

Evidence of Contrasting Patterns for Suppression and Reappraisal Emotional Regulation Strategies in Alexithymia

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Abstract: Alexithymia generally refers to difficulties in identifying and describing emotions. In this paper, two studies explored whether the emotion deficits observed in alexithymia may be related to the use of emotion regulation strategies. Relations with various sociodemographic variables were also explored. In the first study, 255 students completed the Emotion Regulation Questionnaire (ERQ) and the Toronto Alexithymia Scale–20. For the second study, 1107 participants from the general population completed the ERQ and the Bermond-Vorst Alexithymia Questionnaire. Results demonstrated that alexithymia was related to the use of a suppression strategy and in particular to difficulties verbalizing emotions, suggesting that the capacity to communicate and name one's emotion is a central aspect in alexithymia. Concerning sociodemographic variables, alexithymia and the use of a suppression strategy were found to be related to age and to be higher in males. The results of these studies and their clinical implications for treatment are discussed.

Key Words: Alexithymia, emotion regulation, Bermond-Vorst Alexithymia Questionnaire, Toronto Alexithymia Scale

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Alexithymia refers to the difficulty in recognizing, identifying and describing one's own emotions, and also to an externally oriented thinking and a poor fantasy life (Sifneos, 1973). It is a multifaceted construct composed of conceptually distinct, yet logically related, salient features. Certain authors have proposed four different alexithymia dimensions: poor fantasy life, difficulties identifying emotions, difficulties analyzing emotions, and difficulties verbalizing emotions (Bagby et al., 2006; Taylor et al., 1997). Furthermore, some authors have included a fifth dimension: the degree or capability of emotional arousability (lack of emotion reactivity) (Vorst and Bermond, 2001).

Alexithymia is associated with a number of psychopathological disorders but is also present in the general population. For instance, in a large general population study ($n = 3004$), Honkalampi et al. (2000) found that 10.3% of participants were found to be alexithymic in a Finnish sample. Similarly, in another general population study conducted in Finland ($n = 1285$), Salminen et al. (1999) report that the prevalence of alexithymia was 13%. More recently, Mattila et al. (2006) observed a 9.9% prevalence rate in a sample of 5454 participants aged from 30 to 97 years. Studies including nonclinical participants have also examined the effects of age, sex, and educational level. Concerning age effects, a number of studies using the Toronto Alexithymia Scale (TAS and TAS-20; Bagby et al., 1994; Bagby et al., 1988) have

found that alexithymia is associated with increasing age (Honkalampi et al., 2000; Mattila et al., 2006; Salminen et al., 1999). Previous studies using the TAS or TAS-20 (Bagby et al., 1994; Bagby et al., 1988) and the Bermond-Vorst Alexithymia Questionnaire (BVAQ; Vorst and Bermond, 2001) have also observed that men have higher alexithymia levels compared with women (Dumoutheil et al., 2008; Honkalampi et al., 2000; Mattila et al., 2006; Salminen et al., 1999; Vorst and Bermond, 2001). In contrast, in an adolescent sample, Joukamaa et al. (2007) found a higher prevalence of alexithymia in women than in men. Finally, alexithymia has also been associated with low educational level (Honkalampi et al., 2000; Mattila et al., 2006; Salminen et al., 1999) in studies using the TAS or TAS 20 (Bagby et al., 1994; Bagby et al., 1988).

According to Gross (1998), emotion regulation may be defined as the processes by which people influence their emotions, that is, how they change the emotion they have, when they have it, and how they express it. Gross and John (2003) have proposed several common emotion regulation strategies but particularly focus on two independent main strategies: cognitive reappraisal (or reappraisal) and expressive suppression (or suppression). Briefly, reappraisal is an antecedent-focused strategy: it occurs early, and intervenes before the emotion response tendencies have been fully generated. In other words, reappraisal changes the way of thinking about the event. By contrast, suppression is a response-focused strategy: it arises relatively late in the emotion-generative process and primarily modifies the behavioral aspects of the emotion response tendencies. In other words, suppression changes the behavioral response to the event. The use of these strategies differs across sex and age. Concerning sex differences, Gross and John (2003) found that men significantly use suppression more often than women, but they observed no difference concerning reappraisal. With regards to age, Nolen-Hoeksema and Aldao (2011) have demonstrated that the use of the suppression strategy increases with age. Both strategies also have different consequences for individuals. For example, Gross and John (2003) have shown that the use of the reappraisal strategy is associated with more experience and expression of positive emotions and less of negative emotions. Moreover, reappraisal was also associated with better interpersonal functioning and well-being (as measured by several scales including depression, self-esteem, life satisfaction, optimism, and a general scale of well-being). Contrasting with these results, the use of the suppression strategy was associated with less positive emotion experiences and expression, and with more negative ones. In addition, this strategy was associated with poorer interpersonal functioning and a lower level of well-being. Similarly, Nezlek and Kuppens (2008) found that reappraisal of positive emotions was associated with an increase in these emotions; moreover, it was also associated with increased self-esteem and psychological adjustment. In contrast, suppression was associated with a decrease in positive emotions and an increase in negative ones, and also with a decrease in self-esteem and psychological adjustment. Moreover, Troy et al. (2010) demonstrated that the utilization of reappraisal was associated with less depressive symptoms in the context of high levels of stress, suggesting that reappraisal may be a mediator in the link between stress and depressive symptoms. Likewise, Haga et al. (2009) also found that reappraisal was positively associated with well-being (including life

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satisfaction, emotional experiences and lower levels of depression), whereas suppression was negatively associated with well-being. In a recent review, Cutuli (2014) found that the use of reappraisal strategies was associated with less intense symptoms of depression, more life satisfaction, higher self-esteem, optimism about the future, self-acceptance and sense of autonomy, coping skills, personal growth, sense of autonomy, and better interpersonal relationships. On the other hand, suppression was associated with a lower level of social support and lack of close social relationships, poorer coping skills, lower life satisfaction and self-esteem, less optimism about the future, and more depressive symptoms. Finally, a recent study (McRae et al., 2012) also demonstrated that the efficacy of emotion regulation (e.g., reappraisal) is also influenced by the goals (e.g., what the persons is trying to achieve) and tactics (e.g., what the person does) of the person. More specifically, they demonstrated that the goal of increasing positive emotions was more effective (greater increase of positive emotions) than the goal of decreasing negative emotions.

After reviewing this literature on emotion regulation and its consequences for well-being, it can be suggested that the emotion deficits observed in alexithymia may be related to a higher use in high alexithymia scorers of suppression-related emotion regulation strategies when faced with emotions and with a lower use of reappraisal strategies. Indeed, the use of suppression as an emotion regulation strategy is associated with decreased emotional expression and experiences (intensity) and with more negative ones, and with worse social consequences compared with other emotion regulation strategies (Gross and John, 2003). To the best of our knowledge, only one study (Chen et al., 2011) has explored the relation between suppression and reappraisal emotion regulation strategies and the different dimensions of alexithymia. In this study, alexithymia subgroups were explored by using the three factors (i.e., difficulties identifying emotions, difficulties verbalizing emotions, and externally oriented cognitive style of thinking) of the TAS-20 (Bagby et al., 1994; Bagby et al., 1988) in a group of 1788 college students. They found three subgroups of alexithymia who were characterized by different scores on the different factors, and one nonalexithymia subgroup. The first alexithymia subgroup was characterized by general high scores on all three factors of the TAS-20 ("general high subgroup"); the second was characterized by high scores on difficulties identifying emotions and difficulties verbalizing emotions, but low scores on externally oriented cognitive style of thinking ("introvert high alexithymia"); the third subgroup consisted of high scores on externally oriented cognitive style of thinking but normal scores on the others ("extrovert high alexithymia"). The "nonalexithymia subgroup" was characterized by low scores on all factors. Concerning relations with emotion regulation style, two of the alexithymia subgroups (i.e., general high subgroup and extrovert high alexithymia) demonstrated a lower reappraisal score than the nonalexithymia group. Moreover, concerning suppression, these two subgroups also demonstrated a higher score than the nonalexithymia subgroup. These results suggest that alexithymia is associated with a more frequent use of suppression and a less frequent use of reappraisal. However, these results do not allow to clearly and directly identify which dimensions of alexithymia are more related to suppression and reappraisal strategies. Indeed, the authors use a typology perspective in which the specific contribution of each alexithymia factor cannot be examined.

Another limitation is related to the fact that the TAS-20 was used, which does not measure the poor fantasy life dimension (Taylor et al., 1997) nor the lack of emotional reactivity dimension (Vorst and Bermond, 2001) of alexithymia. Finally, this study was also only conducted on college students (average age = 22.44, SD = 1.40 years), which limits the generalizability of the results.

The main goal of this paper is to examine the relations between dimensions of alexithymia and two dimensions of emotion regulation strategies, namely, reappraisal and suppression. This was done first in

a sample of college students and, thereafter, in a sample of participants from the general population. Moreover, two different questionnaires exploring alexithymia (TAS-20 and BVAQ) were used in order to examine whether the results can be replicated across instruments. To the best of our knowledge, this is the first study adopting a dimensional approach. Furthermore, this study (for the first time in the literature) also directly examines how emotion regulation strategies are related to levels of alexithymia, and moreover doing so with the help of two different measures of alexithymia (i.e., BVAQ and TAS-20). It was hypothesized that alexithymia would be positively related to the use of the suppression emotion regulation strategy and negatively to the use of reappraisal. Another goal was to examine the extent to which sociodemographic variables (such as age, sex, and educational level) are associated with alexithymia and emotion regulation strategies, respectively. Although a number of studies have examined relations between sociodemographic variables and alexithymia, the majority of studies have only utilized two scales, the TAS and the TAS-20, in order to assess alexithymia. However, as mentioned above, these scales have some limitations (Vorst and Bermond, 2001). Thus, the originality of this study is to use a measure of alexithymia that assesses additional dimensions of this construct (e.g., the BVAQ). Furthermore, crossing results from two different questionnaires measuring the same constructs will sustain the consistency of the relations between alexithymia and emotion regulation strategies. Finally, few studies have investigated relations between sociodemographic variables and emotion regulation strategies and thus these relations need to be confirmed.

STUDY 1

METHODS

Participants

Participants consisted of 255 college students recruited from a French-speaking university via announcements during courses. No incentive was offered for their participation. An exclusion criterion for all participants was that they had received a psychiatric or neurological diagnosis in the past 5 years (based on self-report). Average age of participants was 20.05 (SD = 3.29; range = 17–34 years), average years of education was 13.78 (SD = 2.78), and 69.1% of participants were women.

Measures

Emotion Regulation Questionnaire

The Emotion Regulation Questionnaire (ERQ; Gross and John, 2003) assesses individual differences in the habitual use of two common emotion regulation strategies: cognitive reappraisal (ERQ-R) and expressive suppression (ERQ-S). The ERQ comprises 10 items, 6 for the reappraisal scale (e.g., "When I want to feel less negative emotion, I change the way I'm thinking about the situation"; items 1, 3, 5, 7, 8, 10) and 4 for the suppression scale (e.g., "I control my emotions by not expressing them"; items 2, 4, 6, 9). All items are rated on a 7-point Likert scale so that a high score indicates frequent use of reappraisal/suppression. For the present study, a French adaptation (D'Argembeau and Van der Linden, 2006) of the ERQ was used, which possesses adequate psychometric properties in line with those reported in Gross and John (2003).

Toronto Alexithymia Scale-20

Alexithymia was assessed with the help of a French version (Loas et al., 1996) of the Toronto Alexithymia Scale-20 (TAS-20; Bagby et al., 1994). This questionnaire consists of three subscales. The "difficulties identifying emotions" subscale refers to the degree to which someone has difficulties in identifying his/her own emotional

states (e.g., “I am often confused about what emotion I am feeling”). “Difficulties verbalizing emotions” refers to the degree to which someone has difficulties in describing his/her own emotions (e.g., “I am able to describe my emotions easily”). “Externally oriented thinking” refers to a tendency to focus one’s attention externally and is related to reduced fantasy and reduced imaginal thinking (e.g., “I prefer to analyze problems rather than just describe them”). Answers are scored on a 5-point Likert scale (1 = “strongly disagree”, up to 5 = “strongly agree”). High scores are an indication of alexithymia. Validation studies reveal that the TAS-20 possesses adequate psychometric properties (Bagby et al., 1994; Loas et al., 1996; Zech et al., 1999).

Bonferroni corrections were used for all analyses in order to diminish the probability of type II errors.

Procedure

Informed consent was obtained from all participants following a full explanation of the experimental procedure. Detailed written and oral instructions explained that participants would be asked questions about different aspects of their everyday experiences and feelings. They participated anonymously and on a volunteer basis. The study was approved by the local ethics committee. The experimental design is presented in Figure 1.

RESULTS AND DISCUSSION

Correlations (Pearson) between ERQ and TAS-20 are presented in Table 1. Alpha was set at 0.006. Results revealed that suppression was significantly correlated to the total TAS-20 score and all the TAS-20 dimensions (higher levels of alexithymia were related to higher levels of suppression).

Correlational analyses were conducted between TAS-20 and demographic variables (age and number of years of education; Table 2). Results revealed no significant correlation.

Finally, sex effects were examined (Table 3). *t*-Tests revealed significant differences between men and women for suppression (higher in men) but not for reappraisal. Moreover, no significant differences were found for any of the TAS-20 dimensions or for the total score.

TABLE 1. Correlations Between ERQ and TAS-20, Study 1

	ERQ Reappraisal	ERQ Suppression
TAS total score	−0.05	0.40***
Difficulties verbalizing emotions	−0.04	0.50***
Difficulties identifying emotions	−0.11	0.21**
Externally oriented thinking	−0.08	0.20**

* $p < 0.006$; ** $p < 0.001$; *** $p < 0.0001$.

Thereafter, we conducted regression analyses to examine the contribution of the alexithymia dimensions and demographic variables to the two regulations strategies. Concerning the suppression strategy, multiple regression analyses revealed that the model explained up to 25% of the variance of the suppression score (multiple $R^2 = 0.26$; adjusted multiple $R^2 = 0.25$; $F = 18.26$; $df = 5, 249$; $p < 0.0001$). Further inspection revealed that only difficulties verbalizing emotions ($\beta = 0.57$; $F = 65.46$; $p < 0.0001$; partial $\eta^2 = 0.21$) significantly explained any part of the variance of the suppression score apart from the variance already explained by the other variables. The contributions of the difficulties identifying emotions ($\beta = -0.13$; $F = 3.65$; $p > 0.05$; partial $\eta^2 = 0.01$), externally oriented thinking ($\beta = 0.03$; $F = 0.35$; $p > 0.05$; partial $\eta^2 = 0.001$), age ($\beta = 0.02$; $F = 0.09$; $p > 0.05$; partial = 0.000), and number of years of education ($\beta = 0.04$; $F = 0.49$; $p > 0.05$; partial $\eta^2 = 0.001$) were not significant. Concerning the reappraisal strategy, the model was not significant (multiple $R^2 = 0.01$; adjusted multiple $R^2 = -0.003$; $F = 0.83$; $df = 5, 249$; $p > 0.05$).

The main goal of this first study was to explore relations between dimensions of alexithymia and emotion regulation strategies and, in particular, with reappraisal and suppression, with the help of the widely used TAS-20. Higher levels of alexithymia (both total and factor scores) were significantly related to higher levels of suppression, and in particular with difficulties identifying emotions, difficulties verbalizing emotions, and externally oriented thinking. Moreover, we also found that the use of suppression was specifically predicted by the alexithymia factor “difficulties verbalizing emotions.” These results suggest that

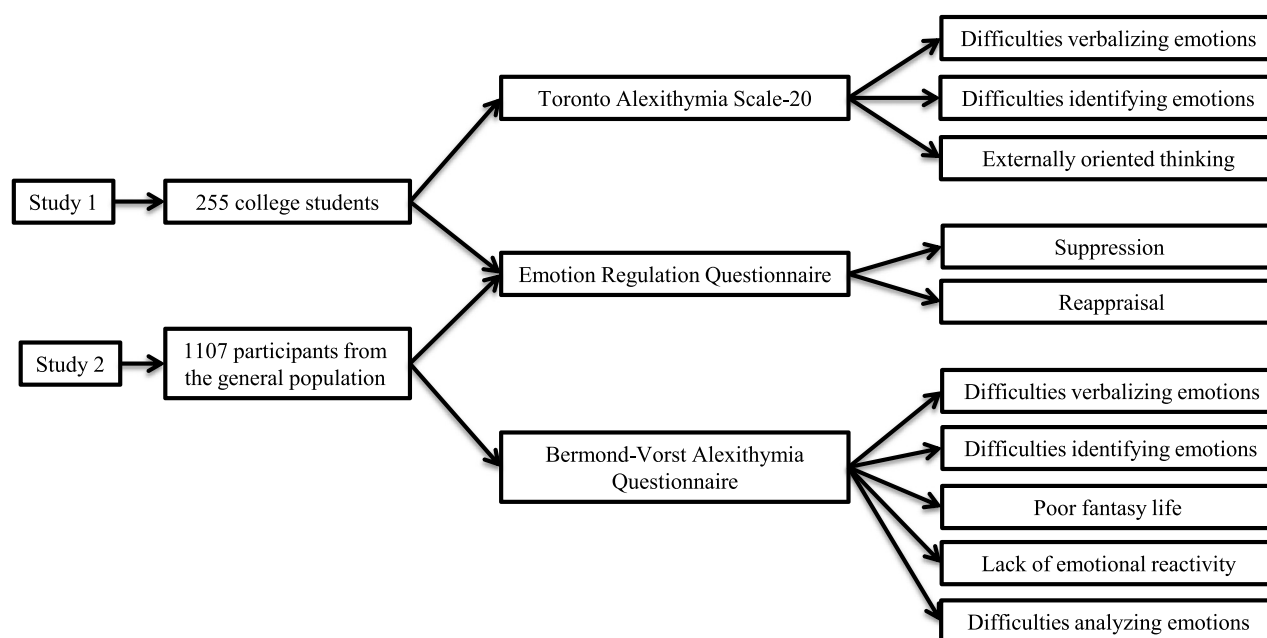


FIGURE 1. Scheme representing the experimental design.

alexithymic individuals tend to use more suppression-like strategies and are therefore consistent with the results of Chen et al. (2011) and with the concept of alexithymia in general (Sifneos, 1973; Taylor et al., 1985; Vorst and Bermond, 2001) as they demonstrated that the poorer the understanding one has of one's emotions, the greater the likelihood that one will utilize a suppression-based strategy. The present results demonstrated that the use of the suppression strategy was particularly related to the difficulties verbalizing emotions dimension. However, contrary to the results of Chen et al. (2011), no significant association was found between reappraisal and dimensions of alexithymia. Moreover, the present results demonstrated no significant correlation with age nor level of education as has been found in previous studies (Honkalampi et al., 2000; Mattila et al., 2006; Salminen et al., 1999). Concerning the use of emotion regulation strategies, no significant correlation was found between age and suppression as reported in Nolen-Hoeksema and Aldao (2011). No significant correlation was found between level of education and emotion regulation strategies, which is in line with the results of Gross and John (2003). The inconsistent results could simply be due to the homogeneous nature (in terms of age and level of education) of the sample, thus lacking in variability and representativeness of the general population.

Finally, concerning sex effects, the results demonstrated a unique significant difference concerning the use of suppression strategy, which was higher in men than women, but no sex effect for reappraisal. These results are in line with those of Gross and John (2003). In contrast, we did not find evidence of sex differences for the alexithymia dimensions (TAS-20), which is not in accordance with previous studies (Honkalampi et al., 2000; Mattila et al., 2006; Salminen et al., 1999; Vorst and Bermond, 2001). This effect could be due to the relatively young age of the sample. Indeed, findings from Joukamaa et al. (2007) suggest that the male dominance in alexithymia could be related to age. Another explanation is that our sample is composed of a larger proportion of women (69.1%) compared with men (30.9%). As the sample was not equal in terms of the proportion of women and men, we conducted supplementary analyses in order to examine a potential sex effect. Concerning correlations (with a corrected alpha of 0.006), results remained the same with two exceptions. The first concerns the correlation between the externally oriented thinking dimension (TAS-20) and suppression, where the correlation was not significant in the male sample ($r = 0.06$, $p = 0.59$) but remained significant in the female sample ($r = 0.25$, $p = 0.001$). The second exception was the correlation between difficulties identifying emotions and suppression that was not significant in the male sample ($r = 0.25$, $p = 0.011$), yet remained significant in the female sample ($r = 0.23$, $p = 0.002$). Multiple regression analyses concerning suppression revealed the same results. However, concerning reappraisal, the results were the same for the female sample (e.g., the model was not significant) but were different for the male sample as the model reached significance. Indeed, multiple regression analyses revealed that the model explained up to 11% of the variance of the suppression score (multiple $R^2 = 0.16$; adjusted multiple $R^2 = 0.11$; $F = 2.87$; $df = 5, 73$; $p < 0.0001$). Further inspection

TABLE 2. Correlations Between Sociodemographic Variables, TAS-20 and ERQ, Study 1

	Age	Years of Education
ERQ suppression	-0.04	0.02
ERQ reappraisal	0.05	0.09
TAS total score	-0.15	-0.08
Difficulties verbalizing emotions	-0.16	-0.07
Difficulties identifying emotions	-0.10	-0.11
Externally oriented thinking	-0.08	0.02

TABLE 3. Comparisons Between Male and Female Participants in Terms of BAVQ and ERQ Scores, Study 1

	Men (SD)	Women (SD)	<i>t</i>
ERQ suppression	16.06 (5.11)	13.43 (5.21)	3.75*
ERQ reappraisal	26.36 (7.14)	26.89 (6.08)	-0.61
TAS total score	48.71 (10.44)	50.35 (11.02)	-1.12
Difficulties verbalizing emotions	14.17 (4.18)	14.76 (4.85)	-0.92
Difficulties identifying emotions	17.31 (5.48)	18.87 (5.69)	-2.05
Externally oriented thinking	17.21 (4.38)	16.71 (3.70)	0.94

* $p < 0.001$.

revealed that only number of years of education ($\beta = 0.41$; $F = 10.85$; $p < 0.001$; partial $\eta^2 = 0.12$) significantly explained any part of the variance of the suppression score apart from the variance already explained by the other variables. The contributions of the other variables were not significant. Indeed, the sample size (particularly the male sample) is quite small and not representative of the general population. Additional studies are clearly needed to clarify these results.

As in Chen et al. (2011), the use of TAS-20, which only measures three dimensions of alexithymia (Vorst and Bermond, 2001) does not allow an exploration of possible relations between emotion regulation strategies and the dimensions of poor fantasy life and lack of emotion reactivity included in the BVAQ.

Furthermore, findings were only based on a specific population (i.e., college students) that moreover constituted more women than men, all of which limit the generalizability of the results. We thus conducted a second study in order to overcome these limitations.

STUDY 2

METHODS

Participants

Participants consisted of 1111 subjects who were approached for their participation, which was voluntary. Participants were recruited by undergraduate students in the context of a practical exercise for a course. No incentive was offered for the participation, and no credit was offered to the students. An exclusion criterion for all participants was that they had received a psychiatric or neurological diagnosis in the past 5 years (based on self-report). Average age of participants was 40.61 (SD = 15.98; range = 17–77 years), average years of education was 13.93 (SD = 2.77), and 49.5% of the participants were men. Four participants were excluded due to incomplete data, resulting in a final total of 1107 participants. Furthermore, participants from various age groups were included: 377 participants were aged from 17 to 30 years (34%); 115 from 31 years to 40 (10.4%); 245 from 41 to 50 (22.1%); 265 from 51 to 60 (24%); and 105 from 61 to 77 years old (9.5%).

Assessments

Emotion Regulation Questionnaire

Participants completed the ERQ (Gross and John, 2003) as in the first study.

Bermond-Vorst Alexithymia Questionnaire

Contrary to the first study, alexithymia was assessed with the help of a French adaptation (Zech et al., 1999) of the 40-item BVAQ (Vorst and Bermond, 2001). The BVAQ consists of five subscales (in

order to make it as clear as possible to the reader, we use the same dimension names of the TAS-20 to designate the names of the BVAQ dimensions). The “lack of emotion reactivity” subscale refers to the degree to which someone is emotionally aroused by emotion-inducing events (e.g., “When something totally unexpected happens, I remain calm and unmoved”). “Poor fantasy life” refers to the degree to which someone is inclined to fantasize, imagine, daydream, etc. (e.g., “Before I fall asleep I make up all kinds of events, encounters and conversations”). “Difficulties identifying emotions” refers to the degree to which one is able to define one’s arousal states (e.g., “When I’m distressed, I know whether I’m afraid or sad or angry”). “Difficulties analyzing emotions” is the degree to which one seeks out explanations of one’s own emotional reactions (e.g., “I hardly ever go into my emotions”). Finally, “difficulties verbalizing emotions” refers to the degree to which one is able or inclined to describe or communicate about one’s own emotional reactions (“I find it difficult to verbally express my emotions”). Each of the subscales consists of eight items. Half of the questions are positively formulated in reference to the trait and the other half is negatively formulated. Answers are scored on a 5-point Likert scale (1 = “certainly does not apply to me,” up to 5 = “certainly applies to me”). High scores are an indication for alexithymia. Validation studies reveal that the BVAQ possesses adequate psychometric properties (Müller et al., 2004; Taylor and Luminet, 2000; Vorst and Bermond, 2001).

Bonferroni corrections were used for all analyses in order to diminish the probability of type II errors.

Procedure

Informed consent was obtained from all participants following a full explanation of the experimental procedure. Detailed written and oral instructions explained that participants would be asked questions about different aspects of their everyday experiences and feelings. They participated anonymously and on a volunteer basis. The study was approved by the local ethics committee. The experimental design is presented in Figure 1.

RESULTS AND DISCUSSION

Correlations (Pearson) between ERQ and BVAQ are presented in Table 4. Alpha was set at 0.002. Both suppression and reappraisal correlated significantly with the total BVAQ score, albeit this correlation was positive and of higher magnitude in suppression (revealing that higher levels of alexithymia were related to higher levels of suppression) and negative and of lower magnitude in reappraisal (revealing that lower levels of alexithymia were related to higher levels of reappraisal). Positive significant correlations were found between suppression and all the BVAQ dimensions (higher levels of alexithymia related to higher levels of suppression). In contrast, negative significant correlations were observed between reappraisal and only three of the five BVAQ

TABLE 4. Correlations Between ERQ and BVAQ, Study 2

	ERQ Reappraisal	ERQ Suppression
BVAQ total score	−0.17*	0.49*
Difficulties verbalizing emotions	−0.11*	0.55*
Difficulties identifying emotions	−0.19*	0.13*
Poor fantasy life	−0.03	0.21*
Lack of emotional reactivity	−0.02	0.26*
Difficulties analyzing emotions	−0.22*	0.35*

* $p < 0.001$.

TABLE 5. Correlations Between Sociodemographic Variables and BVAQ and ERQ, Study 2

	Age	Years of Education
ERQ suppression	0.17*	−0.10
ERQ reappraisal	0.07	0.03
BVAQ total score	0.13*	−0.11*
Difficulties verbalizing emotions	−0.05	−0.10
Difficulties identifying emotions	−0.13*	−0.11*
Poor fantasy life	0.43*	−0.03
Lack of emotional reactivity	0.02	0.07
Difficulties analyzing emotions	0.07	−0.17*

* $p < 0.001$.

dimensions, that is, with difficulties analyzing, identifying, and verbalizing emotions (lower levels of alexithymia dimensions related to higher levels of reappraisal).

Correlations (Pearson) between sociodemographic variables and BVAQ and ERQ are presented in Table 5. Age was significantly correlated to suppression but not with reappraisal. Age was significantly correlated to the total BVAQ score (higher score related to older age) and with the poor fantasy life (less inclined to fantasize with increasing age) and difficulties identifying emotions (less able to define one’s arousal states with increasing age) BVAQ dimensions. Years of education correlated significantly with the total BVAQ score and with the difficulties analyzing and identifying emotions dimensions (higher education related to lower levels of alexithymia).

Sex effects were also examined (see Table 6). *t*-Tests revealed significant differences between men and women for suppression (higher in men) but not for reappraisal. The total BVAQ score differed significantly between men and women (higher in men) and for all the BVAQ dimensions, except poor fantasy life.

Thereafter, we conducted regression analyses to examine the contribution of the alexithymia dimensions and demographic variables to the regulations strategy. Concerning the suppression strategy, multiple regression analyses revealed that the model explained up to 36% of the variance of the suppression score (multiple $R^2 = 0.36$; adjusted multiple $R^2 = 0.36$; $F = 80.72$; $df = 7, 971$; $p < 0.0001$). Further inspection revealed that difficulties verbalizing emotions ($\beta = 0.50$; $F = 301.10$; $p < 0.0001$; partial $\eta^2 = 0.24$), lack of emotional reactivity ($\beta = 0.12$; $F = 17.64$; $p < 0.0001$; partial $\eta^2 = 0.02$), difficulties analyzing

TABLE 6. Comparisons Between Male and Female Participants in Terms of BVAQ and ERQ Scores, Study 2

	Men (SD)	Women (SD)	<i>t</i>
ERQ suppression	16.65 (5.49)	14.30 (6.03)	−6.78*
ERQ reappraisal	27.02 (6.99)	27.70 (6.94)	1.63
BVAQ total score	105.94 (20.80)	93.82 (18.82)	−10.16*
Difficulties verbalizing emotions	25.60 (7.61)	23.15 (7.55)	−5.38*
Difficulties identifying emotions	19.68 (5.81)	18.39 (6.20)	−3.59*
Poor fantasy life	21.21 (7.70)	20.37 (7.84)	−1.80
Lack of emotional reactivity	20.68 (5.57)	16.56 (4.69)	−13.33*
Difficulties analyzing emotions	18.73 (6.42)	15.36 (5.46)	−9.42*

* $p < 0.001$.

emotions ($\beta = 0.08$; $F = 5.41$; $p < 0.05$; partial $\eta^2 = 0.01$), age ($\beta = 0.19$; $F = 40.89$; $p < 0.0001$; partial $\eta^2 = 0.04$), and years of education ($\beta = -0.05$; $F = 4.61$; $p < 0.05$; partial $\eta^2 = 0.004$) significantly explained a part of the variance of the suppression score apart from the variance already explained by the other variables. However, the contribution of poor fantasy life ($\beta = 0.02$; $F = 0.35$; $p > 0.05$; partial $\eta^2 = 0.00$) and difficulties identifying emotions ($\beta = -0.05$; $F = 2.68$; $p > 0.05$; partial $\eta^2 = 0.00$) was not significant.

Concerning the reappraisal strategy, multiple regression analyses revealed that the model explained up to 6% of the variance of the reappraisal score (multiple $R^2 = 0.07$; adjusted multiple $R^2 = 0.06$; $F = 10.66$; $df = 7, 971$; $p < 0.0001$). Further inspection revealed that difficulties analyzing emotions ($\beta = -0.23$; $F = 31.02$; $p < 0.0001$; partial $\eta^2 = 0.03$), difficulties identifying emotions ($\beta = 0.07$; $F = 4.08$; $p < 0.05$; partial $\eta^2 = 0.004$), and age ($\beta = 0.11$; $F = 9.7$; $p < 0.001$; partial $\eta^2 = 0.01$) significantly explained a part of the variance of the reappraisal score apart from the variance already explained by the other variables. Moreover, it is important to note that difficulties analyzing emotions was negatively related to reappraisal use whereas difficulties identifying emotions was positively related, although this last effect was marginal regarding the partial η^2 . In contrast, the contribution of poor fantasy life ($\beta = -0.05$; $F = 1.73$; $p > 0.05$; partial $\eta^2 = 0.00$), lack of emotional reactivity ($\beta = 0.06$; $F = 2.7$; $p > 0.05$; partial $\eta^2 = 0.00$), and years of education ($\beta = 0.03$; $F = 0.7$; $p > 0.05$; partial $\eta^2 = 0.00$) was not significant.

The main goal of this second study was to explore relations between dimensions of alexithymia and emotion regulation strategies and, in particular, with reappraisal and suppression in a representative group of healthy participants using the BVAQ to assess all the dimensions of alexithymia. Higher levels of alexithymia were significantly related to higher levels of suppression, whereas lower levels of alexithymia were significantly related to higher levels of reappraisal. As was hypothesized, the results demonstrated that higher levels of alexithymia were strongly and positively related to the suppression strategy and negatively to the use of a reappraisal strategy. As in the first study, these results suggest that alexithymic individuals tend to use more suppression-like strategies and less reappraisal ones, and these findings are consistent with the results of Chen et al. (2011). More precisely, the use of a suppression strategy was significantly and positively related to dimensions of alexithymia and, in particular, with difficulties verbalizing emotions, but also with difficulties analyzing emotion, lack of emotional reactivity, poor fantasy life, and difficulties identifying emotions. Moreover, the use of a reappraisal strategy was significantly and negatively related to difficulties analyzing, identifying, and verbalizing emotions, which is not in line with the first study where a reappraisal strategy was not significantly related to any alexithymia dimension. The present results are thus also consistent with the concept of alexithymia in general (Sifneos, 1973; Taylor et al., 1985; Vorst and Bermond, 2001).

Another goal of the present study was to examine relations between sociodemographic variables and alexithymia and emotion regulation strategies, respectively. Age was significantly correlated (but weakly) with suppression but not with reappraisal, which is in line with previous studies (Nolen-Hoeksema and Aldao, 2011), indicating that older people tend to suppress emotions but do not change in their use of reappraisal. Years of education did not correlate significantly with suppression nor with reappraisal. Suppression was significantly higher in men, but there were no sex differences for reappraisal. These results are in line with Gross and John (2003). In order to elucidate the relations between emotion regulation strategies and demographic and alexithymia dimensions, we conducted multiple regression analyses. Results showed that the use of a suppression strategy was significantly predicted by several demographic variables (i.e., age and level of education) and alexithymia dimensions and in particular by difficulties verbalizing emotions, difficulties analyzing emotions, lack of emotional

reactivity, age, and level of education. However, only the difficulties verbalizing emotions dimension had a mean predictive value as it significantly predicted up to 23% of the variance already explained by the other variables. The contribution of the other variables (i.e., age, level of education, difficulties analyzing emotions, and lack of emotional reactivity dimensions) was very weak. Concerning the use of a reappraisal strategy, multiple regression analyses revealed that even if the model was significant, it only significantly explained 6% of the variance of the reappraisal score. Moreover, the contribution of the significant variables (i.e., age, difficulties analyzing, and identifying emotions) was marginal.

We found that age was positively associated with alexithymia (higher alexithymia scores correlated with advanced age) and in particular with the poor fantasy life and difficulties identifying emotions dimensions. These results are in line with previous studies (Honkalampi et al., 2000; Mattila et al., 2006; Salminen et al., 1999). One possible explanation is that this result is related to cognitive and/or affective changes occurring with development (e.g., Carstensen et al., 2011). Another explanation could be related to a secondary phenomenon due to the natural physical degradation of elderly people. That is, getting older is usually accompanied with slight normal physical deteriorations such as arthrosis or fatigue. While facing these inconveniences, people may become emotionally more constricted. Indeed, pain is also often associated with different kinds of pain disorders, such as fibromyalgia, which furthermore is mainly or often associated with alexithymia (Di Tella and Castelli, 2013). Finally, another possible explanation is that elderly people have grown up in a different cultural environment and may have been brought up with different ways of dealing with their affects as compared with younger generations.

Years of education correlated significantly with alexithymia and, in particular, with identifying and analyzing alexithymia dimensions. This is in line with previous studies (Honkalampi et al., 2000; Mattila et al., 2006; Salminen et al., 1999) that used the TAS and TAS-20 (Bagby et al., 1994; Bagby et al., 1988) and may be related to the fact that education provides more capacities to understand and conceptualize emotions. We also observed sex effects in alexithymia (higher in men), which is in accordance with previous studies (Honkalampi et al., 2000; Mattila et al., 2006; Salminen et al., 1999; Vorst and Bermond, 2001). Furthermore, we found that all alexithymia dimensions were higher in men compared with women, except for poor fantasy of life, which did not reach significance. This is in line with Müller et al. (2004) and Vorst and Bermond (2001), who found that sex plays a role in the lack of emotional reactivity dimension (lower scores in women).

GENERAL DISCUSSION

The main goal of the present studies was to directly explore relations between dimensions of alexithymia and emotion regulation strategies—in particular, reappraisal and suppression. To the best of our knowledge, this is the first study of its kind. In both studies—the first using the TAS-20 and the second the BVAQ to assess dimensions of alexithymia—we found that higher levels of alexithymia were significantly related to higher levels of suppression. Moreover, concerning the BVAQ, lower levels of alexithymia were significantly related to higher levels of reappraisal. As was hypothesized, the results demonstrated that higher levels of alexithymia were strongly and positively related to the use of a suppression strategy. These results suggest that alexithymic individuals tend to use more suppression-like strategies and less reappraisal ones and are consistent with the results of Chen et al. (2011). More precisely, the use of a suppression strategy was significantly and positively correlated to all dimensions of alexithymia as measured by both the TAS-20 and BVAQ, that is, with the dimensions related to not only difficulties verbalizing emotions, difficulties identifying emotions but also difficulties analyzing emotions, and finally lack

of emotional reactivity and poor fantasy life. Indeed, these dimensions of the TAS-20 and BVAQ have been demonstrated to be highly correlated (Vorst and Bermond, 2001; Zech et al., 1999). Moreover, the use of the reappraisal strategy was significantly and negatively related to the total score of the BVAQ, but also with several dimensions, that is, with analyzing, identifying, and verbalizing emotions. However, no significant correlations were found between dimensions of the TAS-20 and the use of a reappraisal strategy. As the TAS-20 and BVAQ have been demonstrated to be highly correlated (Zech et al., 1999), the different results concerning the link between the use of reappraisal and the two questionnaires could not be explained by these different measures. Moreover, *z*-tests were conducted in order to compare the results from both studies while taking into account sample size. The results revealed that there was no significant difference between the correlation coefficients between the studies (total score: $z = 1.71, p = 0.08$; difficulties identifying emotions: $z = 1.14, p = 0.24$; and difficulties verbalizing emotions: $z = 1.00, p = 0.31$). These analyses indicate that results in both studies are not incompatible even considering the lack of significance in the first study. These results strongly indicate that if the sample size of the first study was bigger, these correlations might be significant. However, other explanations (albeit more hypothetical) such as sample differences may also help explain these divergences. Indeed, in the first study, the sample consisted of students (e.g., young and highly educated sample), whereas in the second study, the sample was more representative of the general population. Thus, in the first sample, it seems that being highly alexithymic does not impair the use of reappraisal strategies. However, being highly alexithymic has a deleterious effect on older and less educated people as it is known that reappraisal strategies are important for well-being (Cutuli, 2014).

We also conducted regression analyses in order to examine the contribution of alexithymia dimensions and demographic variables to the use of emotion regulations strategies. Results demonstrated the major implication of the dimensions related to difficulties verbalizing emotions in the use of a suppression strategy. Moreover, concerning the BVAQ model—age, level of education, and the lack of emotional reactivity dimension were also significant predictors, but their contributions to the model were particularly weak. Concerning the reappraisal strategy, it was significantly predicted by the difficulties identifying emotions and analyzing emotions dimensions of the BVAQ; however, the contributions were weak as was the case for age. In summary, it seems that difficulties to verbalize emotions are a main predictor of the use of suppression-like strategies. Moreover, even if the use of suppression strategies increases with age (Nolen-Hoeksema and Aldao, 2011), it does not seem to be a main predictor of the utilization of this type of strategy.

The present results are consistent with the concept of alexithymia in general (Sifneos, 1973; Taylor et al., 1985; Vorst and Bermond, 2001), as they demonstrated that the poorer the understanding one has of one's emotions (and, in particular, in one's capacity to verbalize emotions), the greater the likelihood that one will utilize a suppression-based, instead of a reappraisal-based, strategy. However, relations between reappraisal and dimensions of alexithymia were not as strong as the correlations with suppression, indicating that a better understanding of emotions (and, in particular, in identifying, analyzing, and verbalizing them) is a necessary but not a sufficient condition to use a reappraisal strategy. Indeed, the use of suppression strategies has been demonstrated to be associated with several aspects of well-being (Cutuli, 2014) (e.g., lower level of social support and lack of close social relationships, and more depressive symptoms). The fact that high alexithymics tend to use suppression-like strategies could thus, at least in part, explain the associations that have been demonstrated in the literature between alexithymia and aspects of well-being such as depression (Luminet et al., 2001) and low social support and lack of close social relationships (Lumley et al., 1996), but also with high frequency of negative emotions (Yelsma, 2007).

The present results demonstrated that the use of a suppression strategy was particularly and positively related to difficulties in verbalizing emotions. These results suggest that the capacity to communicate and name one's emotions is a central aspect in alexithymia. This is in line with Wotschack and Klann-Delius (2013), who demonstrated that alexithymia is associated with a reduced semantic space of emotional words suggesting that emotion schemata are less differentiated. According to Macklem (2011), little is known as to why labeling an emotion could influence someone's emotions. Nevertheless, some of the results from Lieberman et al. (2007) showed that simply labeling negative emotion (putting emotion into words) decreases one's subjective emotional experience (i.e., regulates emotion).

Indeed, the present results have several clinical implications as it has been demonstrated that using repression strategies has a negative impact on well-being (e.g., Cutuli, 2014). Therefore, it would be interesting to examine the effect that a program aimed at improving a person's verbalization capacities would have on his/her emotion regulation strategy habits. To date, several emotion training programs have been developed to improve emotion regulation. A pioneering therapy in the domain of verbalization of emotion (e.g., expressive writing) has been developed by Pennebaker and Beall (1986) in the domain of trauma. More specifically, they demonstrated that writing down the emotions and thoughts surrounding a deeply personal issue promotes physical health (e.g., fewer health center visits). During this therapy, persons are usually asked to write about an emotional event within a period of several consecutive days for 10–30 minutes and to express all their emotions and thoughts about this event (Kacwicz et al., 2007). A meta-analysis conducted on healthy subjects (Smyth, 1998) revealed that writing about emotional experiences improved physical health (e.g., number of health center visits), well-being (e.g., depression, anxiety, and happiness), physiological functioning (e.g., blood pressure), and general functioning (e.g., reemployment, absenteeism). More recently, another meta-analysis (Frisina et al., 2004) focused on the effects of expressive writing in people with physical or psychiatric disorders. The results revealed that this therapy improved physical (e.g., pain, health care utilization) and psychological (e.g., depression, anxiety) health. However, the effect was less for psychological outcomes compared with physical outcomes. More specifically concerning alexithymia, some studies have examined the effect of expressive writing in individuals presenting a physical disorder and high scores of alexithymia (see Lumley, 2004 for a synthesis). The results suggested that alexithymia tends to interfere with the health benefits of the therapy usually observed, suggesting that interventions based on introspection are not entirely adapted for persons with alexithymia as emotion deficits could interfere with the therapy (Luminet et al. 2013). However, a study by Solano et al. (2003) demonstrated beneficial effects of this therapy in alexithymic individuals. Nevertheless, the positive effects were mainly in relation with the difficulties verbalizing emotions dimension. Thus, this suggests that such a therapy has positive effects on this dimension of alexithymia but is less effective on the others. Per se, future interventions should be designed that specifically take into account these different dimensions according to each individual alexithymic profile. It is worth mentioning that other programs have also been developed. For example, Greenberg (2010) developed emotion-focused therapy that teaches participants how to become more aware of their emotions and how to properly regulate them. Similarly, Berking and Whitley (2013) developed affect regulation training (ART), a transdiagnostic program aiming to enhance emotion regulation skills. The ART program starts with psychoeducation regarding emotions and emotion regulation (including the negative effects of using suppression-based strategies). Thereafter, participants are taught skills that help enhance emotion regulation including relaxation, acceptance, compassionate self-support, and the identification of emotional states and their causes. More recently, Weytens et al. (2014) developed a program that focuses on the regulation of positive emotions. Important to note is that, even though these programs have demonstrated

a certain degree of efficacy, they have not been specifically designed for those with high levels of alexithymia.

Another aim and original feature of this study was to examine relations between alexithymia, emotion regulation strategies, and sociodemographic variables using the BVAQ instead of the TAS-20, the latter measure having been used in the majority of previous studies but that possess some limitations (Vorst et al., 2001). Indeed, in the first study, no significant correlations between dimensions of alexithymia, and age and level of education were found contrary to previous studies (Honkalampi et al., 2000; Mattila et al., 2006; Salminen et al., 1999). Moreover, concerning the use of emotion regulation strategy, no significant correlation was found between age and suppression, as observed by Nolen-Hoeksema and Aldao (2011). These results could be related to the fact that the sample (students) of the first study is quite homogeneous in terms of age and level of education. Indeed, using a larger and more representative sample such as was the case in Study 2, alexithymia was found to be clearly associated with age and level of education, which is in line with previous studies (Honkalampi et al., 2000; Mattila et al., 2006; Salminen et al., 1999). Concerning the emotion regulation strategies, Study 2 demonstrated that age was significantly and positively related to the use of a suppression strategy but not to reappraisal, which is coherent with previous findings (Nolen-Hoeksema and Aldao, 2011). Moreover, emotion regulation strategies were not related to level of education, which is in line with Gross and John (2003).

Finally, concerning sex differences, in both studies, men demonstrated a significantly higher score on suppression but not on reappraisal, which is in line with previous studies (Gross and John, 2003). However, in the first study, no significant difference between sexes was found for alexithymia dimensions. In contrast, in Study 2, we found that all dimensions of alexithymia (except poor fantasy life) were significantly higher in men than women, which is in line with previous studies (Honkalampi et al., 2000; Mattila et al., 2006; Salminen et al., 1999; Vorst and Bermond, 2001).

Although these studies have helped clarify the relations between alexithymia and emotion regulation strategies, and in particular concerning suppression and reappraisal, it would be interesting to explore the links between dimensions of alexithymia (except poor fantasy life) and more specific emotion regulation strategies by using other questionnaires, such as the Cognitive Emotion Regulation Questionnaire (Garnefski et al., 2001), which includes a relatively large array of adaptive (i.e., acceptance, positive refocusing, putting into perspective, positive reappraisal, refocus on planning) and nonadaptive (i.e., self-blame, blaming others, rumination, catastrophizing) strategies.

Finally, this study presents several limitations. A cross-sectional design and only self-report questionnaires were utilized. Indeed, even if this method has the advantage of being easy to administer to large numbers of participants, results cannot permit to conclude to a causal effect. Laboratory measures are therefore clearly needed in order to directly explore the ability to regulate emotions in alexithymia (see Westermann et al., 2014 for an example for delusion proneness). Future studies also need to employ a longitudinal design to elucidate these relations. A final limitation concerns the use of two different questionnaires in two different populations, which does not allow a direct comparison of the results. To do so, additional studies are needed that administer both alexithymia questionnaires to the same sample (i.e., BVAQ and TAS-20).

CONCLUSIONS

In general, findings from the present study demonstrated that alexithymia was related to the use of a suppression strategy and in particular to difficulties verbalizing emotions, suggesting that the capacity to communicate and name one's emotion is a central aspect in alexithymia. Concerning sociodemographic variables, alexithymia and the use of a suppression strategy were both found to be related to age and to be higher in males.

DISCLOSURE

The authors declare no conflict of interest.

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