The role of alexithymia factors in glucose control of persons with type 1 diabetes: a pilot study

O Luminet1,2, Ph de Timary1,3, M Buysschaert1,4, A Luts1,3

SUMMARY

Objective: To clarify the respective contribution of demographic characteristics, health conditions and three psychological variables (depression, anxiety, alexithymia) for glycaemic control measured by glycated hemoglobin (HbA1c).

Materials and methods: Sixty-four persons diagnosed with type 1 diabetes completed psychological measures and demographic information at admission (T1) to the hospital and in a follow-up (+8 weeks) (T2). Additional information about their health conditions was also considered.

Results: At T1, the alexithymia factor “difficulties describing feelings” (DDF) predicted HbA1c over and above the predictive power of demographic information, health conditions, anxiety, and depression. Additionally, higher decrease in HbA1c from T1 to T2 was predicted by higher scores on the alexithymia factor DDF at admission over and above the other predictors.

Conclusion: DDF is an important predictor of glucose control. Scoring higher on this factor is related to poorer glycaemic control at admission. Additionally, people with higher scores on this factor seem to benefit highly from the treatment administered at the hospital.

Key-words: Alexithymia · Glycaemic control · Psychological variables · Type 1 diabetes · HbA1c.

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RÉSUMÉ

Objectifs : Clarifier la contribution respective des caractéristiques démographiques, des conditions de santé et de trois variables psychologiques (dépression, anxiété et alexithymie) sur l’équilibre glycémique mesuré par le taux d’hémoglobine glyquée (HbA1c).

Matériel et méthodes : Soixante-quatre personnes présentant un diabète de type 1 ont rempli des questionnaires psychologiques et des informations démographiques à leur admission à l’hôpital (T1) et lors d’un suivi après 8 semaines (T2). Des informations additionnelles sur leur état de santé étaient également disponibles.

Résultats : À T1, le facteur « difficulté à décrire ses sentiments » (DDS) de l’échelle d’alexithymie prédisait le niveau d’HbA1c au-delà de la variance expliquée par les informations démographiques, l’état de santé, la dépression et l’anxiété. Par ailleurs, une diminution plus importante d’HbA1c entre T1 et T2 était prédite par un score plus élevé sur le facteur DDS de l’alexithymie mesuré à T1, au-delà du pouvoir prédictif des autres variables du modèle.

Conclusion : Le facteur DDS est un prédicteur important de l’équilibre glycémique. Avoir un score plus élevé sur ce facteur est lié à un moins bon équilibre glycémique à l’admission. Par ailleurs, les personnes avec un score plus élevé à l’admission semblent particulièrement bénéficier du traitement administré à l’hôpital.

Mots-clés : Alexithymie · Équilibre glycémique · Variables psychologiques · Diabète de type 1 · HbA1c.

1 Université catholique de Louvain (UCL), Belgium.
2 Department of Psychology and Belgian National Fund for Scientific Research, Belgium.
3 Department of Psychiatry, Belgium.
4 Department of Diabetology, Belgium.

Address correspondence and reprint requests to:
O Luminet, Université catholique de Louvain (UCL), Department of Psychology, Research Unit for Emotion, Cognition, and Health, 10, place Cardinal Mercier, B-1348 Louvain-la-Neuve, Belgium.
Olivier.Luminet@psp.ucl.ac.be

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**Introduction**

The management of type 1 diabetes is complex and requires daily multiple insulin injections, diet, physical exercise as well as home blood glucose monitoring [1]. The goal of treatment is to maintain blood glucose levels at steady near normal values, which is of paramount importance for avoiding its long-term complications [2]. Persons with type 1 diabetes also have to cope with life-threatening risks of hypo- and hyperglycaemia. Therefore, diabetes has important psychological consequences [3-5] as well as an impact on quality of life [6] and family functioning [7]. For instance, persons with type 1 diabetes face multiple daily hassles and parents of type 1 diabetic children have elevated levels of anxiety that are often associated with difficulties in parenting [8]. While these contextual variables and their possible effects on glycaemia were widely explored in the literature of type 1 diabetes, the complementary hypothesis that specific personality characteristics present in some diabetic persons may influence glycaemic control has only been studied scarcely [9,10]. Clarifying the respective roles of situational and personality variables is however of interest for the development of integrated medical and psychological procedures to treat the person and to understand better the link between metabolic and psychological variables.

In the present study, we investigated the relationship between four sets of variables and glycaemic control as assessed by HbA1c. Demographic variables were considered first, then health status, general psychopathology and a specific personality trait named alexithymia, which has been found to be a vulnerability factor that influences the onset or course of various medical and psychiatric illnesses [11,12].

Alexithymia is as a multifaceted construct, whose salient features include: [1] difficulty identifying own feelings, [2] difficulty describing feelings to other people, and [3] a reduced capacity to engage in fantasy and other imaginal activities [13-15]. These last characteristics are usually referred to an externally-oriented thinking style. Collectively, all these traits are thought to reflect a deficit in the cognitive processing and regulation of emotional states [14-16].

Sustaining the vulnerability hypothesis, studies have shown that alexithymia is associated with several emotional disorders and physical illnesses [11,16] such as depression [17], alcoholism [18] and anorexia nervosa [19] in the psychiatry field and with hypertension [20,21] and functional gastrointestinal disorders [22] in the medical field, all diseases related to physiological stress reactions.

Alexithymic individuals would be more susceptible to developing stress related diseases than non-alexithymic because they have deficits in the way they process and regulate emotional states.

We hypothesized that total alexithymia score should be related to poor glucose control when persons were admitted at the hospital. We also examined the specific role of each alexithymia factor as some studies suggest that factors do not relate in the same way to health related variables [23-25].

An additional hypothesis was that high alexithymia scorers would particularly benefit from their stay at the hospital as they would be in a supportive environment that they usually lack at home. There is a large amount of data showing that people scoring high on alexithymia have less appropriate conditions in their environment to favor the identification and the expression of their emotional states due to a lack of social support [26-29]. At hospital, persons had the opportunity to interact with the medical and the nursing staff. We thus predicted that people scoring higher on alexithymia would have greater decrease in HbA1c measured at admission to the hospital and during a follow-up session approximately 8 weeks later as compared to people scoring lower on alexithymia. Again, we examined the effect of each alexithymia factor on this dependent variable.

**Methods**

**Participants**

All patients who were currently at the endocrinology unit of UCL-St-Luc University Hospital during the recruitment period (13 months from November 2000 to December 2001) were contacted, except if they had one of the following exclusion criteria: not being a native French-speaker, or being below 18 or over 60 years old. Participants who conformed to these conditions and who were willing to take part to the study (>80%) then received a complete description of the protocol as approved by the ethics committee of the hospital. Patients were hospitalized for poor glycaemic control, and/or assessment of diabetic complications.

Macroangiopathy was considered in patients who had an history of cardiovascular event and/or in the presence of angina, claudication, abolished peripheral pulse and/or permanent ischaemic electrocardiogram abnormalities at rest and/or during a stress test. Microangiopathy consisted of retinopathy, established on the basis of an eye visual examination and/or by fluorescein angiography and/or (incipient) nephropathy, determined by micro- or macroalbuminuria and/or plasma creatinine levels. Peripheral neuropathy was based on clinical examination and sexual dysfunction was assessed on the basis of a validated questionnaire.
The sample that was recruited for the study was composed of 64 type 1 diabetes inpatients (for details see table I). Only an individual approach was followed during the treatment (no collective courses were received). One full-time dietetician specialized in diabetes was also involved in the treatment during the hospitalization.

The large majority of patients had an insulin scheme (basal/bolus) of 4 injections/day both at admission and end of hospitalization. The range for the number of injections was 1 to 6 at admission, 2 to 5 when leaving the hospital, and 1 to 4 at follow-up. Insulin units/day was on average 41 (±23, range 18-108) at admission, 43 (±20, range 8-108) when leaving the hospital. Seven personal capillary blood glucose measures were made each day (7 am, 10 am, before lunch, 3 pm, before dinner, at bed time and if needed, a night control at 4 am). Patients received three main meals, and if necessary, snacks were provided (morning, afternoon, at bedtime). Meals contained at least 50% glucides. Meal plans were always discussed with the dietetician. It is important to note that at the time the study was conducted (2000-2002), use of insulin analogs was not systematic.

Overall, the present sample is representative of diabetic persons regularly attending a Belgian University hospital [30,31], although the percentage of neurological complications was slightly higher.

**Measures**

**Toronto-Alexithymia Scale (TAS-20)**

The Toronto-Alexithymia Scale 20 item (TAS-20) is the most widely used measure of the alexithymia construct [32,33]. Concurrent, predictive, convergent and discriminant validity, reliability and stability have been demonstrated (for a review, see 34). This questionnaire involves rating 20 items on a 5-point Likert scale (from 1 to 5). The TAS-20 has a 3-factor structure: a) “difficulty identifying feelings”; b) “difficulty describing feelings to others”; and c) an “externally oriented thinking style” (see table II for psychometric properties). We used the French version of the scale [35,36].

**Stait-Trait Anxiety Inventory (STAI)- trait form**

The Stait-Trait Anxiety Inventory (STAI) [37,38] is one of the most widely used self-report scales for assessing anxiety. It consists of 20 self-report statements, with nine items inversely scored.

We used the French version of the scale [39]. Possible scores range from 20 to 80.

**Beck Depression Inventory (BDI)**

The Beck Depression Inventory (BDI) is the most widely used self-report measure for assessing the severity of depression. We used the short 13 item French version of the scale [40]. Values between 0 and 3 are considered as no depression, between 4 and 7 as mild depression, 8-15 as moderate and above 15 as severe.

**HbA1c**

HbA1c was measured by ion-exchange high performance liquid chromatography. Small elevations of HbA1c significantly increase the risk of major complications of diabetes [41]. The American Diabetes Association recommends an HbA1c of ≤7% and careful reevaluation of treatment regimens for HbA1c values consistently >8% [42].

**Procedure**

**Time 1**

After the informal consent was signed, participants were contacted by a research assistant for a formal appointment that took place in a quiet room in which they were asked to complete the questionnaires. The first measure of HbA1c was taken when participants were at the hospital.

**Time 2**

Eight weeks after they left the hospital, the patient received a letter asking them to complete again within a week the STAI, BDI and TAS-20 questionnaires.

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**Table I**

Sociodemographic and Medical Characteristics of the Sample.

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male sex (%)</td>
<td>55</td>
<td></td>
</tr>
<tr>
<td>Age (years) Mean (SD)</td>
<td>42 (14) (18-76)</td>
<td></td>
</tr>
<tr>
<td>Duration of diabetes (years) Mean (SD)</td>
<td>27 (16) (2-53)</td>
<td></td>
</tr>
<tr>
<td>Body mass index (kg/m²) Mean (SD)</td>
<td>25 (5) (16-37)</td>
<td></td>
</tr>
<tr>
<td>Education (% primary school)</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>(% secondary school)</td>
<td>56</td>
<td></td>
</tr>
<tr>
<td>(% university)</td>
<td>38</td>
<td></td>
</tr>
<tr>
<td>Marital status (% single)</td>
<td>24</td>
<td></td>
</tr>
<tr>
<td>(% with partner only)</td>
<td>24</td>
<td></td>
</tr>
<tr>
<td>(% with partner and child(ren))</td>
<td>41</td>
<td></td>
</tr>
<tr>
<td>(% with child(ren) but without partner)</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>Previous stays at hospital Overall mean number (SD) (range)</td>
<td>7 (10) (0-30)</td>
<td></td>
</tr>
<tr>
<td>Mean number for diabetes 1 hospitalization (SD) (range)</td>
<td>2 (2) (0-10)</td>
<td></td>
</tr>
<tr>
<td>Complications (% of the sample)</td>
<td>28</td>
<td></td>
</tr>
<tr>
<td>Macroangiopathy</td>
<td>45</td>
<td></td>
</tr>
<tr>
<td>Microangiopathy</td>
<td>60</td>
<td></td>
</tr>
<tr>
<td>Erectile dysfunction</td>
<td>21</td>
<td></td>
</tr>
</tbody>
</table>
| Overall, the present sample is representative of diabetic persons regularly attending a Belgian University hospital [30,31], although the percentage of neurological complications was slightly higher.**

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The usual procedure involved a post-treatment screening with the physician twelve weeks after participants left the hospital. During this screening, a second measurement of HbA1c was performed.

### Results

The analyses reported in this section were performed with the SPSS software, version 12. In a first step, we examined whether the stay at hospital (medical treatment, social support provided) was efficient to make significant changes in the level of HbA1c and in the measures of psychopathology. Table II indicates that all variables — except anxiety and the alexithymia externally-oriented thinking factor — were characterized by a significant decrease from time 1 to time 2.

The second step was to investigate whether alexithymia was related to glycaemic control at Time 1. In a hierarchical regression analysis, demographic variables, health status variables, psychopathology (anxiety and depression) and alexithymia factors were entered as first, second, third and fourth block respectively. At each step, the increase of explained variance (ΔR²) was computed. The rationale for the order of entry of variables was that if some alexithymia factors still predicted level of HbA1c after the variance taken by more general variables was left out, this will mean that these alexithymia factors make a unique contribution to the prediction of HbA1c concentration. Table III shows that the block of alexithymia factors was the only one which made a significant contribution to the prediction of HbA1c. This effect was explained by the factor “difficulty describing feelings” of the TAS-20 that was positively and significantly related to the level of HbA1c, over and above the effects of demographic variables, health conditions and psychopathological conditions, which were not significant2.

It might be argued that some additional variables concerning medical treatment should have been included in the research design as they are likely to affect glucose control (duration of diabetes, duration of the stay at hospital and intensity of the medical therapy measured by the number of insulin units at admission [43]). These additional variables were available for a large proportion of the total sample (76.6 to 87.5%). When these variables were entered in a regression analysis in this subset of persons, similar results were found as those obtained with the total sample, with the block of alexithymia factors being almost significant (F change=2.69, P=0.06, ΔR²=0.136), while the other blocks were not (P>0.10). This effect was explained by the factors “difficulty identifying feelings” (β=.42, P=0.06) and “difficulty describing feelings” (β=.29, P=.06).

In a third step, we examined the hypothesis that people having more difficulties in describing feelings to others (i.e., scoring higher on that factor of the TAS-20) might benefit more from the treatment provided at the hospital as compared to people with low difficulties. In order to test for this

### Table II

<table>
<thead>
<tr>
<th></th>
<th>Time 1</th>
<th>Cronbach α (Range)</th>
<th>Time 2</th>
<th>Cronbach α (Range)</th>
<th>DF</th>
<th>F value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glycated hemoglobin (HbA1c)</td>
<td>9.63 (2.17)</td>
<td>(5.30 – 16.20)</td>
<td>8.64 (1.44)</td>
<td>(6.30 – 13.00)</td>
<td>1,63</td>
<td>11.41*</td>
</tr>
<tr>
<td>Depression</td>
<td>5.12 (5.59)</td>
<td>0.65 (0 – 25)</td>
<td>2.91 (4.07)</td>
<td>0.83 (0 – 15)</td>
<td>1,63</td>
<td>11.49*</td>
</tr>
<tr>
<td>Anxiety</td>
<td>40.55 (9.84)</td>
<td>0.88 (23 – 71)</td>
<td>42.66 (9.23)</td>
<td>0.95 (21 – 66)</td>
<td>1,63</td>
<td>3.43</td>
</tr>
<tr>
<td>Alexithymia – difficulty identifying feelings factor</td>
<td>16.20 (6.74)</td>
<td>0.69 (7 – 33)</td>
<td>9.56 (8.91)</td>
<td>0.78 (7 – 32)</td>
<td>1,63</td>
<td>27.83*</td>
</tr>
<tr>
<td>Alexithymia – difficulty describing feelings factor</td>
<td>12.34 (4.11)</td>
<td>0.64 (5 – 25)</td>
<td>9.31 (5.35)</td>
<td>0.73 (5 – 22)</td>
<td>1,63</td>
<td>21.44*</td>
</tr>
<tr>
<td>Alexithymia – Externally oriented thinking factor</td>
<td>17.89 (4.32)</td>
<td>0.62 (8 – 28)</td>
<td>16.77 (5.02)</td>
<td>0.65 (8 – 27)</td>
<td>1,63</td>
<td>2.31</td>
</tr>
<tr>
<td>Alexithymia total score</td>
<td>46.44 (10.86)</td>
<td>0.73 (29 – 68)</td>
<td>35.64 (14.03)</td>
<td>0.85 (20 – 72)</td>
<td>1,63</td>
<td>41.63*</td>
</tr>
</tbody>
</table>

*P<0.001.

1 Newly diagnosed participants are expected to have higher HbA1c values at admission to the hospital. This assumption was confirmed in this sample for the four newly diagnosed patients who had a mean level of HbA1c of 15.0 (SD=2.2) as compared to the other patients (M=9.4, SD=2.0), t (56)=3.55, P<0.001. At time 2, however, the two groups did not differ anymore. It can thus be important to analyse this group separately in order to keep the results unbiased by this initial difference and by the natural stronger decrease of HbA1c in the newly diagnosed subgroup. A new regression analysis was thus performed after removing these 4 patients. The second factor of alexithymia was still the strongest predictor (β=0.53), but it was only marginally significant (P=0.078). Since the relationship was no longer significant it is likely explained by the lower power in the analysis due to a smaller number of participants. We can thus consider that the analyses were not biased by this small subsample.
Type 1 diabetes and alexithymia

A hierarchical regression analysis was conducted with changes in HbA$_{1c}$ from time 1 to time 2 as the dependent variable. Six blocks of predictors were entered in the regression in the following order: 1. demographic variables, 2. health status, 3. anxiety and depression at time 1, 4. anxiety and depression at time 2, 5. alexithymia factors at time 1 and 6. alexithymia factors at time 2. Results showed that only the block of alexithymia factors at time 1 made a contribution to the prediction of changes in HbA$_{1c}$, that was almost significant, $F_{\text{change}}=2.48$, $P=0.07$, while none of the other blocks were predictive ($P>0.10$). This effect was due to a significant relationship with the factor “difficulty describing feelings”, $\beta=0.37$, $P<0.05$. This result suggests that people who scored higher on this alexithymia factor at admission had a stronger decrease in HbA$_{1c}$ from admission to the follow-up than people scoring lower on this factor$^1$.

We also conducted complementary analyses on a large proportion of the total sample (76.6 to 90.6%) for which the following additional variables were available: duration of diabetes, duration of stay at hospital, and changes in the intensity of the medical treatment over time (absolute value of the difference between the number of insulin units at admission and at the end of the stay at hospital) [43]. However, this new regression would have involved too many predictors for this limited sample size. We thus considered only the three blocks which had the highest predictive impact on the dependent variable (demographic variables, change in intensity of the medical treatment, and alexithymia factors at time 1). The block of demographic variables was significant, $F_{\text{change}}=5.24$, $P<0.01$, $R^2=0.236$. The effect was related significantly with level of education, $\beta=0.26$, $P<0.05$, as people with a higher level of education had more decrease in the level of HbA$_{1c}$. Change in intensity of the medical treatment made a significant additional contribution to the model, $F_{\text{change}}=9.40$, $P<0.01$, $R^2=0.121$. This was due to a positive significant relation between the variables, $\beta=0.31$, $P<0.05$. The more people had changes in number of insulin units from admission to the time they left

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Table III
Hierarchical Regression Analysis Predicting Glycated Hemoglobin (HbA$_{1c}$) by Demographic Variables, Health Status, Anxiety, Depression and Alexithymias Scores at the Admission to Hospital.

<table>
<thead>
<tr>
<th>Factors</th>
<th>Final $\delta$</th>
<th>R2</th>
<th>R2adj</th>
<th>R2chg</th>
<th>df</th>
<th>F</th>
<th>Fchg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1: Demographic</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>-0.22</td>
<td>0.098</td>
<td>0.048</td>
<td>0.098</td>
<td>3,54</td>
<td>1.94</td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td>-0.03</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Studies</td>
<td>0.06</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Step 2: Health conditions</td>
<td></td>
<td>0.19</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Complications</td>
<td></td>
<td>0.180</td>
<td>0.101</td>
<td>0.082</td>
<td>5,52</td>
<td>2.28</td>
<td>2.61</td>
</tr>
<tr>
<td>Hospital</td>
<td>-0.09</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Step 3: Psychopathology</td>
<td></td>
<td>0.258</td>
<td>0.154</td>
<td>0.078</td>
<td>7,50</td>
<td>7.50</td>
<td>2.49*</td>
</tr>
<tr>
<td>Anxiety</td>
<td>0.23</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depression</td>
<td>-0.39</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Step 4: Alexithymia</td>
<td></td>
<td>0.381</td>
<td>0.249</td>
<td>0.122</td>
<td>10,47</td>
<td>2.89**</td>
<td>3.10*</td>
</tr>
<tr>
<td>Identify</td>
<td>0.24</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Describe</td>
<td>0.33*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>External</td>
<td>-0.16</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

For gender, 1 is related to males and 2 to females. “Studies” refers to the highest level of diploma obtained. “Complications” refers to the occurrences of diabetes complications (cardio-vascular, sexual/urologic, ocular or neurological) in the last two months. “Hospital” refers to the number of stay in a hospital. Depression is measured by the Beck Depression Inventory (BDI, Beck et al., 1988), anxiety is measured by the State-Trait Anxiety Inventory (STAI, trait version, Spielberger, 1983), and alexithymia is measured by the Toronto Alexithymia Scale (TAS-20, Bagby, Taylor, & Parker, 1994). “Identify” refers to the first factor of the TAS-20 (difficulty identifying feelings). “Describe” refers to the second factor of the TAS-20 (difficulty describing feelings), and “External” refers to the third factor of the TAS-20 (externally-oriented thinking).

$^*P<0.05$  $^{**}P<0.01$

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1 When the analysis was conducted after the four newly diagnosed participants had been excluded, the coefficient for “difficulty describing feelings” was of similar magnitude to when the total sample was considered ($\beta=0.36$) but similarly to the regression predicting HbA$_{1c}$ at admission, this relation was only marginally significant, $P=0.09$. Again, this difference can likely be attributed to a decrease in power due to a smaller number of participants.
the hospital the more they had a decrease in HbA1c from their admission at the hospital to the follow-up procedure (an identical result was obtained when number of injections per day was considered as a predictor instead of number of insulin units). Finally, the block of alexithymia factors made an additional contribution to the model that was almost significant, \( F_{\text{change}} = 2.51, P = 0.07, \Delta R^2 = 0.089 \). This effect was due to a positive significant relation with the factor “difficulty describing feelings” measured at time 1, \( \beta = 0.27, P < 0.05 \). People with higher scores on this trait measure had stronger decrease in HbA1c.

**Discussion**

The results first showed that the level of HbA1c decreased from admission to the follow-up conducted 8 weeks after patients left the hospital. An average decrease of 1%, as observed in the present study, has important implications, for at HbA1c levels >7-8%, a curvilinear relationship has been shown between this level and the risk of complication [44]. For instance, a similar 1% decrease in HbA1c, from 9.5 to 8.5 was associated with a 30% reduction in the rate of progression of retinopathy in elderly persons [45].

A first aim of the study was to examine, at admission, the predictors of HbA1c. Demographic variables, health conditions, two criteria for psychopathology (depression and anxiety) and one personality trait (alexithymia) were selected as potential predictors. The results showed that demographic variables, health conditions and psychopathology (depression and anxiety) each accounted for approximately 5% of the total variance (respectively 4.8, 5.3, and 5.2%, see column R² adj. in Table III). None of these blocks of predictors were considered as significant. The absence of relation between medical complications and HbA1c can be explained by non-linear relationships between these variables [30]. Two measures of HbA1c would thus not necessarily be associated with significant changes in medical complications. Although several studies have shown a significant association between depression and poor glycaemic control in diabetic persons [46], the type of scale used for assessing depression could be a critical issue. Studies using the BDI, as we did in the present study, were inconsistent with some studies that showed a positive and significant correlation between depression score and HbA1c, while others showed no significant correlations between these variables. This could explain why depression was not retained as a significant predictor of HbA1c. The absence of relation between these variables cannot be explained by floor effects in depression. Although the mean score was relatively low, the standard deviation and the range of scores were large. The finding that anxiety did not predict HbA1c replicates previous studies [47,48]. It has been suggested that anxiety is rather related to distortions in symptom detection and blood glucose estimation [e.g., 49]. People with higher trait anxiety tend to misattribute non-diabetes-related symptoms to blood glucose symptom perceptions [50].

The block of alexithymia factors was significant, explaining an additional 10% of the variance over and above the variance explained by demographic variables (4.8%), health conditions (5.3%), and general psychopathology – depression and anxiety – variables (5.2%). This result is quite impressive for three reasons. First 10% of gain in explained variance for a single psychological variable is high. Second, this result was obtained despite the inclusion of a large set of situational and dispositional predictors. Even when additional predictors concerning the severity of diabetes, available on a sub-sample of the participants were added in the regression, the contribution of alexithymia factors was almost identical. Finally, this result cannot be explained by some particular pattern of newly diagnosed persons as the contribution of alexithymia factors was of similar magnitude when they were excluded from the analyses (see footnotes 1 and 2). More specifically, the results showed that scoring higher on “difficulty describing feelings” was associated with elevated levels on HbA1c. This result extends previous studies showing that alexithymia represents a risk factor for physical illnesses [20-22], but more specifically in relation to long-term glucose control, an area that has been scarcely examined and with unvalidated instruments for the assessment of alexithymia. It is worth noting that although the block including the three alexithymia factors made a significant contribution to the prediction of HbA1c, the effect was only explained by the “difficulty describing feelings” factor. It thus seems important that future studies examine the respective role of each alexithymia factor in the prediction of glucose control and that they examine whether this specific contribution can be replicated. The second main finding was that people who scored initially higher on “difficulty describing feelings” had a stronger decrease of HbA1c over and above the predictors usually considered in the literature [51], explaining an additional 7% of the variance. This result is quite strong as it was found despite the inclusion of a large set of alternative predictors. Importantly, this result cannot be explained by floor effects in HbA1c for people scoring low on this alexithymia factor as their mean score at admission (8.99%) was above the admitted criteria for pathology (8%, 42). We would suggest two hypotheses for explaining the independent contribution of the “difficulty describing feelings” factor to changes in HbA1c. First, it is possible that people scoring high on this dimension benefited more from the treatment. Alexithymia has been related to deficits in social support [26-29]. One can thus suggest that these people were more sensitive to the support provided by the medical and the nursing staff when they were at the hospital (better adaptation to the diabetes treatment, better benefits from information sessions organised during the hospitalisation) partly.
because they were likely to have deficits in the amount of social support received outside the hospital and in the degree of satisfaction related to it. The availability of social support is an important mediating variable that needs to be considered more carefully in future studies.

Some improvements can be considered for future studies. Only one follow-up was provided and we do not know whether the present results can be replicated over a longer time period. Future studies would need to involve additional follow-up sessions. Additional predictors would also need to be considered such as diabetes self-care activities or experienced social support. Despite these limitations, it was still noticeable that alexithymia factors were significant predictors over and above predictors usually retained in the literature.

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