

Characterization of Self-Defining Memories in Individuals with Severe Alcohol Use Disorders After Mid-Term Abstinence: The Impact of the Emotional Valence of Memories

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Background: Self-defining memories (SDM) are distinguished from other autobiographical memory (AM) processes to delineate those associated with the sense of personal identity and continuity in one's individual history. With chronic alcohol consumption, the construction of such memories may be modified in terms of specificity, valence, meaning-making, and evoked topics. This study sought to characterize SDM in a population of 27 patients with alcohol use disorder (AUD) who had been abstinent for at least 2 months compared with 28 control participants.

Methods: Besides cognitive and clinical assessment, participants were told to describe verbally and date 5 SDM and their narratives were recorded. For each memory, 5 dimensions were evaluated: level of specificity, emotional valence, integration of meaning, topics, and distance of memory in time.

Results: Overall, SDM of participants with AUD were specifically characterized by (i) low specificity, (ii) low integration, (iii) a predominance of memories with negative emotional valence and a low frequency of positive memories, and (iv) a low frequency of topics related to success. When different dimensions of the SDM were crossed, their characteristics depended mainly on the valence of the memory. Negative memories were more frequent, more specific and more integrated, while positive SDM were less frequent, less specific and less integrated.

Conclusions: The results underline the construction of a form of SDM with drinking problems that is mainly characterized by the disruption of positive memory and the presence of highly specific and integrated negative experiences. A disruption of the integration process modulated by the valence of memories could have repercussions on maintaining a sense of personal identity, the pursuit of personal goals and on social adaptability, and could constitute one of the main risks associated with persistent drinking problems. These results highlight the relevance of developing AM training programs for patients with AUD.

Key Words: Alcohol, Autobiographical Memory, Self-Defining Memories, Emotion.

BESIDES STUDIES THAT typically describe working memory and episodic memory disorders in individuals with alcohol use disorder (AUD) (Pfefferbaum et al., 2001; Pitel et al., 2007, 2009), difficulties in reliving past personal events and in organizing autobiographical memories have been highlighted in AUD (Nandrino et al., 2014, 2016). Autobiographical memory (AM), which corresponds to a memory system in the very long term, serves to encode, store, and retrieve a set of representations accumulated since early

age. It allows the individual to build his or her sense of identity and continuity through time and can be associated with the construction of the self (Conway, 2005; Prebble et al., 2013). Various characteristics of AM have been identified in detoxified patients and after long-term abstinence. First, D'Argembeau and colleagues (2006) and Whiteley and colleagues (2009) showed that nonamnesic patients with AUD reported more general memories than specific memories. As described in other autobiographical models (Conway, 2005; Conway and Pleydell-Pearce, 2000; Kopelman, 1994), this defect in AM specificity highlights the fact that as in other forms of addiction (Gandolphe et al., 2013; Nandrino et al., 2006), AUD patients have difficulty in accessing the specific perceptual and emotional material of AM. However, this phenomenon was not observed in AUD patients who had been abstinent for a longer period (6 months), whereas it was present in recently detoxified ones (Poncin et al., 2015). This change may be in part due to the improvement in executive functioning that occurs after abstinence (Poncin et al., 2015), given that a lack of specificity is also considered as a

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way of avoiding the emotional distress triggered by the reactivation of past experiences (Dalglish et al., 2008).

Other studies (Nandrino et al., 2014, 2016) using another instrument to explore AM (the Autobiographical Memory Interview [AMI]; Kopelman et al., 1990) have shown that AUD patients have lower scores than controls on both episodic and semantic components and at different periods of life. Concerning the degradation of semantic knowledge, they found that semantic AM performance for the childhood period was maintained, thereby supporting the hypothesis that individuals with AUD retain their ability to organize memories of events occurring early in life but present a deficit for later ones. This observation is concordant with the data of Fitzgerald and Shifley-Grove (1999), who found that recently detoxified patients with AUD recalled fewer memories from their recent past and more memories from their early adulthood (5 previous years) than healthy controls.

In line with the temporal distribution of AM, a specific period called “the reminiscence bump” refers to a substantial increase in memories of events that occurred between the ages of 10 and 30 years. It covers the most important events in people’s lives (e.g., first day at high school, first meeting with a partner, or first driving lesson) and is thus considered as the result of many first-time experiences that are used later in life as milestones when people experience similar events (Pillemer, 2001). Moreover, the reminiscence bump has been defined as a self-defining component as it covers self-defining memories (SDM), that is, events that are vivid and emotional with a strong impact on identity construction and maintenance (Conway et al., 2004). By explicitly referring to the self, recent models of AM propose a new conceptual frame that underlines the close relationships between personal identity and SDM (Blagov and Singer, 2004; Singer et al., 2013). In these models, SDM have been distinguished from other AM processes to define those associated with the sense of personal identity and continuity in one’s individual history (Conway et al., 2004). These memories which are particularly resistant to time are linked to an important positive or negative moment, a major concern for the subject that frequently recurs in memory (internal reminders or repeats) (Martinelli and Piolino, 2009; Singer and Salovey, 1993).

Various dimensions of SDM have been identified: level of specificity (corresponding to access to the specific perceptual and emotional content of AM; Williams, 2006; Williams et al., 2007), emotional valence (positive, negative, neutral, or mixed), integration of meaning (corresponding to the ability to update self-concept and personal goals by integrating important experiences in the self), themes developed in memories, and sometimes the time of onset or the period of life from which the memories were extracted. Several modifications of SDM have already been observed in various pathologies and have been related to changes in the sense of identity (Berna et al., 2011; Berntsen and Rubin, 2008; Sutherland and Bryant, 2005). In AUD patients, only 1 study has focused on SDM in recently detoxified patients (3 weeks) (Cuervo-Lombard et al., 2016), and it confirmed the reduced

specificity of SDM in AUD patients. The patients also reported SDM that were more negative, with a higher emotional intensity and containing more references to alcohol than those of control participants. However, these results cannot be extended to AUD with a long duration of abstinence as AM abilities, and at least specificity, may improve after several months of abstinence (Poncin et al., 2015).

The objective of this study was to characterize SDM in individuals suffering from AUD after mid- to long-term abstinence on the basis of the dimensions defined by Blagov and Singer (2004) (specificity, integration of meaning, affect, content, and age of remembrance). With chronic alcohol consumption and the memory process impairments associated at the encoding level and the recall processes, we hypothesized that the characteristics of SDM would be modified. In view of the literature showing impairment in recalling specific memories in patients with AUD (Cuervo-Lombard et al., 2016; D’Argembeau et al., 2006; Poncin et al., 2015; Whiteley et al., 2009), we hypothesized that SDM in such patients would display a lower level of specificity and that the latter would be linked to the cognitive functioning of the participants, with a greater cognitive performance associated with a higher frequency of specific SDM recalled. Furthermore, and as already found concerning the characteristics of SDM in recently detoxified patients with AUD (Cuervo-Lombard et al., 2016), we expected that SDM in the experimental group would be more negative and would contain more reference to their illness, as in schizophrenia (Berna et al., 2011) and posttraumatic stress disorder (Berntsen and Rubin, 2008; Sutherland and Bryant, 2005). Indeed, focalization on their illness may deprive patients of the ability to attribute meaning to their past life events. Hence, we hypothesized that the experimental group would recall fewer integrated memories. Finally, we sought to analyze the frequency distribution of combined SDM dimensions (specificity, valence, and integration).

MATERIALS AND METHODS

Participants

Demographic data are presented in Table 1. Twenty-seven detoxified patients with AUD and 28 nondependent (ND) individuals participated in the study. All participants were native French speakers. For both groups, the exclusion criteria included a history of psychotic disorder, bipolar disorder, neurological disorder, head injury, or intellectual deficiency. The Montreal Cognitive Assessment Scale (MoCA) (Nasreddine et al., 2005) was used to assess the general cognitive functioning of each participant.

Patients with AUD were recruited in the addiction departments of 2 French hospitals (Lille and Hénin-Beaumont) and in a rehabilitation unit in the north of France. The diagnosis of AUD was made by a psychologist or a physician specialized in addiction according to the DSM 5 criteria. Data concerning substance dependence and consumption were obtained from the medical records of the patient. They contained no history of other addictive behaviors except nicotine use.

ND individuals were recruited among employees of the addiction treatment centers or the University of Lille. They were interviewed and recruited after a clinical interview conducted by a psychologist.

Table 1. Demographic Characteristics of Participants (Means and Standard Deviations)

	Alcohol use disorder group (<i>n</i> = 27)		Nondependent group (<i>n</i> = 28)		Value	<i>p</i>	Cohen's <i>d</i>
	Mean (or <i>M</i>)	SD (or %)	Mean (or <i>M</i>)	SD (or %)			
Gender							
Male (<i>n</i> , %)	19	70	15	54	$\chi^2(1) = 1.64$	0.20	
Female (<i>n</i> , %)	8	30	13	46			
Age	50.44	7			$t(53) = 1.94$	0.06	
Level of education							
<baccalaureate (<i>n</i> , %)	10	37	8	29	$\chi^2(2) = 0.80$	0.68	
=baccalaureate (<i>n</i> , %)	11	41	11	39			
>baccalaureate (<i>n</i> , %)	6	22	9	32			
Length of substance abuse (years)	11.55	10.83	–	–			
	Range 1 to 40						
Length of abstinence (months)	11.76	10.89	–	–			
	Range 2 to 36						
MoCA scores	23.8	3.34	26.32	2.29	$t(53) = 3.23$	0.002	0.88
	Range 18 to 30		Range 21 to 29				
BDI scores	9.93	6.27	3.61	3	$t(53) = 4.80$	<0.001	1.28
STAI-Y B scores	50.52	10.27	41.25	6.98	$t(53) = 3.93$	0.001	1.05

They were social drinkers, all volunteers, and were recruited according to their age and education level. They were excluded if they presented a history of any form of addictive behavior except nicotine use.

All the participants took part in the study on a voluntary basis. Each participant was free to refuse to participate after the aims and the methods of the research had been presented. They were included in the sample after providing written informed consent.

Procedure

Clinical assessments and SDM measures were conducted individually by psychologists specifically trained for this study. The level of anxiety was assessed with the trait subscale of the state-trait anxiety inventory (STAI-Y B) (Spielberger et al., 1983; translation and French validation by Gauthier and Bouchard, 1993), a self-report questionnaire containing 20 items. We chose to use the Y-B form to obtain a global score of their anxiety symptoms and to assess a possible effect of anxious states on the choice of the SDM. Higher scores on the scale indicate higher levels of anxiety. Level of depression was evaluated with another self-administered questionnaire, the shortened Beck Depression Inventory (BDI-13), which has been validated among patients with AUD (Luty and O'Gara, 2006; translation and French validation by Collet and Cottraux, 1986). Higher scores indicate higher levels of depression.

SDM were evaluated with an adaptation of the procedure designed by Singer and Moffitt (1991). SDM were described to the participants as memories that refer to individuals' important concerns and which help them to understand who they are. These memories would be those they would recount to allow another person to get to know them better. Given their importance for personal identity, they are memories that individuals think about often and can remember very clearly. It was also specified that participants had to choose memories that went back at least 1 year and that created strong positive or negative emotions.

Participants were told to describe verbally 5 SDM and their narratives were recorded. After exposing their memories, they were asked to date each of them as precisely as possible. For each memory, 5 dimensions were evaluated: level of specificity (specific vs. general), emotional valence (positive, negative, neutral, or mixed), integration of meaning (integrative vs. nonintegrative), theme (life-threatening event, recreation, relationship, achievement, guilt/shame, substance use, and other), and distance of the memory in time (months elapsed since the event creating the memory occurred).

All the SDM were transcribed and then analyzed by independent judges who referred to the coding instruction described by Singer and Blagov (2002) for the level of specificity and integration. The themes were coded according to the manual developed by Thorne and McLean (2001). The independent judges were 3 graduate students in psychology specially trained in the SDM scoring methods. To evaluate interjudge agreement, Cohen's kappa was calculated for all SDM dimensions but distance in time, considering no agreement when $\kappa \leq 0$; none to slight when $0.01 < \kappa < 0.20$; fair when $0.21 < \kappa < 0.40$; moderate when $0.41 < \kappa < 0.60$; substantial when $0.61 < \kappa < 0.80$; and almost perfect when $0.81 < \kappa < 1$ (Landis and Koch, 1977). For the 4 SDM dimensions, Cohen's kappa reached a substantial agreement score (level of specificity, $\kappa = 0.76$; emotional valence, $\kappa = 0.78$; integration, $\kappa = 0.64$; theme, $\kappa = 0.71$).

Statistical Analysis

Chi-square tests were conducted to compare patients with AUD and the ND sample with respect to sex and education level. The *t*-test for independent samples was used to compare AUD and ND groups regarding age, depression (BDI-13 score), anxiety (STAI-Y B score), and global cognitive functioning (MoCA score). Cohen's *d* was used to measure the effect size for these comparisons. The effect size was estimated as Cohen's *d*: 0.20 = small, 0.50 = medium, 0.80 = large (Cohen, 1992).

To characterize SDM in each group of participants according to level of specificity, emotional valence, integration, and theme, the chi-square and Fisher's exact tests were performed. They were also performed to evaluate the difference between AUD and ND groups on these SDM dimensions and in combined SDM dimensions (level of specificity \times emotional valence; level of specificity \times integration; integration \times emotional valence). For significant chi-square results, the effect size was evaluated by estimating Cramer's *V*, considering the effect to be small when 0.10, medium when 0.30, and large when 0.50 (Cohen, 1988).

The *t*-test for independent samples was used to compare the distance in time of the SDM recalled in both groups, with the effect size evaluated by calculating Cohen's *d*.

Pearson's correlation coefficients were also examined to explore possible bivariate relationships between clinical variables (cognitive functioning, anxiety, depression, length of substance abuse, length of abstinence) and some SDM dimensions: specificity (number of specific SDM), emotional valence (number of positive, negative, neutral, or mixed SDM), and integration (number of integrated

SDM) in both groups. Given the numbers of themes and the size of the sample, we do not present the correlations between the themes and the clinical variables.

Analyses were conducted using SPSS for Windows version 18 (SPSS Inc., Chicago, IL).

RESULTS

Clinical Characteristics of AUD and ND Groups

There were no differences between patients with AUD and ND individuals regarding sex, educational level, and age. Concerning anxiety and depression, patients with AUD were more depressive and anxious than ND individuals. Patients with AUD had lower scores on the MoCA than ND individuals (see Table 1).

Group Comparisons of SDM Dimensions

Frequency distribution and frequencies of SDM according to the level of specificity, emotional valence, integration of meaning, and theme in AUD and ND groups are presented in Table 2.

The results showed a lower frequency of specific SDM ($\chi^2(1) = 7.40, p < 0.01$) and a lower frequency of integrated SDM recalled ($\chi^2(1) = 11.82, p = 0.001$) in the AUD group than in the ND group. Cramer's V were, respectively, 0.16 and 0.21. There was a significant group effect on the emotional valence of SDM recalled ($\chi^2(1) = 23.79, p < 0.001$; Cramer's $V = 0.29$). We observed a lower frequency of positive SDM ($\chi^2(1) = 13.4, p < 0.001$; Cramer's $V = 0.22$), and

higher frequencies of negative ($\chi^2(1) = 8.12, p < 0.01$; Cramer's $V = 0.17$) and neutral ($\chi^2(1) = 9.73, p < 0.01$, Cramer's $V = 0.19$) SDM in the AUD group than in ND group. The frequency of mixed (both positive and negative) SDM was the same in the 2 groups ($\chi^2(1) = 1.75, p > 0.10$). Concerning themes, the results showed a significant group effect on the theme recalled ($p = 0.03$). The frequency of recall differed between the groups only for the theme "achievement, mastery" with a higher frequency of this theme recalled in the ND group than in the AUD group ($\chi^2(1) = 7.91, p < 0.01$, Cramer's $V = 0.17$). The 2 groups recalled the same frequency of "life-threatening event" ($\chi^2(1) = 0.90, p > 0.10$), "recreation" ($\chi^2(1) = 0.38, p > 0.10$), "relationship" ($\chi^2(1) = 3.68, p > 0.05$), "guilt/shame" ($p > 0.10$), "substance use" ($p > 0.05$), and "other" SDM ($\chi^2(1) = 0.05, p > 0.10$) themes. Concerning the distance in time of the SDM recalled, patients with AUD recalled older memories than ND participants. These differences were significant with a small effect size ($t(259) = 2.09, p = 0.04, d = 0.26$).

Group Comparison of Combined SDM Dimensions

Frequency distribution and frequencies of combined SDM dimensions in AUD and ND groups are presented in Table 3.

When combining the level of specificity and the emotional valence of the SDM, there was a significant group effect on the emotional valence of SDM recalled among specific SDM ($p < 0.001$) and general SDM ($p < 0.01$). The results showed a lower frequency of specific positive SDM ($\chi^2(1) = 5.11, p < 0.05$; Cramer's $V = 0.19$) and lower frequency of general positive ones ($\chi^2(1) = 10.05, p < 0.01$; Cramer's $V = 0.27$) in the AUD group than in the ND group. At the same time, there was a higher frequency of specific negative ones ($\chi^2(1) = 7.55, p < 0.01$; Cramer's $V = 0.23$) in the AUD group than in the ND group. Although there was a higher frequency of general neutral SDM ($p = 0.02$) in the AUD group than in the ND group, there was no difference in the frequency of specific neutral ones ($p = 0.12$). The frequency of specific mixed ($\chi^2(1) = 1.84, p > 0.10$), general negative ($\chi^2(1) = 1.80, p > 0.10$), and general mixed ($\chi^2(1) = 0.08, p > 0.10$) SDM did not differ between the 2 groups.

When combining level of specificity and integration of meaning, the results showed a lower frequency of integrated SDM among specific memories in the AUD group than in the ND group ($\chi^2(1) = 11.08, p < 0.001$; Cramer's $V = 0.29$). This significant difference in integration between the 2 groups was not found for general memories ($\chi^2(1) = 0.69, p > 0.10$). When combining the integration of meaning and the emotional valence of the SDM, we observed a significant group effect on emotional valence of SDM for integrated ($p < 0.001$) and nonintegrated SDM ($\chi^2(3) = 9.95, p < 0.05$; Cramer's $V = 0.24$). In the AUD group, there was a lower frequency of integrated positive ($p < 0.001$) and nonintegrated positive SDM ($\chi^2(1) = 4.74, p < 0.05$; Cramer's $V = 0.16$) than in the ND group. Furthermore, there was a

Table 2. Frequency Distribution and Frequencies of Self-Defining Memories (SDM) According to Level of Specificity, Emotional Valence, Integration of Meaning, and Theme in alcohol use disorder (AUD) and Nondependent (ND) Groups

	AUD group		ND group	
	N (or mean)	% (or SD)	N (or mean)	% (or SD)
Level of specificity				
Specific	55	41	80	57
General	80	59	60	43
Emotional valence				
Positive	37	27	68	49
Negative	50	37	30	21
Neutral	24	18	8	6
Mixed	24	18	34	24
Integration of meaning				
Integrated	34	25	63	45
Nonintegrated	101	75	77	55
Theme				
Life-threatening event	25	19	20	14
Recreation	15	11	19	14
Relationship	47	35	34	24
Achievement	22	16	43	31
Guilt/shame	4	3	4	3
Substance use	4	3	0	0
Other	18	13	20	14
Mean distance in months (SD)	248.58	(189.40)	203.92	(155.71)
SDM Total	135	100	140	100

Table 3. Frequency Distribution and Frequencies of Self-Defining Memories (SDM) by Combining Level of Specificity, Emotional Valence, and Integration of Meaning in alcohol use disorder (AUD) and Nondependent (ND) Groups

	AUD group		ND group	
	N	(%)	N	(%)
Specific SDM				
Total	55	100	80	100
Specific positive	13	24	34	42
Specific negative	23	42	16	20
Specific neutral	7	13	4	5
Specific mixed	12	16	26	33
Specific integrated	15	27	45	56
Specific nonintegrated	40	73	35	43
General SDM				
Total	80	100	60	100
General positive	24	30	34	57
General negative	27	34	14	23
General neutral	17	21	4	7
General mixed	12	15	8	13
General integrated	19	24	18	30
General nonintegrated	61	76	42	70
Integrated SDM				
Total	34	100	63	100
Integrated positive	1	3	28	45
Integrated negative	17	50	14	22
Integrated neutral	5	15	2	3
Integrated mixed	11	32	19	30
Nonintegrated SDM				
Total	101	100	77	100
Nonintegrated positive	36	36	40	51
Nonintegrated negative	33	33	16	21
Nonintegrated neutral	19	19	6	8
Nonintegrated mixed	13	13	15	20

higher frequency of integrated negative SDM ($\chi^2(1) = 7.84, p < 0.01$; Cramer’s $V = 0.28$) and a higher frequency of nonintegrated neutral SDM ($\chi^2(1) = 4.39, p < 0.05$; Cramer’s $V = 0.16$) in the AUD group. Among integrated SDM, there were no significant differences in the frequency of neutral ($p = 0.05$) and mixed SDM ($\chi^2(1) = 0.05, p > 0.05$) between the 2 groups. Furthermore, no significant differences were found in the frequency of negative ($\chi^2(1) = 3.10, p > 0.05$) and mixed ($\chi^2(1) = 1.44, p > 0.10$) SDM recalled among nonintegrated SDM.

Relationships Between Clinical Variables and SDM Dimensions

Pearson’s correlation coefficients conducted to explore possible relationships between cognitive functioning, length

of abstinence, anxiety, depression, and SDM dimensions in patients with AUD and ND participants are presented in Table 4.

MoCA scores were negatively related to the number of negative SDM and positively linked to the number of integrated memories. This indicates that the better the cognitive performance of the participants was, the less they recalled negative memories and the more they recalled integrated memories. STAI-Y B and BDI-13 scores were positively correlated with the number of negative memories and negatively correlated with the number of positive memories, meaning that the more participants were anxious or depressive, the less they recalled positive memories and the more they recalled negative ones. Finally, there was no significant correlation between length of abstinence and SDM dimensions (level of specificity, emotional valence, integration, and theme) in patients with AUD.

DISCUSSION

The present study explored how SDM are characterized in a population of patients with AUD who had been abstinent for at least 2 months compared with control participants. Overall, when we compared the SDM of the 2 groups, we found that they were specifically characterized by: (i) low specificity, (ii) low integration, (iii) a predominance of memories with negative emotional valence and a low frequency of positive memories, and (iv) a low frequency of topics related to success.

Concerning the lack of specificity of the memories, this result is consistent with the observation of Cuervo-Lombard and colleagues (2016) in recently detoxified AUD patients and in studies using cue words to initiate the recall of memories (e.g., using the Autobiographical Memory Test) both in individuals with AUD (D’Argembeau et al., 2006; Whiteley et al., 2009) or with other substance addictions (Gandolphe and Nandrino, 2011; Gandolphe et al., 2013). Whatever the method used, the results showed that patients with AUD overgeneralized their AM, including SDM. Despite an improvement in cognitive functions with abstinence, SDM remained less specific in mid- to long-term abstinent patients, which indicates that the lack of specificity is not due to impaired cognitive abilities. In addition, the absence of correlation between the level of specificity and cognitive functioning (globally assessed with the MoCA) supports the idea that a recovery of cognitive functions cannot alone explain

Table 4. Correlations Between MoCA, STAI-Y B, BDI-13 Scores, and Self-Defining Memories Dimensions

	Level of specificity	Emotional valence				Integration of meaning	Themes						
		Positive	Negative	Neutral	Mixed		1	2	3	4	5	6	7
MoCA	0.26	0.06	-0.38	0	0.27	0.42	0.09	0.14	-0.13	0.25	0.16	-0.04	-0.37
STAI-Y B	0.08	-0.39	0.38	0.06	0.06	-0.15	0.04	0.06	0.12	-0.28	0.03	0.15	0
BDI-13	0.11	-0.34	0.47	0	-0.02	-0.19	0.14	-0.02	0.06	-0.18	0.10	0.07	-0.05
Length of abstinence	-0.20	-0.24	-0.13	0.35	-0.04	-0.03	0.25	-0.34	0.06	-0.16	-0.03	-0.31	0.21

overgeneralization in AUD patients (Cuervo-Lombard et al., 2016).

Such a reduced specificity in AM could correspond to a cognitive strategy of blocking or disrupting access to the details of distressing autobiographical events (Dalgleish et al., 2008). This reduced specificity of AM concerned affect regulation processes, where specific personal information is especially avoided by individuals experiencing greater distress and compromised executive control (Dalgleish et al., 2008; Williams et al., 2007). More importantly, regarding the relationships between the different dimensions characterizing SDM, it is interesting to note that AUD patients actually remembered more specific negative memories and fewer specific and general positive memories than control participants. In fact, negative SDM were frequent and specific while positive SDM were rarely evoked. This demonstrates that access to positive memories or the encoding of such events is impaired and therefore that the possibility of reliving a positive emotion is locked. In contrast, negative emotion is present and mainly specific, suggesting preferential access to these memories and their emotional load.

Regarding the integration of memories, individuals with AUD recalled significantly fewer integrated SDM than control participants. According to Blagov and Singer (2004), this process allows individuals to stand back from a past event and to evaluate how they have integrated it and how it has modified the way they see themselves, others, or the world. Hence, participants with AUD would not derive meaning or any particular lesson from these salient events for their lives or the memories recalled would not be related to their knowledge of themselves or with their current objectives. This difficulty to recall integrated memories may be linked to impairments in the cognitive functioning in patients with AUD, as individuals with poorer cognitive abilities recall fewer integrated SDM. Moreover, when the characteristics of specificity and integration were crossed, the integrated memories in individuals with AUD were less specific than those in control participants but were also dependent on the valence of the SDM. Indeed, the emotional valence of the SDM affects the quality of integration as we observed both a higher frequency of integrated negative SDM and a lower frequency of integrated positive memories in patients with AUD. The self-meaning-making process seems to be modified during the course of drinking problems in that there is a disconnection between the memory and a value or a goal for a positive memory and because there is a strong connection for negative memories. In other words, patients incorporate especially negative experiences and draw a lesson from them that is also well specified and emotionally consistent. Such an integration of negative SDM has also been observed in other pathologies such as depression (Kuyken and Howell, 2006) and posttraumatic stress disorder (Sutherland and Bryant, 2005) in that traumatic or negative events are specifically integrated. This lack of integration of positive memories and conversely this preferential integration of negative memories could be considered a vulnerability to relapse if these

negative memories are not enriched and compensated by new positive experiences. Nevertheless, conversely, it can also be assumed that this trend to attributing meaning more to negative experiences than to positive ones may also be considered as the result of the therapeutic process. To be engaged in a recovery process may involve active work on past negative experiences to offset the tendency to deny or repress problems from the past. This work may indeed maintain negative memories in a more activated and salient state than positive ones. Longitudinal or prospective studies will help to verify the role of each of these 2 kinds of memories integration (positive or negative memories integration) on the recovery processes.

In addition, regarding emotional valence, the results showed that individuals with AUD recalled significantly more SDM with a negative emotional valence and fewer with a positive valence than control participants. These results are congruent with those of Cuervo-Lombard and colleagues (2016) who found that AUD patients recalled more SDM with a negative valence than control individuals. Furthermore, anxiety and depression scores were significantly correlated with emotional valence, suggesting that anxious and depressive symptoms may account for the emotional valence of SDM in patients with AUD. Indeed, a prevalence of SDM with negative emotional valence is characteristic of patients suffering from posttraumatic stress disorder (Sutherland and Bryant, 2005) or depressive disorders (Moffitt et al., 1994). Moreover, by combining the different dimensions of SDM, it may be seen that their characteristics depend mainly on the valence of the memory. Thus, negative memories are more frequent, more specific and more integrated, while positive ones are less frequent, less specific, and less integrated.

Furthermore, the topics addressed in the SDM patients differed from those of the controls. Participants with AUD recalled significantly fewer memories related to success or failure than the controls. This includes events that involve effortful attempts to achieve a goal event if it is finally unsuccessful, such as success/failure in an examination, the beginning of a new life after moving or making important decisions in one's life. This weak recall of this topic in which emphasis is placed on accomplishment may be explained by the impact of self-esteem on the ability to recall SDM in AUD. As shown by Tafari and colleagues (2003), low self-esteem is associated with selective memory for negative information, offering little in terms of supportive return. This heightened concern renders deficit-related experiences especially memorable. In this line, some authors suggest that encouraging the recall of situations that need fighting in AUD results in a reduction in hopelessness and a greater ability to solve problems (Szabó and Tóth, 2014).

In addition, individuals with mid- to long-term abstinence recalled very few SDM referring to their alcohol consumption. This result differs from what has been observed in recently abstinent patients who included more reference to alcohol in their SDM, given that these alcohol-related memories are correlated with the intensity of negative emotional

responses (Cuervo-Lombard et al., 2016). This result is particularly interesting in the sense that along with their clinical improvement, patients with AUD no longer consider their previous alcohol experiences to be a component of their personal identity. A limited access to self-threatening information, such as specific information related to past personal drinking experiences, may be motivated by the attempt to protect the integrity of the self and may thus be considered as a form of denial (Poncin et al., 2015).

In addition, both control participants and those with AUD aged over 40 years recalled memories of events that took place around the age of 30 years. Nevertheless, even if there was a significant difference in the distance in time of the SDM recalled between the patients with AUD and ND individuals, when we deducted this distance from the average age of our groups, we found no difference concerning the period of life recalled in SDM. Contrary to our expectations, the memories recalled by the participants with AUD were not older than those of the controls. Our results do not match those of the study by Raffard and colleagues (2009) in which patients with schizophrenia recalled memories referring to events that took place around the age of 15 to 19 years, while controls had significantly more memories of events that took place around the age of 20 to 24 years.

To summarize, the present findings confirm a global lack of specificity in patients with AUD that is thought to contribute to a form of suppression in AUD patients (Poncin et al., 2015) and to impact the benefit of psychotherapy negatively by impeding the integration of therapeutic sessions (Van Daele et al., 2013). Furthermore, they point to the construction of a specific form of SDM with drinking problems mainly characterized by the disruption of positive memories and the presence of highly specific and integrated negative experiences. A disruption of the integration process modulated by the valence of such memories could have repercussions on maintaining a sense of personal identity, the pursuit of personal goals, and on social adaptability (D'Argembeau et al., 2006; Raffard et al., 2009). Such a disruption could constitute one of the main risks of continued drinking problems and could stop the individual from exiting the vicious circle of repeated negative memories. Our results highlight the relevance of developing AM training programs for patients with AUD, as is already the case in other clinical populations such as schizophrenia or depression (Neshat-Doost et al., 2013; Raes et al., 2009; Ricarte et al., 2012; Serrano et al., 2004). In particular, memory specificity training has proved to be successful in increasing the recall of specific memories in depressive patients (Raes et al., 2009), and in patients suffering from posttraumatic stress disorder (Moradi et al., 2012). Some life review therapy interventions have also demonstrated that overgeneralization bias can be improved, again in depressive patients (Serrano et al., 2004), and in patients with schizophrenia (Ricarte et al., 2012). These promising results concerning the efficiency of AM training in clinical populations open up clinical perspectives for individuals

with AUD. Given the common factors possibly involved in autobiographical retrieval deficit and in alcohol excessive consumption, one may hypothesize that AM training would improve both overgenerality and emotional or cognitive variables through which the bias is considered to maintain the alcohol consumption, such as rumination, emotional avoidance, or problem-solving difficulties.

However, to better understand the links between AM processes and alcohol consumption, it is important to carry out studies throughout therapeutic follow-up to assess the evolution of SDM at different stages of the therapy. This type of study will make it possible to distinguish the effect due to the therapy and the process of alcohol withdrawal. Moreover, the results obtained in this study need to be complemented by longitudinal studies seeking to investigate whether these characteristics evolve according to the duration of alcohol abstinence and whether these SDM characteristics have a prognostic value regarding continuing abstinence or relapse. Finally, the absence of detailed neuropsychological investigation and other characteristics of drinking history (longer duration of abstinence, repetition of withdrawal) constitute a limitation of the results that should be addressed in future research.

CONFLICT OF INTEREST

The authors have no conflict of interest to declare.

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