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EMOTIONAL DISPOSITIONS AND SUBSTANCE USE: MEDIATING EFFECT OF ALEXITHYMIA[1]

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Summary.—Substance consumption behaviors can range from use to abuse, the latter including addictive behaviors. Relationships between emotionality, alexithymia and substance-consumption behaviors among young adults were investigated through an explanatory model wherein alexithymia fulfills a mediating function by acting as an emotion-adjustment process. 256 students (62.1% women) with a mean age of 20.7 yr. ($SD = 1.6$), enrolled at two universities in southern France took part in the study. They filled out a substance-use questionnaire, the *Émotionnalité positive et négative à 31* (EPN–31) emotionality scale, and the 20-item Toronto Alexithymia Scale (TAS–20). Mediation analyses validated the hypothesis that emotional dimensions of alexithymia act as mediators between emotionality (negative emotionality and emotional arousal) and substance use. As a mediating factor, alexithymia may be regarded as a type of operational process that regulates emotions. These results could have important implications for clinical and therapeutic applications focusing on emotion-regulation strategies and substance use.

Although young adults' consumption of substances such as tobacco, alcohol, and cannabis seems to be leveling off in France, it remains an important issue in terms of its psychosocial and health effects (Karila, Legleye, Donnadieu, Beck, Corruble, & Reynaud, 2004). Alcohol, tobacco and cannabis are the most common drugs among adolescents in all Western countries (Choquet, Morin, Hassler, & Ledoux, 2004). Many studies have shown that marijuana users are more likely than nonusers to be alcohol drinkers and cigarette smokers (Kandel & Yamaguchi, 1993; Merrill, Kleber, Shwartz, Liu, & Lewis, 1999). Growing attention has been paid to polydrug use (Hoffman, Welte, & Barnes, 2001). Moreover, multiple substance use is a high risk factor for substance-related problems, such as abuse and dependence (Wills, McNamara, Vaccaro, & Hurky, 1996). However, data are lacking on the increase in polydrug use among young adults.

Researchers have analyzed the role played by psychosocial, familial, and psychological factors in substance use. Emotionality (Larsen & Diener, 1985) was a statistically significant moderator in the relation of family risk factors to adolescents' use of tobacco, alcohol, and marijuana (Wills, Sandy, Yaeger, & Shinar, 2001) and has been posited to play a direct role in the

use of substances like tobacco (Gonzalez, Zvolensky, Vujanovic, Leyro, & Marshall, 2009) and alcohol and illegal drugs (McGue, Slutske, & Iacono, 1999; Elkins, King, McGue & Iacono, 2006). Positive emotionality and negative emotionality are temperament-related dimensions that account for individual differences in the experience of predominantly positive or negative affect, respectively (Rothbart & Bates, 1996). Positive and negative emotionality are regarded as distinct dimensions by personality theorists (Diener & Larsen, 1993). Negative emotionality is often defined as proneness to experience negative emotions and psychological distress. Numerous studies have found a significant relationship between the propensity to experience negative emotional states and substance-use disorders. Negative emotionality is associated with drug use and impulsivity (Magyar, Edens, Lilienfeld, Douglas, & Poythress, 2011), and is the construct most strongly associated with marijuana use (Gorman & Derzon, 2002). It also mediates the relationship between alcohol use problems and symptoms of cluster B personality disorders (James & Taylor, 2007). It has been shown that adolescents and young adults may rely on substance consumption to alleviate emotional distress (Turner, Larimer, Sarason, & Trupin, 2005). So, negative emotionality, as a part of emotional functioning, would appear to be a predictive factor for substance-consumption behaviors.

Alexithymia encompasses both an emotional dimension: difficulty identifying and describing one's emotions, and a cognitive dimension: externally oriented thinking and impoverished fantasy life (Loas, Otmani, Lecercle, & Jouvent, 2000). Alexithymia is difficulty identifying emotional states, distinguishing emotions and sensations, and expressing emotions using words (Sifneos, 1973). It appears to be overrepresented among subjects with substance-use disorders and is associated with an increased risk and severity of alcohol-related problems (for a review, see Thorberg, Young, Sullivan, & Lyvers, 2009). It may also have an adverse effect on the treatment of alcohol use disorder (Loas, Fremaux, Otmani, Lecercle, & Delahousse, 1997). Alexithymia has been hypothesized to be a risk factor in the genesis of alcohol use disorder (De Rick & Vanheule, 2006; de Timary, Roy, Luminet, Fillée, & Mikolajczak, 2008). Moreover, a study with cannabis users (Dorard, Berthoz, Haviland, Phan, Corcos, & Bungener, 2008) supported evidence that 35.6% to 43.7% in their research population could be described as alexithymic [depending on which measure was used, the 20-item Toronto Alexithemia scale (TAS–20) or Bermond-Vorst Alexithymia Questionnaire (BVAQ) scores]. Despite the relatively small number of studies, there is supporting evidence of a strong relationship between alexithymia, difficulty dealing with negative affect, and substance-use disorders (Handelsman, Stein, Bernstein, Oppenheim, Rosenblum, & Magura, 2000). Alexithymia was also revealed as a media-

tor that reflects emotional dysregulation and is related to neuroticism and depression (Lee & Guajardo, 2011), and emotional dimensions and substance use (Zimmerman, Salamin, & Reicherts, 2008). It is also often associated with depression in people with alcohol dependence (Haviland, 1988) and with excessive consumption of psychoactive substances (Loas, *et al.*, 2000). Alexithymia may reinforce or maintain an individual's engagement in certain behaviors (Thorberg, *et al.*, 2009).

It is possible that negative emotionality may lead to "use" of alexithymia to alleviate negative emotions. Such a use of alexithymia may predict substance use. The goals of the present study were to confirm previous findings on the relationship between emotionality (negative emotionality and emotional arousal), alexithymia (difficulty identifying and describing feelings), and substance use in young adults, and to make an initial attempt to identify a mediating effect of alexithymia on the relationship between emotionality and substance use. Hypotheses were: (1) a mediating effect of Difficulty Identifying Feelings on Negative Emotionality and substance use, and (2) a mediating effect of Difficulty Describing Feelings on Negative Emotionality and substance use. These relationships should explain the largest percentage of variance in substance consumption.

<div align="center">METHOD</div>

Participants

Students ($N = 268$) enrolled at two universities in southern France were contacted for the study. Of these, 256 students participated and validated the protocol. There were 159 women (62.1%) and 97 men (37.9%) with a mean age of 20.7 yr. ($SD = 1.6$) who took part in the study. Those from the University of Provence comprised 198 students, 166 women (83.8%) and 32 men (16.2%) with a mean age of 22.7 yr. ($SD = 5.2$) and from the University of the Mediterranean 58 students, 46 women (79%), and 12 men (21%) with a mean age of 20.7 yr. ($SD = 5.9$). All participants, recruited at the beginning of a lecture, gave their written informed consent, and were told that their participation was entirely voluntary and would remain anonymous and confidential. None of the students refused to participate. The majority of the participants were Caucasian, with a small minority of Asian or North African origin. The protocol was distributed randomly.

Measures

Substance use.—Consumption of three different substances was assessed by self-report: tobacco, alcohol, and cannabis. The frequency of substance use over the previous six months was assessed with items from a questionnaire on substance use and risk-taking developed for a previ-

ous study (Bréjard, Bonnet, & Pedinielli, 2008), and items were rated on a 7-point Likert-type scale (see Simons, Correia, Carey, & Borsari, 1998, for an example), with anchors 0: No use and 6: More than once a day. An overall score was calculated for each individual by summing the scores for each substance, with a maximum score of 18. Given that the target of the study was substance consumption as a whole, it was not necessary to distinguish the type of substance used.

Emotionality.—Negative Emotionality, Positive Emotionality, and Emotional Arousal were assessed using the *Émotionnalité positive et négative à 31* (EPN–31; Pélissolo, Rolland, Perez-Diaz, Jouvent, & Allilaire, 2007), comprising items rated on a 31-item Likert-type scale. Scores on each of the three factors were sums of item ratings, which gave possible scores ranging from 10 to 70. The factor structure of the EPN–31 is well established, with the three-factor solution accounting for 58.2% of the variance in scores. The pattern of correlation with anxiety and depression scores is consistent with Clark and Watson's tripartite model (Clark & Watson, 1991; Pélissolo, *et al.*, 2007). For this study, Cronbach's alpha internal consistency reliabilities for Negative Emotionality, Positive Emotionality, and Emotional Arousal were .93, .87, and .77, respectively.

Alexithymia.—Alexithymia was assessed on the French version of the TAS–20 (Loas, Corcos, Stephan, Pellet, Bizouard, Venisse, *et al.*, 2001). This scale has a three-factor structure like the original version (Bagby, Parker, & Taylor, 1994) and is rated on a Likert-type scale. Factor 1, Difficulty Identifying Feelings, includes seven items assessing the ability to identify feelings and to distinguish them from the somatic sensations that accompany emotional arousal. Factor 2, Difficulty Describing Feelings, consists of five items assessing the ability to describe feelings to other people. Factor 3, External-oriented Thinking, consists of eight items assessing externally oriented thinking. In the present study, scores on the three factors were used, and gave a score ranging from 20 to 100. Both the reliability and the validity of the TAS–20 have been amply demonstrated. Internal consistency was acceptable for the total TAS–20 scale (alpha = .79) and for Difficulty Identifying Feelings (alpha = .77) and Difficulty Describing Feelings (alpha = .72) subscales, but the internal consistency of External-oriented Thinking was poor (alpha = .61).

Procedure

This study was part of a larger research project on general health risks and risk-taking behaviors, conducted at the Universities of Provence and the Mediterranean. Participants answered questionnaires at their university during one group session for each. Twenty-seven of the questionnaires turned in were discarded due to missing data.

Analyses

Statistical analyses were performed using SPSS Version 15. Descriptive statistics were used to study confounding variables and describe participants' characteristics. Hierarchical multiple regressions were used to study the mediation effects. Mediation was assessed using the guidelines set forth by Baron and Kenny (1986). Evidence of mediation is said to be present if there is (a) a significant predictor-to-outcome association (Path *c* in Figs. 1 and 2), (b) a significant predictor-to-mediator association (Path *a* in Figs. 1 and 2), (c) a significant mediator-to-outcome association (Path *b* in Figs. 1 and 2), and (d) a reduction in the predictor-to-outcome association after controlling for the mediator (Path *c'* in Figs. 1 and 2). The significance of the indirect effect was assessed using Sobel's test (Sobel, 1982). Following the recommendations by MacKinnon, Lockwood, and Williams (2004), a re-sampling procedure with bootstrapping was used (Preacher & Hayes, 2008) to test the mediation model. This approach allows testing the significance of the indirect effect. Moreover, bootstrap estimation is insensitive to violations of normality which may occur in size-limited samples. To conduct the mediation analyses in this study, 5,000 re-samples were obtained from the original sample ($N = 256$) with 95% confidence interval (*CI*) for the indirect effect. The SPSS Macro provided by Preacher and Hayes (2008) was used to perform the analyses. Given the cross-sectional design of the study, Sheets and Braver (1999) recommendations were followed, conducting additional analysis by reversing the proposed mediator with the criterion for each mediational model.

<div align="center">Results</div>

Participants' Characteristics by Sex

Table 1 presents the values of the predictors and outcome variables for the whole sample and for men and women separately. A univariate analysis of variance (ANOVA) failed to reveal any significant sex differences, except for the emotional arousal subscale ($F_{1,255} = 5.41$, $p < .05$, $\eta^2 = 0.05$). There was no statistically significant effect of sex on any other variable.

Multiple Regressions

A first multivariate regression (Model 1, Table 2) of all the emotionality subscales and all the alexithymia subscales showed that Negative Emotionality (beta = .12, $p = .04$), Difficulty in Identifying Feelings (beta = .42, $p = .0001$), and Difficulty in Describing Feelings (beta = 01, $p = .04$) significantly contributed to explaining 31.5 % of the total variance in substance use. As statistically significant correlations between Emotionality and Alexithymia were found, respectively, between Negative Emotionality and Difficulty in Identifying Feelings ($r = .50$, $p < .0001$), Positive Emotionality and Difficulty in Describing Feelings ($r = -.20$, $p = .001$), and Emotion-

TABLE 1
MEANS AND STANDARD DEVIATIONS OF MEASURES AMONG WOMEN, MEN, AND TOTAL SAMPLE

Measure	Women		Men		Total		Univariate F	η²
	M	SD	M	SD	M	SD		
Age	20.66	1.63	20.88	1.67	20.74	1.64	0.99	0.01
Substance Use	5.65	4.68	5.87	5.24	5.73	4.89	0.15	0.00
Positive Emotionality	47.69	9.80	47.28	10.75	47.54	10.15	0.01	0.00
Negative Emotionality	55.61	17.48	53.88	16.54	54.95	17.12	0.45	0.01
Emotion Arousal	7.86	2.97	9.07	3.67	8.32	3.30	5.41*	0.05
Difficulty Identifying Feelings	18.26	5.87	17.55	6.15	17.99	5.98	0.92	0.01
Difficulty Describing Feelings	14.74	4.96	15.52	4.75	15.03	4.89	0.44	0.00
External-oriented Thinking	16.77	4.96	17.18	3.70	16.92	4.52	0.16	0.00
Total Toronto Alexithymia Scale	49.76	11.95	50.24	10.67	49.94	11.46	0.00	0.00

*$p < .05$.

al Arousal and Difficulty in Identifying Feelings ($r = .28$, $p = .0001$), mediation analyses were performed to assess whether the relationship between substance use and the Positive Emotionality and Negative Emotionality dimensions (measured on the EPN–31 subscales) was mediated by the different components of alexithymia (measured by the TAS–20).

Mediation Analyses

In the present study, the mediating effect of alexithymia on the relationship between emotionality and substance use was assessed. Alexithymia was deemed to be a mediator if it accounted for some or all of the relationship between emotionality and substance use. Three distinct models were considered.

Model A: Difficulty Identifying Feelings on Negative Emotionality and substance use.—The analyses revealed that Negative Emotionality was significantly associated with the amount of substance use (Fig. 1; beta = .10, $p < .0001$), and was significantly and positively related with the Difficulty Identifying Feelings score (beta = .17, $p < .0001$). In turn, the Difficulty Identifying Feelings score was significantly and positively related with substance use (beta = .37, $p < .001$). The significant relationship found earlier between Negative Emotionality and substance use diminished significantly after controlling for Difficulty Identifying Feelings, becoming non-significant (beta = .036, $p = .06$), indicating full mediation. The indirect effect of Negative Emotionality through Difficulties in Identifying Feelings was significant (Sobel $z = 5.95$, $p < .0001$), and estimated to lie between .05 and .09 ($SE = .02$) with 95% CI. However, substance use does not mediate the relationship between Negative Emotionality and Difficulties in Identifying Feelings (beta changed little from .17 to .12, remaining statistically significant).The model, including mediation, accounted for 30% of the variance in substance use.

TABLE 2

RESULTS FOR REGRESSIONS: MODEL 1 (EMOTIONALITY AND ALEXITHYMIA SUBSCALES PREDICT SUBSTANCE USE), MODEL A (MEDIATION OF DIFFICULTIES IN IDENTIFYING FEELINGS ON NEGATIVE EMOTIONALITY AND SUBSTANCE USE), MODEL B (MEDIATION OF DIFFICULTIES IN DESCRIBING FEELINGS ON POSITIVE EMOTIONALITY AND SUBSTANCE USE), AND MODEL C (MEDIATION OF DIFFICULTIES IN IDENTIFYING FEELINGS ON EMOTIONAL AROUSAL AND SUBSTANCE USE)

Model	Unstandardized Coefficients			Standardized Coefficients β	t	p
	B	95%CI B	SE			
Model 1: Multiple Linear Regression						
Negative Emotionality	.03	.00, .07	.02	.12	1.86	.04
Difficulties in Identifying Feelings	.34	.23, .44	.05	.42	6.10	.0001
Difficulties in Describing Feelings	.11	−.01, .23	.06	.12	1.92	.04
Total variance explained, 31.5%						
Mediation Analysis						
Model A : Difficulties in Identifying Feelings on Negative Emotionality and Substance Use						
Substance use	.10	.07, .13	.01	.37	6.38	.001
Difficulties in Identifying Feelings	.38	.28, .47	.05	.17	7.68	.0001
Total variance explained, 30%						
Model B : Difficulties in Describing Feelings on Positive Emotionality and Substance Use						
Substance use	.35	.23, .48	.06	.37	6.29	.0001
Difficulties in Describing Feelings	−.10	−.15, −.04	.03	−.20	−3.26	.001
Total variance explained, 15.4%						
Model C : Difficulties in Identifying Feelings on Emotional Arousal and Substance Use						
Substance use	.16	.01, .31	.08	.11	1.79	.05
Difficulties in Identifying Feelings	.50	.28, .70	.11	.54	9.92	.0001
Total variance explained, 28%						

Model B: Mediating effect of Difficulty Describing Feelings on Positive Emotionality and substance use.—The results indicated a significant direct relationship between Positive Emotionality and the amount of substance use (Fig. 2; beta = −.08, p = .006) and a significant relationship between Positive Emotionality and the Difficulty Describing Feelings subscale of the TAS–20 (beta = −.10, p = .001). Difficulty Describing Feelings was also positively associated with substance use (beta = .35, p < .0001). This time, however, the previously significant relationship between Positive Emotionality and substance use became non-significant after controlling for Difficulty Describing Feelings (beta = −.04, p = .10), indicating full mediation. The test of the indirect effect revealed that Difficulty Describing Feelings served as a full mediator between Positive Emotionality and substance use (Sobel z = −2.91, p = .004). However, substance use failed to mediate the relationship between Positive Emotionality and Difficulty Describing Feelings (beta changed from −.10 to −.08, remaining significant). The model including mediation explained 15.4% of the variance in substance use.
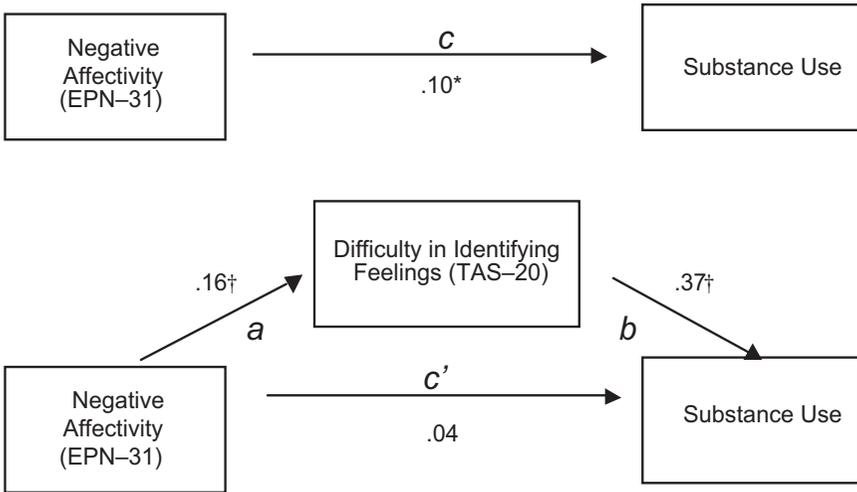
FIG. 1.   Direct effect between negative affectivity and substance use (upper panel) and Difficulties in identifying feelings as a mediating variable between negative affectivity and substance use. The path weight between negative affectivity and substance use significantly decreased in the mediation model ($F_{2,253} = 58.9$, $p < .0001$). *$p < .001$. †$p < .0001$.

Model C: Mediating Effect of Difficulty Identifying Feelings on Emotional Arousal and substance use.—Analyses revealed a statistically significant, direct relationship between Emotional Arousal and substance use (beta = .16, $p < .05$), and between Emotional Arousal and Difficulty Identifying Feelings (beta = .50, $p < .0001$). The Difficulty Identifying Feelings score was also significantly associated with substance use (beta = .44, $p < .0001$). After controlling for Difficulty Identifying Feelings, the significant relationship found earlier between Emotional Arousal and substance use was no
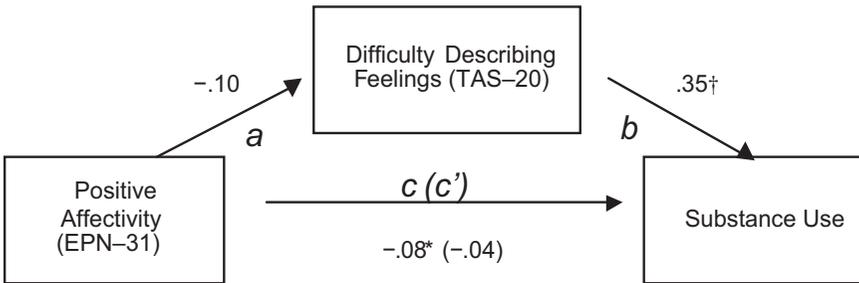

FIG. 2.   Difficulty Describing Feelings as a mediating variable between Positive Affectivity and substance use. *$p < .001$. †$p < .0001$.
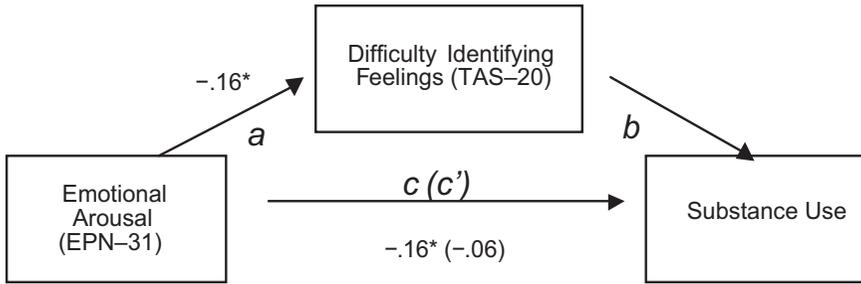
FIG. 3.   Difficulty Identifying Feelings as a mediating variable between Emotional Arousal and substance use. *$p < .001$.

longer significant (beta = −.06, ns). The indirect effect of Emotional Arousal through Difficulty in Identifying Feelings was significant (Sobel $z = 4.23$, $p < .0001$) and estimated to lie between .12 and .33 ($SE = .05$) with 95%CI. In alternative analyses, substance use was not a mediator between Emotional Arousal and Difficulty in Identifying Feelings, as beta changed from .50 to .40, remaining statistically significant, but the indirect effect was not (beta = .10, Sobel $z = 1.77$, $p = .07$). The model, including mediation, accounted for 28% of the variance in substance use.

DISCUSSION

The present study met two main objectives: exploring the relationship between emotionality, alexithymia, and substance use, and demonstrating the mediating effect of alexithymia on the relationship between emotionality and substance use self-reports.

The results showed a positive correlation between Negative Emotionality and substance use. The relationships between Positive Emotionality (negative correlation), Emotion Arousal (positive correlation), and substance use were secondary and not as strong. These findings are in line with those reported in previous studies investigating substance abuse and risk-taking in general (Desrichard & Denarie, 2005; James & Taylor, 2007). The results also indicated that Negative Emotionality, as a stable dimension, predicted substance use in part. This is in line with earlier findings in this field confirming that negative emotions experienced by individuals affect—mainly in the form of a direct effect (Henderson, 2003)—subsequent substance use (Neighbors, Kempton, & Forehand 1992).

The current findings also indicated a direct relationship between Emotional Arousal and substance use. This was an unexpected result. Emotional Arousal can therefore be regarded as a second dispositional factor in promoting substance-use behaviors, alongside Negative Emotionality. These findings are consistent with others from previous studies indicating

that they were favored not only by negative emotional states but also by a high level of arousal, suggesting that consumption behaviors are consequences of an individual's mood, whether it is negative or the product of a strong arousal. Empirical findings supported that substance abusers have lower activation when highly aroused, compared to the normative population. Some studies have shown that alterations of emotional arousal are a concern in the clinical population of substance abusers (Aguilar de Arcos, Verdejo-García, Peralta-Ramirez, Sanchez-Barrera, & Pérez-Garcia, 2005). Individuals who exhibit deficits in emotion-regulation strategies appear to be more prone to risky behaviors as a means of avoiding negative affect (Cicchetti, Ackerman, & Izard, 1995; Cooper, Agocha, & Sheldon, 2000). Given people's difficulty in maintaining subjective well-being (Cooper, Frone, Russell, & Mudar, 1995), the negative valence and arousal dimensions of emotionality can be regarded as risk factors for substance-use behaviors.

The mediating effect of alexithymia on substance use was also expected. Statistical analyses indicated positive links between the emotional dimensions of alexithymia, Difficulty Identifying Feelings and Difficulty Describing Feelings, and substance use: the more difficulty individuals reported identifying and describing their emotions, the greater the likelihood of reporting substance use. These results indicated that emotionality and alexithymia are closely linked and could constitute an emotional-functioning mode that is related to the substance use behaviors. Alexithymia might be a process of emotion regulation, by acting as an operator between emotional-disposition effects and behavior.

Results highlighted the role of the emotional dimension of alexithymia, especially Difficulty Identifying Feelings, in reinforcing the effect of emotional disposition. Hierarchical analyses demonstrated that Negative Emotionality explained 30% of the variance in the participants' scores on substance use in combination with Difficulty Identifying Feelings, whereas Emotional Arousal explained 28% of those same scores. The results also identified a mediating effect of Difficulty Describing Feelings through the relationship between Positive Emotionality and substance use that accounted for 15.4% of the variance in substance use.

The present findings stressed the importance of both of the emotional dimensions of alexithymia in substance use. These dimensions seem to correspond to the manner in which substance "consumers" process their feelings, and have often been observed in studies of addicted patients (Speranza, Corcos, Stephan, Loas, Pérez-Diaz, Lang, *et al.*, 2004). The results also point out the relevance of regarding the emotional dimension of alexithymia as a kind of process that mediates the relationship between emotional disposition and behavior. Emotion regulation can be useful in

maintaining a form of psychic homeostasis. These findings argued for developing a mediation model to account for substance use, as some authors have already done using the concept of emotional intelligence, for example, Uva, Timary, Cortesi, Mikolajczak, Blicquy, and Luminet, 2010.

This study allowed demonstrating the relevance of the dimensional aspect of emotionality. The results indicate that emotionality may play a role in the development of substance-use behaviors. They also suggest that alexithymia can be regarded as a specific form of emotional processing. This "go-between" role between a particular disposition and its psychopathological manifestation has already been highlighted in the case of somatic symptoms (de Gucht, Fischler, & Heiser, 2004) and raises the question of the specificity of alexithymia as a regulator of substance use.

The limitations of the present study were twofold. To begin, the fact that the sample consisted solely of students prevents us from regarding it as representative of the general population. Secondly, insofar as this was a cross-sectional study, it could neither validate nor refute the hypothesis of a definite causal link between emotional variables and substance use. Moreover, emotional dimensions could not be considered as vulnerability factors because of the cross-sectional design. It would be necessary to conduct a longitudinal study to clarify the notion of vulnerability, which depends on the stability of the construct. Here, a functionalist perspective was chosen in which alexithymia is considered as a process that would—as a secondary factor of personality—likely be interconnected with other, more fundamental dimensions. A strictly causal model has been avoided: negative emotions may very well be *generated* by substance use, and a feedback model might prove to be more useful.

REFERENCES

Aguilar de Arcos, F., Verdejo-García, A., Peralta-Ramirez, M. I., Sanchez-Barrera, M., & Pérez-Garcia, M. (2005)   Experience of emotions in substance abusers exposed to images containing neutral, positive, and negative affective stimuli. *Drug and Alcohol Dependence,* 78(2), 159-167.

Bagby, R. M., Parker, J. D. A., & Taylor, G. J. (1994)   The twenty-item Toronto Alexithymia scale: I. Item selection and cross-validation of the factor structure. *Journal of Psychosomatic Research,* 38(1), 23-32.

Baron, R. M., & Kenny, D. A. (1986)   The moderator-mediator variable distinction in social psychological research: conceptual, strategic and statistical considerations. *Journal of Personality and Social Psychology,* 51, 1173-1182.

Bréjard, V., Bonnet, A., & Pedinielli, J. L. (2008)   Régulation des émotions, dépression et conduites à risques: l'alexithymie, un facteur modérateur. *Annales Medico-Psychologiques,* 166(4), 260-268.

Choquet, M., Morin, D., Hassler, C., & Ledoux, S. (2004)   Is alcohol, tobacco, and cannabis use as well as polydrug use increasing in France? *Addictive Behaviors,* 29, 607-614.

CICCHETTI, D., ACKERMAN, B. P., & IZARD, C. E. (1995) Emotions and emotion regulation in developmental psychopathology. *Development and Psychopathology,* 54, 1-10.

CLARK, L. A., & WATSON, D. (1991) Tripartite model of anxiety and depression: psychometric evidence and taxonomic implications. *Journal of Abnormal Psychology,* 100(3), 316-336.

COOPER, M. L., AGOCHA, V. B., & SHELDON, M. S. (2000) A motivational perspective on risky behaviours: the role of personality and affect regulatory processes. *Journal of Personality,* 68, 1059-1088.

COOPER, M. L., FRONE, M. R., RUSSELL, M., & MUDAR, P. (1995) Drinking to regulate positive and negative emotions: a motivational model of alcohol use. *Journal of Personality and Social Psychology,* 69(5), 990-1005.

DE GUCHT, V., FISCHLER, B., & HEISER, W. (2004) Neuroticism, alexithymia, negative affect, and positive affect as determinants of medically unexplained symptoms in primary care. *Personality and Individual Differences,* 36(7), 1655-1667.

DE RICK, A., & VANHEULE, S. (2006) The relationship between perceived parenting, adult attachment style and alexithymia in alcoholic inpatients. *Addictive Behaviors,* 31(7), 1265-1270.

DESRICHARD, O., & DENARIE, V. (2005) Sensation seeking and negative emotionality as predictors of risky behaviors: a distinction between occasional versus frequent risk-taking. *Addictive Behaviors,* 30, 1449-1453.

DE TIMARY, P., ROY, E., LUMINET, O., FILLÉE, C., & MIKOLAJCZAK, M. (2008) Relationship between alexithymia, alexithymia factors and salivary cortisol in men exposed to a social stress test. *Psychoneuroendocrinology,* 33(8), 1160-1164.

DIENER, E., & LARSEN, R. J. (1993) The experience of emotional well-being. In M. L. J. M. Haviland (Ed.), *Handbook of emotions.* New York: Guilford. Pp. 405-415.

DIENER, E., SMITH, H., & FUJITA, F. (1995) The personality structure of affect. *Journal of Personality and Social Psychology,* 69(1), 130-141.

DORARD, G. R., BERTHOZ, S., HAVILAND, M. G., PHAN, O., CORCOS, M., & BUNGENER, C. (2008) Multimethod alexithymia assessment in adolescents and young adults with a cannabis use disorder. *Comprehensive Psychiatry,* 49(6), 585-592.

ELKINS, I. J., KING, S. M., MCGUE, M., & IACONO, W. G. (2006) Personality traits and the development of nicotine, alcohol, and illicit drug disorders: prospective links from adolescence to young adulthood. *Journal of Abnormal Psychology,* 15(1), 26-39.

GONZALEZ, A., ZVOLENSKY, M. J., VUJANOVIC, A. A., LEYRO, T. M., & MARSHALL, E. C. (2009) An evaluation of anxiety sensitivity, emotional dysregulation, and negative emotionality among daily cigarette smokers: relation to smoking motives and barriers to quitting. *Journal of Psychiatric Research,* 43, 138-147.

GORMAN, D. M., & DERZON, J. H. (2002) Behavioral traits and marijuana use and abuse: a meta-analysis of longitudinal studies. *Addictive Behaviors,* 27(2), 193-206.

HANDELSMAN, L., STEIN, J. A., BERNSTEIN, D. P., OPPENHEIM, S. E., ROSENBLUM, A., & MAGURA, S. (2000) A latent variable analysis of coexisting emotional deficits in substance abusers: alexithymia, hostility, and PTSD. *Addictive Behaviors,* 25(3), 423-428.

HAVILAND, M. G., MACMURRAY, J. P., & CUMMINGS, M. A. (1988) The relationship between alexithymia and depressive symptoms in a sample of newly abstinent alcoholic inpatients. *Psychotherapy Psychosomatics,* 49, 37-40.

HENDERSON, M. J., & GALEN, L. W. (2003) A classification of substance-dependent men on temperament and severity variables. *Addictive Behaviors,* 28, 741-760.

HOFFMAN, J. H., WELTE, J. W., & BARNES, G. M. (2001) Co-occurrence of alcohol and cigarette use among adolescents. *Addictive Behaviors*, 26, 63-78.

JAMES, L. M., & TAYLOR, J. (2007) Impulsivity and negative emotionality associated with substance use problems and Cluster B personality in college students. *Addictive Behaviors,* 32(4), 714-727.

KANDEL, D., & YAMAGUCHI, K. (1993) From beer to crack: developmental patterns of drug involvement. *American Journal of Public Health*, 83, 851-855.

KARILA, L., LEGLEYE, S., DONNADIEU, S., BECK, F., CORRUBLE, E., & REYNAUD, M. (2004) Consommations nocives de produits psychoactifs à l'adolescence. Résultats préliminaires de l'étude Adoctecno. *Alcoologie et Addictologie,* 26(2), 99-109.

LARSEN, R. J., & DIENER, E. (1985) A multitrait-multimethod examination of affect structure: hedonic level and emotional intensity. *Personality and Individual Differences,* 6(5), 631-636.

LEE, S. A., & GUAJARDO, N. R. (2011) Affect intensity and alexithymia differentially influence the relationship between neuroticism and depressive symptomatology among college students. *Personality and Individual Differences,* 50(5), 646-650.

LOAS, G., CORCOS, M., STEPHAN, P., PELLET, J., BIZOUARD, P., VENISSE, J. L., PEREZ-DIAZ, F., GUELFI, J. D., & JEAMMET, P. (2001) Factorial structure of the 20-item Toronto Alexithymia Scale: confirmatory factorial analyses in nonclinical and clinical samples. *Journal of Psychosomatic Research,* 50(5), 255-261.

LOAS, G., D. FREMAUX, D., OTMANI, O., LECERCLE, C., & DELAHOUSSE, J. (1997) Is alexithymia a negative factor for maintaining abstinence? A follow-up study. *Comprehensive Psychiatry,* 38(5), 296-299.

LOAS, G., OTMANI, O., LECERCLE, C., & JOUVENT, R. (2000) Relationships between the emotional and cognitive components of alexithymia and dependency in alcoholics. *Psychiatry Research,* 96(1), 63-74.

MACKINNON, D. P., LOCKWOOD, C. M., & WILLIAMS, J. (2004) Confidence limits for the indirect effect: distribution of the product and resampling methods. *Multivariate Behavioral Research*, 39, 99-128.

MAGYAR, M. S., EDENS, J. F., LILIENFELD, S. O., DOUGLAS, K. S., & POYTHRESS, N. G. (2011) Examining the relationship among substance abuse, negative emotionality, and impulsivity among subtypes of antisocial and psychopathic substance abusers. *Journal of Criminal Justice*, 39(3), 232-237.

MCGUE, M., SLUTSKE, W., & IACONO, W. G. (1999) Personality and substance use disorders: II. Alcoholism versus drug use disorders. J*ournal of Consulting and Clinical Psychology*, 67(3), 394-404.

MERRILL, J. C., KLEBER, H. D., SHWARTZ, M., LIU, H., & LEWIS, S. R. (1999) Cigarettes, alcohol, marijuana, other risk behaviors, and the American youth. *Drug and Alcohol Dependence*, 56, 205-212.

NEIGHBORS, B., KEMPTON, T., & FOREHAND, R. (1992) Co-occurence of substance abuse with conduct, anxiety, and depression disorders in juvenile delinquents. *Addictive Behaviors,* 17(4), 379-386.

PÉLISSOLO, A., ROLLAND, J. P., PEREZ-DIAZ, F., JOUVENT, R., & ALLILAIRE, J. F. (2007) Évaluation dimensionnelle des émotions en psychiatrie: validation du questionnaire Émotionnalité positive et négative à 31 items (EPN–31). *L'Encéphale,* 33(3), 256-263.

PREACHER, K. J., & HAYES, A. F. (2008) Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. *Behavior Research Methods*, 40, 879-891.

REID, R. C., CARPENTER, B., SPACKMAN, M., & WILLES, D. L. (2008) Alexithymia, emotional in-stability, and vulnerability to stress proneness in patients seeking help for hypersexual behavior. *Journal of Sex and Marital Therapy,* 34(2), 133-149.

ROTHBART, M. K., & BATES, J. E. (1996) Parent report in the study of temperament. *Infant Be-havior and Development,* 19(Suppl. 1), 276-276.

SAARIJÄRVI, S., SALMINEN, J. K., & TOIKKA, T. (2006) Temporal stability of alexithymia over a five-year period in outpatients with major depression. *Psychotherapy and Psychosomatics,* 75, 107-112.

SHEETS, V. L., & BRAVER, S. L. (1999) Organizational status and perceived sexual harassment: detecting the mediators of a null effect. *Personality and Social Psychology Bulletin*, 25, 1159-1171.

SIFNEOS, P. E. (1973) The prevalence of "alexithymic" characteristics in psychosomatic pa-tients. *Psychotherapy and Psychosomatics,* 22(2), 255-262.

SIMONS, J., CORREIA, C. J., CAREY, K. B., & BORSARI, B. E. (1998) Validating a five-factor mari-juana motives measure: relations with use, problems, and alcohol motives. *Journal of Counseling Psychology,* 45(3), 265-273.

SOBEL, M. E. (1982) Asymptotic confidence intervals for indirect effects in structural equa-tion models. In S. Leinhart (Ed.), *Sociological methodology*. San Francisco: Jossey-Bass. Pp. 290-312.

SPERANZA, M., CORCOS, M., STEPHAN, P., LOAS, G., PÉREZ-DIAZ, F., LANG, F., VENISSE, J. L., BIZOUARD, P., FLAMENT, M., HALFON, O., & JEAMMET, P. (2004) Alexithymia, depressive experiences, and dependency in addictive disorders. *Substance Use and Misuse,* 39(4), 551-579.

THORBERG, F. A., YOUNG, R. M., SULLIVAN, K. A., & LYVERS, M. (2009) Alexithymia and alcohol use disorders: a critical review. *Addictive Behaviors,* 34(3), 237-245.

TURNER, A. P., LARIMER, M. E., SARASON, I. G., & TRUPIN, E. W. (2005) Identifying a negative mood subtype in incarcerated adolescents: relationship to substance use. *Addictive Be-haviors,* 30(7), 1442-1448.

UVA, M., TIMARY, P. D., CORTESI, M., MIKOLAJCZAK, M., BLICQUY, P. D. R. D., & LUMINET, O. (2010) Moderating effect of emotional intelligence on the role of negative affect in the motivation to drink in alcohol-dependent subjects undergoing protracted withdrawal. *Personality and Individual Differences,* 48(1), 16-21.

WATSON, D., & CLARK, L. A. (1984) Negative emotionality: the disposition to experience aver-sive emotional states. *Psychological Bulletin,* 96(3), 465-490.

WILLS, T. A., MCNAMARA, G., VACCARO, D., & HURKY, A. E. (1996) Escalated substance use: a longitudinal grouping analysis from early to middle adolescence. *Journal of Abnormal Psychology*, 105(2), 166-180.

WILLS, T. A., SANDY, J. M., YAEGER, A., & SHINAR, O. (2001) Family risk factors and adolescent substance use: moderation effects for temperament dimensions. *Developmental Psychol-ogy*, 37(3), 283-297.

ZIMMERMAN, G., SALAMIN, V., & REICHERTS, M. (2008) L'alexithymie aujourd'hui: essai d'arti-culation avec les conceptions contemporaines des émotions et de la personnalité. *Psy-chologie Française,* 53, 115-128.