15-item Likert scale ranging from (0) “never” to (3) “almost always”. Higher scores indicate elevated levels of RNT. The Portuguese version was validated by Chaves et al. (2013). Even though it hasn’t been validated for the Brazilian population yet, it was adapted for research. The questionnaire demonstrated good internal consistency (Cronbach’s  $\alpha = 0.964$ ).

### Data Analysis

The G\*Power 3.1 software analysis calculated the minimum sample size for 95% reliability in each arm of analysis. All data were analysed using IBM SPSS version 26. The Shapiro-Wilk statistical test was performed to assess sample distribution. It was expected that not all results would meet the normality crite-

tion, as the literature indicates that the prevalence of mental health issues tends not to follow a normal distribution in the population (Andrade, 2012). To address distribution issues and increase the reliability of the analysis, bootstrapping with 1,000 repetitions (95% CI; Haukoos & Lewis, 2005) was applied.

The descriptive analysis was conducted, and all tests showed statistically relevant internal consistency (Cronbach's  $\alpha > 0.7$ ). A two-tailed Pearson's correlation analysis was performed. Using the  $r$  coefficient, the measure of association between variables was calculated ( $r^2 * 100$ ), representing the percentage of variance in the data explained by the relationship between the two variables.

Additionally, the effect size of the correlations was calculated using the online tool "Testing the Significance of Correlations" (available in: <https://www.psychometrica.de/correlation.html>). For this, the Fisher  $r$ -to- $z$  transformation test was conducted using the second item of the tool, "Fisher-Z-Transformation." Furthermore, to determine whether the differences between the correlations were statistically significant, the sixth item, "Comparison of correlations from dependent samples" was used.

Based on the strongest correlations, mediation analysis was performed using Model 4 of the PROCESS extension v. 3.5 by Andrew F. Hayes, with 5,000 repetitions (Hayes, 2018). The objective of this analysis was to evaluate the impact of PI levels on RNT when this relationship is mediated by CF. This model allows the verification of the total effect ( $c$ ; when there is no CF mediation), i.e., the direct impact of PI on RNT; the indirect effect ( $a*b$ ; i.e., the impact of PI on RNT when mediated by CF); and the direct effect ( $c'$ ; i.e., the effect of PI on RNT when controlled for CF). This approach allows for determining whether the relationship is mediated by CF and comparing the effects of the relationships with and without this mediating variable (Rockwood & Hayes, 2020).

## Results

A total of 340 individuals accessed the online survey. Data from participants who did not complete one or more of the scales, skipped any items, or responded multiple times were excluded, resulting in 225 valid participants' responses. Of these, only 187 participants completed the questionnaire to measure psychological distress (i.e., DASS-21). Sociodemographic data was collected from 225 participants, 76% were men ( $n = 171$ ), 23.6% were women ( $n = 53$ ), and 0.4% ( $n = 1$ ) identified as non-binary. Regarding the participants' age, 30.7% ( $n = 69$ ) were between 18 and 25 years old; 22.7% ( $n = 51$ ) between 26 and 30 years old, 16% ( $n = 36$ ) between 31 and 40 years old; 14% ( $n = 32$ ) between 41 and 50 years old; 11.6% ( $n = 26$ ) between 51 and 60 years only; and only 4.9% ( $n = 11$ ) were over 60 years old (see Table 12).

**Table 12. Distribution of participants across age and gender (n=225).**

Age	Male	Female	Non-Binary	Total
18-25	49	19	1	69
26-30	36	15	0	51
31-40	29	7	0	36
41-50	28	4	0	32
51-60	21	5	0	26
Over 60	8	3	0	11
<b>Total</b>	<b>171</b>	<b>53</b>	<b>1</b>	<b>225</b>

A liability analysis was conducted to assess the questionnaires' internal consistency. To avoid Type II errors, sample size was calculated using G\*Power software. The results indicated that a sample size of  $n = 132$  was required to have sufficient statistical power ( $(1-b) > 0.8$ ;  $d = 0.3$ ) in the correlation analysis with a statistically significant  $p$ -value,

Then, a Shapiro-Wilk normality test was conducted, which demonstrated that none of the scales followed a normal distribution ( $p < 0.001$ ). To address the lack of normality in the sample and the numerical differences between the number of participants who completed each questionnaire, *Bootstrapping* was conducted (sample = 1000; 95% CI BCa). This data analysis method allows for parametric analysis and higher result reliability (Haukoos & Lewis, 2005).

**Table 13. Correlational analysis of PI, CF and RNT.**

	Pearson's rho	1	2	3
1. CFQ-7	<i>r</i>			
	<i>p</i>			
2. AAQ-II	<i>r</i>	.794**		
	<i>p</i>	0.00		
3. PTQ	<i>r</i>	.827**	.800**	
	<i>p</i>	0.00	0.00	

Note. CFQ-7 (Cognitive Fusion Questionnaire); AAQ-II (Acceptance and Action Questionnaire); PTQ (Perseverative Thinking Questionnaire). \*\*. Correlation is significant at the 0.01 level (2-tailed).

Table 13 presents the results obtained from the first correlational analysis (*n* = 225), where all correlations were found to be positive. RNT

scores (PTQ) were strongly correlated with PI levels (AAQ-II; *r* = 0.800, *p* < 0.001; *r*<sup>2</sup> = 64%, see Table 13) with an effect size of *z* = 1.18. A similarly strong correlation was found between cognitive fusion and RNT (CFQ; *r* = 0.830, *p* < 0.001; *r*<sup>2</sup> = 68.4%), with an effect size of *z* = 1.19. Finally, PI levels were strongly correlated with cognitive fusion (CFQ; *r* = 0.794, *p* < 0.001; *r*<sup>2</sup> = 63.04%), with an effect size of *z* = 1.08.

As all reported correlations can be considered very strong (Cohen, 1998), a statistical comparison of magnitude was conducted using Fisher's *r*-to-*z* transformation test across the three scales. The analysis indicated that the difference in strength between the correlations of RNT with PI and CF was not statistically significant (*z* = 1.208; *p* = 0.114; Lenhard & Lenhard, 2014).

**Table 14. Correlational analysis of PD, PI, CF and RNT (n=187).**

	Peason's rho	1	2	3	4	5	6	7
1. CFQ-7	<i>r</i>	--						
	<i>p</i>							
2. AAQ-II	<i>r</i>	.803**	--					
	<i>P</i>	0.000						
3. PTQ	<i>r</i>	.840**	.805**	--				
	<i>p</i>	0.000	0.000					
4. DASS-21	<i>r</i>	.230**	.230**	.220**	--			
	<i>p</i>	0.000	0.000	0.000				
5. DASS-21 Depression	<i>r</i>	.211**	.203**	.181**	.924**	--		
	<i>p</i>	0.000	0.000	0.000	0.000			
6. DASS-21 Anxiety	<i>r</i>	.197**	.189**	.211**	.900**	.708**	--	
	<i>p</i>	0.000	0.000	0.000	0.000	0.000		
7. DASS-21 Stress	<i>r</i>	.220**	.238**	.209**	.955**	.855**	.802**	--
	<i>p</i>	0.000	0.000	0.000	0.000	0.000	0.000	

Note. CFQ-7 (Cognitive Fusion Questionnaire); AAQ-II (Acceptance and Action Questionnaire-II); PTQ (Perseverative Thinking Questionnaire); DASS-21 (Depression, Anxiety and Stress Scale-21); \*\*. Correlation is significant at the 0.01 level (2-tailed); \*. Correlation is significant at the 0.05 level (2-tailed)

The second arm of analysis examined the relationship between levels of PD, PI, CF, and RNT via correlational analysis (see Table 14). The results showed that, even though the correlations were statistically significant, the ones between RNT and PD ( $r = 0.230$ ;  $p < 0.001$ ;  $r^2 = 5.29\%$ ;  $z = 0.234$ ), depression ( $r = 0.181$ ;  $p < 0.001$ ;  $r^2 = 3.27\%$ ;  $z = 0.183$ ), anxiety ( $r = 0.211$ ;  $p < 0.001$ ;  $r^2 = 4.45\%$ ;  $z = 0.214$ ), and stress ( $r = 0.209$ ;  $p < 0.001$ ;  $r^2 = 4.36\%$ ;  $z = 0.212$ ) were weak. The results are presented in Table 14.

Regarding other variables, overall levels of PD were significantly correlated with CF ( $r = 0.230$ ;  $p < 0.001$ ;  $r^2 = 5.3\%$ ;  $z = 0.234$ ) and PI ( $r = 0.230$ ;  $p < 0.001$ ;  $r^2 = 5.3\%$ ;  $z = 0.234$ ). All subscales were also positively and significantly correlated with CF and PI. The comparison of the effect size among the correlations was found not statistically significant ( $p = 0.5$ ;  $z = 0$ ; see Table 14).

The relationship between depressive symptoms and PI ( $r = 0.203$ ;  $p < 0.001$ ;  $z = 0.206$ ) explained 4.1% of the variance in PI, while its relationship with CF ( $r = 0.211$ ;  $p < 0.001$ ;  $z = 0.214$ ) accounted for 4.45%. The differences across effect sizes were not statistically significant ( $p = 0.43$ ;  $z = 0.177$ ; see Table 14).

Furthermore, anxiety levels were associated with CF ( $r^2 = 3.9\%$ ;  $r = 0.197$ ;  $p < 0.001$ ;  $z = 0.2$ ) and PI ( $r^2 = 3.6\%$ ;  $r = 0.189$ ;  $p < 0.001$ ;  $z = 0.191$ ). The effect sizes' variation between these correlations was not statistically significant ( $p = 0.43$ ;  $z = 0.177$ ; see Table 14).

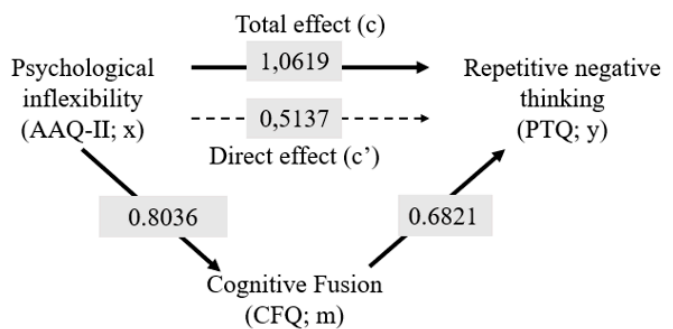
Stress symptoms demonstrated an effect size of  $z = 0.224$  when correlated with CF ( $r = 0.220$ ;  $p < 0.001$ ;  $r^2 = 4.8\%$ ) and  $z = 0.243$  when correlated with PI ( $r = 0.238$ ;  $p < 0.001$ ;  $r^2 = 5.7\%$ ). The variation in effect sizes between these correlations was not statistically significant ( $p = 0.344$ ;  $z = -0.401$ ; see Table 14).

After completing the correlation analysis, a mediation analysis ( $n = 225$ ) involving PI, CF, and RNT was conducted using PROCESS v. 3.5 by Andrew F. Hayes. Considering that it was a simple mediation analysis, it was used Model 4, with 5000 bootstrap samples. This analysis aimed to evaluate the effects of PI on RNT when mediated by CF. The PD variables were excluded from this analysis.

The model's direct effect (PI on RNT mediated by CF;  $b = 0.514$ , 95% CI [0.376, 0.651],  $t = 7.333$ )

was statistically significant ( $b = 0.8036$ , 95% CI [0.7278, 0.8795],  $t = 20.86$ ,  $p < 0.000$ ;  $r^2 = 63.06\%$ ). Cognitive fusion also showed a statistically significant effect on RNT ( $b = 0.682$ , 95% CI [0.546, 0.819],  $t = 9.85$ ,  $p < 0.001$ ;  $r^2 = 73.9\%$ ). Without the mediating variable, PI explained 63.92% of RNT levels, whereas this influence increased to 73.9% with the mediator. This result demonstrates that CF plays an important mediating role in the model (see Figure 1).

The mediation effect (indirect effect) was statistically significant ( $b = 0.548$ , 95% BCa CI [0.4243, 0.6776]). This finding suggests that 51.62% of the RNT scores related to PI were explained by CF levels (see Figure 19).



Indirect effect (PI over RNT mediated by CF) = 0.548

Mediation proportion = direct effect/total effect  
MP = 0.5137/1.0619 = 0.483756

Mediated effect (ME) = 1 - MP  
ME = 0.516244

**Figure 19. Mediation model describing total, direct and indirect effects of PI over RNT when mediated by CF.**

A statistically significant relationship was observed between RNT and PI ( $p < 0.001$ ), CF ( $p < 0.001$ ), stress ( $p < 0.001$ ), depression ( $p < 0.001$ ), and anxiety ( $p < 0.001$ ). The subsequent mediation analysis demonstrated that PI levels by itself predicted 63.92% of RNT levels. When this relationship was mediated by CF, PI accounted for 73.9% of RNT scores. The results indicate that 51.62% of the RNT levels related to PI are explained by CF levels.

## Discussion

The main objective of this study was to explore the correlations between RNT and psychological inflexibility, psychological distress, and cognitive fusion in the Brazilian population. Additionally, the secondary objective was to investigate whether CF is a mediator in the relationship between PI and RNT.

ACT literature suggests that rumination and worry are significantly and positively correlated with levels of PI (McCracken et al., 2014; Tavakoli et al., 2019). Thus, it is considered that, as RNT patterns increase, there is a higher likelihood that individuals will engage and entangle with their thoughts to avoid unpleasant internal experiences. Based on prior findings with people with high RNT and considering the cross-cultural applicability of the Psychological Flexibility Model (Hayes & Toarmino, 1995; Hayes et al., 2011; Woidneck et al., 2012), it was predicted that RNT levels would be significantly correlated with CF, PI, and PD in the Brazilian population (D'Souza, 2016; Lucena-Santos et al., 2017; Ruiz et al., 2016; Ruiz et al., 2018).

Initially, it was evaluated the correlations between CF, PI, and RNT for 225 participants. The results corroborated the hypothesis, because the correlations between RNT, CF, and PI were strong and significant, coherent with the literature. The strong correlation between RNT and PI ( $r = 0.8$ ) indicates a potential overlap between these variables. This is probably due to function of excessive thought patterns often being experiential avoidance (i.e., a component of the PI model; Gil-Luciano et al., 2019).

The second correlational analysis examined the relationships between PI, CF, and RNT with overall levels of PD, including depression, anxiety, and stress. Although the bootstrapping method increased analysis precision, the correlations regarding anxiety, stress, and depression were considerably weaker than those observed in similar studies (Ruiz et al., 2016; Ruiz et al., 2018), although this relation was present and significant.

Considering that RNT is frequently present in cases of anxiety and depression, it was expected that the relationships between RNT and PD levels would

be more significant at the Pearson's  $r$  level (Aldao et al., 2010; Baxter et al., 2012; Lucena-Santos et al., 2017; Nolen-Hoeksema et al., 2008). To explain that phenomenon, we must take into account the timing of data collection which occurred during the first wave of COVID-19 in July 2020. A possible hypothesis for these results is that changes in lifestyle habits caused by the pandemic, such as the shift to home-office and absence of commute to work, may have played a significant role in distress and RNT levels (either increasing or decreasing them). Studies around the world have unanimously reported increased PD during the COVID-19 pandemic, including Brazil (De Azevedo Barros et al., 2020; Pereira et al., 2021) and several other countries (Kim & Jung, 2020; Herrera-Añazco, 2022; Koch & Park, 2022). However, the current findings are not aligned with these studies. A second hypothesis considers the sampling bias: the sample may not accurately represent the general population's levels of PD. Thus, these findings may be circumstantial, highlighting the need for further studies on the correlations between PD and RNT in this population.

The mediation analysis aimed to explore whether CF plays a significant mediating role in the relationship between RNT and PI. Previous research on the Brazilian population has shown that the relationship between rumination and depression was mediated by CF (Lucena-Santos et al., 2017). Given that CF is commonly a mediator in the relationship between PI and symptoms of DSM-5 disorders, in which RNT is a formal diagnostic criterion, mediation was expected.

Furthermore, the mediation analysis confirmed that the relationship between PI and RNT was more significant when CF was a mediator, explaining 73.9% of RNT levels compared to the model without the mediating variable (in which PI explained 63.92% of RNT levels). Levels of CF alone explains more than half of the RNT scores (73.9%) when predicted by psychological inflexibility. Therefore, it is not surprising that individuals with higher levels of PI are more likely to engage in RNT patterns, because they fuse with their thoughts' content. In other words, people with reduced capacity to distance from their thoughts as products of their own thinking patterns, are more likely to excessively worry or ruminate.

Thus, it can be inferred that interventions aimed at reducing CF— that is, promoting cognitive defusion (DF)—can significantly help to reduce RNT. DF is conceptualized as a state in which individuals observe their thoughts and, instead of acting in alignment with them, engage in behaviours under the influence of other environmental variables (Assaz et al., 2023). It is well-established that interventions that seek to promote cognitive defusion tend to significantly increase engagement in value-driven actions and reduce maladaptive avoidance (Assaz, 2020; Luciano et al., 2013; Ritzert et al., 2015), thus, increasing psychological flexibility.

Additionally, brief interventions focused on reducing RNT have been widely studied and have shown promising results across various populations, such as adults with different RNT levels (Dereix-Calonge et al., 2020; Ruiz et al., 2016; Ruiz et al., 2018) and children and adults with depression and generalised anxiety (Ruiz et al., 2020; Salazar et al., 2019; Ruiz et al., 2020). These interventions include a series of exercises aimed at promoting DF, such as engaging in value-driven actions. Therefore, the results of this study suggest that Brazilians with high levels of RNT would likely benefit from similar interventions.

## Conclusion

In conclusion, the correlations found between RNT, PI, CF and PD are consistent with other findings in the literature in other contexts, although the correlation between RNT and PD was less pronounced in the Brazilian population. The mediation analysis confirmed that CF is a significant mediating variable in the correlation between PI and RNT. This study successfully achieved its objective of providing an initial evaluation of the relationships between RNT and PI in the Brazilian population. However, further studies are needed to deepen and expand the understanding of this topic within this population.

### Limitations and future directions

This study has certain limitations. First, the sample was potentially biased regarding gender and age. Seventy-six percent of the sample identified as fe-

male. According to the scientific literature on anxiety, women are twice as likely to develop anxiety symptoms compared to men (Johnson & Whisman, 2013; Baxter et al., 2012). Consequently, the results of this study may have higher scores in RNT and PD (i.e., stress, anxiety, and depression) than a sample in which gender distribution is representative of the wider population.

Another potential bias pertains to participants' age, as 52.4% of the valid data were from individuals aged between 18 and 30 years. The age bias can be explained by young adults' familiarity with technological tools (such questionnaires on smartphones and computers), increasing the chances of them participating in the survey. Furthermore, young adults (under 30 years old) represent 42.9% of the Brazilian population. Therefore, it is possible that these results are not fully representative of the country's demography. We recommend that future studies use more representative samples, potentially considering other sociodemographic variables, such as educational level, social class, employment status, etc.

Additionally, mediation findings should be interpreted cautiously for two reasons. Firstly, multicollinearity is likely because PI, CF and RNT are conceptually adjacent. High overlap inflates standard error (indexed by tolerance and variance inflation factor; VIF; Hayes, 2018). Secondly, cross-sectional mediation cannot establish causal ordering, given that mediation are inherently causal relations and require that causes precede events in time; even the randomization of *X* (i.e., psychological inflexibility) does not guarantee that *M* (i.e., cognitive fusion) precedes *Y* (i.e., RNT). Therefore, alternative orderings of *X*, *M* and *Y* remains plausible in single-wave design (Hayes, 2018). Based on this analysis, we recommend future investigations to perform longitudinal or experimental tests to adjacent temporal precedence and bolster internal validity.

Finally, it is important to note that this study was conducted during the first phase of the COVID-19 pandemic. However, the correlations between PI and CF are consistent with findings on rumination in the Brazilian population prior to the COVID-19 pandemic (Barbosa & Murta, 2015; de Paula et al., 2018; Lucena-Santos et al., 2017; Lucena-Santos et al., 2017b). This corroborates the

argument that these results are not limited to this specific period. Consequently, we recommend replicating this study when COVID-19 is possibly no longer a relevant variable.

Lastly, we acknowledge the limitations of self-report measures. We recommend that future studies use alternative methods, such as implicit measures or digital monitoring tools.

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