

ORIGINAL ARTICLE

Repetitive Thinking in Alcohol-Dependent Patients

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ABSTRACT

Background: Recent studies proposed that a tendency to have repetitive negative thinking (RNT) could be a predictor of alcohol use. Nevertheless, results differ depending on the studied population (non-clinical samples or patients with alcohol abuse or alcohol dependence) and on the type of repetitive thinking (rumination or worry). These heterogeneous results might be explained by the impact of anxiety and depression level on RNT and alcohol consumption. **Objectives:** The aim of the present study was to explore different type of repetitive thinking (i.e., worry, brooding and reflection rumination, analytic-abstract repetitive thinking, and concrete-experiential thinking) in a clinical sample of alcohol-dependent patients and a non-clinical sample and the role played by depression and anxiety. **Method:** Eighty-four inpatients with a diagnosis of alcohol dependence and 68 individuals from a nonclinical sample completed questionnaires evaluating repetitive thinking, anxiety, depression and alcohol consumption. **Results:** Mann-Whitney *U* tests showed that patients with alcohol dependence reported more analytic-abstract repetitive thinking, brooding and reflection rumination and worry, as well as anxious and depressive symptoms, compared with social drinkers, who reported more concrete-experiential repetitive thinking. Moreover, a multiple mediation model indicated that the link between RNT and alcohol consumption was significantly mediated by both anxiety and depression. **Conclusion/Importance:** The results support the implication of RNT in alcohol dependence and the distinction between different types of repetitive thinking with adaptive or maladaptive consequences. This link seems to be explained by the levels of depression and anxiety that mediate the impact of RNT on alcohol consumption.

KEYWORDS

Alcohol; anxiety; depression; repetitive thinking; rumination; transdiagnostic; worry

Although considerable work has been done to improve clinical prevention and intervention for alcohol dependence, further research is needed to increase our understanding of the risk and maintaining factors of this highly prevalent disorder. An interesting line of research—based on the self-medication hypothesis (Khantzian, 1985, 2003)—emphasized that people could use alcohol to cope with negative emotions, such as the ones experienced in anxious and depressive disorders (Swendsen et al., 2010; Swendsen et al., 1998; Swendsen et al., 2000). Consistently, the co-occurrence of alcohol dependence with anxiety and depressive disorders has been clearly established in the literature (Penick et al., 1994; Swendsen & Merikangas, 2000; Swendsen et al., 1998). Moreover, repetitive negative thinking (RNT) such as rumination and worry, is a transdiagnostic process involved in the onset and maintenance of various disorders, including anxiety and depressive disorders (Ehring & Watkins, 2008; McEvoy, Watson, Watkins, & Nathan, 2013; Nolen-Hoeksema & Watkins 2011; Watkins & Nolen-Hoeksema, 2014). RNT are defined as a “style of thinking about one’s problem

(current, past, of future) or negative experiences (past or anticipated)” (Ehring et al., 2011, p. 226) and is an emotional regulation strategy of negative mood (i.e. sadness, anxiety) (Ehring et al., 2011; Watkins, 2004, 2008; Watkins & Nolen-Hoeksema, 2014). It has also been evidenced that individuals tend to engage in RNT drink alcohol to reduce or avoid negative state resulting from RNT (Hull & Young, 1983; Caselli, Bortolai, Leoni, Rovetto, & Spada, 2008; Caselli, Ferretti, Leoni, Rebecchi, Rovetto, & Spada, 2010). In line with this reasoning, the current study examined RNT, depression and anxiety in alcohol-dependent patient compared to social drinkers from general population. The aim was to determine whether alcohol-dependent patients used RNT to regulate their negative mood, with an increase of negative mood as a consequence and then, if they drink to escape from sadness and anxiety, contrary to non-psychiatric population that demonstrated more adaptive form of repetitive thinking.

Rumination is a type of RNT with a specific depressive content of thoughts (Ehring & Watkins, 2008; Watkins & Nolen-Hoeksema, 2014). Historically, rumination has

been examined primarily in the context of depressive mood. According to the first version of the Response Style Theory (RST; Nolen-Hoeksema, 1991), rumination was conceptualized as a response to sad mood involving repetitive thoughts focusing on one's negative emotional state and the possible causes and consequences of these negative states (Nolen-Hoeksema, Wisco, & Lyubomirsky, 2008). Later, it has been suggested to distinguish two different subtypes of rumination—brooding and reflection—that have been associated with different outcomes (Treyner, Gonzales, & Nolen-Hoeksema, 2003). Brooding is defined as “a passive comparison of one's current situation with some unachieved standards” (Treyner et al., 2003, p. 256) and is associated with dysfunctional coping strategies. Reflection refers to “a purposeful training inward to engage in cognitive problem solving to alleviate one's depressive symptoms” (Treyner et al., 2003, p. 256) and is mostly associated with functional coping strategies.

The anxious type of RNT—worry—is viewed as “a chain of thoughts and images charged with negative affect that are relatively uncontrollable” and “an attempt to engage in mental problem solving for which the outcome is uncertain but contains the possibility of one or more negative outcomes” (Borkovec, Robinson, Pruzinsky, & Depree, 1983, p. 9). Worry is a central characteristic of generalized anxiety disorder (Borkovec, Ray, & Stöber, 1998) leading to anxious behavior and depressed affect. Similar to depressive rumination, worry impedes emotional regulation (Borkovec et al., 1998).

Until now, the role played by rumination and worry in alcohol consumption was studied independently, as if rumination and worry were two different constructs. The majority of studies in the field focused on the link between depressive rumination and alcohol abuse. To our knowledge, only one study has examined the relationship between alcohol abuse and worry (Ciesla, Dickson, Anderson, & Neal, 2011). Surprisingly, in their sample of college students, worry was associated with lower level of drinking and less frequent binge drinking among women compared to men (Ciesla et al., 2011). The current study aimed to provide data on the relationship between worry and alcohol consumption in a clinical sample.

Regarding rumination, a growing body of research has suggested that this process could be involved in alcohol abuse. For example, prospective studies have demonstrated that rumination predicts alcohol abuse and the onset of major depression in community samples of adults and adolescents (Nolen-Hoeksema & Harrell, 2002; Nolen-Hoeksema, Stice, Wade, & Bohon, 2007). In an adult sample, Caselli et al. (2008) showed that a clinical population with alcohol abuse reported higher levels of depression, rumination and alcohol consumption than individuals from the general population, and that

rumination and depressive symptoms predicted alcohol consumption in a clinical sample of alcohol abusers. In addition, a longitudinal study highlighted that rumination on its turn predicts the excessive consumption of alcohol in alcohol abusers (Caselli et al., 2010) closing a kind of alcohol consumption-rumination vicious circle.

Surprisingly, in cross-sectional studies conducted in a sample of adolescents (Willem, Bijttebier, Claes, & Raes, 2011) and college students (Ciesla et al., 2011), rumination (brooding and reflection) was not significantly associated with alcohol use. It is however interesting to note that brooding was positively associated with the negative consequences of alcohol and drug use, regardless of the presence of depressive symptoms. In addition, a longitudinal study failed to show a correlation between brooding and alcohol consumption in adolescents (Willem, Bijttebier, Claes, Vanhalst, & Raes, 2014).

Considering previous results in patients with alcohol problems or dependence, Ciesla et al. (2011) suggested that the association between rumination and alcohol abuse could be significant only in the clinical population. The results of a recent experimental study in alcohol-dependent patients support this hypothesis (Caselli et al., 2013). This study revealed that an induction of rumination increased craving in alcohol-dependent individuals when compared to distraction. Contrary to earlier studies by Caselli et al. (2008, 2010), these results were observed among alcohol-dependent drinkers but not in problem and social drinkers. The higher level of depression and anxiety in clinical population could explain these divergent results. Previous studies have already demonstrated the mediating role played by anxiety and depression in other transdiagnostic process (Allan, Albanese, Norr, Zvolensky, & Schmidt, 2015; DeMartini & Carey, 2011). Accordingly, the role of rumination on alcohol consumption in each of the concerned groups (nonclinical, alcohol abuse, and alcohol dependence) might depend on the anxiety and depression level. In the current study, we examined different types of RNT in alcohol-dependent patient and in general population, in addition, we aimed at testing how depression and anxiety mediate this relation.

Over the last ten years, several studies showed that rumination and worry share more similarities than differences (Watkins, 2008; Watkins, Moulds, & Mackintosh, 2005). Consequently they are currently studied as a single transdiagnostic process labeled Repetitive Negative Thinking (RNT) and defined as “a style of thinking about one's problems (current, past, or future) or negative experiences (past or anticipated)” (Ehring et al., 2011, p. 226). Moreover, a recent model of repetitive thinking has suggested to focus less on the content of RNT (i.e., critical evaluation of oneself in depressive rumination or future threat in worry) and more on the

information processing mode involved. This processing mode theory (PMT) by Watkins (2004, 2008) proposed to distinguish between two types of repetitive thinking. On the one hand, abstract-analytic thinking (AAT) is characterized by abstract and evaluative thoughts about the causes and consequences of the mood or of a situation by questioning the reasons of mood and situation, by focusing on the past or the future rather than on the present experience. Abstract-analytic thinking is a dysfunctional repetitive thinking mode that contributes to the development and persistence of depression and anxiety. On the other hand, concrete-experiential thinking (CET) is a functional repetitive thinking mode characterized by an attention focused on the direct experience of the current situation, including current emotions and details from the context centered on the way that experience evolves time after time (Watkins, 2004; Watkins, Baeyens, & Read, 2009; Watkins & Moulds, 2005). Although promising, this conceptualization has not yet been applied to the understanding of repetitive thinking in alcohol-dependent patients. The current study examined for the first time abstract-analytic thinking and concrete-experiential thinking in psychiatric population of alcohol-dependent patients compared to individuals from the general population, and the potential mediator role of anxiety and depression in the link between RNT and alcohol consumption.

In sum, our aim in the current study was to explore the link between RNT, depression, and anxiety in alcohol-dependent patients, compared to non-clinical social drinkers. We assessed different types of repetitive thinking (i.e., worry, brooding and reflection rumination, analytic-abstract repetitive thinking, and concrete-experiential thinking) to examine RNT regarding to the processing mode theory (Watkins, 2004). Our first hypothesis (1) was that alcohol-dependent patients would report more depressive rumination, worry, abstract-analytic thinking, anxiety and depressive symptoms than individuals with socially accepted consumption, who would have more concrete-experiential thinking. Then, our second hypothesis (2) was that RNT would predict consumption status (the alcohol dependence group vs. the social drinker group membership). Finally, we hypothesized (3) that anxiety and depression would mediate the link between RNT and alcohol consumption.

Method

Participants

Participants ($N = 152$) were either alcohol-dependent inpatients (“alcohol-dependent patients”) or individuals with socially accepted consumption (“social drinkers”). Alcohol-dependent patients ($N = 84$; 17 women and 67

men; mean age = 47.11 years; $SD = 9.87$) were recruited in three French addiction centers. The participants were recruited 7 days after their admission to the addiction center for a primary diagnosis of alcohol dependence. They had all been weaned for at least 7 days when they completed the self-report measures. They did not have any withdrawal symptoms. One of the criteria for admission to the addiction center was to be weaned since the day before, checked by the medical staff at the entrance of each patient (with the medical records, and systematic urine analysis and alcohol breath test). The inclusion criteria were as follows: (1) being between 18 and 64 years, (2) speaking French as a native language, (3) being diagnosed with alcohol dependence by a medical doctor according to the criteria of the International Statistical Classification of Diseases and Related Health Problems (CIM 10, World Health Organization, 2008) and (4) having no substance use in the last seven days (with the exception of tobacco). The exclusion criteria were as follows: (1) having a serious somatic problem diagnosed by the medical doctor, (2) having serious cognitive deficit diagnosed by a medical doctor, (3) having other dependence issues, except tobacco dependence, which were reported during the medical interview at the beginning of treatment and (4) having a score less than 13 on the Alcohol Use Disorder Identification Test (AUDIT) suggesting no alcohol dependence according to the AUDIT’s cut-off score (Gache et al., 2005).

Social drinkers ($N = 68$; 18 women and 50 men; mean age = 40.96 years; $SD = 11.57$) were recruited via non-probability sampling from the general community. Participants were volunteers recruited in public places (e.g., on the train, in the street) and among the acquaintance of the experimenters for a study on repetitive thinking and alcohol consumption. The inclusion criteria were as follows: (1) being 18 years and 64 years and (2) speaking French as a native language. Women who were evaluated using the Alcohol Use Disorders Identification Test (AUDIT) and scored higher than 6 and men with an AUDIT score higher than 7 were considered being at risk of having a problem drinking and excluded from the study as suggested by the AUDIT’s French validation study (Gache et al., 2005).

The study protocol was carried out according to the 1964 Declaration of Helsinki. Participants did not receive compensation for their participation.

Measures

The Mini Cambridge Exeter Ruminative Thought Scale (Mini-CERTS; Douilliez et al., 2014)

This self-report questionnaire consists of 9 items evaluating quantity of abstract-analytic thinking (AAT)

(e.g., item 1: “My thinking tends to get stuck in a rut, involving only a few themes.”) and of 7 items evaluating concrete-experiential thinking (CET) (e.g., item 2: “I can grasp and respond to changes in the world around me without having to analyze the details.”). The participants responded using a 4-point Likert scale ranging from 1 (*almost never*) to 4 (*almost always*). Higher score on each dimension reflects a high level of the type of repetitive thinking considered. Participants were instructed to rate the items in order to reflect how they typically think when they are confronted to a difficult situation. This scale demonstrated an acceptable level of internal consistency (for CET, $\alpha = .77$; for AAT, $\alpha = .75$) in a sample from general population, and AAT was positively correlated with measures of depression, anxiety and rumination (Douilliez et al., 2014). In the current study, internal consistency was lower than in the validation study but still acceptable (for CET, $\alpha = .64$; for AAT, $\alpha = .66$) (criterion defined by Nunnally, 1967).

The Ruminative Response Scale-reconsidered (RRS-R; Treynor et al., 2003; French version by Douilliez, Baeyens & Philippot, 2016)

This sub-scale of the Response Styles Questionnaire (RSQ) (Nolen-Hoeksema & Morrow, 1991) evaluates the tendency to ruminate in response to depressed mood. In the present study, we used the re-examined version (10 items) evaluating the reflection (e.g., item 3: “Go someplace alone to think about your feelings”) and brooding factors of rumination (e.g., item 9: “Think : What am I doing to deserve this?”). Participants responded using a 4-point Likert scale ranging from 1 (*almost never*) to 4 (*almost every time*). Higher score on each dimension reflects an high level of the factor of rumination considered. Validation study reported an acceptable level of internal consistency (for brooding, $\alpha = .73$; for reflection, $\alpha = .73$) and positive correlation with depression symptoms in general population (Douilliez, Baeyens, & Philippot, 2016). In the present study, internal consistencies were satisfying for both factors of rumination (for brooding, $\alpha = .79$; for reflection, $\alpha = .66$).

The Penn State Worry Questionnaire (PSWQ; Meyer, Miller, Metzger, & Borkovec, 1990; French version by Gosselin, Dugas, Ladouceur, & Freeston, 2001)

This 16-item self-report questionnaire evaluates the frequency and intensity of worries and cognitive intrusions (e.g., item 2: “My worries overwhelm me.”). The participants responded using a Likert scale varying from 1 (*not characteristic at all*) to 5 (*extremely characteristic*). Higher score on this scale reflects a high level

of worries. Validation studies reported excellent validity and consistency properties in general and clinical population with general anxiety disorder (Gana, Martin, Canouet, Trouillet, & Meloni, 2002; Gosselin et al., 2001; Ladouceur et al., 1992). In the present study, internal consistency for the PSWQ was high ($\alpha = .86$).

The State Trait Anxiety Inventory-Trait (STAI-B; Spielberger, 1989; French version by Bruchon-Schweitzer & Paulhan, 1993)

This 20-item self-report questionnaire evaluates recurrent anxious symptoms. The participants responded using a 4-point Likert scale, ranging from 1 (*never*) to 4 (*always*). Internal Consistency for the STAI was very high ($\alpha = .94$).

The Beck Depression Inventory II (BDI II; Beck, Steer & Brown, 1996)

This 21-item self-report questionnaire measures the severity of depressive symptoms during the two previous weeks. In the present study, internal consistency for the BDI-II was very high ($\alpha = .92$).

The Alcohol Use Disorders Identification Test (AUDIT; Saunders, Aasland, Amundsen, & Grant, 1993; French version by Gache et al., 2005)

This 10-item self-report questionnaire is a screening tool to detect excessive alcohol consumption and dependence in primary health care settings. Participants answered each question by choosing a response among 5, rated from 0 to 4. According the French validation study, AUDIT enables the classification of individuals into three categories (no problem, excessive consumption and alcohol dependence). For men, scores between 0 and 6 indicate no problematic alcohol consumption, scores between 7 and 12 indicate excessive alcohol consumption, and scores above 13, indicate that the participant is alcohol-dependent. Regarding women, scores between 0 and 5 indicate absence of problematical consumption; scores between 6 and 12 indicate excessive consumption; scores above 13, indicate that the individual is alcohol-dependent. In the present study, this questionnaire was used to exclude participants that did not meet inclusion criteria and as a measure of alcohol consumption. In the absence of a formal diagnostic interview, the following AUDIT criteria were applied to exclude individuals at risk for alcohol abuse problems from the non-clinical sample (less than 6 for women and less than 7 for men). Internal consistency for this scale was very high ($\alpha = .95$).

Table 1. Descriptive statistics for measures of abstract-analytic thinking and concrete-experiential thinking, rumination, worry, anxiety, depression, alcohol dependence and comparisons of the mean values between alcohol-dependent inpatients ($N = 84$) and social drinkers ($N = 68$) on different measures studied.

	Alcohol-dependent inpatients			Social drinkers			<i>U</i>	<i>Z</i>
	Mean	SD	Rank sum	Mean	SD	Rank sum		
1. Mini-CERTS AAT	20.45	4.15	8270.50	16.11	3.16	3510.50	1164.50	6.35**
2. Mini-CERTS CET	16.30	3.18	5491.00	18.36	3.19	6290.00	1836.00	-3.89**
3. RRS-R Reflection	11.57	2.74	7425.00	10.14	2.92	4356.00	2010.00	3.25**
4. RRS-R Brooding	13.80	3.33	8407.00	9.79	2.85	3374.00	1028.00	6.86**
5. PSWQ	48.09	12.00	8231.00	36.14	7.87	3550.00	1204.00	6.19**
6. STAI B	55.79	8.51	8914.50	39.81	7.94	2866.50	520.50	8.71**
7. BDI II	23.49	10.08	8987.00	6.88	7.92	2794.00	448.00	8.97**
8. AUDIT	27.72	5.32	9435.00	2.85	1.94	2346.00	.00	10.63**

Mini-CERTS AAT, Mini-Cambridge Exeter Repetitive Thoughts—Abstract Analytic Thinking; Mini-CERTS CET, Mini-Cambridge Exeter Repetitive Thoughts—Concrete Experiential Thinking; RRS-R Reflection, Ruminative Response Scale Reflection factor; RRS-R Brooding, Ruminative Response Scale Brooding factor; PSWQ, Penn State Worry Questionnaire; STAI-B, State Trait Anxiety Inventory—Trait factor; BDI-II, Beck Depression Inventory II; AUDIT, Alcohol Use Disorders Identification Test; SD, Standard deviation; Group AD, Alcohol-Dependent inpatients; Group SD, Social drinkers.

** $p < .001$, * $p < .05$.

Procedure

First, all participants received information about the study: (1) the aim (to study the link between repetitive thinking and alcohol consumption), (2) the procedure of the research (filling-in several questionnaires), (3) the risks of their participation (evoking negative emotion and alcohol consumption could lead to feeling bad) and (4) the benefits of their participation (improving knowledge about repetitive thinking and thus helping individuals with alcohol consumption abuse). After ensuring that the participants understood this information, the experimenter asked them to sign an informed consent form. All participants completed the questionnaires assessing their repetitive thoughts (Mini-CERTS, RRS-R, and PSWQ), depressive symptoms (BDI-II), anxious symptoms (STAI-B) and alcohol consumption (AUDIT). A one-hour group session was established for patients one week after their admission to the addiction center. The participants in the “social drinkers group” received the same information as the patients and completed the consent form and questionnaires in public places (e.g., on the train, in waiting room or in their workplace).

Results

Data description, mean comparisons and correlations

Preliminary analyses revealed no univariate outliers ($z > 3.29$) and 1 multivariate outlier (Mahalanobis distance greater than 15; see Field, 2000) that was excluded from the analyses. In spite of transformation, AUDIT, CERTS-CET, RRS-R-Reflection, BDI and STAI remained non-normally distributed. Therefore, non-parametric statistics were used for subsequent analyses. Descriptive statistics and comparisons of the mean values are

presented in Table 1. Alcohol-dependent patients reported significantly higher scores on all the measures excepted on concrete-experiential thinking that was significantly lower compared to social drinkers.

As the alcohol-dependent patients group and the social drinkers group were distinct with regard to alcohol consumption, depressive and anxiety symptoms, and repetitive thinking, correlations were conducted separately in both groups and presented in Table 2.

Binary logistic regression analyses

Hierarchical binary logistic regression analyses were used to test whether the different types of repetitive thoughts (i.e., brooding, reflection, worry, abstract-analytic thinking, and concrete experiential thinking) predicted group membership (alcohol-dependent or social drinkers), regardless of the presence of depression or anxiety.

The results, as shown in Table 3, revealed that brooding predicted group membership before depression and anxiety were entered in the model. The $\text{Exp}(B)$ for brooding was 1.50 ($p < .001$). However, once depression and anxiety were included in the model, those were the only significant predictors of group membership. The $\text{Exp}(B)$ for depression and anxiety were respectively 1.13 and 1.10 ($p < .001$). This model explains 62.9% of the total variance.

In the second analysis (see Table 4), worry predicted group membership before anxiety and depression were entered in the model. The $\text{Exp}(B)$ for worry was 1.12 ($p < .001$). Once depression and anxiety were included, these were the only significant predictors of group membership. The $\text{Exp}(B)$ for depression and anxiety were respectively 1.15 and 1.13 ($p < .001$). This model explains 62.8% of the total variance.

Finally, the results, as shown in Table 5, indicated that abstract-analytic thinking (AAT) predicted group

Table 2. Intercorrelations between dysfunctional and functional repetitive thought, rumination, anxious concerns, anxiety, depression, and alcohol dependence as a function of group.

	1	2	3	4	5	6	7	8
1. Mini-CERTS AAT	—	-.01	.35**	.52**	.51**	.69**	.54**	-.03
2. Mini-CERTS CET	.07	—	.18	-.03	-.13	-.23**	-.36**	-.07
3. RRS-R Reflection	.20**	.11	—	.49**	.38**	.29**	.18	.13
4. RRS-R Brooding	.62**	.06	.45**	—	.44**	.58**	.44**	.09
5. PSWQ	.59**	.12	.35**	.46**	—	.49**	.48**	.32**
6. STAI B	.68**	-.07	.37**	.56**	.68**	—	.53	-.04
7. BDI-II	.57**	-.13	.27**	.48**	.65**	.70**	—	.22**
8. AUDIT	.21**	0.2	.04	.05	.19**	.24**	.24**	—

Intercorrelations for social drinkers ($N = 68$) are presented above the diagonal, and intercorrelations for alcohol-dependent inpatients ($N = 84$) are presented below the diagonal. Mini-CERTS AAT, Mini-Cambridge Exeter Repetitive Thoughts—Abstract Analytic Thinking; Mini-CERTS CET, Mini-Cambridge Exeter Repetitive Thoughts—Concrete Experiential Thinking; RRS-R Reflection, Ruminative Response Scale Reflection factor; RRS-R Brooding, Ruminative Response Scale Brooding factor; PSWQ, Penn State Worry Questionnaire; STAI-B, State Trait Anxiety Inventory—Trait factor; BDI-II, Beck Depression Inventory II; AUDIT, Alcohol Use Disorders Identification Test.

*** $p < .001$, ** $p < .05$, * $p < .10$.

Table 3. Hierarchical binary logistic regression statistics with group membership (absence or presence of alcohol dependence) as the outcome variable and level of depression and brooding and reflection as predictor variables at baseline ($N = 152$).

	B	SE	Wald	p	Class (%)
Step 1					
Brooding	.40	.07	34.62	.000	78.6
χ^2	52.58				
df	1				
Step 2					
Brooding	.02	.09	.03	.117	82.6
BDI-II	.12	.04	10.18	.001	
STAI-B	.10	.04	5.28	.022	
χ^2	109.60				
df	3				

RRS-R Brooding, Ruminative Response Scale Brooding factor; BDI-II, Beck Depression Inventory II; STAI-B, State Trait Anxiety Inventory—Trait factor; SE, Standard error.

membership before that depression and anxiety were included in the model. The $\text{Exp}(B)$ for AAT was 1.40 ($p < .001$). However, once depression and anxiety were included in the model, they were significant predictors of group membership (alcohol-dependent or social drinkers), whereas AAT was not. The $\text{Exp}(B)$ for depression was 1.14 ($p < .005$), and the $\text{Exp}(B)$ for anxiety was

Table 4. Hierarchical binary logistic regression statistics with group membership (absence or presence of alcohol dependence) as the outcome variable and level of anxiety and worries as predictor variables at baseline ($N = 152$).

	B	SE	Wald	p	Class (%)
Step 1					
PSWQ	.11	.02	31.45	.000	70.2
χ^2	43.46				
df	1				
Step 2					
PSWQ	-.04	.03	1.98	.159	83.6
STAI-B	.12	.04	11.77	.001	
BDI-II	.14	.04	8.47	.004	
χ^2	110.127				
df	3				

PSWQ, Penn State Worry Questionnaire; BDI-II, Beck Depression Inventory II; STAI-B, State Trait Anxiety Inventory—Trait factor; SE, Standard error.

Table 5. Hierarchical binary logistic regression statistics with group membership (absence or presence of alcohol dependence) as the outcome variable and level of AAT, depression and anxiety as predictor variables at baseline ($N = 152$).

	B	SE	Wald	p	Class (%)
Step 1					
Mini-CERTS AAT	.34	.06	34.24	.000	71.5
χ^2	51.65				
df	1				
Step 2					
Mini-CERTS AAT	-.11	.10	1.33	.249	83.1
BDI-II	.13	.04	11.63	.001	
STAI-B	.12	.04	8.10	.004	
χ^2	110.94				
df	3				

Mini-CERTS AAT, Mini-Cambridge Exeter Repetitive Thoughts—Abstract analytic Thinking; BDI-II, Beck Depression Inventory II; STAI-B, State Trait Anxiety Inventory—Trait factor; SE, Standard error.

1.13 ($p < .005$). This model explains 63.4% of the total variance.

Multiple mediation model

In order to test the mediation effect, we used Process software developed by Hayes (2013). Using this approach enables to evaluate directly the indirect and direct effects by Ordinary Least Squares (OLS) regressions with bootstrapping resampling with replacement procedure. Following Hayes' (2013) recommendations, we set up bootstrap samples level at 10000 in the analysis presented above. The direct and indirect effects are considered as significant if 0 is not included in the Bias Corrected and Accelerated Confidence Interval (BCA CI).

In the proposed theoretical model, we tested whether anxiety and depressive symptomatology level mediates the link between abstract analytic thinking and alcohol consumption. The multiple mediation model was significant with $R^2 = .49$, $F(3,175) = 56.92$, $MSE = 80.87$, and $p < .001$. The direct effect between negative repetitive thinking (abstract-analytic thinking was considered here)

and alcohol consumption (AUDIT) was not significant, $b = -1.38$, $SE = 1.07$, ns , 95% BCA CI $[-3.48; .73]$. The total indirect effect was significant, $b = 7.48$, $SE = 0.90$, 95% BCA CI $[5.86; 9.38]$. Both indirect effects, via anxiety (STAI) and depression (BDI), were significant, respectively $b = 3.78$, $SE = 1.15$, 95% BCA CI $[1.55; 6.05]$ and $b = 3.70$, $SE = 1.01$, 95% BCA CI $[1.77; 5.72]$. The contrast between indirect effects via STAI and via BDI was not significant, $b = .08$, $SE = 1.97$, 95% BCA CI $[-3.79; 3.98]$ indicating that none of these mediation effects is preponderant.

Discussion

The aim of the present study was to explore the links between different types of repetitive thinking, depression and anxiety, in a clinical sample of alcohol-dependent patients and a nonclinical sample. First, (1) we examined whether RNT (brooding and reflection rumination, worry, and abstract-analytic thinking) was more frequent in alcohol-dependent patients than in social drinkers, who would present more adaptive form of repetitive thinking (concrete-experiential thinking). Moreover, (2) we tested whether RNT would predict consumption status (the group membership). Our third hypothesis (3) was that anxiety and depression would mediate the link between RNT and alcohol consumption.

As expected in the first hypothesis, the results showed that RNT is an important feature of alcohol dependence. The findings revealed that alcohol-dependent patients reported more abstract-analytic thinking, brooding, reflection, worry, depression and anxiety than social drinkers, who in turn reported more concrete-experiential thinking. These results are consistent with previous studies showing that patients with alcohol abuse ruminate more than individuals from the general population (Caselli et al., 2008). Moreover, our results showed a higher level of worry in alcohol-dependent patients.

Correlational analyses showed strong associations between the different measures of RNT (i.e., abstract-analytic thinking, reflection, brooding and worry) and no association with concrete-experiential thinking. These results are in line with the findings of Nolen-Hoeksema and Watkins (2011), who postulated that different forms of RNT (i.e., rumination and worry) may be studied as a single transdiagnostic process. Moreover, abstract-analytic thinking, brooding and worry positively correlated with depression and anxiety in both social drinkers and alcohol-dependent in-patients. As expected, concrete-experiential thinking seems to be a specific and distinct construct: Concrete-experiential thinking did not correlate with other measures of repetitive thinking in any group. Moreover, concrete-experiential thinking was

negatively associated with anxiety and depression in social drinkers. These results are in line with the Watkins's theory (2004) postulating that abstract-analytic thinking would be a dysfunctional mode of repetitive thinking associated with negative affect and negative consequences, whereas concrete-experiential thinking could be a more appropriate mode of repetitive thinking. Contrary to the assumption of Treynor et al. (2003), reflection was positively associated with worry, anxiety and depression in alcohol-dependent patients and with worry and anxiety in social drinkers. These results questioned the idea that reflection is an adaptive form of rumination associated with positive consequences. They are nevertheless congruent with other studies suggesting that reflection predicts negative outcomes (e.g., suicidal ideation; Miranda & Nolen-Hoeksema, 2007; Surrence, Miranda, Marroquín, & Chan, 2009). Further studies should be carried out to elucidate the differential (positive vs. negative) outcomes of reflection with a potential mediator being the processing mode (the processing mode theory; Watkins, 2004).

To extend the results of previous studies (Caselli et al., 2008; Caselli et al., 2010), the second hypothesis of the present study was to examine whether different types of repetitive thinking could predict consumption status (alcohol-dependent patients vs. social drinker group membership). As expected, logistic regression analyses revealed that brooding rumination, worry and abstract-analytic thinking were significant predictors of group membership. Nevertheless, when depression and anxiety were included in the model, brooding, worry and abstract-analytic thinking did not predict group membership. Only depressive symptoms and anxiety were significant predictors of consumption status (group membership). According to previous studies (Allan et al., 2015; DeMartini & Carey, 2011), our results suggested that the link between rumination and alcohol dependence was not direct but operates through anxiety and depression. Consistently with the third hypothesis, the multiple mediation model confirmed that the link between RNT and alcohol consumption is mediated by both anxiety and depression. Our results are in line with the self-medication hypothesis (Khantzian, 1985, 2003) suggesting that individuals with psychiatric disorder use substance to escape from their depressive and anxious symptoms. In this case, alcohol is used for its pharmacological properties.

These results supported the idea that alcohol could be used as a regulatory strategy for escaping from negative emotions resulting from RNT (Hull & Young, 1983; Caselli et al., 2008, 2010). This idea could be interpreted in light of several theories. Firstly, according to Martin and Tesser (1989), rumination results from the perception of a

discrepancy between one's current situation and a desired goal. For example, if individuals would like to be abstinent but cannot stop drinking, they will tend to focus on the discrepancy between their goal and their actual situation. The perception of a gap between the goal and the current state implies self-awareness and will generate negative affects such as sad mood and anxiety. In response to this negative affects, healthy individuals will try to reduce the discrepancy between their current state and their personal standard by adopting a concrete mode of thinking to focus on the specific details of the situation and to find more adaptive way to cope with it (control theory; Carver & Scheier, 1982; Duval & Wicklund, 1972; processing mode theory; Watkins, 2004, 2008). Conversely, persons with psychopathology such as anxiety and depression tend to have abstract and analytic thinking in response to negative mood (processing mode theory; Watkins, 2004, 2008). In turn, these RNT increase sadness and anxiety (Ehring et al., 2011; Watkins, 2004, 2008; Watkins & Nolen-Hoeksema, 2014). Finally, the escape theory (ET; Heatherton & Baumeister, 1991) account that people with a high level of aversive self-consciousness use alcohol to avoid focusing on the self. Self-consciousness is a disposition to chronically self-focus and self-analyze regardless of mood (Fenigstein, Scheier, & Buss, 1975). This idea is in line with the self-medication hypothesis suggesting that individuals with psychopathology could use alcohol to cope with negative emotions (Khantzian, 1985, 2003). Hull and Young (1983) found that individuals with high self-consciousness who were allocated to a failure situation drank significantly more than individuals with high self-consciousness placed in a successful situation, whereas alcohol consumption by individuals with low self-consciousness did not change across the situations. From the perspective of the escape theory, these results suggested that individuals consume alcohol to escape from negative mood resulting from rumination (Hull, Levenson, Young, & Sher, 1983; Hull & Levy, 1979). These combined theories, sustained by current study, demonstrated that in a problematic situation, such as a gap between the goal and the current state arousing negative mood, individuals unable to use a concrete mode of thinking (CET) to cope with negative mood drink alcohol to escape from their negative mood state resulting from abstract analytic thinking (AAT).

Some limitations of this study should be acknowledged. First, the sample is composed by more men than women. Previous literature demonstrated that rumination was more linked to depression in women than in men, and rumination accounted for the gender difference in depression (Nolen-Hoeksema, 1987; Nolen-Hoeksema, Larson, & Grayson, 1999). Moreover, Nolen-Hoeksema and Harrell (2002) demonstrated that

rumination was a significant predictor of alcohol problems in woman, but not in men. The large number of men compared to women in our sample could explain why depression is better predictor of alcohol consumption than RNT. Second, despite our precautions (use of AUDIT, standardization of inclusion and exclusion criteria between inclusion centers), several variables were not controlled in the alcohol-dependent patients group (e.g., co-morbidity and exact number of days from weaning) and in the social drinkers group (e.g., diagnostic of psychopathology, alcohol problems in the past). Because of the cross-sectional nature of our design, we could not reach a conclusion regarding the direction of the relationship between repetitive thinking and alcohol consumption. Finally, as in previous studies, rumination was evaluated here in with self-reported measures. Despite the fact that we used validated questionnaires, the internal consistency of RNT measures was acceptable but low in our samples. Moreover, questionnaires are limited by biases (retrospective recall bias, social desirability bias, and lack of accuracy) (Serre, Fatseas, Swendsen, & Auriacombe, 2015). By contrast, studies conducted with experimental induction in clinical populations are limited in term of ecology. It is difficult to interpret and generalize results from experimental studies. Therefore, new studies are needed to establish whether repetitive thinking plays a direct or indirect role in alcohol use disorders. Moreover, these studies should examine the role of repetitive thinking in relapse. Studies conducted using Ecological Momentary Assessment (EMA; Stone & Shiffman, 1994) appears to be an excellent approach for assessing the dynamic and subjective process in a clinical sample. By measuring these processes several time a day in the real lives of participants, new technologies could help us to precisely define the role played by RNT in alcohol dependence. These further studies will provide additional data about the link between RNT, depression, anxiety and alcohol consumption observed in the current study. The current paper is the first study focusing on RNT as a transdiagnostic process involved in alcohol consumption and it requires further experimental studies with ecological momentary assessment to identify the link between those variables in patients' everyday life.

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Declaration of interest

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the article.

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