

## Chapter 3

# Risk and Protective Factors for Suicidality at 6-Month Follow-up in Adolescent Inpatients Who Attempted Suicide: An Exploratory Model

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**Objective:** To assess risk and protective factors for suicidality at 6-month follow-up in adolescent inpatients after a suicide attempt.

**Methods:** One hundred seven adolescents from 5 inpatient units who had a suicide attempt were seen at 6-month follow-up. Baseline measures included sociodemographics, mood and suicidality, dependence, borderline symptomatology, temperament and character inventory (TCI), reasons for living, spirituality, and coping scores.

**Results:** At 6-month follow-up, 41 (38%) subjects relapsed from suicidal behaviours. Among them, 15 (14%) had repeated a suicide attempt. Higher depression and hopelessness scores, the occurrence of a new suicide attempt, or a new hospitalization belonged to the same factorial dimension (suicidality). Derived from the best-fit structural equation modelling for suicidality as an outcome measure at 6-month follow-up, risk factors among the baseline variables included: major depressive disorder, high depression scores, and high scores for TCI self-transcendence. Only one protective factor emerged: coping–hard work and achievement.

**Conclusion:** In this very high-risk population, some established risk factors (for example, a history of suicide attempts) may not predict suicidality. Our results suggest that adolescents who retain high scores for depression or hopelessness, who remain depressed, or who express a low value for life or an abnormally high connection with the universe are at higher risk for suicidality and should be targeted for more intense intervention. Improving adolescent motivation in school and in work may be protective. Given the sample size, the model should be regarded as exploratory.



## Facteurs de risque et de protection de la suicidabilité au suivi de 6 mois d'adolescents hospitalisés pour tentative de suicide : un modèle exploratoire

**Objectif :** Évaluer les facteurs de risque et de protection de la suicidabilité au suivi de 6 mois d'adolescents hospitalisés pour une tentative de suicide.

**Méthodes :** Cent sept adolescents de 5 unités d'hospitalisation qui ont fait une tentative de suicide ont été vus à un suivi de 6 mois. Les mesures de base étaient les scores sociodémographiques, d'humeur et suicidabilité, de dépendance, de symptomatologie limite, de l'inventaire de tempérament et caractère (TCI), de raisons de vivre, de spiritualité, et d'adaptation.

**Résultats :** Au suivi de 6 mois, 41 (38 %) sujets ont eu une rechute de comportement suicidaire. Parmi ceux-ci, 15 (14 %) ont répété une tentative de suicide. Des scores plus élevés de dépression et de désespoir et la survenue d'une nouvelle tentative de suicide ou d'une nouvelle hospitalisation s'inscrivaient dans la même dimension factorielle (suicidabilité). Dérivés de la modélisation par équation structurelle la mieux ajustée à la suicidabilité comme mesure de résultat au suivi de 6 mois, les facteurs de risque des variables de base étaient notamment : le trouble dépressif majeur, des scores de dépression élevés, et des scores élevés d'auto-transcendance au TCI. Un seul facteur de protection s'est dégagé : l'adaptation – travailler dur et réussir.

**Conclusion :** Dans cette population à risque très élevé, certains facteurs de risque établis (par exemple, des antécédents de tentatives de suicide) peuvent ne pas prédire la suicidabilité. Nos résultats suggèrent que les adolescents qui maintiennent des scores élevés de dépression et de désespoir, qui demeurent déprimés, ou qui expriment une valeur faible pour la vie ou une connexion anormalement élevée avec l'univers sont à risque accru de suicidabilité et devraient être la cible d'interventions plus intenses. Améliorer la motivation des adolescents à l'école et au travail peut servir de protection. Étant donné la taille de l'échantillon, le modèle doit être considéré exploratoire.

Suicide is the second leading cause of death in adolescents and young adults in European countries.<sup>1</sup> In France, recent epidemiological data showed that the suicide rate in adolescents, aged 15 to 19, was 4.1/100 000 inhabitants in 2007 (5.8 in males; 2.3 in females).<sup>2</sup> Suicidal behaviours are also the main reason for adolescent psychiatric hospitalizations in many countries. The annual prevalence of suicidal ideation ranges from 15% to 25% in the general population,<sup>3</sup> whereas the lifetime estimates for a suicide attempt among adolescents ranges from 1.3% to 3.8% in males and from 1.5% to 10.1% in females, with higher

rates in females than in males in the older age range.<sup>4</sup> Moreover, adolescents who die by suicide are at risk having been exposed to early life adversities, having made a prior suicide attempt, and being left without appropriate health care support within the month prior to the completion.<sup>5,6</sup>

Current models of suicide phenomena in youth have emphasized: the importance of distinguishing suicidal ideation, nonsuicidal self-harm, suicide attempt, and successful suicide<sup>7</sup>; the key role of depression in the process that transforms suicidal ideation into a suicide attempt, with depression being a strong proximal factor<sup>8</sup>; that the numerous identified risk factors do not adequately capture the outcome; and that protective factors may have to be taken into account for suicide prediction.<sup>9,10</sup>

### Abbreviations

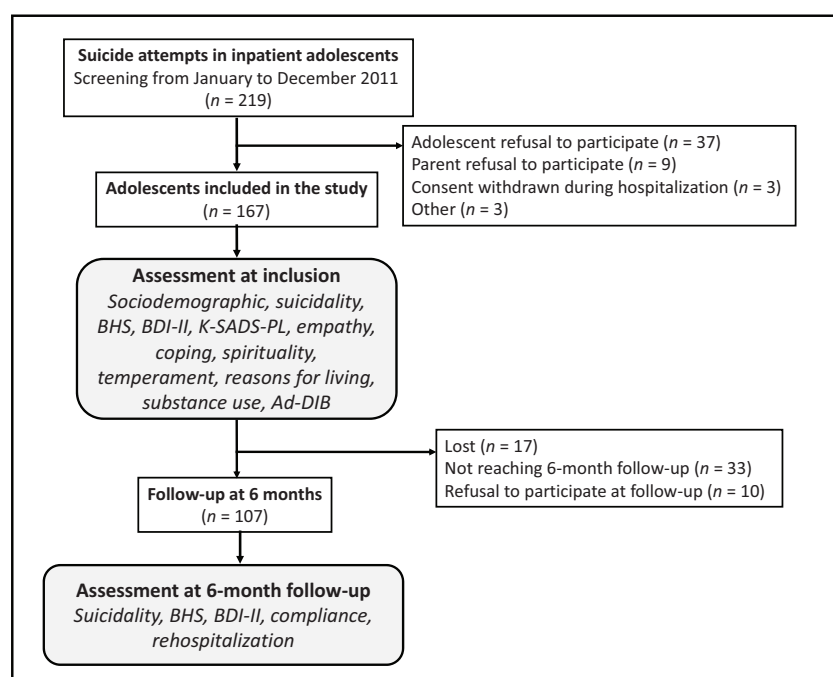
ACS	Adolescent Coping Scale
BDI-II	Beck Depression Inventory, Second Edition
BHI	Beck Hopelessness Inventory
BHS	Beck Hopelessness Score
CFI	Comparative Fit Index
ED	emergency department
GAF	Global Assessment of Functioning
MDD	major depressive disorder
MDE	major depressive episode
RFL-A	Reasons for Living Inventory for Adolescent
RMSEA	root mean square error of approximation
SE	standard error
SEM	structural equation modelling
SS	Spirituality Scale
TCI	Temperament and Character Inventory
TLI	Tucker-Lewis Index

### Clinical Implications

- In adolescents who attempted suicide, the maintenance of depression and hopelessness, seeking intense spiritual help, expressing a low value for life, or high connection with the universe exposed them to relapse before 6 months.
- School inclusion and motivation should be promoted.

### Limitations

- The sample size may have limited power for some variables.
- Some sites did not recruit in the same way and may have introduced biases.
- Some important risk factors (for example, family history and cohesion, sexual abuse, and school bullying) were not assessed.

**Figure 1** Flow diagram of our study

Compared with general population studies, fewer longitudinal studies have assessed the re-occurrence of suicide attempts in adolescents who have previously attempted suicide. Proximal risk factors include depressed mood,<sup>11–13</sup> hopelessness,<sup>14</sup> suicidal ideation,<sup>12,15</sup> more severe functional impairment,<sup>11</sup> poor family cohesion,<sup>16,17</sup> and low peer connectedness.<sup>17</sup> Long-lasting or distal risk factors include a previous history of suicide attempts,<sup>15–19</sup> a lower maximum lethality for the previous suicide attempts,<sup>16</sup> high scores for anger and hostility,<sup>19</sup> bipolar<sup>20</sup> or borderline personality symptomatology,<sup>21</sup> a history of sexual abuse,<sup>16,21</sup> a family history of suicide attempts in relatives,<sup>11</sup> and a family history of mental health problems.<sup>11</sup> Protective factors have been less explored in studies in very high-risk samples, with the possible exception of coping. Adolescents with previous suicide attempts show less task-oriented coping.<sup>22</sup>

Our study aimed to conduct univariate and multivariate analyses of potential risk and protective factors and to compute a model of suicidality at follow-up.<sup>23</sup> To do so, proximal and distal risk and protective factors (socio-demographics, mood, hopelessness and suicidality, self-esteem, borderline personality symptomatology, dependence, recent life events, spirituality, reasons for living, TCI scores, and coping scores) were studied at baseline in a sample of 107 inpatient adolescents hospitalized for a suicide attempt (T1). At 6-month follow-up, we re-assessed mood, suicidality, treatment, and services given during the follow-up period and assessed T1 factors predictive of readmissions for suicidal behaviours during follow-up.

## Methods

Our study, called the “Evaluation des modalités de prise en charge post hospitalière des adolescents suicidants,” is a multisite, naturalistic, prospective study on suicidal behaviours in adolescents involving 3 periods of data collection: baseline, 6-month follow-up, and 12-month follow-up. Here, we present preliminary results on the 6-month follow-up.

## Participants

From January to December 2011, subjects aged 13 to 17 years were recruited from 5 pediatric departments (Rouen, Amiens, Crépy, Creil, and Meaux) in France. All adolescents who presented in the ED for a suicide attempt (according to Columbia Classification Algorithm of suicide assessment<sup>7</sup>) were invited to be hospitalized in keeping with French national clinical practice guidelines.<sup>24</sup> The exclusion criteria included an inability to provide written informed consent (for example, moderate to severe cognitive impairment) or a current medical condition or residence outside of the geographical area of each centre to limit lost patients at follow-up. Consent for minors was obtained from each adolescent as well as from both parents. Clinical research interviews were performed by a research psychiatrist or resident. Ethics approval was obtained from the Nord-Ouest I (Centre Hospitalo-Universitaire Charles-Nicolas) Group Ethics and Medical Research Committee.

Figure 1 summarizes the flow diagram for our study. An initial 219 patients were eligible, and 167 were enrolled during their inpatient stay. The demographics of patients who refused to participate were comparable with those of the participants for average age (14.6 years for participants, compared with 15.1 years for nonparticipants) and sex (79% female participants,

compared with 76% female nonparticipants). Among the 167 participants, the relative proportion of adolescents included in the study was 50% in Rouen, 24% in Amiens, 15% in Crépy, 7% in Creil, and 4% in Meaux. The centres did not differ on a subjects' age, sex, or the presence of an internalized or externalized disorder. After discharge, treatment plans were made as usual practice in each centre except for telephone support that was systematically implemented in the Rouen site. At 6-month follow-up, 107 adolescents had a follow-up clinical assessment. There was no difference in baseline characteristics between patients assessed at follow-up and those who were not assessed for BDI-II scores, BHSs, and the number of suicide attempts (BDI-II: mean 23.5 [SD 13], compared with mean 22.1 [SD 13.8],  $P = 0.51$ ; BHS: mean 8.4 [SD 5.5], compared with mean 9.3 [SD 5.6],  $P = 0.30$ ; and number of suicide attempts: mean 1.6 [SD 1.5], compared with mean 1.3 [SD 0.7],  $P = 0.14$ ).

### Measures

Details of the baseline measures are given in the related report by Labelle et al<sup>25</sup> in this supplement. The baseline measures included: sociodemographic characteristics; DSM-IV Axis I main diagnoses and GAF obtained after a standardized interview, the Schedule for Mood Disorders and Schizophrenia for Children and Adolescents of School Age, Version Current and Past Episode (Kiddie-SADS-Present and Lifetime Version interview)<sup>26</sup>; depression, hopelessness and suicidality as scored with the BDI-II,<sup>27</sup> the BHI, and the Posner Scale<sup>7</sup>, respectively, substance use and misuse as assessed with the Dependence Questionnaire for Adolescents (DEP-ADO)<sup>28</sup>; borderline personality symptomatology as scored with the Abbreviated Self-Questionnaire of the Diagnostic Interview for Borderline Personality Disorder<sup>29</sup>; and self-esteem with the Rosenberg Self-Esteem Rating Questionnaire.<sup>30</sup>

We also used the following scales as they have shown good psychometric properties and high interests in adolescent suicidal behaviours (for details, see Labelle et al<sup>25</sup> in this supplement):

- 1) the Eysenck Questionnaire to score impulsivity;
- 2) the Buss-Durke Hostility Inventory;
- 3) the TCI-56 items to score 4 temperaments (novelty seeking, harm avoidance, reward dependence, and persistence) and 3 characters (self-directedness, cooperativeness, and self-transcendence)<sup>31</sup>;
- 4) the SS to score spiritual beliefs, self-discovery, self-awareness and collective consciousness, and respect for others and environment<sup>32</sup>;
- 5) the RFL-A was used to score family alliance, suicide-related concerns, self-acceptance, peer acceptance and support, and future optimism<sup>33</sup>; and
- 6) the ACS to assess how adolescents cope with a situation or resolve a problem by scoring 3 main factors: productive coping, nonproductive coping, and reference to others.<sup>34,35</sup> Given the key role of traumatic life, we also used the Newcomb Life Events Questionnaire for Adolescents.<sup>36</sup>

At 6-month follow-up, we explored the treatment given to participants after their stay through a standardized questionnaire querying psychotropic treatment, formal psychotherapy, family treatment, group approaches, and telephone support that was systematically implemented in the Rouen site. Suicidal ideation and suicide attempts were scored using the Posner Scale. As current depression and hopelessness are important proximal factors for suicidality, patients received the BDI-II and BHS again at 6-month follow-up. We define relapse as all patients rehospitalized for suicidal behaviours during the 6-month follow-up period (whether they had repeated a suicide attempt or not), plus all patients who reported a new suicide attempt without hospitalization. Participants are fully described in Table 1.

### Statistical Analysis

All statistical analyses were performed using the R statistical package, version 2.12.2.<sup>37</sup> The significance level alpha was set at 0.05, and all statistical tests were 2-tailed.

First, we conducted several univariate analyses to explore variables measured at inclusion that were significantly associated with a new suicide attempt or a new hospitalization during the 6-month follow-up. Given the literature and the model we used to plan the study, which indicates both depression and hopelessness as key proximal risk factors for suicide attempts, we also performed univariate regression analysis to assess variables measured at inclusion that were significantly associated with BDI-II scores and BHSs at 6-month follow-up, after adjusting for the score at inclusion.

Second, to model suicidality at follow-up, we chose to use SEM, a statistical method that combines a factorial approach with regressions, in our case partial least square regression modelling. We choose this method as it is highly accurate to model prediction even when sample sizes are limited, and when several variables are strongly correlated, it allows creating a latent variable to better assess outcome.<sup>38</sup> As suicidality is a complex variable, to model suicidality, we hypothesized a single latent variable related to relapse during the 6-month follow-up period, and related to high BDI-II scores and high BHSs at 6-month follow-up. These are all key proximal risk factors for suicidality. Before computing the model, we performed multivariate analyses to retain the most explanatory variables from the univariate analyses in a comprehensive model to predict relapse for suicidal behaviours during the 6-month follow-up and to explore the relation between variables at admission and variables at 6-month follow-up (or proxy variables). Therefore, the model included suicidality as a latent variable related to 3 dependent variables as follows: relapse during follow-up, BHS, and BDI-II scores at 6-month follow-up. Explanatory variables were those selected after a multivariate analysis exploring the 3 different variables. Several computations were made to eliminate variables that did not contribute to the final model. To check the quality of the final model, we explored whether the 3 dependent variables were included

<b>Table 1 Adolescents who attempted suicide and successfully followed up at 6 months (<i>n</i> = 107): characteristics at inclusion</b>	
Sociodemographic characteristics	
Age, years, mean (SD), range	14.91 (1.4), 12.1–17.7
Sex, <i>n</i> (%)	
Female	90 (84)
Male	17 (16)
Number of children in the family, mean (SD), range	2.4 (1.22), 0–6.0
Significant life events, mean (SD), range	3.85 (2.23), 0–11.0
Living with both parents, <i>n</i> (%)	48 (45)
One parent plus a step parent	11 (10)
Living with one parent, <i>n</i> (%)	34 (32)
Other (for example, foster care)	14 (13)
Typical school, <i>n</i> (%)	87 (83)
Vocational school, <i>n</i> (%)	18 (17)
At least 1 class repeated, <i>n</i> (%)	
No	66 (62)
Yes	41 (38)
Suicidality characteristics	
Number of suicide attempts, mean (SD), range	1.56 (1.45), 1–10.0
Posner ideation, <i>n</i> (%)	29 (28)
No	20 (19)
Passive	53 (51)
Active	2 (2)
Posner intentionality, <i>n</i> (%)	25 (24)
No	14 (13)
Masked	38 (36)
Ambivalent	26 (25)
Definitive	2 (2)
Method of suicide attempt, <i>n</i> (%)	
Intoxication	82 (84)
Laceration	7 (7)
Precipitation	1 (1)
Strangulation	5 (5)
Other	3 (3)
Clinical characteristics	
Major depressive episode, yes, <i>n</i> (%)	65 (64)
Borderline disorder, yes, <i>n</i> (%)	70 (67)
BDI-II, mean (SD), range	23.51 (12.99), 0–53.0
BHS, mean (SD), range	8.38 (5.46), 0–19.0
Ab-DIB score, mean (SD), range	17.78 (9.30), 0–40.0
GAF, mean (SD), range	68.15 (15.58), 15.0–92.0
Eysenck impulsivity, mean (SD), range	12.25 (4.77), 2.0–22.0
Self-esteem, mean (SD), range	4.54 (2.76), 0–10.0
Dependence total score, mean (SD), range	8.02 (7.07), 0–43

<b>Table 1 continued</b>	
Dimensional characteristics	
SS, mean (SD), range	
Spiritual beliefs	18.6 (7.62), 4.0–38.0
Self-discovery	20.14 (4.23), 7.0–28.0
Self-awareness and collective consciousness	15.37 (4.41), 5.0–25.0
Respect of others and environment	19.22 (3.15), 7.0–24.0
Total	73.4 (14.11), 36.0–102.0
RFL-A, mean (SD), range	
Family alliance	4.48 (1.02), 1.0–6.0
Suicide related concerns	3.44 (1.4), 0.33–6.0
Self-acceptance	3.96 (1.12), 1.0–6.0
Peer acceptance and support	4.61 (0.98), 1.0–6.0
Future optimism	4.37 (1.0), 1.4–6.0
Total	4.19 (0.87), 1.63–6.0
TCI, mean (SD), range	
Novelty seeking	16.52 (4.22), 5.0–30.0
Persistence	15.47 (4.41), 4.0–26.0
Harm avoidance	17.91 (4.70), 5.0–31.0
Self-directedness	16.12 (5.29), 1.0–27.0
Reward dependence	18.88 (4.75), 8.0–29.0
Cooperativeness	18.77 (5.43), 4.0–32.0
Self-transcendence	10.16 (8.68), 0–24.0
ACS, mean (SD), range	
Seek social support	54.23 (18.79), 20.0–96.0
Focus on solving problem	54.25 (14.97), 16.0–96.0
Work hard and achieve	63.13 (15.53), 12.0–96.0
Worry	52.53 (16.09), 20.0–100.0
Invest in close friends	62.64 (16.45), 28.0–96.0
Seek to belong	58.06 (14.3), 24.0–88.0
Wishful thinking	49.09 (15.74), 20.0–84.0
Not coping	49.13 (17.16), 12.0–96.0
Tension reduction	52.53 (16.35), 20.0–92.0
Social action	31.12 (10.73), 20.0–70.0
Ignore the problem	48.74 (17.13), 20.0–85.0
Self-blame	58.16 (19.53), 15.0–100.0
Keep to self	62.50 (19.72), 15.0–100.0
Seek spiritual support	32.26 (19.51), 15.0–100.0
Focus on the positive	52.82 (16.32), 20.0–95.0
Seek professional help	42.14 (18.28), 20.0–85.0
Seek relaxing diversions	76.86 (18.07), 21.0–105.0
Physical recreation	63.66 (24.28), 21.0–105.0
Ad-DIB = Abbreviated Self-Questionnaire of the Diagnostic Interview for Borderline Personality Disorder; RFL-A = Reasons for Living Inventory for Adolescents; SS = Spirituality Scale	

<b>Table 2 Univariate analysis in adolescents hospitalized for a suicide attempt at 6-month follow-up (n = 107)</b>				
Relapse from suicidal behaviours during the 6-month follow-up, n = 85	No n = 51	Yes n = 34	t, df = 83	P
Major depressive disorder at first hospitalization, n = 85, (%)	27 (53)	25 (74)	2.9 (1–9.4) <sup>a</sup>	0.06
BDI-II, mean (SD)	11.5 (9.9)	21 (14.1)	3.21	0.002
BHS, mean (SD)	5 (3.4)	8.4 (5.2)	3.21	0.002
ACS seek spiritual support, mean (SD)	26.8 (11.7)	36.5 (25.4)	2.07	0.04
New suicide attempt, n = 88	No n = 63	Yes n = 15	t, df = 86	P
BDI-II, mean (SD)	12.9 (10.5)	20.7 (15.2)	2.36	0.02
SS self-awareness and collective consciousness, mean (SD)	15.7 (4.5)	13.0 (4.3)	2.03	0.04
ACS work hard and achieve, mean (SD)	64.7 (13.4)	51.7 (20.5)	2.26	0.04
ACS physical recreation, mean (SD)	66 (24.4)	47 (24.3)	2.6	0.01
New hospitalization, n = 101	No n = 75	Yes n = 26	t, df = 99	P
BDI-II, mean (SD)	13.9 (11.9)	23.1 (14.8)	2.94	0.004
BHS, mean (SD)	5.2 (3.9)	9.4 (5.3)	3.93	<0.001
Number of suicide attempts at first hospitalization, mean (SD)	1.3 (0.8)	2.4 (2.4)	2.23	0.03
ACS seek social support, mean (SD)	56.9 (18.5)	46.6 (18.3)	2.42	0.02
GAF at first hospitalization, mean (SD)	70.8 (13.9)	63.2 (18.5)	2.11	0.03
Self-esteem, mean (SD)	4.1 (2.8)	5.5 (2.7)	2.03	0.05
Hopelessness (BHS), n = 107 <sup>b</sup>	Estimate	Standard error	t, df = 105	P
Ab-DIB score	0.16	0.05	3.37	0.001
BDI-II at first hospitalization	0.15	0.039	3.76	<0.001
BDI-II	0.22	0.026	8.58	<0.001
TCI cooperativeness	–0.18	0.07	2.57	0.01
ACS work hard and achieve	–0.06	0.029	2.08	0.04
ACS seek relaxing diversion	0.06	0.024	2.5	0.01
Eysenck impulsivity	0.29	0.09	3.17	0.002
Depression (BDI-II score), n = 107 <sup>b</sup>	Estimate	Standard error	t, df = 105	P
Ab-DIB score	0.32	0.14	2.21	0.03
BHS	1.6	0.24	6.55	<0.001
Spirituality–spiritual beliefs	0.33	0.13	2.4	0.02
TCI harm avoidance	–0.55	0.27	2.07	0.04
TCI self-transcendence	0.62	0.18	3.41	<0.001
ACS seek social support	0.12	0.05	2.12	0.03
GAF at first hospitalization	0.15	0.07	1.94	0.06

<sup>a</sup> OR (95% CI); <sup>b</sup> Adjusted on score at inclusion (first hospitalization)

Ad-DIB = Abbreviated Self-Questionnaire of the Diagnostic Interview for Borderline Personality Disorder

in a common dimension (which could possibly relate to our latent variable, suicidality). We also calculated several quality parameters, such as the CFI, TLI, and RMSEA.

## Results

### Univariate Analyses

Among the 107 adolescents with available data at 6-month follow-up, 41 (40.6%) relapsed from suicidal

behaviours during the follow-up period. Among them, 15 (17%) had repeated a suicide attempt. Table 2 shows all of the variables that showed a significant association with the variables to be predicted at follow-up: relapse during 6-month follow-up, BDI-II score and BHS at 6-month follow-up. We also detailed risk and protective factors of new suicide attempts and new hospitalizations for indicative purposes as they were fused in the relapse variable.

Higher BHS and BDI-II scores at 6-month follow-up and higher scores for the ACS seek spiritual support were significant risk factors for relapse from suicidal behaviours at 6-month follow-up. Higher BDI-II scores at 6-month follow-up were the only risk factor for new suicide attempts at 6-month follow-up. Three protective factors emerged from the variables assessed at inclusion as follows: the ACS hard work and achievement, physical recreation and spirituality self-awareness, and collective consciousness. Several variables were significantly associated with risk for a new hospitalization during 6-month follow-up: higher BHS and BDI-II scores at 6-month follow-up, the number of suicide attempts at inclusion, and the severity at inclusion. The ACS seeking social support was the only protective factor that emerged from the variables assessed at inclusion.

Higher hopelessness (BHS) at 6-month follow-up was significantly associated with higher borderline personality, impulsivity, and the ACS seeking relaxing diversion scores at inclusion and BDI-II scores at 6-month follow-up. Higher TCI cooperativeness and ACS hard work and achievement scores predicted lower BHS at 6-month follow-up.

Higher depression (BDI-II) scores at 6-month follow-up were significantly associated with higher borderline personality, severity (GAF), spiritual beliefs, TCI self-transcendence, and higher ACS seeking social support scores at inclusion and higher BHS at 6-month follow-up. Higher TCI harm avoidance scores predicted lower BDI-II scores at 6-month follow-up.

### **Modelling Suicidality at 6-Month Follow-Up**

As suicidality is a complex variable, to model suicidality, we hypothesized it could be a latent variable related to relapse from suicidal behaviours during follow-up and to high BDI-II and BHS at 6-month follow-up. These are the key proximal risk factors for suicidality. To enter fewer potential explanatory variables into the model, we also conducted multivariate regression based on previous univariate analyses to select the most robust variables that predicted BHS and BDI-II scores at 6-month follow-up. We also performed new analyses to explore relapse from suicidal behaviours.

Using multivariate regression, higher BDI-II (estimate = 0.1, SE = 0.04,  $t = 2.57$ ,  $df = 81$ ,  $P = 0.01$ ), and impulsivity (estimate = 0.2, SE = 0.09,  $t = 2.21$ ,  $df = 81$ ,  $P = 0.03$ ) scores at inclusion predicted higher hopelessness (BHS) at 6-month follow-up. Also, higher ACS hard work and achievement scores at inclusion predicted lower BHS at 6-month follow-up. Finally, higher TCI self-transcendence (estimate = 0.62, SE = 0.18,  $t = 3.41$ ,  $df = 87$ ,  $P < 0.001$ ) and BDI-II scores at inclusion (estimate = 0.58, SE = 0.077,  $t = 7.43$ ,  $df = 87$ ,  $P < 0.001$ ) predicted higher depression (BDI-II) scores at 6-month follow-up.

Multivariate analysis showed that risk factors for relapse from suicidal behaviours included the existence of a MDE (OR 3.25; 95% CI 1.17 to 10.2,  $P = 0.03$ ) and a higher ACS seeking spiritual support score at inclusion (OR 1.03; 95% CI 1.005 to 1.064,  $P = 0.03$ ); this means that an ACS seeking

spiritual support score increase of 20 points increased the odds ratio for relapse by a factor of 1.8 ( $e^{20 \times 0.03}$ ). No protective factors were found.

The first SEM model included suicidality as a latent variable related to 3 dependent variables as follows: relapse from suicidal behaviours during the follow-up period, as well as BHS and BDI-II scores at 6-month. Explanatory variables were impulsivity, BDI, TCI self-transcendence, ACS seeking spiritual support, ACS hard work and achievement scores, and the existence of a MDE at inclusion. Impulsivity and ACS seeking spiritual support score did not reach statistical significance.

The final SEM model is summarized in Figure 2 and shows excellent quality parameters. First, the 3 dependent variables (relapse, BHS, and BDI-II scores at 6-month follow-up) did, indeed, belong to a common dimension, for example, a common latent variable (suicidality), as they were significantly associated (BDI-II as baseline: estimate = 0.347, SE = 0.11,  $P = 0.002$ ; for BHS: estimate = 0.088, SE = 0.025,  $P = 0.001$  for relapse). Second, model quality parameters were excellent: the CFI and the TLI were close to 1 as expected (CFI = 0.96 and TLI = 0.92). The RMSEA was close to 0 as expected (RMSEA = 0.08; 90% CI 0.00 to 0.17). Statistical links between variables in the model are indicated in Figure 2. Risk factors included higher BDI-II and TCI self-transcendence scores and the existence of a MDE at inclusion. We found only 1 significant protective factor: higher ACS hard work and achievement scores at inclusion.

## **Discussion**

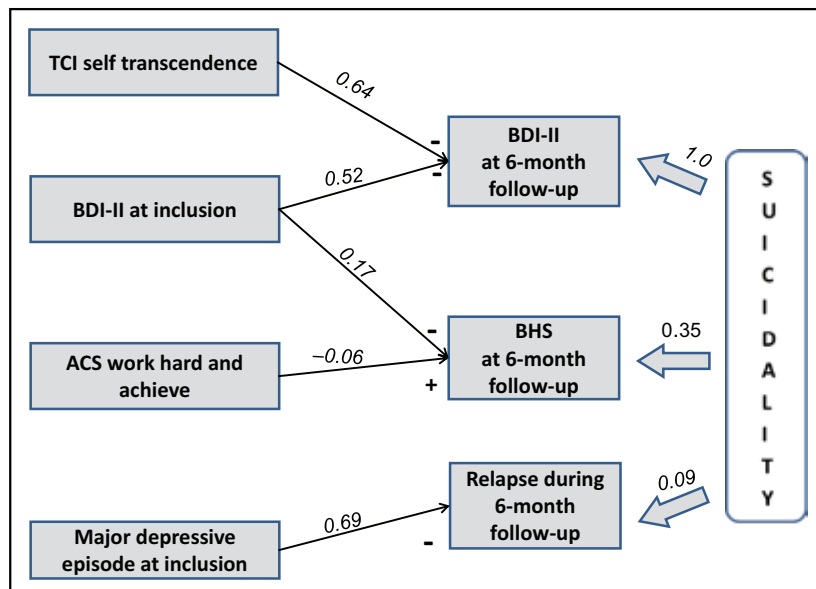
### **Summarizing Current Data**

In adolescents hospitalized for a suicide attempt, the risk of relapse for suicidal behaviours is very high (40.6% in our sample). Among these relapses, re-occurrence of active suicidal behaviours (suicide attempt) is also high (17%). These rates are in line with those found in previous similar studies<sup>16,21</sup> conducted in inpatients that range between 19% to 26% for new suicidal events and 12% to 19% for new suicide attempts during the first 6-month follow-up and confirm that adolescent inpatients who experienced a suicide attempt should be regarded as very high risk subjects. The best fitting SEM did confirm that high depression and hopelessness scores at 6-month follow-up and the occurrence of relapses for suicidal behaviours belonged to the same factorial dimension. Risk factors among the baseline variables included a diagnosis of MDD, high depression scores, and high scores for TCI self-transcendence; only 1 protective factor emerged, ACS hard work and achievement.

### **Limitations and Strengths**

Although our study has some strengths (multisite, prospective, context of free access to care, and hypotheses driven), the exploratory model should be interpreted within the study limitations. First, the sample size may have limited power for some variables (for example, the borderline dimension, impulsivity, and the 1-point data

**Figure 2 Modelling suicidality at 6-month follow-up in adolescent inpatients who had attempted suicide**



for 6-month follow-up) and did not permit the inclusion of treatment moderators in the model. We are hoping to include these measures in further research as the study is still ongoing. Second, the 6-month follow-up was short, and we expect more suicidal events to occur during the next 6 months.<sup>15</sup> Third, some sites did not recruit in the same way and may have introduced biases despite the absence of any site effects in the analysis. Fourth, some important risk factors were not assessed: history of suicide attempts in relatives,<sup>11</sup> family history of mental health problems,<sup>11</sup> poor family cohesion,<sup>16,17</sup> parental relationship,<sup>39</sup> sexual abuse, and school bullying.<sup>40,41</sup> Finally, the sampling only captured a part of the adolescents who died by suicide (Berkson bias) as many completers may not be hospitalized or experience a previous suicide attempt.<sup>5</sup>

### **Comments on Positive Results**

Regarding the clinical risk factors found here, we are not surprised that we again found that MDD, high depression scores at baseline, and at 6-month follow-up are significant risk factors. Both a diagnosis of MDD and the severity of the depression are associated with higher risk for re-occurrence of suicide attempts in adolescent inpatients.<sup>16,21</sup> More striking are the findings from the coping and temperament instruments that we used to examine spirituality.

Spiritual and religious behaviours have always been part of the human experience; however, much controversy remains as to how we should define them. Historically, religiosity and spirituality were well-defined constructs. Based on qualitative analyses of various definitions, Shek<sup>42</sup> reported that the conceptions were distributed over several content areas as connectedness or relationships (horizontality), processes contributing to a higher level of connectedness (verticality), reactions to sacred things,

and personal transcendence. Today, spirituality often refers to an individualistic, open-ended, freeing, and ultimately subjective quest, whereas religiosity has been gradually moving toward a more narrow characterization that represents doctrinal and ritual aspects.<sup>43</sup> Adolescence and young adulthood appear to be key developmental periods for the settlement of one's spirituality. Research on the impact of spirituality on adolescent developmental outcomes suggests that high spirituality is associated with overall better youth development.<sup>44</sup> In at-risk children (for example, children of a depressed mother), family agreement and the practice of a religious denomination may be a protective factor, independent of the effects of maternal depression.<sup>45</sup>

In our study, we used several instruments that referred to spirituality: the SS and some factors from the TCI, ACS, and RFL-A. The Delaney Scale did not appear to influence outcomes. The formulation of the questions is always positive, and the scale does not explore how the adolescent uses spirituality to adapt or cope with life experiences. Here, we found that higher TCI self-transcendence scores at baseline were risk factors for suicidality at 6-month follow-up. TCI self-transcendence refers to questions indicating that the adolescent identifies him- or herself as part of the universe (for example, "I have sometimes the feeling I belong to something that has no limit in time nor space") or has already been involved in an unusual experience (for example, "I think I already experienced once an extra sensorial perception"). In other words, in the context of adolescents who have attempted suicide, those expressing a low value for their life or perceiving themselves as part of a greater universe should be targeted more carefully during treatment. Do these findings mean that, in some cases, the positive support structure commonly present through spirituality is not functioning, as it typically is in



general population samples?<sup>21</sup> Alternatively, do these findings instead mean that the adolescent is desperately seeking outside or magical forces to overcome their suffering? Or does it mean that in some way these adolescents experienced brief psychotic moments?

Only 1 protective factor emerged from the ACS: hard work and achievement. These strategies suggest that the adolescent is conscientious about work or school, works hard and tries to achieve high standards. Stated as a reverse proposition, it also suggests that poor school achievement and school withdrawal are risk factors for suicide attempts in adolescents.<sup>39</sup> As for clinical implications, it suggests that every effort should be made to promote school success and to include in the therapeutic process a discussion of the adolescent's life goals, especially those that also refer to school and education.

### Comments on Negative Predictions

In this very high-risk sample, we found that neither a previous history of suicide attempts at baseline nor the number of suicide attempts prior to hospitalization predicted the re-occurrence of suicidality during the follow-up period in the multivariate analyses. This is contrary to expectations and to other similar studies.<sup>15-17,19,46</sup> In our sample, only 5% of the adolescents had not experienced a past suicide attempt; thus, it can be argued that there was not enough variability to assess the prediction. Yen et al<sup>21</sup> reported a similar finding and proposed that a past history of suicide attempts might be a more reliable predictor of subsequent suicidality in less acute settings (for example, community, school, or primary care samples).

Borderline personality disorder or traits were the second predictors that were significant in univariate analysis but were not significant in the multivariate model. Greenfield et al<sup>46</sup> reported on a 6-month outcome study a large group of adolescents admitted at ED for suicidal behaviours. Borderline personality disorder was associated with subsequent suicidality together with substance use and female sex.<sup>46</sup> However, our findings are similar to those of Yen et al.<sup>21</sup> As we used a dimensional approach and a borderline construct that included symptoms of impulsivity, depressed mood with suicidality and self-injurious behaviours, and psychosis, it may be possible that the construct was too diffuse to adequately represent as a single independent variable. Although controversial, we recommend the assessment of borderline symptomatology in high-risk adolescents.

The third negative finding was the lack of prediction of substance use in our study. This could be because of the young age of our sample and the middle-town areas for recruitment.

The last negative finding was the lack of prediction of traumatic life events, both recent (<1 year) and lifetime, despite several studies reporting the importance of a history of child sexual abuse.<sup>16,21</sup> The Newcomb Inventory includes the probing of 11 events that have occurred in family members and 9 events that were experienced directly by the adolescent. None directly assess a history of child sexual abuse.

## Conclusion

In this very high-risk population, the re-occurrence of a suicide attempt during adolescence is a frequent and major public health concern. Risk factors for future suicide attempts in this population are more difficult to ascertain as some established risk factors may not predict suicidality in adolescents. Our results suggest that adolescents who retain high scores for depression or hopelessness, who seek intense spiritual help, or who express a low value for life through being part of the universe are at higher risk of suicidality and should be targeted with more intense intervention. Developing abilities to improve adolescent motivation in school and work may be protective. Given the sample size, the model should be regarded as exploratory.

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