SUPPLEMENTAL MATERIAL

Case examples:

Cluster 1: Cognitive deficits with psychopathology

Participant is a 72-year old white male, never married, who shot himself in the chest with a 16-gauge shotgun in a forest, where he was found accidently by a policeman. He dropped out of school after 8th grade and worked blue collar jobs, eventually obtaining work in a steel mill. He reported being a loner all of his life, a description confirmed by his nephew, who noted that he was "socially backward" and avoided social interactions with people unless he knew them well. He was uncomfortable in new surroundings, lived by routines, and did not cope well when they were disturbed. He reported being comfortable with this life until the onset of his current (first) depressive episode at age 72. At this time he felt sad and useless, he was concerned about his health and burdening others, ruminated about actions from 30 years prior, had trouble thinking and concentrating, and had intermittent thoughts of taking his own life. He had severe deficits in cognitive control (EXIT: 19) and some deficits in other cognitive domains (total cognition DRS: 129). He responded well to antidepressant and at his one year follow-up he was living in a personal care home. He said "he gets angry with himself when he thinks of the suicide attempt last year", but states "I tried to tell people how bad the pain was getting."

Cluster 2: Intact

Participant is a 73-year old retired, married, male living with his wife with no history of suicide attempt or ideation. He went into the service after high school and upon returning home began working for a vending machine company, married and had three children. Though he retired from a stable career, had a good relationship with his wife, and successful children and grandchildren, patient reported feeling down, having little interest or pleasure, trouble sleeping, psychomotor retardation, loss of energy, and feeling like he has let his family down. He stated

that he just has absolutely no interest in doing anything as he ages, and started to see that as a problem. "I just feel like maybe there is something else, it seems like a waste to not have a purpose." He was no longer engaged in activities he formerly enjoyed, such as hunting, fishing, gardening, checking out cars, and home remodeling.

Cluster 3: Poor decision-making and moderate cognitive deficits

Participant is an 82-year old widowed male with suicidal ideation following the loss of his "lady friend." He completed high school and joined the Navy upon graduation. When he returned home he got married and had four children. He worked as a school counselor for 30 years. Participant and his wife were married 55 years until her death in 2007, after which he entered into a relationship with another woman who died of leukemia. He notes these losses as the trigger for his depression, as he doesn't expect to find companionship again "at his age." Impulsively, patient "acquired" a book about poisons with a plan to end his life but he did not take steps to further this plan. At baseline he had moderately severe cognitive impairments (DRS= 127; EXIT=11). Two years after entering the study, patient failed his driving test three times and his license was revoked. He found this loss of independence extremely upsetting. He felt increasingly lonely, as his children had moved out of the area. He made a suicide attempt by overdose of Ambien and Vicodin, stating that he "just became very discouraged, hit a low point in [his] life" and that his "world was collapsing around him." He described the attempt as impulsive, which he immediately regretted and reached out for help.

Cluster 4: Dysfunctional personality

Participant is a 72-year old widowed female who lives alone. She attempted suicide via overdose on 7-15 Ambien pills. She concedes that she knew lethality would be unlikely, but recalls "just wanting to escape…to end it all," and longing to join her late husband in heaven. She endured physical abuse at the hands of her alcoholic father from a young age and

was physically and sexually abused by an older brother. Her mother was depressed and attempted suicide at least twice. Patient reported losing her identity after she retired 6 years ago, and seems to struggle now with finding "where she fits." Long-term patterns of conflict with her family and financial difficulties were her primary stressors. Her son-in-law recently commented that "[patient] needs to let her daughters know what's going on [financially] so that they can decide what to do" with her, and her daughter cut up her credit card in front of her grandchildren, leaving her only an allowance. Patient felt hurt, humiliated, and betrayed by these events, and maintains that she refuses to burden her daughters by living with them as her mother did with her. When asked her reaction to the suicide attempt, she stated "There's a part of me that feels I'm lucky to be here and I should be thankful for what I have, but it's hard not to be paranoid and negative."

Cluster 5: Framing effects but good social support and self-esteem

Participant is a 72-year old married male who resides with his wife of 42 years. He completed high school and worked at US Steel as a shipper until his retirement. Since then he kept busy by volunteering at his church and spending time with his 3 children and 15 grandchildren. He runs a cancer support group and mentors young men with a group called MAD DADS. He had a period of alcohol abuse between ages 30 and 40, at which time he would miss work, get into drunken altercations, and received several DUI charges. His first depressive episode began at age 28 after the death of his father, and his current depressive episode began when he was diagnosed with prostate cancer. Although the cancer is now in remission, his worsening arthritis has led to multiple knee replacement surgeries and mobility limitations, which he cites as triggers of his depression. He denied suicidal ideation and had moderately severe depression (Hamilton score 16).

Measurements:

Global cognitive ability was assessed with the Mattis Dementia Rating Scale (DRS) total score, ranging from 0-144, with lower scores indicating more impairment. The DRS subscales assess Initiation/Perseveration, Attention, Construction, Conceptualization, and Memory. Cognitive control was assessed using the Executive Interview (EXIT; range 0-50 with higher scores indicating more impairment). The 25 items comprising this screening test are administered in rapid succession with minimal instructions to elicit automatic behaviors and disinhibition and also include modifications of well-known "frontal lobe" tests (number/letter sequencing, Stroop, fluency tests, go/no-go tests, and Luria's hand sequences).

Decision competence was assessed using two subscales of the Adult Decision Competence task: Resistance to Framing and Resistance to Sunk Cost (ADMC). These two constructs measure cognitive biases in decision-making. Framing effects occur when value assessments are affected by irrelevant variations in problem descriptions. Sunk cost is the inability to stop an action even after realizing its futility. Sunk cost occurs when one cannot ignore prior investments when making decisions. Optimally, past expenditures should be ignored so that decisions reflect only possible future outcomes. Resistance to framing is cognitively demanding, while susceptibility to sunk cost has been associated with impulsivity. Lower scores indicate suboptimal decision making. Delay discounting was assessed with the Monetary Choice Questionnaire (MCQ).

Dispositional factors: We measured negative urgency (UPPS Negative Urgency subscale, and impulsive/careless social problem solving style (Social Problem Solving Inventory Impulsive/Carelessness subscale. UPPS higher scores, and SPSI lower scores indicate more pathology. We assessed personality functions and different aspects of social support with the perceived burdensomeness scale (higher scores indicate feeling more of a burden), and the

Interpersonal Support Evaluation List (ISEL) Self-esteem subscale (lower scores less self-esteem) and Belongingness subscales.

Supplementary eTable 1. Clinical Characteristics by Suicide Group Status

	Healthy Control[c] (n=57)		All subjects (n=251)		Depressed Controls (n=50)		Ideators (n=46)		Low Lethality Attempters (n=49)		High Lethality Attempters (n=49)		*F / Chi-Squared*	*P*	*Post-hoc*
	Mean|SD(Percentage)														
Age	67.0	6.8	66.7	7.8	67.6	5.8	66.4	9.0	65.5	8.1	67.1	9.0	0.6	0.59	
Gender	28	49%	127	50.6%	25	50%	25	54%	23	47%	26	53%	0.6	0.89	
Caucasian	50	88%	216	86.1%	42	84%	39	85%	40	82%	45	92%	2.3	0.51	
Education (Years)	15.2	2.8	14.3	2.9	14.4	2.4	14.6	2.8	13.8	2.6	13.3	3.4	2.1	0.14	
SES per-capita	29,600	15,400	22,900	19,200	21,600	17,100	22,700	21,800	16,800	17,800	23,800	21,500	0.9	0.46	
Hamilton depression scale (without suicide item)[a]	2.4	1.9	15.0	8.3	16.9	3.4	19.5	5.0	19.6	6.0	19.2	5.6	3.0	**0.03**	D<I,LL
IQ	108.6	12.2	105	15.1	107.4	14.8	106.5	15.4	102.1	15.5	98.5	19.0	3.2	**0.03**	D>HL
Age of Onset of First Depressive Episode	N/A	N/A	45.7	20.9	50.5	18.4	46.4	22.1	39.5	19.3	46.7	22.3	2.3	0.08	
Physical Illness Burden[a]	6.6	3.9	8.3	4.0	10.2	3.4	7.6	4.0	9.2	3.6	8.2	4.4	4.5	**0.00**	D>I,HL
Ideation (Current)[a]	0.2	0.1	10.4	11.3	0.02	0.1	12.3	8.1	18.7	8.9	22.7	7.1	99.0	**0.00**	D<I,LL,HL I<LL, HL LL<HL
Ideation (Lifetime)[a]	0.2	0.1	13.6	12.6	0.7	1.7	18.4	7.2	25.3	6.1	26.2	4.6	245.5	**0.01**	D<I,LL,HL I<LL,HL
Anxiety Disorder (Current)	0%		34%		50%		48%		43%		35%		2.8	0.43	
Anxiety Disorder (Lifetime)	1.8%		37%		49%		51%		51%		39%		0.67	0.57	
Substance Abuse (Current)	0%		9.6%		0%		15%		18%		16%		9.7	**0.02**	D<I,LL,HL
Substance Abuse (Lifetime)	0%		27.9%		26%		37%		47%		35%		4.8	0.19	

[a]Higher scores indicative of more pathology

[c]Please note that ANOVA was only performed in the 4 depressed groups.

Supplementary eTable 2. Cognitive and Personality Characteristics and Social Support by Suicide Group Status

	Healthy Control[c] (n=57)		All subjects (n=251)		Depressed Controls (n=50)		Ideators (n=46)		Low Lethality Attempters (n=49)		High Lethality Attempters (n=49)		*F / Chi-Squared*	*P*	*Post-hoc*
	Mean|SD(Percentage)														
Global Cognition	138.3	2.8	134.4	6.3	135.2	4.0	132.9	7.8	132.2	7.5	132.7	5.9	2.1	0.10	
Cognitive Control[a]	5.7	3.1	7.2	4.1	6.3	3.5	8.5	4.8	8.2	4.3	8.3	3.9	3.0	**0.03**	**D<I**
Resistance to Framing	4.3	0.5	4.1	0.7	4.2	0.7	4.0	0.7	4.0	0.8	3.8	0.8	2.7	**0.05**	**D>LL**
Resistance to Sunk Cost	4.8	0.6	4.7	0.7	4.6	0.6	4.7	0.6	4.1	0.8	4.7	0.8	6.7	**0.00**	**D,I>LL LL<HL**
UPPS Negative Urgency[a]	18.9	4.3	26.0	7.9	25.1	5.9	28.3	7.7	30.2	7.3	27.2	9.7	3.7	**0.01**	**D<LL**
Delay Discounting[b]	-5.4	1.2	-2.2	0.7	-4.7	1.2	-4.4	1.2	-4.3	1.4	-5.1	1.7	3.1	**0.03**	**LL>HL**
Impulsive Carelessness[a]	86.0	9.3	96.7	16.6	98.0	15.8	98.9	15.8	102.6	18.8	99.8	17.1	0.7	0.57	
Perceived Burden-someness[a]	0.2	0.5	2.2	2.8	0.6	0.8	3.5	3.3	4.1	3.3	2.4	2.8	16	**0.00**	**D<I,LL,HL LL>HL**
Self-Esteem	9.4	1.4	6.2	3.1	6.7	2.7	4.8	2.7	4.4	2.7	5.3	2.6	7.4	**0.00**	**D>I,LL,HL**
Belonging	10.5	1.5	7.9	3.1	8.2	2.5	6.6	3.6	5.9	2.3	7.8	3.2	6.5	**0.00**	**D>I,LL LL<HL**
Practical Support	11.0	1.5	8.6	3.2	9.2	2.2	7.5	3.6	6.9	3.1	7.8	3.2	5.2	**0.00**	**D<I,LL**

[a]Higher scores indicative of more pathology

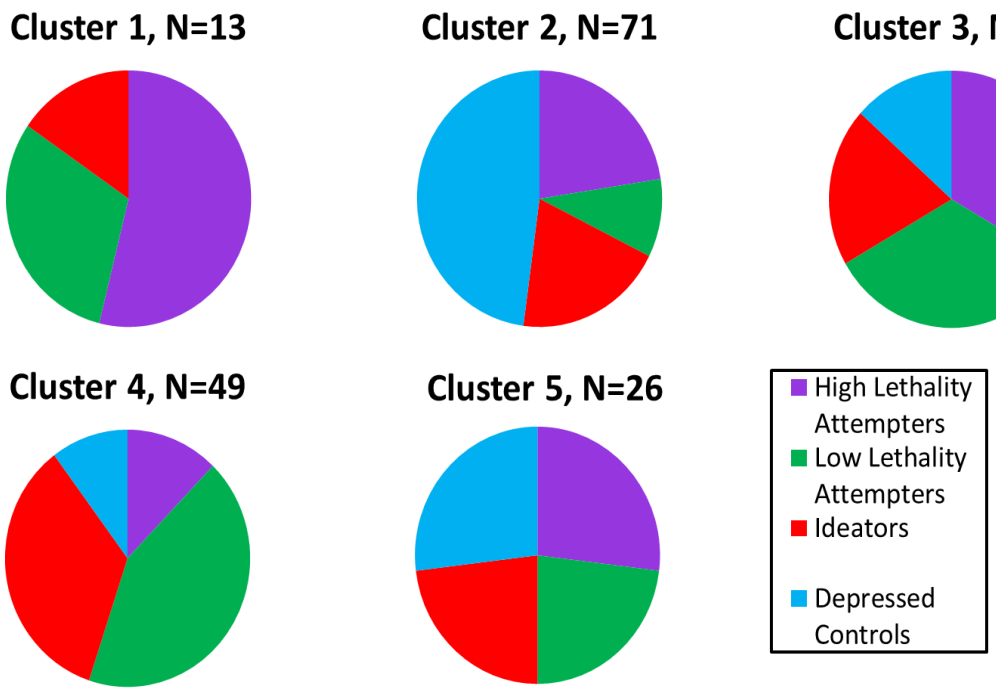
[b]For this assessment, both extremely high and extremely low scores are indicative of maladaptive decision making

[c]Please note that ANOVA was only performed in the 4 depressed groups.

The 194 depressed patients were compared on demographic, clinical, cognitive and personality measures by suicide subgroups. High-lethality attempters had lower IQ than the other depressed groups. The three suicidal groups were more likely to have current substance use than non-suicidal depressed participants, but did not differ among themselves on this measure.

Although depression level was significantly different across groups, none of the pairwise comparisons passed the significance cutoff. Differences across groups on most cognitive and personality/social support measures were driven predominantly by the non-suicidal depressed group. Suicide attempters had higher ideation severity than the ideators. The low-lethality attempter group had more severe deficiencies on Resistance to Sunk Cost than all other groups, including ideators and high-lethality attempters. There were also significant differences between attempters: low-lethality attempters were worse in delaying future rewards, had higher perceived burdensomeness, and reported less belonging than high-lethality attempters.

Supplementary eFigure 1. Proportion of Low- and High- lethality Suicide Attempters, Ideators, and Depressed Controls in each Cluster



[a]The figure illustrates that there were large differences in the compositions of clusters with greater and lesser degrees of suicidal ideation/behavior. The number of participants in the four groups were similar (High lethality attempters N= 49, Low lethality attempters N=49, Ideators N=46, Depressed controls N=50), as high suicide risk groups were oversampled. Thus, we can interpret between-cluster differences but not the absolute proportions.

Attempt lethality by clusters

We reported that there were significant differences among the clusters when binary lethality data were used (see Manuscript). Results were similar when continuous lethality scores of past attempts were used between clusters ($F=4.53$, $df=4,89$; $p=0.002$). Post-hoc comparisons indicated that C-1 and C-2 included individuals with higher lethality of attempts than C-4 (the high personality risk cluster).