Clustering Suicide Attempters:
Impulsive-Ambivalent, Well-Planned, or Frequent

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ABSTRACT

Background: Attempts to predict suicidal behavior within high-risk populations have so far shown insufficient accuracy. Although several psychosocial and clinical features have been consistently associated with suicide attempts, investigations of latent structure in well-characterized populations of suicide attempters are lacking.

Methods: We analyzed a sample of 1,009 hospitalized suicide attempters that were recruited between 1999 and 2012. Eleven clinically relevant items related to the characteristics of suicidal behavior were submitted to a Hierarchical Ascendant Classification. Phenotypic profiles were compared between the resulting clusters. A decisional tree was constructed to facilitate the differentiation of individuals classified within the first 2 clusters.

Results: Most individuals were included in a cluster characterized by less lethal means and planning ("impulse-ambivalent"). A second cluster featured more carefully planned attempts ("well-planned"), more alcohol or drug use before the attempt, and more precautions to avoid interruptions. Finally, a small, third cluster included individuals reporting more attempts ("frequent"), more often serious or violent attempts, and an earlier age at first attempt. Differences across clusters by demographic and clinical characteristics were also found, particularly with the third cluster whose participants had experienced high levels of childhood abuse.

Conclusions: Cluster analysis consistently supported 3 distinct clusters of individuals with specific features in their suicidal behaviors and phenotypic profiles that could help clinicians to better focus prevention strategies.

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The World Health Organization estimates that at least 20 suicide attempts (SAs) happen for every completed suicide in the world. Thus, 20 to 30 million SAs could be expected by 2020 if the number of suicides reaches up to 1 million per year.[1] Any SA causes significant affliction to the patients and their kin, as well as a considerable burden on health care systems. The number of SAs assessed in health services of industrialized countries every year is staggering, with about 600,000 attempts in the United States alone,[2] leading to an estimated $6.4 billion expenditure to treat self-harm in 2005.[3] Most suicide attempters are affected by anxiety or depressive disorders,[4] and at least 1 of every 4 is probably a reattempter.[5] Moreover, psychological autopsies have shown that nearly 1 of every 2 suicides is preceded by an unsuccessful attempt.[6] Thus, the prevention of suicide reattempts is a crucial target in which there is plenty of room for improvement.[7] This target would be facilitated if we were able to differentiate the individuals at greater risk among the large population of attempters.

However, in clinical practice, we ignore how to classify attempters into relevant homogeneous groups. Research on this topic started in the 1960s with a pioneer study suggesting that the severity of SAs could be useful to differentiate attempters.[8] Since then, several studies have tried to classify suicide attempters without a priori subgroups, but most of them involved relatively small samples with a limited characterization.[9,10] These clustering studies have been essentially based on either the characteristics of an index SA or the personality traits of the attempters. Regarding the former, a review of the literature showed that the results are inconsistent but provide evidence for a 3-group solution based on medical lethality: mild, moderately severe, and severe attempts.[9] More recently, a study on inpatients who had made medically serious SAs also identified 3 groups with increasing levels of suicidal intent and lethality.[11]

On the other hand, there is substantial variability between studies trying to cluster the personality of suicide attempters with only 2 subtypes that are more robust: (1) an internalizing subtype, characterized by chronic depression and hopelessness and (2) an emotionally dysregulated subtype, close to borderline personality disorder.[12,13] In these studies, groups based on personality differed significantly in psychiatric diagnoses and psychosocial factors, but hardly in the characteristics of their suicidal behavior.

Improving the characterization of suicidal behavior disorder, one of the new research categories of *DSM-5*,[14] could facilitate prevention. To identify clinical profiles of risk, in this study we used a hierarchical model to classify a large sample of suicide attempters into homogeneous clusters according to the global severity of their suicidal behavior. Thus, to better capture the clusters of suicide attempters, and contrary to prior studies, we combined different sources of information: (1) two scales that assess suicidal intent

Clinical Points

- Distributing the large population of suicide attempters into homogenous and relevant subgroups can help to guide clinical decision-making and preventive interventions.
- Some suicide attempters, usually women that have suffered severe childhood abuse, start early and then make very frequent attempts that can become serious.
- Male attempters who have suffered some kind of childhood trauma make well-planned attempts with high suicidal intent.

and medical lethality, (2) features of severity, such as the suicidal method or the age at the first attempt, and (3) use of both categorical and dimensional variables, such as number of attempts and use of drugs. To avoid apriorities, variables not describing the suicidal behavior were not used for clustering. We secondarily compared the phenotypic characteristics of each cluster to facilitate the recognition of the clinical profiles of risk.

METHODS

Sample

Study participants were identified from a cohort of suicide attempters[15] consecutively hospitalized -in a specialized unit of the Montpellier University Hospital between 1999 and 2012. All patients (N = 1,009) had made their SAs in the frame of an affective episode; patients with psychotic features were not hospitalized in the unit. Suicide attempts were defined as self-injury behaviors with a nonzero level of suicidal intent.[16] Patients were aged 18 years and over, French speaking, and had all 4 biological grandparents originating from Western European countries. Trained psychiatrists or psychologists interviewed all patients. After providing a complete description of the study to the subjects, written informed consent was obtained. The local research ethics committee approved this study (CPP Sud Mediterranée IV, CHRU Montpellier, France).

Assessment

Either the French version of the Diagnostic Interview for Genetic Studies (DIGS)[17] or the Mini-International Neuropsychiatric Interview (MINI)[18] were used to obtain Axis I *DSM-IV* psychiatric diagnoses. Lifetime diagnoses were determined using a best-estimate procedure: the psychiatrist in charge of the patient's care assigned the diagnosis based on the MINI or DIGS interview, medical records, and when available, information from relatives.

The assessment of suicidal behavior was based on the Columbia Suicide History Form[19] and Section O of the DIGS. The procedure is a semistructured interview with validated questionnaires to collect information about sociodemographic features and characteristics of the SAs. The questionnaires included the Suicide Intent Scale (SIS)[20] and the Risk-Rescue Rating Scale (RRRS).[21] The SIS is a 20-item ordinal scale that measures specifically the intent to die of any SA, summing up the scores on each item (varying from 0 to 2 or 0 to 3). Two subscales of the SIS were studied: objective circumstances and subject's self-report conception of the SA. The former explores factual aspects of the suicide attempt while the latter examines the thoughts and feelings of the patient at the moment of the attempt. The RRRS measures the medical danger of the SA (risk factors) and the probabilities of being discovered and rescued (rescue factors) and summarizes them in a compound ratio. This ratio provides an estimate of the lethality, or probability of inflicting irreversible damage, of the SA. The French versions of these scales have been previously validated.[22] For each subject, only the highest SIS or RRRS scores of all previous SAs were considered. The violence of SAs was categorized using Åsberg et al's (1976) criteria.[23] Those SAs that required intensive care interventions were considered serious.[15] Cutting was considered violent if surgical treatment was needed. Clinical data, such as age at first SA, were assessed by the interviewer and then blindly rated by an independent psychiatrist according to medical case notes and interviews.

Due to the close relationship between suicidal behavior and hopelessness,[24] subjects were assessed with the Beck Hopelessness Scale[25] (H scale), a 20-item self-reported inventory. The total score ranges from 0 to 20, with 0–8 scores described as absent or low suicide risk and 9–20 scores described as moderate or high suicide risk. Personality assessment included (1) the Buss-Durkee Hostility Inventory[26] (BDHI), which comprises 75 true-false items to evaluate aggressiveness in 8 different subscales including assault (10 items), indirect hostility (9 items), irritability (11 items), resentment (8 items), negativism (5 items), suspicion (10 items), verbal hostility (13 items), and guilt (9 items); (2) the 10th version of the Barratt Impulsiveness Scale[27] (BIS), a 34-item self-reported scale that evaluates impulsive personality traits with a global score and the cognitive, motor, and planning subscales; (3) the State-Trait Anxiety Inventory,[28] a self-report scale that measures anxiety about an event (state) and anxiety level as a personal characteristic (trait), the total score for each ranging from 0 to 60 and that should be interpreted depending on sex and age; and, (4) the Tridimensional Personality Questionnaire[29] (TPQ), a 98-item true-false self-administered questionnaire that measures 3 personality dimensions: novelty seeking (34 items), reward dependence (30 items) and harm avoidance (34 items).

The assessment of the history of childhood trauma was performed using the short version of the Childhood Trauma Questionnaire (CTQ).[30] The CTQ is a 28-item self-report questionnaire that investigates retrospectively 5 dimensions of child maltreatment: emotional abuse, emotional neglect, physical abuse, physical neglect, and sexual abuse. The responses to each item are made in the context of childhood ("when you were growing up") according to a 5-point Likert scale ranging from "never" = 1 to "very often" = 5. Scores range from 5 to 25 for each of the abuse dimensions.

Statistical Analyses

First, an unsupervised clustering method was performed to identify homogeneous clusters of suicide attempters from the following 11 items: violent SA, serious SA, number of SAs, age at the first SA, SA planning score (SIS subscale), SA conception score (SIS subscale), rescue score (RRRS), means of SA (RRRS item 1), SA preparation (item 6 of the SIS), and alcohol or drug use before the SA (items 19 and 20 of the SIS). These variables are commonly used to characterize the severity of suicidal behavior in any given subject.[19] A Hierarchical Ascendant Classification (HAC) was implemented to obtain *k* homogenous groups with low-within variability but high-between variability. The method used to identify subgroups was the Ward method[31] based on the squared Euclidian distance. The number of clusters to conserve was determined by the Semipartial R-Square (SPRSQ), which measures the loss of homogeneity when 2 clusters are aggregated. A low SPRSQ for *k* clusters followed by a high SPRSQ for $k-1$ clusters indicates an appropriate classification in *k* subgroups. Previously, quantitative variables were standardized and a multiple correspondence analysis (MCA) was performed to convert qualitative data into quantitative variables. MCA is the equivalent of principal component analysis for categorical data.[32] To validate the classification, the whole sample was randomly divided into 2 equal subsamples (n = 505 and n = 504). Cluster analyses (with HAC and previous MCA for qualitative variables and standardization for quantitative variables) were repeated in both subsamples independently. Each subsample was divided into 3 groups. The distribution of the variables defined very similar clusters to those obtained with the whole sample (Supplementary eTable 1).

Second, we compared the clusters with regard to their phenotypic profiles using χ^2 or Fisher test for qualitative variables and analysis of variance or Kruskal-Wallis test for quantitative variables. When the global result was significant ($P < .20$), clusters were compared pairwise and *P* values were adjusted for multiple testing by Holm correction.

Finally, to facilitate the distinction in clinical settings between the first 2 clusters of attempters (the demographic and clinical profile of cluster 3 being divergent), a multivariate analysis using classification and regression trees (CART) was performed.[33] This model included all variables that significantly differentiated clusters 1 and 2 ($P < .20$): sex; tobacco use; familial history of suicidal behavior; CTQ responses for emotional abuse, emotional neglect, physical abuse, and physical neglect; the total score of the Beck Hopelessness Scale; and the harm avoidance score from the TPQ.

The CART algorithm builds a binary decision tree through recursive partitioning. Thus, our data set was split into subgroups. At each stage (node), the explanatory variable that divided the observations into 2 subsets with maximum homogeneity was selected. The process was repeated until each node was homogenous with regard to clusters 1 and 2. Then, the tree was pruned using a cross-validation algorithm to avoid overfitting and to obtain the optimal tree with the lowest misclassification cost. Sensitivity, specificity, and positive and negative predictive values were reported to evaluate the performance of the model. Statistical analyses were performed using SAS version 9 statistical software (SAS Institute, Cary, North Carolina) and R 2.9.2 (R Development Core Team and R Foundation for Statistical Computing, Vienna, Austria).

RESULTS

Sample Description

The total sample was composed of 1,940 patients, but we analyzed only 1,009 suicide attempters that had complete records on all selection variables. Excluded patients were significantly younger at the time of assessment (median = 38, interquartile range [IQR] = 27–48, $P = .003$) and at the first suicide attempt (median = 28, IQR = 20–41, $P = .042$) and made more serious attempts (159/654, 24.3%, $P = .013$). They did not differ significantly with the study sample in any other variable.

The study sample had a median age of 41 years (IQR = 29–50) and was composed mostly of females (n = 716, 71%). The majority of the sample was not married (n = 629, 63%) and reported intermediate or high educational level (years of studies median = 12, IQR = 9–14). The main psychiatric diagnoses were major depression (n = 720/1,005, 72%), anxiety disorders (n = 682/904, 75%), and bipolar disorders (n = 251/999, 25%).

According to the characteristics of the suicide attempts, the study sample was divided into 3 clusters with the HAC method (Table 1). There were significant differences between the clusters in all variables used for the selection ($P < .001$). Intercorrelations between quantitative variables used to construct the clusters are shown in Supplementary eTable 2. The main characteristics of each cluster follow.

First Cluster (n = 604)

Suicidal behavior was less severe in the first cluster compared with the others; we labeled this cluster "impulse-ambivalent." Only 12.9% of this cluster had made a serious SA (n = 78). Low-lethality suicidal methods, such as overdose or cutting, were more frequent than in the second cluster (n = 556, 92.1%). Most subjects in this cluster (cluster 1) had never made any active preparation for the SA (n = 436, 72.2%). They also showed the lowest scores regarding self-reported conception of the SA (median = 8, IQR = 5–11).

Second Cluster (n = 365)

The majority of the second cluster (n = 273, 74.8%) had made an active preparation for the SA; we considered their attempts to be "well-planned." Accordingly, this cluster showed the highest scores in the objective circumstances of the SA (SIS subscale; median = 9.0, IQR = 7–10, $P < .01$) and the lowest RRRS rescue scores (median = 11, IQR = 10–12, $P < .01$). Moreover, 1 in every 5 individuals had chosen a suicidal method other than overdose/cutting (n = 75, 20.5%), and attempts by drowning, suffocation, or strangulation

Table 1. Distribution of Selection Features by Clusters ($P < .001$ for all comparisons)

Selection Feature	Total (N = 1,009)	Cluster 1 (n = 604)	Cluster 2 (n = 365)	Cluster 3 (n = 40)	*P* (post hoc tests)[a] 1–2	1–3	2–3
Median (IQR)							
Number of suicide attempts	2 (1–3)	2 (1–3)	2 (1–3)	14 (10–18)	**<.01**	**<.01**	**<.01**
Age at first suicide attempt	30 (20–43)	30 (21–42)	31 (19–47)	24 (15–32)	*.83*	**<.01**	**<.01**
SIS score: objective circumstances	6 (3–8)	4 (2–6)	9 (7–10)	5 (3–6)	**<.01**	.07	**<.01**
SIS score: self-report	10 (7–12)	8 (5–11)	12 (11–14)	12 (7–13)	**<.01**	**<.01**	**<.01**
RRRS rescue score	12 (11–13)	13 (12–14)	11 (10–12)	13 (11–14)	**<.01**	*.11*	**<.01**
n (%)							
Violent suicide attempt	193 (19.1)	87 (14.4)	93 (25.5)	13 (32.5)	**<.01**	**<.01**	.34
Serious suicide attempt	194 (19.2)	78 (12.9)	92 (25.2)	24 (60.0)	**<.01**	**<.01**	**<.01**
Suicide means (RRRS item 1)					**<.01**	*.16*	*.45*
Drowning, suffocation, strangulation	74 (7.3)	28 (4.6)	44 (12.1)	2 (5.0)			
Jump, gunshot	55 (5.5)	20 (3.3)	31 (8.5)	4 (10.0)			
Ingestion, cut, stab	880 (87.2)	556 (92.1)	290 (79.5)	34 (85.0)			
Active preparation for attempt (SIS item 6)					**<.01**	*.87*	**<.01**
None	556 (55.1)	436 (72.2)	92 (25.2)	28 (70.0)			
Minimal to moderate	307 (30.4)	140 (23.2)	157 (43.0)	10 (25.0)			
Extensive	146 (14.5)	28 (4.6)	116 (31.8)	2 (5.0)			
Relationship between alcohol intake and attempt (SIS item 19)					**<.01**	*.82*	.08
No alcohol intake	607 (60.2)	377 (62.4)	202 (55.3)	28 (70.0)			
Intentional alcohol intake	75 (7.4)	61 (10.1)	11 (3.0)	3 (7.5)			
Enough alcohol intake to impair judgment	64 (6.3)	15 (2.5)	48 (13.2)	1 (2.5)			
Not enough to impair judgment	263 (26.1)	151 (25.0)	104 (28.5)	8 (20.0)			
Relationship between drug intake and attempt (SIS item 20)					**<.01**	*.60*	*.55*
No drug intake	326 (32.1)	403 (66.7)	226 (61.9)	30 (75.0)			
Intentional drug intake	6 (0.6)	18 (3.0)	0 (0)	0 (0)			
Enough drug intake to impair judgment	18 (1.8)	0 (0)	6 (1.6)	0 (0)			
Not enough to impair judgment	659 (65.3)	183 (30.3)	133 (36.4)	10 (25.0)			

[a]*P* values for pairwise cluster comparison were corrected by the Holm method. Significant values are in boldface type. Values in italic type indicate nonsignificance ($P > .1$).
Abbreviations: IQR = interquartile range, RRRS = Risk Rescue Rating Scale, SIS = Suicide Intent Scale.

were particularly frequent (n = 44, 12.1% of the cluster). Alcohol (n = 163, 44.6%) or drug (n = 139, 38.1%) intake before the SA was frequent compared to the other clusters. The majority of cases that reported enough alcohol intake to impair judgment before the SA were in this cluster (n = 48, 75.0%). Of note, the use of alcohol before the attempt (no alcohol intake compared to the other modalities of SIS item 19) in this cluster was associated neither with serious attempts ($\chi^2_1 = 2.18$, $P = .14$) nor with more lethal methods (ingestion, cut, or stab compared to the other modalities of RRRS item 1: $\chi^2_1 = 1.37$, $P = .24$).

Third Cluster (n = 40)

Individuals in the third cluster showed by far the earliest age at first SA (median = 24, IQR = 15–32, $P < .01$) and the greater number of SAs (median = 14, IQR = 10–18, $P < .01$). This cluster was labeled "frequent." Serious SAs and violent suicidal means with high potential lethality (jumping from heights or gunshot) were reported more frequently than in the other clusters (n = 24 [60% of the cluster] and n = 4 [10%], respectively). However, they reported less often the use of drugs (only n = 10, 25%) or alcohol (n = 12, 30%) before the SA.

Phenotypic Profiles

A detailed description of demographic and clinical features of the overall sample and the 3 clusters can be found in Table 2. Most phenotypic features differentiated cluster 3 from the other 2 clusters, although statistical significance was not always reached due to the small size of this cluster. Particularly evident for cluster 3 was the majority of females and tobacco smokers (n = 36 [90.0%] and n = 29 [80.6%], respectively). Regarding clinical variables, this cluster had a higher prevalence of anorexia nervosa (n = 8, 23.5%) and anxiety disorders (n = 33, 91.7%) than the other clusters; it also showed a nonsignificant trend for more bipolar disorders (n = 16, 41.0%). Moreover, the rate of familial history of suicidal behavior was highest in cluster 3 (n = 22, 55.0%) followed by cluster 2 (n = 164, 46.5%), both being significantly higher than in cluster 1 (n = 213, 36.5%).

Regarding assessment scales, BDHI scores across clusters differed only in suspicion, which was higher in cluster 3 (median = 7, IQR = 6–8). Again, harm avoidance was elevated in cluster 3 compared to the other clusters (median = 25, IQR = 20–29), but there were no differences in novelty seeking or reward dependence. No significant differences between the clusters were found for the BIS and its subscales.

All CTQ dimensions differed across clusters ($P < .01$), mostly due to higher scores in cluster 3. Pairwise comparisons showed significant differences between cluster 3 and the other clusters in all CTQ dimensions and CTQ total score ($P < .01$), with the sole exception of emotional neglect.

Comparison Between Cluster 1 and Cluster 2

The few phenotypic differences between these clusters ($P < .20$) were submitted to a multivariate analysis in order to better identify subjects in cluster 2, which is associated with higher suicidal intent. The relationships between the

Table 2. Phenotypic Profiles of the Clusters

Profile	N[a]	Total	Cluster 1 (n = 604)	Cluster 2 (n = 365)	Cluster 3 (n = 40)	*P* Global	*P* (post hoc tests)[b] 1–2	1–3	2–3
Demographic features									
Age, median, y (IQR)	1,009	41 (29–50)	40 (28–50)	41 (29–52)	46 (34–51)	*.27*	…	…	…
Female sex, n (%)	1,009	716 (71.0)	438 (72.5)	242 (66.3)	36 (90.0)	**<.01**	**.04**	**.03**	**.01**
Married, n (%)	999	370 (37.0)	229 (38.4)	126 (34.8)	15 (37.5)	*.54*	…	…	…
Years of studies, median (IQR)	983	12 (9–14)	12 (9–14)	12 (10–14)	12 (9–14)	*.58*	…	…	…
Smoking, n (%)	843	566 (67.1)	312 (62.3)	225 (73.5)	29 (80.6)	**<.01**	**<.01**	.06	*.36*
Clinical features, n (%)									
Major depression	1,005	720 (71.6)	432 (71.8)	265 (73.0)	23 (57.5)	*.12*	*.68*	*.12*	*.12*
Bipolar disorder	999	251 (25.1)	149 (24.9)	86 (23.8)	16 (41.0)	.06	*.71*	.06	.06
Anxiety disorder	904	682 (75.4)	409 (75.9)	240 (73.0)	33 (91.7)	**.04**	*.33*	.06	**.04**
Alcohol use disorder	1,003	172 (17.1)	148 (24.6)	105 (29.0)	15 (37.5)	.10	*.27*	*.21*	*.27*
Anorexia	861	69 (8.0)	38 (7.4)	23 (7.42)	8 (23.5)	**.01**	*1*	**.01**	**.01**
Familial history of suicidal behavior	977	399 (40.8)	213 (36.5)	164 (46.5)	22 (55.0)	**<.01**	**<.01**	**.04**	*.31*
Assessment scales, median (IQR)									
Buss-Durkee Hostility Inventory									
Assault	748	4 (2–6)	4 (2–6)	3 (2–6)	4 (3–6)	*.50*	…	…	…
Indirect hostility	757	5 (4–7)	5 (4–7)	5 (4–7)	6 (5–7)	*.45*	…	…	…
Irritability	741	8 (6–9)	8 (6–9)	8 (6–9)	9 (7–9)	*.14*	*.63*	*.14*	*.16*
Resentment	766	5 (4–7)	5 (4–6)	6 (4–7)	6 (4–6)	*.84*	…	…	…
Negativism	781	3 (2–4)	3 (2–4)	3 (2–4)	4 (3–5)	.09	*.66*	.09	.09
Suspicion	749	6 (4–7)	6 (4–7)	6 (4–7)	7 (6–8)	**.03**	*.43*	**.03**	**.02**
Verbal hostility	717	8 (6–9)	8 (6–9)	8 (6–10)	8 (5–9)	*.62*	…	…	…
Guilt	759	7 (5–8)	7 (6–8)	7 (5–8)	7 (6–8)	*.45*	…	…	…
Barratt Impulsiveness Scale									
Cognitive	712	22 (17–26)	22 (17–26)	21 (17–27)	25 (20–29)	*.16*	*.87*	*.16*	*.16*
Motor	713	20 (14–25)	19 (14–25)	20 (14–26)	19 (15–25)	*.92*	…	…	…
Planning	687	20 (15–25)	20 (15–25)	21 (15–25)	23 (19–29)	.06	*.24*	*.13*	*.24*
Total	598	61 (51–74)	60 (51–72)	63 (51–75)	69 (54–78)	*.12*	*.34*	*.20*	*.34*
State-Trait Anxiety Inventory									
State	671	50 (47–53)	50 (47–53)	49 (47–52)	50 (48–55)	.41	…	…	…
Trait	637	50 (47–53)	50 (47–53)	50 (47–53)	50 (49–59)	.27	…	…	…
Beck Hopelessness Scale	611	10 (6–15)	10 (6–14)	11 (7–15)	10 (9–14)	.10	*.15*	*.53*	*.85*
Tridimensional Personality Questionnaire									
Novelty seeking	625	16 (13–19)	16 (13–19)	16 (13–20)	17 (14–21)	*.59*	…	…	…
Reward dependence	619	17 (15–20)	18 (15–20)	17 (15–20)	17 (13–20)	*.66*	…	…	…
Harm avoidance	624	21 (16–26)	22 (16–26)	20 (15–25)	25 (20–29)	**<.01**	**.03**	**.03**	**.01**
Childhood Trauma Questionnaire, median (IQR)									
Physical abuse	754	6 (5–9)	6 (5–9)	6 (5–10)	10 (6–16)	**<.01**	.06	**<.01**	**<.01**
Emotional neglect	751	14 (0–19)	14 (10–20)	14 (10–20)	17 (11–22)	**<.01**	.09	**.01**	.09
Physical neglect	757	7 (5–10)	7 (5–10)	7 (5–10)	9 (7–14)	**<.01**	*.14*	**<.01**	**<.01**
Sexual abuse	746	5 (5–8)	5 (5–8)	5 (5–8)	8 (5–20)	**<.01**	*.25*	**<.01**	**<.01**
Emotional abuse	751	11 (7–16)	10 (7–16)	12 (7–17)	15 (12–20)	**<.01**	**.04**	**<.01**	**<.01**
Total score	680	46 (35–59)	43 (34–58)	48 (36–60)	59 (46–82)	**<.01**	.08	**<.01**	**<.01**

[a]The total number of patients for each variable changes due to missing data.
[b]*P* values for pairwise cluster comparisons were corrected by Holm method. Significant values are in boldface type. Values in italic type indicate nonsignificance (*P* > .1).
Symbol: … = When global *P* value was > .2, clusters were not compared with each other.
Abbreviations: IQR = interquartile range.

variables introduced in the model are reported in Table 3. The familial history of suicidal behavior was strongly associated with female gender, tobacco use, and CTQ scores and was not retained in the decision tree (Figure 1). Additionally, tobacco use was also associated with higher scores in the total CTQ and in the emotional abuse and physical abuse subscales.

According to the decision tree (Figure 1), subjects with a score of emotional abuse ≥ 23.5 were more likely to be classified in cluster 2, while females with a score of < 23.5 usually went into cluster 1. Males with a score of physical abuse < 11.5 were also more likely to be in cluster 1 if they combined either a harm avoidance score of ≥ 20.5 with an emotional neglect score of < 20.5 or a harm avoidance score of < 20.5 with a hopelessness score of < 5.5. Inversely, males reporting high scores of CTQ physical abuse, low harm avoidance combined with high hopelessness, or high harm avoidance combined with high emotional neglect were generally classified into cluster 2.

The sensitivity of this algorithm was 31.2% (CI 95%, 23.4–38.9) and the specificity was 95.4% (CI 95%, 92.7–98.2). A positive predictive value of 81.1% (CI 95%, 70.6–90.6) was obtained in separating clusters 1 and 2, as well as a negative predictive value of 68.8% (CI 95%, 63.5–74.0).

DISCUSSION

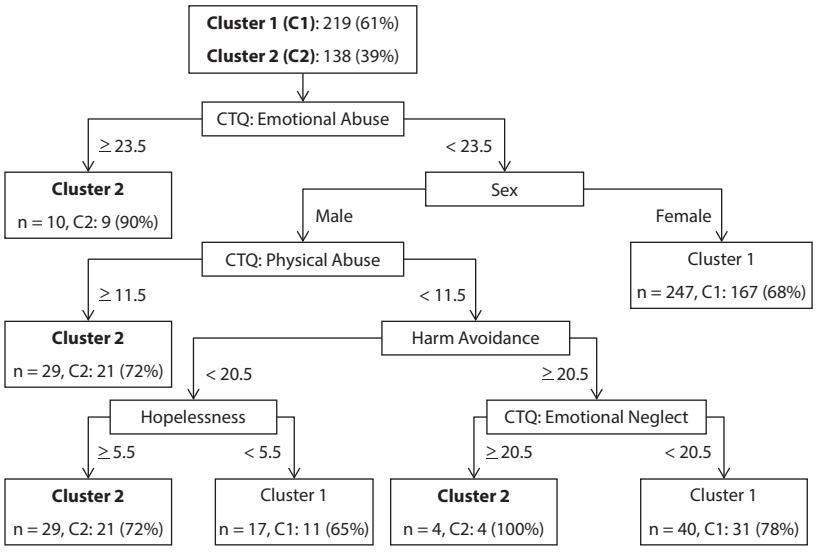
The prediction of suicide and suicidal behaviors has been the object of a large body of research, with unsatisfying results so far.[34] However, few studies to date have tried to

Table 3. Relationships Between Variables in Pooled Clusters 1 and 2 ($P < .20$)[a]

	Familial History (yes)	Tobacco (yes)	Harm Avoidance	CTQ Emotional Abuse	CTQ Physical Abuse	CTQ Emotional Neglect	CTQ Physical Neglect	Hopelessness
Sex (male vs female)	**.03**[b] 35% vs 42%	.10[b] 71% vs 65%	**<.001**[c] 19 (14–23) vs 22 (17–27)	**<.001**[c] 8 (6–13) vs 12 (7–27)	.95	**.007**[c] 13 (10–17) vs 14 (10–19)	.55[c] 7 (5–10) vs 7 (5–10)	.28[c] 10 (6–14) vs 11 (7–15)
	Familial History (no vs yes)	**.004**[b] 62% vs 72%	.56	**<.001**[c] 10 (6–15) vs 12 (8–17)	**<.001**[c] 5 (5–8) vs 7 (5–10)	**<.001**[c] 13 (10–17) vs 15 (11–20)	**<.001**[c] 7 (5–9) vs 8 (5–10)	.44
		Tobacco (no vs yes)	.892	**<.001**[c] 9 (6–14) vs 11.5 (7–17)	**.001**[c] 5 (5–8) vs 6 (5–10)	.07[c] 13 (10–18) vs 15 (10–19)	.07[c] 7 (5–9) vs 7 (5–10)	.35
			Harm Avoidance	**.002**[d] 0.13	.45[d] −0.03	.06[d] 0.08	0.47[d] 0.03	**<.001**[d] 0.33
				CTQ Emotional Abuse	**<.001**[d] 0.53	**<.001**[d] 0.55	**<0.001**[d] 0.40	**<.001**[d] 0.14
					CTQ Physical Abuse	**<.001**[d] 0.42	**<.001**[d] 0.36	.05[d] 0.08
						CTQ Emotional Neglect	**<.001**[d] 0.55	**.02**[d] 0.10
							CTQ Physical Neglect	.10[d] 0.07

[a]Significant values are shown in boldface type.
[b]Dichotomous variables were compared using χ^2 tests; *P* values and percentages are reported.
[c]Median scores were compared between dichotomous variables with Wilcoxon Mann Whitney test; *P* value is shown with median and IQR (P25–P75).
[d]Relationships between 2 continuous variables are expressed using Spearman correlation coefficients with associated *P* values.
Abbreviations: CTQ = Childhood Trauma Questionnaire, IQR = interquartile range.

Figure 1. Classification of Participants (n = 357) in Clusters 1 (impulse-ambivalent) and 2 (well-planned) According to the Decision Tree[a]



[a]The decision tree was built using subsamples of clusters 1 and 2 that had complete information in all variables that significantly differentiated them. In each terminal node, the total number of patients is followed by the number and percentafge of patients correctly classified in the clsuter.
Abbreviation: CTQ = Childhood Trauma Questionnaire.

group suicide attempters in graded levels of risk. In this study, we have explored the latent clusters in a large population of suicide attempters who were consecutively admitted in a specialized unit. Classifying attempters according to the individuals' suicidal behaviors resulted in 3 clearly divergent clusters.

The first and largest cluster included mostly "impulsive-ambivalent" attempters. Their attempts were less organized (lower SIS scores), and they generally used less harmful methods (RRRS item 1: ingestion, cut, stab). The second cluster would correspond to a "well-planned" type of suicide attempter. These subjects made more preparations for the attempt (high SIS subscale scores), used alcohol or drugs more often prior to the attempt, and took more precautions to avoid being interrupted or rescued (low RRRS rescue scores). In other words, they had more suicidal intent and fewer possibilities of receiving help. In the third cluster we found few but "frequent"

attempters. Subjects in this cluster had attempted suicide for the first time at a younger age, had made more attempts with at least 1 being violent or serious, and used primers such as alcohol or drugs less often. Of note, our clusters are similar to those described by Paykel and Rasaby[35]: the first showed, on the whole, less life-risk and psychiatric morbidity; the second made more self-destructive, violent, and serious attempts; and the third and smallest group had a previous history of many attempts and gestures. They are similar also to the repeated serious and nonserious attempts described by Kurz et al[36] in a sample of parasuicide patients. An important difference with their results is that our third cluster was associated with serious or violent attempts, suggesting an increase of suicidal severity with repeated attempts that agrees with the literature.[5] Regarding cluster analysis on completed suicide, 2 studies[37,38] have described one cluster associated with nonacute stress and high planning that resembles our well-planned attempters.

Clinically, frequent attempters would be easily differentiated from the other clusters by the early onset and higher number of attempts, but also by the accompanying psychiatric morbidity, the familial history of suicidal behavior, and the high levels of harm avoidance and childhood maltreatment. Thus, frequent attempters appear to have the typical traits of borderline personality disorder that have been described in studies clustering attempters by their personality.[13] However, impulsive-ambivalent and well-planned attempters showed a similar phenotypic profile. We explored differences between these 2 clusters in order to identify well-planned attempters (Figure 1). The experience of severe emotional abuse in childhood appeared as the most useful feature to differentiate these 2 clusters; high scores were associated with the well-planned cluster in 9 of 10 subjects. If not experiencing severe childhood emotional abuse, females were usually classified in the impulsive-ambivalent cluster (68%), but other factors had to be considered for the remaining subjects. Well-planned attempters were first associated with high scores of physical abuse and then according to harm avoidance scores. Harm avoidance, a tendency to inhibit behavior to avoid being punished, has been previously associated with self-aggressiveness[39] and the severity of suicide attempts.[40] The combination of high harm avoidance with childhood emotional neglect or low harm avoidance with high hopelessness conveyed an accrued risk of well-planned attempts. Hopelessness reflects a negative affective evaluation of the environment and has been described as a vulnerability factor for suicidal behavior.[41]

According to our results, an accurate identification of well-planned attempters requires considering several factors at the same time, including harm avoidance and hopelessness levels, as well as a detailed history of childhood maltreatment. Our decision tree discriminated well the low-risk or impulsive-ambivalent subjects (95.4% specificity) but at the expense of increasing the number of false negative results (31.2% sensitivity). Of note, some variables that differentiated well-planned and impulsive-ambivalent attempters were not retained for the final decision tree, probably because of the strong interactions between risk factors. For instance, all dimensions of childhood abuse have been repeatedly associated with familial history of suicidal behaviors[42] and smoking,[43] and both factors were pruned from the final decision tree.

Interestingly, most personality features did not differ across the 3 clusters of suicide attempters. Indeed, only marked suspicion (BDHI subscale) and harm avoidance (TPQ subscale) were found among frequent attempters when compared with the others. Previous research has associated impulsive aggressive traits and anxiety with suicide reattempters,[5] but our cluster of frequent attempters was identified using several features of suicidal behavior, apart from the number of attempts. Thus, although personality traits may be useful to identify suicidal subjects,[44] they may be less specific for particular subtypes of attempters.

We have thoroughly examined a large cohort of hospitalized suicide attempters to determine their most salient clinical profiles, but some limitations should be considered. First, our results may not be generalized to other clinical settings including psychotic or noncompliant subjects and should be tested in independent samples to confirm the validity of the clusters. Second, because our study was cross-sectional, we could not investigate patients' shifts from one cluster to the next. Third, subjects with incomplete data in the selection variables were excluded, even though they were associated with some features of severity in their SAs. If included, they would have probably helped to differentiate the more severe clusters. Fourth, the decision tree is exploratory in nature and does not imply any causal links.

The Research Prioritization Task Force of the US National Action Alliance for Suicide Prevention recently stated the prevention of subsequent suicidal behavior after an initial attempt as one of the main goals of suicidal research.[45] Thus, we need to identify and target high-risk subjects among the excessive number of suicide attempters that are evaluated every day in any hospital in any industrialized country. Furthermore, the accurate identification of high-risk subjects is key to understanding the mechanisms of suicidal behavior, particularly the overlapping between attempted and completed suicide.[46] Identifying relevant clinical profiles or clusters may help to categorize suicidal patients into graded levels of risk and treatment, but future studies are needed to confirm our results in independent samples.

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REFERENCES

1. Hoven CW, Mandell DJ, Bertolote JM. Prevention of mental ill-health and suicide: public health perspectives. *Eur Psychiatry*. 2010;25(5):252–256.

2. Ting SA, Sullivan AF, Boudreaux ED, et al. Trends in US emergency department visits for attempted suicide and self-inflicted injury, 1993–2008. *Gen Hosp Psychiatry*. 2012;34(5):557–565.
3. Caine ED. Forging an agenda for suicide prevention in the United States. *Am J Public Health*. 2013;103(5):822–829.
4. Nock MK, Hwang I, Sampson NA, et al. Mental disorders, comorbidity and suicidal behavior: results from the National Comorbidity Survey Replication. *Mol Psychiatry*. 2010;15(8):868–876.
5. Mendez-Bustos P, de Leon-Martinez V, Miret M, et al. Suicide reattempters: a systematic review. *Harv Rev Psychiatry*. 2013;21(6):281–295.
6. Trémeau F, Staner L, Duval F, et al. Suicide attempts and family history of suicide in three psychiatric populations. *Suicide Life Threat Behav*. 2005;35(6):702–713.
7. National Institute of Mental Health and the Research Prioritization Task Force. A prioritized research agenda for suicide prevention: an action plan to save lives. 2014:1–176. National Action Alliance for Suicide Prevention Web site. http://www.suicide-research-agenda.org. Updated February 2014. Accessed October 6, 2015.
8. Tuckman J, Youngman WF. Identifying suicide risk groups among attempted suicides. *Public Health Rep*. 1963;78(9):763–766.
9. Arensman E, Kerkhof JF. Classification of attempted suicide: a review of empirical studies, 1963–1993. *Suicide Life Threat Behav*. 1996;26(1):46–67.
10. Wolodzko T, Kokoszka A. Classification of persons attempting suicide: a review of cluster analysis research [in Polish]. *Psychiatr Pol*. 2014;48(4):823–834.
11. Rapeli CB, Botega NJ. Clinical profiles of serious suicide attempters consecutively admitted to a university-based hospital: a cluster analysis study. 2005;27(4):1-5.
12. Engström G, Alling C, Gustavsson P, et al. Clinical characteristics and biological parameters in temperamental clusters of suicide attempters. *J Affect Disord*. 1997;44(1):45–55.
13. Ortigo KM, Westen D, Bradley B. Personality subtypes of suicidal adults. *J Nerv Ment Dis*. 2009;197(9):687–694.
14. American Psychiatric Association. *Diagnostic and Statistical Manual of Mental Disorders*. Fifth Edition. Arlington, VA: American Psychiatric Publishing; 2013.
15. Giner L, Jaussent I, Olié E, et al. Violent and serious suicide attempters: one step closer to suicide? *J Clin Psychiatry*. 2014;75(3):e191–e197.
16. Silverman MM, Berman AL, Sanddal ND, et al. Rebuilding the tower of Babel: a revised nomenclature for the study of suicide and suicidal behaviors. part 1: background, rationale, and methodology. *Suicide Life Threat Behav*. 2007;37(3):248–263.
17. Preisig M, Fenton BT, Matthey M-L, et al. Diagnostic Interview for Genetic Studies (DIGS): inter-rater and test-retest reliability of the French version. *Eur Arch Psychiatry Clin Neurosci*. 1999;249(4):174–179.
18. Sheehan DV, Lecrubier Y, Sheehan KH, et al. The Mini-International Neuropsychiatric Interview (M.I.N.I.): the development and validation of a structured diagnostic psychiatric interview for *DSM-IV* and *ICD-10*. *J Clin Psychiatry*. 1998;59(suppl 20):22–33, quiz 34–57.
19. Mann JJ, Waternaux C, Haas GL, et al. Toward a clinical model of suicidal behavior in psychiatric patients. *Am J Psychiatry*. 1999;156(2):181–189.
20. Beck RW, Morris JB, Beck AT. Cross-validation of the Suicidal Intent Scale. *Psychol Rep*. 1974;34(2):445–446.
21. Weisman AD, Worden JW. Risk-rescue rating in suicide assessment. *Arch Gen Psychiatry*. 1972;26(6):553–560.
22. Misson H, Mathieu F, Jollant F, et al. Factor analyses of the Suicidal Intent Scale (SIS) and the Risk-Rescue Rating Scale (RRRS): toward the identification of homogeneous subgroups of suicidal behaviors. *J Affect Disord*. 2010;121(1–2):80–87.
23. Åsberg M, Träskman L, Thorén P. 5-HIAA in the cerebrospinal fluid: a biochemical suicide predictor? *Arch Gen Psychiatry*. 1976;33(10):1193–1197.
24. Bagge CL, Lamis DA, Nadorff M, et al. Relations between hopelessness, depressive symptoms and suicidality: mediation by reasons for living. *J Clin Psychol*. 2014;70(1):18–31.
25. Beck AT, Steer RA. *Beck Hopelessness Scale*. The Psychological Corporation; 1988.
26. Buss AH, Durkee A. An inventory for assessing different kinds of hostility. *J Consult Psychol*. 1957;21(4):343–349.
27. Patton JH, Stanford MS, Barratt ES. Factor structure of the Barratt Impulsiveness Scale. *J Clin Psychol*. 1995;51(6):768–774.
28. Spielberger CD, Sydeman SJ, Owen AE, et al. *Measuring Anxiety and Anger with the State-Trait Anxiety Inventory (STAI) and the State-Trait Anger Expression Inventory (STAXI)*. Mahwah, NJ: Lawrence Erlbaum Associates Publishers; 1999.
29. Lépine JP, Pelissolo A, Teodorescu R, et al. Evaluation of the psychometric properties of the French version of the Tridimensional Personality Questionnaire (TPQ) [in French]. *Encephale*. 1994;20(6):747–753.
30. Bernstein DP, Stein JA, Newcomb MD, et al. Development and validation of a brief screening version of the Childhood Trauma Questionnaire. *Child Abuse Negl*. 2003;27(2):169–190.
31. Ward JH Jr. Hierarchical grouping to optimize an objective function. *J Am Stat Assoc*. 1963;58(301):236–244.
32. Greenacre M, Blasius JR, eds. *Multiple Correspondence Analysis and Related Methods*. Boca Raton, FL: Chapman and Hall/CRC; 2006.
33. Breiman L, Friedman JH, Olshen RA, et al. *Classification and Regression Trees*. Belmont, CA: Wadsworth Publishing Group; 1984.
34. Blasco-Fontecilla H, López-Castroman J, Giner L, et al. Predicting suicidal behavior: are we really that far along? comment on "discovery and validation of blood biomarkers for suicidality." *Curr Psychiatry Rep*. 2013;15(12):424.
35. Paykel ES, Rassaby E. Classification of suicide attempters by cluster analysis. *Br J Psychiatry*. 1978;133(1):45–52.
36. Kurz A, Möller HJ, Baindl G, et al. Classification of parasuicide by cluster analysis: types of suicidal behaviour, therapeutic and prognostic implications. *Br J Psychiatry*. 1987;150(4):520–525.
37. O'Connor RC, Sheehy NP, O'Connor DB. The classification of completed suicide into subtypes. *J Ment Health*. 1999;8(6):629–637.
38. Chen EYH, Chan WSC, Chan SSM, et al. A cluster analysis of the circumstances of death in suicides in Hong Kong. *Suicide Life Threat Behav*. 2007;37(5):576–584.
39. Giegling I, Olgiati P, Hartmann AM, et al. Personality and attempted suicide: analysis of anger, aggression and impulsivity. *J Psychiatr Res*. 2009;43(16):1262–1271.
40. Perroud N, Baud P, Ardu S, et al. Temperament personality profiles in suicidal behaviour: an investigation of associated demographic, clinical and genetic factors. *J Affect Disord*. 2013;146(2):246–253.
41. Hawton K, van Heeringen K. Suicide. *Lancet*. 2009;373(9672):1372–1381.
42. Lopez-Castroman J, Jaussent I, Beziat S, et al. Suicidal phenotypes associated with family history of suicidal behavior and early traumatic experiences. *J Affect Disord*. 2012;142(1–3):193–199.
43. Kristman-Valente AN, Brown EC, Herrenkohl TI. Child physical and sexual abuse and cigarette smoking in adolescence and adulthood. *J Adolesc Health*. 2013;53(4):533–538.
44. Brezo J, Paris J, Turecki G. Personality traits as correlates of suicidal ideation, suicide attempts, and suicide completions: a systematic review. *Acta Psychiatr Scand*. 2006;113(3):180–206.
45. Claassen CA, Pearson JL, Khodyakov D, et al. Reducing the burden of suicide in the US: the aspirational research goals of the National Action Alliance for Suicide Prevention Research Prioritization Task Force. *Am J Prev Med*. 2014;47(3):309–314.
46. Aleman A, Denys D. Mental health: a road map for suicide research and prevention. *Nature*. 2014;509(7501):421–423.

Editor's Note: We encourage authors to submit papers for consideration as a part of our Focus on Suicide section. Please contact Maria A. Oquendo, MD, at moquendo@psychiatrist.com.

Supplementary material follows this article.

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Supplementary Material

Article Title: Clustering Suicide Attempters: Impulsive-Ambivalent, Well-Planned, or Frequent

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List of Supplementary Material for the article

1. **eTable 1** Distribution of the Variables Used to Construct the Clusters Across 2 Randomly Selected Subsamples
2. **eTable 2** Intercorrelations Between Quantitative Variables Used to Construct the Clusters

Disclaimer

This Supplementary Material has been provided by the author(s) as an enhancement to the published article. It has been approved by peer review; however, it has undergone neither editing nor formatting by in-house editorial staff. The material is presented in the manner supplied by the author.

Supplementary eTable 1. Distribution of the variables used to construct the clusters across 2 randomly selected subsamples.

Construction variables	Subsample 1	Subsample 2
Violent Suicide Attempt		
Cluster 1	36 (12.72%)	56 (13.79%)
Cluster 2	56 (30.43%)	28 (32.56%)
Cluster 3	13 (35.14%)	4 (30.77%)
Serious suicide attempt		
Cluster 1	24 (8.48%)	60 (14.78%)
Cluster 2	50 (27.17%)	27 (31.40%)
Cluster 3	24 (64.86%)	9 (69.23%)
Number of suicide attempts *median (IQR_{25-75})*		
Cluster 1	2 (1-2)	2 (1-3)
Cluster 2	2 (1-3)	1 (1-2)
Cluster 3	10 (6-11)	15 (15-20)
Age at first suicide attempt *median (IQR_{25-75})*		
Cluster 1	28 (20-43)	28.5 (20-41)
Cluster 2	35 (23-45)	42 (30-52)
Cluster 3	24 (17-33)	21 (16-28)
SIS score: Objective Circumstances *median (IQR_{25-75})*		
Cluster 1	4 (2-5)	5 (3-7)
Cluster 2	9 (7-10)	10.5 (8-12)
Cluster 3	6 (4-7)	7 (6-10)
SIS score: Self-report *median (IQR_{25-75})*		
Cluster 1	8 (6-11)	9 (6-12)
Cluster 2	12 (11-13)	13 (12-14)
Cluster 3	11 (9-13)	12 (10-14)
RRRS Rescue score, *median (IQR_{25-75})*		
Cluster 1	13 (12-14)	13 (12-14)
Cluster 2	11 (10-12)	10 (9-11)
Cluster 3	12 (11-13)	11 (10-12)
Suicide means (RRRS item 1),		
Cluster 1 *Drowning, suffocation,* *strangulation Jump, gunshot* *Ingestion, cut, stab*	 10 (3.53%) 8 (2.83%) 265 (93.64%)	 15 (3.69%) 14 (3.45%) 377 (92.86%)
Cluster 2 *Drowning, suffocation,* *strangulation Jump, gunshot* *Ingestion, cut, stab*	 33 (17.93%) 17 (9.24%) 134 (72.83%)	 12 (13.95%) 12 (13.95%) 62 (72.1%)

Cluster 3		
Drowning, suffocation,	4 (10.81%)	0
strangulation Jump, gunshot	4 (10.81%)	0
Ingestion, cut, stab	29 (78.38%)	13 (100%)
Relationship between Drug Intake and Attempt (SIS item 20)		
Cluster 1		
No drug intake	193 (68.20%)	265 (65.27%)
Intentional drug intake	0	10 (2.46%)
Enough drug to impair	0	2 (0.49%)
judgement	90 (31.80%)	129 (31.77%)
Not enough to impair judgement		
Cluster 2		
No drug intake	116 (63.04%)	57 (66.28%)
Intentional drug intake	8 (4.35%)	0
Enough drug to impair	4 (2.17%)	0
judgement	56 (30.43%)	29 (33.7%)
Not enough to impair judgement		
Cluster 3		
No drug intake	22 (59.46%)	6 (46.15%)
Intentional drug intake	0	0
Enough drug to impair	0	0
judgement	15 (40.5%)	7 (53.85%)
Not enough to impair judgement		
Active Preparation for Attempt (SIS item 6)		
Cluster 1		
None	206 (72.79%)	263 (64.78%)
Minimal to moderate	65 (22.97%)	112 (27.59%)
Extensive	12 (4.24%)	31 (7.64%)
Cluster 2		
None	45 (24.46%)	7 (8.14%)
Minimal to moderate	85 (46.20%)	33 (38.37%)
Extensive	54 (29.35%)	46 (53.49%)
Cluster 3		
None	25 (67.57%)	10 (76.92%)
Minimal to moderate	10 (27.03%)	2 (15.38%)
Extensive	2 (5.41%)	1 (7.69%)
Relationship between Alcohol Intake and Attempt (SIS item 19)		
Cluster 1		
No alcohol intake	180 (63.60%)	242 (59.61%)
Intentional alcohol intake	17 (6.01%)	36 8.87%)
Enough alcohol to impair	13 (4.59%)	29 (7.14%)
judgement		
Not enough to impair judgement	73 (25.80	99 (24.38%)
Cluster 2		
No alcohol intake	104 (56.52%)	53 (61.63%)

Intentional alcohol intake	14 (7.61%)	7 (8.14%)
Enough alcohol to impair judgement	19 (10.33%)	2 (2.33%)
Not enough to impair judgement	47 (25.54%)	24 (27.91%)
Cluster 3		
No alcohol intake	21 (56.76%)	7 (53.85%)
Intentional alcohol intake	1 (2.70%)	0
Enough alcohol to impair judgement	0	1 (7.7%)
Not enough to impair judgement	15 (40.54%)	5 (38.5%)

Supplemenary eTable 2. Intercorrelations between quantitative variables used to construct the clusters.

Spearman Correlation Coefficients, N=1009 Prob > |r| under H0: Rho=0	**Number of suicide attempts**	**Age at the first suicide attempt**	**SIS scale: objective circumstances**	**SIS scale: self-concept**	**RRRS Rescue score**
Number of suicide attempts	1.00000	-0.38184 <.0001	0.02095 0.5063	0.18947 <.0001	-0.05881 0.0618
Age of the patient at the first suicide attempt	-0.38184 <.0001	1.00000	0.04532 0.1503	-0.00434 0.8905	-0.07240 0.0215
SIS scale: objective circumstances	0.02095 0.5063	0.04532 0.1503	1.00000	0.48260 <.0001	-0.55861 <.0001
SIS scale: self-concept	0.18947 <.0001	-0.00434 0.8905	0.48260 <.0001	1.00000	-0.40751 <.0001
RRRS Rescue score	-0.05881 0.0618	-0.07240 0.0215	-0.55861 <.0001	-0.40751 <.0001	1.00000