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Cognitive, Emotional, Temperament, and Personality Trait Correlates of Suicidal Behavior

Lucas Giner[1] · **Hilario Blasco-Fontecilla**[2] · **Diego De La Vega**[3] · **Philippe Courtet**[4,5]

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Abstract Suicide is one of the leading causes of violent death in many countries and its prevention is included in worldwide health objectives. Currently, the DSM-5 considers suicidal behavior as an entity that requires further study. Among the three validators required for considering a psychiatric disorder, there is one based on psychological correlates, biological markers, and patterns of comorbidity. This review includes the most important and recent studies on psychological factors: cognitive, emotional, temperament, and personality correlates (unrelated to diagnostic criteria). We included classic factors related to suicidal behavior such as cognitive, inflexibility, problem-solving, coping, rumination, thought suppression, decision-making, autobiographical memory, working memory, language fluency, burdensomeness, belongingness, fearless, pain insensitivity, impulsiveness, aggressiveness, and hopelessness. The personality correlates reported are mainly based on the personality theories of Cloninger, Costa and McCrae, and Eysenck. Moreover, it explores conceptual links to other new pathways in psychological factors, emptiness, and psychological pain as a possible origin and common end path for a portion of suicidal behaviors.

Keywords Psychological · Cognitive · Coping · Memory · Burdensomeness · Mental pain · Impulsive · Emptiness · Suicide · Suicidal behavior

This article is part of the Topical Collection on *Mood Disorders*

✉ Lucas Giner
lginer@us.es

[1] Department of Psychiatry, School of Medicine, Universidad de Sevilla, Av. Sánchez-Pizjuán s/n, Seville 41009, Spain

[2] Department of Psychiatry, IDIPHIM-Puerta de Hierro University Hospital, CIBERSAM, Madrid, Spain

[3] Unidad de Salud Mental Comunitaria de Sevilla. Area Sanitaria Hospital Virgen Macarena, Servicio Andaluz de Salud, Sevilla, Spain

[4] CHRU Montpellier, University of Montpellier, INSERM unit 1061, Montpellier, France

[5] Fondamental Foundation, Créteil, France

Introduction

Suicide is a major public health problem worldwide and its prevention is a priority in many countries. It is the leading cause of unnatural death in most countries [1]. In the USA, for every completed suicide, there were about 10 people treated in emergency departments for self-inflicted injuries in 2013 and 10–20 suicide attempts are estimated for every completed suicide [2, 3]. The consequences of completed suicide or suicide attempts in terms of quality of life in suicide attempters, grieving in surviving loved ones, and economic consequences of suicidal behaviors (SBs) have been the focus of numerous studies.

History of attempted suicide is the most important predictive risk factor for completed suicide [4]. About 25 % of suicide attempters have exhibited SBs in the previous year [5]. Among subjects who died due to completed suicide, more than 90 % in the Western and 60 % in the Eastern world were diagnosed with a psychiatric disorder. However, there are a percentage of subjects who did not fit any of the psychiatric disorders recognized today. Oquendo and Baca reported that researchers and clinicians have been quite disappointed in their objective to decrease suicide rates using primary, secondary, and tertiary prevention strategies as normal predictors simply do not work well, especially in identifying short-term risk [6]. In spite of several discussions [6], suicidal behavior is still not recognized as a diagnostic entity in the DSM 5 [7].

Similarly to other psychiatric disorders, SB includes specific characteristics, in this case, violence of the method used, medical consequences, and degree of planning involved. Moreover, possible cultural differences and functional consequences of the suicidal act should also be taken into account. The Guidelines for Making Changes to DSM-5 [8] takes Robins and Guze's concept of validators [9] and modified the classification from that proposed earlier by Kendler as antecedent validators, concurrent validators, and predictive validators. Furthermore, these guidelines indicate that, in order to validate SB as a disorder in the DSM-5, it must meet the three types of validators: antecedent validators (four categories), concurrent validators (two categories), and predictive validators (three categories).

The objectives of this review were to review "psychological factors" related to SB in order to unearth the best scientific evidence regarding one of the three categories of concurrent validators, i.e., cognitive, emotional, temperament, and personality correlates (unrelated to the diagnostic criteria).

Method

The authors conducted a search on PubMed with the following keywords: suicidal behavior [title], suicide attempt* [title], suicide [title] and either temperamental [title], emotion* [title], impulsiv* [title], aggress* [title], hostil* [title], hopeless* [title], cogni* [title], neurocogni* [title], personality [title], and empt* [title] within the last 5 years (from 2012 to 2016). A selection of studies best fitted to our objective was performed. The authors also focused on a set of studies focusing on the role of emptiness as a correlate of SB. Moreover, reference lists from original studies were also screened.

Results and Discussion

Cognitive Correlates

In the last few years, there has been considerable advances in understanding the neurocognitive basis of SB. Neurocognitive distortions may be seen as vulnerability factors (and therefore therapeutic goals) as well as potential endophenotypes of SB [10•]. The most important findings were described.

Cognitive inflexibility can be defined as the tendency to maintain an idea despite evidence proving the contrary, i.e., the tendency to put forward problem-solving solutions that were previously proved inefficient. Neuringer described patients with a history of suicidal behavior who showed extreme cognitive inflexibility [11, 12]. In fact, this feature was pointed out as a factor dramatically increasing the tendency to suicidal ideas and suicide attempts, because it has been associated with greater brooding rumination [13, 14]. Furthermore, under certain circumstances, suicidal people come to the conclusion that suicide is the only way out to escape their situation. Numerous studies, following those of Neuringer, support the relationship between cognitive inflexibility and SB and the different suicide etiopathogenic models that were later added [13, 15–18]. However, some studies also challenge this correlation [19, 20]. As a matter of fact, several studies did suggest that this cognitive inflexibility could be more of a state than a trait, since in patients who clinically recover this cognitive, inflexibility disappears [16, 21, 22].

Problem-solving or *coping* is the ability to identify and analyze elements in a situation of conflict and choose the most effective solution in a given context. Patients with poor problem-solving skills exhibit a greater tendency to suicidal ideation and behavior [23–25]. Adolescence is a vital period characterized by the appearance of many changes (anatomical, psychological, and social interaction alterations) that need to be faced. It has been proven that during adolescence, subjects with poorer problem-solving skills bear the highest risk of suicidal ideation [26], although depression and hopelessness should be also considered [27]. Similarly, old age is a crucial period of changes requiring significant adaptations, and in the elderly population, poor problem-solving skills were associated with suicidal attempts [28]. Several studies put forward the idea that problem-solving skill training could improve depression [27, 29] and SB [24], although results were inconclusive [30, 31•].

Rumination is the compulsively focused attention on the symptoms of one's distress and the possible meanings, causes, and consequences in a repetitive and passive manner, instead of implementing an active problem-solving attitude. In the systematic review by Morrison and O'Connor's, 10 out of the 11 reports evaluated did support the association between rumination and suicidality [32] with current suicidal ideation [33], suicidal ideation over time [34], and suicide attempts [33, 35]. Closely related to hopelessness and depression (well-known suicide factors), rumination was also correlated with other suicide-related neurocognition aspects [36, 37], i.e., cognitive inflexibility and poor problem-solving [13]. Similarly, the authors suggested the existence of an indirect path that went from cognitive inflexibility to brooding rumination, from rumination to hopelessness, and from hopelessness to suicidal ideation [13].

Cognitive control regulates the information processed and our behaviors in order to conform to environmental needs [38]. *Thought suppression* is the attempt to willingly avoid the onset of unwanted thoughts, especially when they are associated to unpleasant emotions. This strategy, apart from being ineffective at times, could also be paradoxical, promoting on the contrary the onset of those unwanted thoughts [39]. Apart from being associated to several mental disorders, thought suppression was linked to ideation and suicidal attempts [40–43].

Decision making is the process of choosing one option out of different available possibilities. It is related to suicidal attempts in adolescents [44, 45], adults [46], and elderly subjects [47] and has been linked to suicidal attempts in patients with unipolar and bipolar depression [48]. Furthermore, impaired decision-making skills were evidenced in most violent suicide attempts [46, 49]. Decision-making impairment was observed in euthymic patients who committed suicidal attempts vs. euthymic patients who did not [50]. This suggests a steady cognitive trait of suicidal vulnerability [48]. Furthermore, healthy (without previous suicidal attempts) first-degree relatives of suicide victims showed poorer results in decision-making tasks [51], suggesting the existence of a cognitive endophenotype which is the inherited trait associated with suicidal vulnerability. Subjects with suicidal behaviors present disadvantageous decision-making skills, which reflect alterations in value-based/motivational/reward-learning processes [52]. It has been proposed that suicidal behavior may rely on a combination of deficits affecting value-based processes (such as an increased risk-taking propensity) and deficits affecting cognitive control [10•]. Current concepts regarding the influence of decision-making impairment in suicidal behavior suggest that in the presence of psychological pain, related to negative life events particularly those threatening social integration, the person will select options associated with an immediate reward (pain relief), in spite of the risk (death) [53].

Subjects with previous suicide attempts present a different *autobiographical memory* compared to the controls: they lack the ability to retrieve specific autobiographical memory, and instead, they produce significant over-general autobiographical memories [54, 55]. It has been suggested that ineffective problem-solving in suicide attempters could be caused by the difficulty in recalling specific autobiographical memories: the latter seemingly work like a database offering possible solutions to cope with problems [56]. A more general autobiographical memory was reported in different suicidal samples: depressed and non-depressed subjects [57], women with borderline personality disorders [58], adolescents [59], older adults [60], and subjects with schizophrenia [61]. Interestingly, Taylor et al. reported in subjects with schizophrenia spectrum disorders that the ability to recall specific autobiographical memories was related to greater suicidality, and conversely, they suggested that non-specific memory may have adaptive qualities in these individuals inhibiting the recall of certain distressing memories [62].

Working memory deficits were reported in past suicide attempters with mood disorders [63, 64], showing differences between high- and low-lethality suicide attempts [20]. In psychotic disorders, the tendency was that subjects with previous SB performed better in working memory tasks [65]. Several studies observed that abnormalities in the working memory of subjects with previous SB disappeared after adjusting for motor impulsivity [66] or depressive symptoms in subjects with schizophrenia [67].

Reduced *language fluency* was reported in depressed suicide attempters [68, 69]. Later research did not report differences between attempters and non-attempters in depressive [70] or bipolar [71] samples. As observed in other cognitive domains, including language fluency tasks, suicide attempters with schizophrenia or schizoaffective disorder exhibited higher cognitive functioning than did non-attempters [65].

The evidence available still does not allow the elaboration of a cognitive suicidal model. The lack of consistent results can be explained by taking into account the variety of samples used, size of sample (sometimes too small), patients' diagnosis, treatment, clinical state, time since their last suicide attempt, or characteristics of the attempt. Notwithstanding, there has been significant progress in our understanding of the neurocognitive factors predisposing patients to SB. Richard-Devantoy et al., in a recent meta-analysis, reviewed vulnerability neuropsychological markers for SB in patients with mood disorders, and they found that the most decisive alterations are those shown in Iowa Gambling task tests, categorical verbal fluency test, and Stroop test [10•].

Temperament, Emotional, and Personality Correlates

Currently, the stress-diathesis model is considered as the gold standard for understanding SB. In this model, the core diathesis factors are impulsiveness, aggression, and hopelessness. Thus, individuals characterized by high impulsiveness, aggression, or hopelessness were more likely to act on suicidal ideation when suffering from psychiatric illness (the stressor) [72]. But, this model, based on 347 inpatients aged 14 to 72 years old, mostly Caucasian subjects recruited in the USA, cannot be generalized to psychiatric patients worldwide [73]. Indeed, we recently stressed that most SB research has been conducted in areas of the world where the risk of suicide is at its lowest. And, this is probably hampering our capacity to build predictive and preventive models that can be extrapolated to a worldwide population [74]. For instance, in a study comparing depressed suicide attempters and controls from Madrid (Spain) and New York City (USA), the authors reported that New York citizens—either attempters or controls—appeared to be more aggressive than did their Spanish counterparts, whereas impulsiveness appeared to be a more stable personality trait across populations [75]. In this part of the present review, we will comment on recent findings regarding impulsiveness, aggressiveness, and hopelessness, as well as stressing the emergence of emptiness as a particularly relevant correlate of SB.

Emotions and temperament features (i.e., hopelessness, emptiness, hostility, impulsiveness, aggressiveness, anger) may indicate a risk for both mood disorders and SB, but their

relationship remains unclear [76]. Indeed, impulsive aggressiveness and hopelessness are among risk factors for suicide attempts (for reviews, see [77] and [78]). All these features are diathesis factors that might increase the risk of SB by mediating the impact of Axis I disorders, particularly in patients diagnosed with major depressive disorder (MDD) [79]. For instance, Keilp et al. reported that aggressiveness was the distinguishing feature of suicide attempts, at least in patients with MDD [80]. Furthermore, in the classic study by Soloff and colleagues [81] comparing 81 inpatients with cluster B personality disorders (BPDs)—including 49 patients with BPD and MDD—to 77 inpatients with MDD, both hopelessness and impulsive aggression predicted a risk of suicide. In 2008, Brent and Melhem suggested that aggression could predict SB, and that impulsiveness and aggression might explain the familial transmission of SB [82]. Furthermore, other authors showed that BPDs were also linked to a family history of suicide attempts [83]. For instance, impulsive aggressiveness might explain the increased risk of repeated suicide attempts, including violent suicide attempts, in antisocial individuals [84, 85]. In this part of the review, we will consider three relevant concepts to SB risk: (1) hostility, impulsiveness, aggressiveness, anger, and rage; (2) emotional (affective) dysregulation; and (3) hopelessness and emptiness.

Regarding hostility, impulsiveness, and aggressiveness, all three features are powerfully associated [80, 86, 87] with an increased risk of SB. For instance, in a sample of violent adult men and women ($n = 235$; 193 agreed to participate) referred to court because of spousal abuse, those affected by BPD as measured by the Self-Harm Inventory were more likely to be suicide attempters [88]. In another study on 68 BPD outpatients, suicide attempters were more likely to display higher aggression scores than were non-attempters [89•]. BPD patients displaying suicide attempts were characterized by higher levels of aggression, particularly self-directed aggression, than were BPD patients without suicide attempts.

Affective or emotional dysregulation is a construct composed of avoidance of abandonment, inappropriate anger, and affective instability [90]. Some authors [89•] suggested that patients showing this type of affective dysregulation might be more likely to display self-aggression (i.e., suicide attempts) when facing negative emotions such as guilt, anger, or self-hatred [91]. For instance, in one study, BPD patients who attempted suicide were more likely to display impaired impulse control and showed higher scores of aggressiveness vs. BPD non-attempters [92, 93]. In another interesting study based on the NESARC survey, the authors reported that the main contributor of the relationship between BPD and suicide attempt could largely be explained by affective dysregulation [94].

Furthermore, recently, Ansell et al. [95] compared 431 individuals with PDs who completed a 10-year follow-up to a sample of individuals diagnosed with MDD. The authors replicated the results of Bolton and Robinson [96] who showed that BPD in itself explained the increased risk of suicide attempts over time. They suggested that their findings probably reflected some personality endophenotypes—i.e., emotional dysregulation, impulsive aggression—underlying multiple PDs [83, 84, 97]. For instance, they found that the main PD explaining multiple suicide attempts in their sample was Narcissistic PD. As they suggested, emotional dysregulation associated with failure to meet inflated expectations might result in interpersonal hostile or aggressive behaviors [98]. Furthermore, we also reported that frequent repeaters (individuals with ≥5 lifetime suicide attempts) exhibited higher levels of trait anger (OR = 2.82, 95 % CI = 1.18–6.75) and lower levels of Anger Expression-Out (OR = 0.17, 95%CI = 0.06–0.47) than did individuals with <5 lifetime suicide attempts [99].

Regarding hopelessness and emptiness, whereas the literature on the relationship between hopelessness and SB is quite extensive, there is surprisingly little empirical research on the relationship between emptiness and suicidal behavior [100]. Emptiness may be defined as a human condition related to a sense of boredom, apathy, and social alienation, although there are many ways classify it depending on the point of view (personality, existential state, emotion, or a symptom) [100]. Some authors recently suggested that self-conscious emotions might hide a range of personality pathologies and mediate the increased risk of SB [95]. For instance, shame proneness was related to self-harm and SB [101, 102]. High levels of hopelessness are a strong predictor of suicide attempt [103, 104] and were also associated with an increased risk for repetitive SB [81, 105, 106]. In a recent study, however, Stringer et al. [107], after adjusting for depression, did not find a statistically significant association between hopelessness and recurrent suicide attempts.

Finally, in a recent review and a series of methodologically different studies, we underlined the critical role of emptiness in suicide attempters, particularly for major repeaters (see above) [108•,109–112]. For instance, in one study aimed at identifying the most discriminative items for SB assessment, we found that emptiness was the most relevant personality factor to discriminate between suicide attempters, psychiatric patients, and healthy controls [111]. In a more recent study, we demonstrated that emptiness was a more relevant pathway than BPD is to prevent repetitive suicide attempts [108]. We recently speculated that emptiness might play an important role in the development of SB addiction [110, 112].

An important percentage of personality disorders were identified within both suicide attempters and completers [113]. Also, personality traits were studied and proposed as an intermediate phenotype in SB in order to facilitate the study

of genetics [114•, 115]. Personality traits differ according to SB subpopulations, such as repeated attempters [116], older depressed attempters [117], or completers [118]. These distinctions may help refine the different needs of patients in prevention programs.

Most studies that examined the relationship between personality dimensions and SB were based on three psychobiological models of personality with the following instruments: Temperament and Character Inventory (TCI) [119], NEO Personality Inventory (NEO-PI) [120], and Eysenck Personality Questionnaire (EPQ) [121]. Several studies analyzed the correlations between the dimensions of these instruments [122–124].

Personality traits more commonly associated with SB include neuroticism and extraversion [117]. The first one, neuroticism, is defined as a stable personality trait that causes a predisposition to breakdown when stressed. The second one, extraversion, is a predisposition to greater social interactions with others. Clonninger pointed harm avoidance as the temperament trait conditioning the behavioral inhibition against relevant stimuli (conditioned signals for punishment, novelty, or frustrative nonreward), and novelty seeking would be the behavioral activation in response to novel stimuli (novelty, potential reward, or potential relief of monotony or punishment) [125].

TCI harm avoidance was related to the NEO-PI neuroticism domain [126] and EPQ neuroticism (and correlated negatively with EPQ extraversion) [122] while the TCI novelty-seeking was correlated to EPQ extraversion, and, to a lesser extent, to EPQ psychoticism [122] and NEO-PI extraversion domain [126]. In addition, between EPQ and NEO-PI, we also found correlations between both neuroticism domains [123].

Among EPQ studies, some fundamental studies were published by Indian researchers. Ponnudurai et al. [127] studied the personality in suicide attempts and reported that nearly half of the attempters obtained high score in extraversion, and almost all subjects had a low psychoticism score. Subsequent studies confirmed higher scores in extraversion and in neuroticism in suicide attempters [128, 129]. Another feature associated with suicide attempters was the correlation between neuroticism and impulsiveness, as some authors suggested that this interaction might trigger vulnerability in crisis situations [129]. In a study on a population of suicide attempters aged 75 and above, these patients scored higher on neuroticism and lower on extroversion compared to general population controls [130].

Among studies using the TCI, results commonly report that suicide attempters exhibit higher scores in harm avoidance (HA) and lower scores in self-directedness (SD) and cooperativeness (C), compared to controls [131–135], even in a young population [132]. Higher harm avoidance scores were also reported among suicide attempters compared to non-suicidal subjects with specific diagnoses, such as anorexia or bulimia [136, 137], bipolar disorders [138, 139], schizophrenia [140], substance abuse [141], and depression [142]. Other variables linked, albeit to a lesser extent, with suicide attempts were higher novelty seeking, self-transcendence [133, 138], and reward dependence [132, 139]. Also, in a further analysis of the dimensions of the personality model "Big Five" (involving neuroticism, conscientiousness, openness to experience, agreeableness, and extraversion) in more than 600 suicide attempts, it was observed that males with a history of attempted suicide were more prone to negative emotions while female attempters exhibited dimensions related to activity and self-regulation [128].

The NEO-PI has been used in SB in depressed subjects aged 50 and above ($n = 110$). Results indicated that those with a history of suicide attempts were less inclined to feel positive emotions and were more self-effacing [117].

Despite the above results, some authors found that there were some differences in personality traits that become less significant when depressive symptoms were taken into account [143]. This would go along the same trend underlining the influence of personality traits in the presence of psychiatric disorders [144]. More specifically, neuroticism was linked to anxiety disorders [145] and depression [146]. Personality traits may also contribute to the suicide risk mediating the presence of adverse events such as childhood abuse [147].

Few studies that assessed personality traits in suicides conducted psychological autopsies. There is an Australian study in suicide victims above the age of 35 with the NEO-PI where the authors found that suicide victims of both sexes ($n = 259$) vs. controls ($n = 181$) had higher mean scores in neuroticism and openness and lower scores on extraversion and agreeableness [148]. The authors stated that the control group may influence the results, since it were composed by sudden death subjects that may have "unhealthy lifestyles," which may explain the higher scores in both neuroticism and openness compared to the control group. In another study that applied the Personality Assessment Schedule (PAS) [149] on completed suicide in individuals aged 60 and above, the authors identified personality "trait accentuation" in a third of the suicide victims (anankastic personality and/or anxious traits), both of these related to neuroticism [150].

However, in a follow-up study of 181 subjects with a history of suicide attempt, 11 individuals died by suicide. They exhibited higher scores in the extraversion dimension on the Karolinska Scales of Personality (KSP) [151]. Another way to study completed suicide is via ecological studies or cohort studies. Among the former, two studies examined suicide rates with personality traits in all the 50 states of the USA. In both studies, lower rates of neuroticism were associated with higher rates of suicide [152,

153]. In a Japanese study on nearly 30,000 people with a 19-year follow-up, it was noted that suicide rates and personality traits (EPQ) were differently correlated according to the time period before the economic crisis than during the economic crisis. Thus, while neuroticism in the period prior to the economic crisis did not significantly influence suicide rates, it did in fact influence suicide rates during the economic crisis [154]. These results of neuroticism seem to be contradictory to the non-ecological studies that may be, in part, due to the method that do not study subjects in particular but by population as a whole.

Differences Between Suicide Attempters and Suicide Completers

Some differences arise in the results obtained in attempters versus completers. These differences may be due to the existence of two different populations with differentiated intention to die and some shared overlapping risk factors [155, 156] whether they are two distinct populations (categories) or they form a spectrum (dimensional). Moreover, intentionality can be analyzed based on the results of the suicidal act (low-lethality; high-lethality; or violent, completed suicide), which may refine and characterize subpopulations of suicide attempters [157]. Those who completed suicide were more likely to be male and were typically older than those who survived a suicide attempt [158, 159]. In this sense, impulsiveness was reported to be higher in suicide attempters than in suicide completers [113] and higher in young than in older completers [160].

Mental Pain as Psychic Endophenotype of SB With Potential Biological Correlates

It has been proposed that SB is a way to escape from the unbearable suffering of mental or psychological pain [161, 162], identified as psychache by Shneidman [163]. There are different situations that favor the appearance of psychic pain, including the perception of social rejection, mental disorders, personality disorders, and cognitive factors [164–166]. The mental pain is also associated with suicidal ideation in non-clinical population [167, 168]. Data suggest that subjects with a history of suicide attempts have a decreased threshold to pain, regardless of depressive disorder [135]. Moreover, the intensity and frequency of suicidal ideation may correlate positively with psychological pain [169]. The importance of social factors of belongingness in SB has been previously remarked [170–173]. The social rejection has been the subject of numerous studies that state the similarities between physical and psychological pain in activation of brain areas [174] or implication of both opioid and cannabinoid systems [175]. These areas also seem to be related to the control of aggression [176]. Moreover, pain rejection favors greater sensitivity to rejection [177], which creates a vicious circle. However, mental pain may encourage social reconnection after the rejection, which would be a reparative function [164], similar to physical pain that helps to prevent the somatic injuries. According to this, there may be some population in which that reconnection is not effective, either due to the intensity of pain or other psychological factors (cognitive, temperamental, personality, mental diagnosis). Currently evidences suggest that the mental pain is related to a low-grade neuroinflammation, which is also related to SB (for a review see Courtet et al. [178•]). There are many studies that confirm the antisuicidal [179] and antidepressant [180] proprieties of ketamine, which may be related to both analgesic and anti-inflammatory actions [181]. For all these reasons, the psychological pain and neurobiological bases can be used for characterization and prevention as a common pathway in an important percentage of people with SB.

Conclusion

The presence of cognitive, temperament, personality, and emotional factors in relation to SB is common to multiple studies and may serve as a link between genetic and clinical research in suicidality. They also allow evidence-based profiling models that are essential to identify different subpopulations within SB patients. These populations range from subjects attempting suicide with little or low intentionality to those who die by suicide. This distinction between subpopulations is necessary in order to research new psychopharmacological or psychotherapeutic approaches and describe their effectiveness. The future of research, prevention, and treatment of SB should aim at integrating genetic, epigenetic, biological, cognitive, temperamental, personality, and clinical knowledge for a better understanding of all types of suicidal behaviors.

Compliance with Ethical Standards

Conflict of Interest Lucas Giner and Diego De La Vega declare that they have no conflict of interest.

Hilario Blasco-Fontecilla has received lecture fees from Eli Lilly, AB-Biotics, and Shire.

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Human and Animal Rights and Informed Consent This article does not contain any studies with human or animal subjects performed by any of the authors.

References

Papers of particular interest, published recently, have been highlighted as:
- Of importance

1. World Health Organization. Preventing suicide: a global imperative. Geneva: WHO Press; 2014.
2. Centers for Disease Control and Prevention (CDC). Suicide. Facts at a Glance 2015. National Center for Injury Prevention and Control, CDC. http://www.cdc.gov/violenceprevention/pdf/suicide-datasheet-a.pdf Accessed 5 Apr?2016; 2015.
3. Conwell Y, Duberstein PR. Suicide in elders. Ann N Y Acad Sci. 2001;932:132–47.
4. Gunnell D, Lewis G. Studying suicide from the life course perspective: implications for prevention. Br J Psychiatry. 2005;187:206–8.
5. Owens D, House A. General hospital services for deliberate self-harm. Haphazard clinical provision, little research, no central strategy. J R Coll Physicians Lond. 1994;28(4):370–1.
6. Oquendo MA, Baca-Garcia E. Suicidal behavior disorder as a diagnostic entity in the DSM-5 classification system: advantages outweigh limitations. World Psychiatry. 2014;13(2):128–30. doi:10.1002/wps.20116.
7. American Psychiatric Association. Conditions for further study. Diagnostic and statistical manual of mental disorders. 5th ed. Arlington: American Psychiatric Association; 2013. p. 783–806.
8. Kendler K, Kupfer DJ, Narrow W, Phillips K, Fawcett J. Guidelines for making changes to DSM-V. Available at http://www.dsm5.org/ProgressReports/Documents/Guidelines-for-Making-Changes-to-DSM_1.pdf (visited March?16th 2015). 2009.
9. Robins E, Guze SB. Establishment of diagnostic validity in psychiatric illness: its application to schizophrenia. Am J Psychiatry. 1970;126(7):983–7. doi:10.1176/ajp.126.7.983.
10. • Richard-Devantoy S, Berlim MT, Jollant F. A meta-analysis of neuropsychological markers of vulnerability to suicidal behavior in mood disorders. Psychol Med. 2014;44(8):1663–73. doi:10.1017/S0033291713002304. **Neurocognitive alterations related to suicidal to behavior are reviewed in this meta-analysis, showing which neuropsychological impairments are more strongly associated with a history of suicidal act**.
11. Levenson M, Neuringer C. Problem-solving behavior in suicidal adolescents. J Consult Clin Psychol. 1971;37(3):433–6.
12. Neuringer C. Rigid thinking in suicidal individuals. J Consult Psychol. 1964;28:54–8.
13. Miranda R, Valderrama J, Tsypes A, Gadol E, Gallagher M. Cognitive inflexibility and suicidal ideation: mediating role of brooding and hopelessness. Psychiatry Res. 2013;210(1):174–81. doi:10.1016/j.psychres.2013.02.033.
14. McGirr A, Dombrovski AY, Butters MA, Clark L, Szanto K. Deterministic learning and attempted suicide among older depressed individuals: cognitive assessment using the Wisconsin Card Sorting Task. J Psychiatr Res. 2012;46(2):226–32. doi:10.1016/j.jpsychires.2011.10.001.
15. Turecki G. Dissecting the suicide phenotype: the role of impulsive-aggressive behaviours. J Psychiatry Neurosci. 2005;30(6):398–408.
16. Marzuk PM, Hartwell N, Leon AC, Portera L. Executive functioning in depressed patients with suicidal ideation. Acta Psychiatr Scand. 2005;112(4):294–301. doi:10.1111/j.1600-0447.2005.00585.x.
17. Rickelman BL, Houfek JF. Toward an interactional model of suicidal behaviors: cognitive rigidity, attributional style, stress, hopelessness, and depression. Arch Psychiatr Nurs. 1995;9(3):158–68.
18. Miranda R, Gallagher M, Bauchner B, Vaysman R, Marroquin B. Cognitive inflexibility as a prospective predictor of suicidal ideation among young adults with a suicide attempt history. Depress Anxiety. 2012;29(3):180–6. doi:10.1002/da.20915.
19. Ellis TE, Berg RA, Franzen MD. Neuropsychological performance and suicidal behavior in adult psychiatric inpatients. Percept Mot Skills. 1992;75(2):639–47. doi:10.2466/pms.1992.75.2.639.
20. Keilp JG, Gorlyn M, Russell M, Oquendo MA, Burke AK, Harkavy-Friedman J, et al. Neuropsychological function and suicidal behavior: attention control, memory and executive dysfunction in suicide attempt. Psychol Med. 2013;43(3):539–51. doi:10.1017/S0033291712001419.
21. Westheide J, Quednow BB, Kuhn KU, Hoppe C, Cooper-Mahkorn D, Hawellek B, et al. Executive performance of depressed suicide attempters: the role of suicidal ideation. Eur Arch Psychiatry Clin Neurosci. 2008;258(7):414–21. doi:10.1007/s00406-008-0811-1.
22. Perrah M, Wichman H. Cognitive rigidity in suicide attempters. Suicide Life Threat Behav. 1987;17(3):251–5.
23. Schotte DE, Clum GA. Suicide ideation in a college population: a test of a model. J Consult Clin Psychol. 1982;50(5):690–6.
24. Linda WP, Marroquin B, Miranda R. Active and passive problem solving as moderators of the relation between negative life event stress and suicidal ideation among suicide attempters and non-attempters. Arch Suicide Res. 2012;16(3):183–97. doi:10.1080/13811118.2012.695233.
25. Pollock LR, Williams JM. Problem-solving in suicide attempters. Psychol Med. 2004;34(1):163–7.
26. Abdollahi A, Talib MA, Yaacob SN, Ismail Z. Problem-solving skills appraisal mediates hardiness and suicidal ideation among Malaysian undergraduate students. PLoS One. 2015;10(4):e0122222. doi:10.1371/journal.pone.0122222.
27. Speckens AE, Hawton K. Social problem solving in adolescents with suicidal behavior: a systematic review. Suicide Life Threat Behav. 2005;35(4):365–87. doi:10.1521/suli.2005.35.4.365.
28. Gibbs LM, Dombrovski AY, Morse J, Siegle GJ, Houck PR, Szanto K. When the solution is part of the problem: problem solving in elderly suicide attempters. Int J Geriatr Psychiatry. 2009;24(12):1396–404. doi:10.1002/gps.2276.
29. Kirkham JG, Choi N, Seitz DP. Meta-analysis of problem solving therapy for the treatment of major depressive disorder in older adults. Int J Geriatr Psychiatry. 2016;31(5):526–35. doi:10.1002/gps.4358.
30. Choi NG, Marti CN, Conwell Y. Effect of problem-solving therapy on depressed low-income homebound older adults' death/suicidal ideation and hopelessness. Suicide Life Threat Behav. 2015. doi:10.1111/sltb.12195.
31. • O'Connor RC, Nock MK. The psychology of suicidal behaviour. Lancet Psychiatry. 2014;1(1):73–85. doi:10.1016/S2215-0366(14)70222-6. **Review of personality, cognitive, social, and negative life events in suicidal behavior and an update in psychological model and treatment of suicide**.
32. Morrison R, O'Connor RC. A systematic review of the relationship between rumination and suicidality. Suicide Life Threat Behav. 2008;38(5):523–38. doi:10.1521/suli.2008.38.5.523.
33. Surrence K, Miranda R, Marroquin BM, Chan S. Brooding and reflective rumination among suicide attempters: cognitive vulnerability to suicidal ideation. Behav Res Ther. 2009;47(9):803–8. doi:10.1016/j.brat.2009.06.001.
34. Miranda R, Nolen-Hoeksema S. Brooding and reflection: rumination predicts suicidal ideation at 1-year follow-up in a community

sample. Behav Res Ther. 2007;45(12):3088–95. doi:10.1016/j.brat.2007.07.015.
35. Crane C, Barnhofer T, Williams JM. Reflection, brooding, and suicidality: a preliminary study of different types of rumination in individuals with a history of major depression. Br J Clin Psychol. 2007;46(Pt 4):497–504. doi:10.1348/014466507X230895.
36. Lam D, Schuck N, Smith N, Farmer A, Checkley S. Response style, interpersonal difficulties and social functioning in major depressive disorder. J Affect Disord. 2003;75(3):279–83.
37. Nolen-Hoeksema S, Wisco BE, Lyubomirsky S. Rethinking rumination. Perspect Psychol Sci. 2008;3(5):400–24. doi:10.1111/j.1745-6924.2008.00088.x.
38. Barch DM, Braver TS, Carter CS, Poldrack RA, Robbins TW. CNTRICS final task selection: executive control. Schizophr Bull. 2009;35(1):115–35. doi:10.1093/schbul/sbn154.
39. Abramowitz JS, Tolin DF, Street GP. Paradoxical effects of thought suppression: a meta-analysis of controlled studies. Clin Psychol Rev. 2001;21(5):683–703.
40. Najmi S, Wegner DM, Nock MK. Thought suppression and self-injurious thoughts and behaviors. Behav Res Ther. 2007;45(8):1957–65. doi:10.1016/j.brat.2006.09.014.
41. Pettit JW, Temple SR, Norton PJ, Yaroslavsky I, Grover KE, Morgan ST, et al. Thought suppression and suicidal ideation: preliminary evidence in support of a robust association. Depress Anxiety. 2009;26(8):758–63. doi:10.1002/da.20512.
42. Cukrowicz KC, Ekblad AG, Cheavens JS, Rosenthal MZ, Lynch TR. Coping and thought suppression as predictors of suicidal ideation in depressed older adults with personality disorders. Aging Ment Health. 2008;12(1):149–57. doi:10.1080/13607860801936714.
43. Richard-Devantoy S, Szanto K, Butters MA, Kalkus J, Dombrovski AY. Cognitive inhibition in older high-lethality suicide attempters. Int J Geriatr Psychiatry. 2015;30(3):274–83. doi:10.1002/gps.4138.
44. Ackerman JP, McBee-Strayer SM, Mendoza K, Stevens J, Sheftall AH, Campo JV, et al. Risk-sensitive decision-making deficit in adolescent suicide attempters. J Child Adolesc Psychopharmacol. 2015;25(2):109–13. doi:10.1089/cap.2014.0041.
45. Bridge JA, McBee-Strayer SM, Cannon EA, Sheftall AH, Reynolds B, Campo JV, et al. Impaired decision making in adolescent suicide attempters. J Am Acad Child Adolesc Psychiatry. 2012;51(4):394–403. doi:10.1016/j.jaac.2012.01.002.
46. Jollant F, Bellivier F, Leboyer M, Astruc B, Torres S, Verdier R, et al. Impaired decision making in suicide attempters. Am J Psychiatry. 2005;162(2):304–10. doi:10.1176/appi.ajp.162.2.304.
47. Clark L, Dombrovski AY, Siegle GJ, Butters MA, Shollenberger CL, Sahakian BJ, et al. Impairment in risk-sensitive decision-making in older suicide attempters with depression. Psychol Aging. 2011;26(2):321–30. doi:10.1037/a0021646.
48. Richard-Devantoy S, Olie E, Guillaume S, Courtet P. Decision-making in unipolar or bipolar suicide attempters. J Affect Disord. 2016;190:128–36. doi:10.1016/j.jad.2015.10.001.
49. Wyart M, Jaussent I, Ritchie K, Abbar M, Jollant F, Courtet P. Iowa Gambling task performance in elderly persons with a lifetime history of suicidal acts. Am J Geriatr Psychiatry. 2016;24(5):399–406. doi:10.1016/j.jagp.2015.12.007.
50. Jollant F, Lawrence NS, Olie E, O'Daly O, Malafosse A, Courtet P, et al. Decreased activation of lateral orbitofrontal cortex during risky choices under uncertainty is associated with disadvantageous decision-making and suicidal behavior. NeuroImage. 2010;51(3):1275–81. doi:10.1016/j.neuroimage.2010.03.027.
51. Hoehne A, Richard-Devantoy S, Ding Y, Turecki G, Jollant F. First-degree relatives of suicide completers may have impaired decision-making but functional cognitive control. J Psychiatr Res. 2015;68:192–7. doi:10.1016/j.jpsychires.2015.07.004.
52. Jollant F, Lawrence NL, Olie E, Guillaume S, Courtet P. The suicidal mind and brain: a review of neuropsychological and neuroimaging studies. World J Biol Psychiatry. 2011;12(5):319–39.
53. Caceda R, Durand D, Cortes E, Prendes-Alvarez S, Moskovciak T, Harvey PD, et al. Impulsive choice and psychological pain in acutely suicidal depressed patients. Psychosom Med. 2014;76(6):445–51. doi:10.1097/PSY.0000000000000075.
54. Williams JM, Broadbent K. Autobiographical memory in suicide attempters. J Abnorm Psychol. 1986;95(2):144–9.
55. Evans J, Williams JM, O'Loughlin S, Howells K. Autobiographical memory and problem-solving strategies of parasuicide patients. Psychol Med. 1992;22(2):399–405.
56. Pollock LR, Williams JM. Effective problem solving in suicide attempters depends on specific autobiographical recall. Suicide Life Threat Behav. 2001;31(4):386–96.
57. Rohrer RR, Mackinger HF, Fartacek RR, Leibetseder MM. Suicide attempts: patients with and without an affective disorder show impaired autobiographical memory specificity. Cognit Emot. 2006;20(3–4):516–26. doi:10.1080/02699930500342449.
58. Maurex L, Lekander M, Nilsonne A, Andersson EE, Asberg M, Ohman A. Social problem solving, autobiographical memory, trauma, and depression in women with borderline personality disorder and a history of suicide attempts. Br J Clin Psychol. 2010;49(Pt 3):327–42. doi:10.1348/014466509X454831.
59. Arie M, Apter A, Orbach I, Yefet Y, Zalsman G. Autobiographical memory, interpersonal problem solving, and suicidal behavior in adolescent inpatients. Compr Psychiatry. 2008;49(1):22–9. doi:10.1016/j.comppsych.2007.07.004.
60. Ricarte JJ, Latorre JM, Ros L, Navarro B, Aguilar MJ, Serrano JP. Overgeneral autobiographical memory effect in older depressed adults. Aging Ment Health. 2011;15(8):1028–37. doi:10.1080/13607863.2011.573468.
61. Pettersen K, Rydningen NN, Christensen TB, Walby FA. Autobiographical memory and suicide attempts in schizophrenia. Suicide Life Threat Behav. 2010;40(4):369–75. doi:10.1521/suli.2010.40.4.369.
62. Taylor PJ, Gooding PA, Wood AM, Tarrier N. Memory specificity as a risk factor for suicidality in non-affective psychosis: the ability to recall specific autobiographical memories is related to greater suicidality. Behav Res Ther. 2010;48(10):1047–52. doi:10.1016/j.brat.2010.06.001.
63. Jollant F, Guillaume S, Jaussent I, Bechara A, Courtet P. When knowing what to do is not sufficient to make good decisions: deficient use of explicit understanding in remitted patients with histories of suicidal acts. Psychiatry Res. 2013;210(2):485–90. doi:10.1016/j.psychres.2013.07.011.
64. Richard-Devantoy S, Jollant F, Kefi Z, Turecki G, Olie JP, Annweiler C, et al. Deficit of cognitive inhibition in depressed elderly: a neurocognitive marker of suicidal risk. J Affect Disord. 2012;140(2):193–9. doi:10.1016/j.jad.2012.03.006.
65. Nangle JM, Clarke S, Morris DW, Schwaiger S, McGhee KA, Kenny N, et al. Neurocognition and suicidal behaviour in an Irish population with major psychotic disorders. Schizophr Res. 2006;85(1–3):196–200. doi:10.1016/j.schres.2006.03.035.
66. Raust A, Slama F, Mathieu F, Roy I, Chenu A, Koncke D, et al. Prefrontal cortex dysfunction in patients with suicidal behavior. Psychol Med. 2007;37(3):411–9. doi:10.1017/S0033291706009111.
67. Delaney C, McGrane J, Cummings E, Morris DW, Tropea D, Gill M, et al. Preserved cognitive function is associated with suicidal ideation and single suicide attempts in schizophrenia. Schizophr Res. 2012;140(1–3):232–6. doi:10.1016/j.schres.2012.06.017.
68. Keilp JG, Sackeim HA, Brodsky BS, Oquendo MA, Malone KM, Mann JJ. Neuropsychological dysfunction in depressed suicide attempters. Am J Psychiatry. 2001;158(5):735–41. doi:10.1176/appi.ajp.158.5.735.

69. Bartfai A, Winborg IM, Nordstrom P, Asberg M. Suicidal behavior and cognitive flexibility: design and verbal fluency after attempted suicide. Suicide Life Threat Behav. 1990;20(3):254–66.
70. Pu S, Nakagome K, Yamada T, Yokoyama K, Matsumura H, Yamada S, et al. Suicidal ideation is associated with reduced prefrontal activation during a verbal fluency task in patients with major depressive disorder. J Affect Disord. 2015;181:9–17. doi:10.1016/j.jad.2015.04.010.
71. Olie E, Seyller M, Beziat S, Loftus J, Bellivier F, Bougerol T, et al. Clinical and neuropsychological characteristics of euthymic bipolar patients having a history of severe suicide attempt. Acta Psychiatr Scand. 2015;131(2):129–38. doi:10.1111/acps.12326.
72. Mann JJ, Waternaux C, Haas GL, Malone KM. Toward a clinical model of suicidal behavior in psychiatric patients. Am J Psychiatry. 1999;156(2):181–9.
73. Borges G, Nock MK, Haro Abad JM, Hwang I, Sampson NA, Alonso J, et al. Twelve-month prevalence of and risk factors for suicide attempts in the World Health Organization World Mental Health Surveys. JClin Psychiatry. 2010;71(12):1617–28.
74. Lopez-Castroman J, Blasco-Fontecilla H, Courtet P, Baca-Garcia E, Oquendo MA. Are we studying the right populations to understand suicide? World Psychiatry. 2015;14(3):368–9. doi:10.1002/wps.20261.
75. Baca-Garcia E, Oquendo MA, Saiz-Ruiz J, Mann JJ, De Leon J. A pilot study on differences in aggression in New York City and Madrid, Spain, and their possible impact on suicidal behavior. J Clin Psychiatry. 2006;67(3):375–80.
76. Jylha PJ, Rosenstrom T, Mantere O, Suominen K, Melartin TK, Vuorilehto MS, et al. Temperament, character, and suicide attempts in unipolar and bipolar mood disorders. J Clin Psychiatry. 2016;77(2):252–60. doi:10.4088/JCP.14m09472.
77. Hawton K, Casanas ICC, Haw C, Saunders K. Risk factors for suicide in individuals with depression: a systematic review. J Affect Disord. 2013;147(1–3):17–28. doi:10.1016/j.jad.2013.01.004.
78. Isometsa E. Suicidal behaviour in mood disorders—who, when, and why? Can J Psychiatry. 2014;59(3):120–30.
79. Perroud N, Baud P, Mouthon D, Courtet P, Malafosse A. Impulsivity, aggression and suicidal behavior in unipolar and bipolar disorders. J Affect Disord. 2011;134(1–3):112–8. doi:10.1016/j.jad.2011.05.048.
80. Keilp JG, Gorlyn M, Oquendo MA, Brodsky B, Ellis SP, Stanley B, et al. Aggressiveness, not impulsiveness or hostility, distinguishes suicide attempters with major depression. Psychol Med. 2006;36(12):1779–88. doi:10.1017/S0033291706008725.
81. Soloff PH, Lynch KG, Kelly TM, Malone KM, Mann JJ. Characteristics of suicide attempts of patients with major depressive episode and borderline personality disorder: a comparative study. Am J Psychiatry. 2000;157(4):601–8.
82. Brent DA, Melhem N. Familial transmission of suicidal behavior. Psychiatr Clin North Am. 2008;31(2):157–77. doi:10.1016/j.psc.2008.02.001.
83. McGirr A, Alda M, Seguin M, Cabot S, Lesage A, Turecki G. Familial aggregation of suicide explained by cluster B traits: a three-group family study of suicide controlling for major depressive disorder. Am J Psychiatry. 2009;166(10):1124–34. doi:10.1176/appi.ajp.2009.08111744.
84. Bornovalova MA, Lejuez CW, Daughters SB, Zachary Rosenthal M, Lynch TR. Impulsivity as a common process across borderline personality and substance use disorders. Clin Psychol Rev. 2005;25(6):790–812. doi:10.1016/j.cpr.2005.05.005.
85. Denson TF, Pedersen WC, Friese M, Hahm A, Roberts L. Understanding impulsive aggression: angry rumination and reduced self-control capacity are mechanisms underlying the provocation-aggression relationship. Pers Soc Psychol Bull. 2011;37(6):850–62. doi:10.1177/0146167211401420.
86. Brodsky BS, Groves SA, Oquendo MA, Mann JJ, Stanley B. Interpersonal precipitants and suicide attempts in borderline personality disorder. Suicide Life Threat Behav. 2006;36(3):313–22. doi:10.1521/suli.2006.36.3.313.
87. Menon V, Sarkar S, Kattimani S, Mathan K. Do Personality Traits Such as Impulsivity and Hostility-Aggressiveness Predict Severity of Intent in Attempted Suicide? Findings From a Record Based Study in South India. Indian journal of psychological medicine. 2015;37(4):393–8. doi:10.4103/0253-7176.168563.
88. Sansone RA, Elliott K, Wiederman MW. Suicide attempts among men and women with partner violence according to borderline personality status. Innov Clin Neurosci. 2015;12(1–2):10–1.
89.• Baus N, Fischer-Kern M, Naderer A, Klein J, Doering S, Pastner B, et al. Personality organization in borderline patients with a history of suicide attempts. Psychiatry Res. 2014;218(1–2):129–33. doi:10.1016/j.psychres.2014.03.048. **Patients showing affective dysregulation might be more likely to display self-aggression (i.?e., suicide attempts) when facing negative emotions such as guilt, anger, or self-hatred**.
90. Sanislow CA, Grilo CM, Morey LC, Bender DS, Skodol AE, Gunderson JG, et al. Confirmatory factor analysis of DSM-IV criteria for borderline personality disorder: findings from the collaborative longitudinal personality disorders study. Am J Psychiatry. 2002;159(2):284–90.
91. Mangnall J, Yurkovich E. A literature review of deliberate self-harm. Perspect Psychiatr Care. 2008;44(3):175–84. doi:10.1111/j.1744-6163.2008.00172.x.
92. Zouk H, Tousignant M, Seguin M, Lesage A, Turecki G. Characterization of impulsivity in suicide completers: clinical, behavioral and psychosocial dimensions. J Affect Disord. 2006;92(2–3):195–204. doi:10.1016/j.jad.2006.01.016.
93. McGirr A, Paris J, Lesage A, Renaud J, Turecki G. Risk factors for suicide completion in borderline personality disorder: a case-control study of cluster B comorbidity and impulsive aggression. J Clin Psychiatry. 2007;68(5):721–9.
94. Turnbull DL, Cox BJ, Oleski J, Katz LY. The effects of borderline personality disorder and panic disorder on suicide attempts and the associated influence of affective dysregulation in the general population. J Nerv Ment Dis. 2013;201(2):130–5. doi:10.1097/NMD.0b013e31827f6449.
95. Ansell EB, Wright AG, Markowitz JC, Sanislow CA, Hopwood CJ, Zanarini MC, et al. Personality disorder risk factors for suicide attempts over 10 years of follow-up. Pers Disord. 2015;6(2):161–7. doi:10.1037/per0000089.
96. Bolton JM, Robinson J. Population-attributable fractions of Axis I and Axis II mental disorders for suicide attempts: findings from a representative sample of the adult, noninstitutionalized US population. Am J Public Health. 2010;100(12):2473–80. doi:10.2105/AJPH.2010.192252.
97. Jimenez-Trevino L, Blasco-Fontecilla H, Braquehais MD, Ceverino-Dominguez A, Baca-Garcia E. Endophenotypes and suicide behaviour. Actas Esp Psiquiatr. 2011;39(1):61–9.
98. Ogrodniczuk JS, Piper WE, Joyce AS, Steinberg PI, Duggal S. Interpersonal problems associated with narcissism among psychiatric outpatients. J Psychiatr Res. 2009;43(9):837–42. doi:10.1016/j.jpsychires.2008.12.005.
99. Blasco-Fontecilla H, Jaussent I, Olié E, S. B, S. G, Artieda-Urrutia P et al. A cross-sectional study of major repeaters: a distinct phenotype of suicidal behavior. Prim Care Companion CNS Disord. 2014;16 (0):at press. doi:10.4088/PCC.14m01633.
100. Blasco-Fontecilla H, de Leon-Martinez V, Delgado-Gomez D, Giner L, Guillaume S, Courtet P. Emptiness and suicidal behavior: an exploratory review. Suicidology Online. 2013;4:21–32.
101. Bryan CJ, Morrow CE, Etienne N, Ray-Sannerud B. Guilt, shame, and suicidal ideation in a military outpatient clinical sample. Depress Anxiety. 2013;30(1):55–60. doi:10.1002/da.22002.

102. Schoenleber M, Berenbaum H, Motl R. Shame-related functions of and motivations for self-injurious behavior. Pers Disord. 2014;5(2):204–11. doi:10.1037/per0000035.
103. Beck AT, Steer RA, Kovacs M, Garrison B. Hopelessness and eventual suicide: a 10-year prospective study of patients hospitalized with suicidal ideation. Am J Psychiatry. 1985;142(5):559–63.
104. Brown GK, Beck AT, Steer RA, Grisham JR. Risk factors for suicide in psychiatric outpatients: a 20-year prospective study. J Consult Clin Psychol. 2000;68(3):371–7.
105. Berk MS, Jeglic E, Brown GK, Henriques GR, Beck AT. Characteristics of recent suicide attempters with and without borderline personality disorder. Arch Suicide Res. 2007;11(1):91–104. doi:10.1080/13811110600992951.
106. Hawton K, Houston K, Haw C, Townsend E, Harriss L. Comorbidity of axis I and axis II disorders in patients who attempted suicide. Am J Psychiatry. 2003;160(8):1494–500. doi:10.1176/appi.ajp.160.8.1494.
107. Stringer B, van Meijel B, Eikelenboom M, Koekkoek B, Licht CM, Kerkhof AJ, et al. Recurrent suicide attempts in patients with depressive and anxiety disorders: the role of borderline personality traits. J Affect Disord. 2013;151(1):23–30. doi:10.1016/j.jad.2013.02.038.
108• Blasco-Fontecilla H, Baca-García E, Courtet P, García Nieto R, de Leon J. Horror Vacui: emptiness might distinguish between major suicide repeaters and nonmajor suicide repeaters: a pilot study. Psychother Psychosom. 2015;84(2):117–9. **Relieving emptiness was a more relevant pathway than BPD was to major repetition of suicide attempts**.
109. Delgado-Gomez D, Blasco-Fontecilla H, Alegria AA, Legido-Gil T, Artes-Rodriguez A, Baca-Garcia E. Improving the accuracy of suicide attempter classification. Artif Intell Med. 2011;52(3):165–8. doi:10.1016/j.artmed.2011.05.004.
110. Blasco-Fontecilla H. The addictive hypothesis of suicidal behavior. Med Hypotheses. 2012;78(2):350. doi:10.1016/j.mehy.2011.11.005.
111. Blasco-Fontecilla H, Delgado-Gomez D, Ruiz-Hernandez D, Aguado D, Baca-Garcia E, Lopez-Castroman J. Combining scales to assess suicide risk. J Psychiatr Res. 2012;46(10):1272–7. doi:10.1016/j.jpsychires.2012.06.013.
112. Blasco-Fontecilla H, Fernandez-Fernandez R, Colino L, Fajardo L, Perteguer-Barrio R, de Leon J. The addictive model of self-harming (non-suicidal and suicidal) behavior. Front Psychiatry. 2016;7:8. doi:10.3389/fpsyt.2016.00008.
113. Giner L, Blasco-Fontecilla H, Mercedes Perez-Rodriguez M, Garcia-Nieto R, Giner J, Guija JA, et al. Personality disorders and health problems distinguish suicide attempters from completers in a direct comparison. J Affect Disord. 2013;151(2):474–83. doi:10.1016/j.jad.2013.06.029.
114.• Calati R, Giegling I, Balestri M, Antypa N, Friedl M, Konte B, et al. Influence of differentially expressed genes from suicide postmortem study on personality traits as endophenotypes on healthy subjects and suicide attempters. Eur Arch Psychiatry Clin Neurosci. 2014;264(5):423–32. doi:10.1007/s00406-013-0469-1. **The utility of personality traits as endophenotypes in the study of Suicidal Behavior and genetics**.
115. Rujescu D, Giegling I. Intermediate phenotypes in suicidal behavior focus on personality. In: Dwivedi Y, editor. The Neurobiological Basis of Suicide. Frontiers in Neuroscience. Boca Raton (FL) 2012.
116. Laget J, Plancherel B, Stephan P, Bolognini M, Corcos M, Jeammet P, et al. Personality and repeated suicide attempts in dependent adolescents and young adults. Crisis. 2006;27(4):164–71.
117. Useda JD, Duberstein PR, Conner KR, Conwell Y. Personality and attempted suicide in depressed adults 50 years of age and older: a facet level analysis. Compr Psychiatry. 2004;45(5):353–61. doi:10.1016/j.comppsych.2004.06.002.
118. Useda JD, Duberstein PR, Conner KR, Beckman A, Franus N, Tu X, et al. Personality differences in attempted suicide versus suicide in adults 50 years of age or older. J Consult Clin Psychol. 2007;75(1):126–33. doi:10.1037/0022-006X.75.1.126.
119. Cloninger C, Przybeck T, Svrakic D, Wetzel R. The Temperament and Character Inventory (TCI): a guide to ITS development and use center for psychobiology of personality. St. Louis: Washington University; 1994.
120. Costa P, McCrae R. Revised NEO personality inventory and NEO five factor inventory professional manual. Odessa: Psychological Assessment Resources; 1992.
121. Eysenck H, Eysenck S. Manual of the Eysenck personality inventory. London: University Press; 1964.
122. Zuckerman M, Cloninger CR. Relationships between Cloninger's, Zuckerman's, and Eysenck's dimensions of personality. Personal Individ Differ. 1996;21(2):283–5. doi:10.1016/0191-8869(96)00042-6.
123. Costa Jr PT, McCrae RR. Primary traits of Eysenck's P-E-N system: three- and five-factor solutions. J Pers Soc Psychol. 1995;69(2):308–17.
124. Zuckerman M, Kuhlman D, Joireman J, Teta P, Kraft M. A comparison of three structural models for personality: the big three, the big five, and the alternative five. J Pers Soc Psychol. 1993;65(4):757–68.
125. Cloninger CR. A systematic method for clinical description and classification of personality variants. A proposal. Arch Gen Psychiatry. 1987;44(6):573–88.
126. Fruyt FD, Wiele LVD, Heeringen CV. Cloninger's psychobiological model of temperament and character and the five-factor model of personality. Personal Individ Differ. 2000;29(3):441–52.
127. Ponnudurai R, Jeyakar J, Saraswathy M. Attempted suicides in Madras. Indian J Psychiatry. 1986;28(1):59–62.
128. Rozanov VA, Mid'ko AA. Personality patterns of suicide attempters: gender differences in Ukraine. Span J Psychol. 2011;14(2):693–700.
129. Kumar PN, Rajmohan V, Sushil K. An exploratory analysis of personality factors contributed to suicide attempts. Indian J Psychol Med. 2013;35(4):378–84. doi:10.4103/0253-7176.122231.
130. Wiktorsson S, Berg AI, Billstedt E, Duberstein PR, Marlow T, Skoog I, et al. Neuroticism and extroversion in suicide attempters aged 75 and above and a general population comparison group. Aging Ment Health. 2013;17(4):479–88. doi:10.1080/13607863.2012.749835.
131. Calati R, Giegling I, Rujescu D, Hartmann AM, Moller HJ, De Ronchi D, et al. Temperament and character of suicide attempters. J Psychiatr Res. 2008;42(11):938–45. doi:10.1016/j.jpsychires.2007.10.006.
132. Ghanem M, Gamaluddin H, Mansour M, Samiee AA, Shaker NM, El Rafei H. Role of impulsivity and other personality dimensions in attempted suicide with self-poisoning among children and adolescents. Arch Suicide Res. 2013;17(3):262–74. doi:10.1080/13811118.2013.805645.
133. Becerra B, Paez F, Robles-Garcia R, Vela GE. Temperament and character profile of persons with suicide attempt. Actas Esp Psiquiatr. 2005;33(2):117–22.
134. Giegling I, Olgiati P, Hartmann AM, Calati R, Moller HJ, Rujescu D, et al. Personality and attempted suicide. Analysis of anger, aggression and impulsivity. J Psychiatr Res. 2009;43(16):1262–71. doi:10.1016/j.jpsychires.2009.04.013.
135. Perroud N, Baud P, Ardu S, Krejci I, Mouthon D, Vessaz M, et al. Temperament personality profiles in suicidal behaviour: an investigation of associated demographic, clinical and genetic factors. J Affect Disord. 2013;146(2):246–53. doi:10.1016/j.jad.2012.09.012.
136. Bulik CM, Sullivan PF, Joyce PR. Temperament, character and suicide attempts in anorexia nervosa, bulimia nervosa and major depression. Acta Psychiatr Scand. 1999;100(1):27–32.

137. Favaro A, Santonastaso P, Monteleone P, Bellodi L, Mauri M, Rotondo A, et al. Self-injurious behavior and attempted suicide in purging bulimia nervosa: associations with psychiatric comorbidity. J Affect Disord. 2008;105(1–3):285–9. doi:10.1016/j.jad.2007.05.010.
138. Engstrom C, Brandstrom S, Sigvardsson S, Cloninger CR, Nylander PO. Bipolar disorder. III: harm avoidance a risk factor for suicide attempts. Bipolar Disord. 2004;6(2):130–8.
139. Sayin A, Kuruoglu AC, Yazici Gulec M, Aslan S. Relation of temperament and character properties with clinical presentation of bipolar disorder. Compr Psychiatry. 2007;48(5):446–51. doi:10.1016/j.comppsych.2007.04.004.
140. Albayrak Y, Ekinci O, Caykoylu A. Temperament and character personality profile in relation to suicide attempts in patients with schizophrenia. Compr Psychiatry. 2012;53(8):1130–6. doi:10.1016/j.comppsych.2012.04.007.
141. Evren C, Evren B. The relationship of suicide attempt history with childhood abuse and neglect, alexithymia and temperament and character dimensions of personality in substance dependents. Nord J Psychiatry. 2006;60(4):263–9. doi:10.1080/08039480600790051.
142. Conrad R, Walz F, Geiser F, Imbierowicz K, Liedtke R, Wegener I. Temperament and character personality profile in relation to suicidal ideation and suicide attempts in major depressed patients. Psychiatry Res. 2009;170(2–3):212–7. doi:10.1016/j.psychres.2008.09.008.
143. Pisetsky EM, Wonderlich SA, Crosby RD, Peterson CB, Mitchell JE, Engel SG, et al. Depression and personality traits associated with emotion dysregulation: correlates of suicide attempts in women with Bulimia Nervosa. Eur Eat Disord Rev. 2015;23(6):537–44. doi:10.1002/erv.2401.
144. Khan AA, Jacobson KC, Gardner CO, Prescott CA, Kendler KS. Personality and comorbidity of common psychiatric disorders. Br J Psychiatry. 2005;186:190–6. doi:10.1192/bjp.186.3.190.
145. Brandes M, Bienvenu OJ. Personality and anxiety disorders. Curr Psychiatry Rep. 2006;8(4):263–9.
146. Klein DN, Kotov R, Bufferd SJ. Personality and depression: explanatory models and review of the evidence. Annu Rev Clin Psychol. 2011;7:269–95. doi:10.1146/annurev-clinpsy-032210-104540.
147. Pompili M, Iliceto P, Innamorati M, Rihmer Z, Lester D, Akiskal HS, et al. Suicide risk and personality traits in physically and/or sexually abused acute psychiatric inpatients: a preliminary study. Psychol Rep. 2009;105(2):554–68. doi:10.2466/PR0.105.2.554-568.
148. Draper B, Kolves K, De Leo D, Snowdon J. A controlled study of suicide in middle-aged and older people: personality traits, age, and psychiatric disorders. Suicide Life Threat Behav. 2014;44(2):130–8. doi:10.1111/sltb.12053.
149. Tyrer P, Alexander J. Personality assessment schedule. In: Tyrer P, editor. Personality disorders. London: Wright; 1988. p. 43–62.
150. Harwood D, Hawton K, Hope T, Jacoby R. Psychiatric disorder and personality factors associated with suicide in older people: a descriptive and case-control study. Int J Geriatr Psychiatry. 2001;16(2):155–65.
151. Hirvikoski T, Jokinen J. Personality traits in attempted and completed suicide. Eur Psychiatry. 2012;27(7):536–41. doi:10.1016/j.eurpsy.2011.04.004.
152. McCann SJ. Suicide, big five personality factors, and depression at the American state level. Arch Suicide Res. 2010;14(4):368–74. doi:10.1080/13811118.2010.524070.
153. Voracek M. Big five personality factors and suicide rates in the United States: a state-level analysis. Percept Mot Skills. 2009;109(1):208–12. doi:10.2466/PMS.109.1.208-212.
154. Tanji F, Kakizaki M, Sugawara Y, Watanabe I, Nakaya N, Minami Y, et al. Personality and suicide risk: the impact of economic crisis in Japan. Psychol Med. 2015;45(3):559–73. doi:10.1017/S0033291714001688.
155. Linehan MM. Suicidal people. One population or two? Ann NY Acad Sci. 1986;487:16–33.
156. Beautrais AL. Child and young adolescent suicide in New Zealand. Aust N Z J Psychiatry. 2001;35(5):647–53.
157. Giner L, Jaussent I, Olie E, Beziat S, Guillaume S, Baca-Garcia E, et al. Violent and serious suicide attempters: one step closer to suicide? J Clin Psychiatry. 2014;75(3):e191–7. doi:10.4088/JCP.13m08524.
158. Tuckman J, Youngman WF. Suicide risk among persons attempting suicide. Public Health Rep. 1963;78:585–7.
159. Fushimi M, Sugawara J, Saito S. Comparison of completed and attempted suicide in Akita, Japan. Psychiatry Clin Neurosci. 2006;60(3):289–95.
160. McGirr A, Renaud J, Bureau A, Seguin M, Lesage A, Turecki G. Impulsive-aggressive behaviours and completed suicide across the life cycle: a predisposition for younger age of suicide. Psychol Med. 2008;38(3):407–17.
161. Murray H. Death to the world: the passions of Herman Melville. In: Shneidman E, editor. Essays in self-destruction. New York: Science House; 1967. p. 3–29.
162. Baumeister RF. Suicide as escape from self. Psychol Rev. 1990;97(1):90–113.
163. Shneidman ES. Suicide as psychache. J Nerv Ment Dis. 1993;181(3):145–7.
164. Chester DS, DeWall CN, Pond Jr RS. The push of social pain: does rejection's sting motivate subsequent social reconnection? Cogn Affect Behav Neurosci. 2016. doi:10.3758/s13415-016-0412-9.
165. Fertuck EA, Karan E, Stanley B. The specificity of mental pain in borderline personality disorder compared to depressive disorders and healthy controls. Borderline Personal Disord Emot Dysregul. 2016;3:2. doi:10.1186/s40479-016-0036-2.
166. Orbach I, Mikulincer M, Sirota P, Gilboa-Schechtman E. Mental pain: a multidimensional operationalization and definition. Suicide Life Threat Behav. 2003;33(3):219–30.
167. Campos RC, Holden RR. Testing models relating rejection, depression, interpersonal needs, and psychache to suicide risk in nonclinical individuals. J Clin Psychol. 2015;71(10):994–1003. doi:10.1002/jclp.22196.
168. Patterson AA, Holden RR. Psychache and suicide ideation among men who are homeless: a test of Shneidman's model. Suicide Life Threat Behav. 2012;42(2):147–56. doi:10.1111/j.1943-278X.2011.00078.x.
169. Olie E, Guillaume S, Jaussent I, Courtet P, Jollant F. Higher psychological pain during a major depressive episode may be a factor of vulnerability to suicidal ideation and act. J Affect Disord. 2010;120(1–3):226–30.
170. Joiner TE. Why people die by suicide. Cambridge, MA: Harvard University Press; 2005.
171. Durkheim E. Suicide: a study in Sociology. New York, NY: The Free Press; 1897.
172. Hatcher S, Stubbersfield O. Sense of belonging and suicide: a systematic review. Can J Psychiatr Rev Can Psychiatr. 2013;58(7):432–6.
173. Van Orden KA, Wiktorsson S, Duberstein P, Berg AI, Fassberg MM, Waern M. Reasons for attempted suicide in later life. The American journal of geriatric psychiatry : official journal of the American Association for Geriatric Psychiatry : official journal of the American Association for Geriatric Psychiatry. 2015;23(5):536–44. doi:10.1016/j.jagp.2014.07.003.
174. Kross E, Berman MG, Mischel W, Smith EE, Wager TD. Social rejection shares somatosensory representations with physical pain. Proc Natl Acad Sci U S A. 2011;108(15):6270–5. doi:10.1073/pnas.1102693108.

175. Papini MR, Fuchs PN, Torres C. Behavioral neuroscience of psychological pain. Neurosci Biobehav Rev. 2015;48:53–69. doi:10.1016/j.neubiorev.2014.11.012.
176. Achterberg M, van Duijvenvoorde AC, Bakermans-Kranenburg MJ, Crone EA. Control your anger! The neural basis of aggression regulation in response to negative social feedback. Soc Cogn Affect Neurosci. 2016;11(5):712–20. doi:10.1093/scan/nsv154.
177. Bungert M, Koppe G, Niedtfeld I, Vollstadt-Klein S, Schmahl C, Lis S, et al. Pain processing after social exclusion and its relation to rejection sensitivity in borderline personality disorder. PLoS One. 2015;10(8):e0133693. doi:10.1371/journal.pone.0133693.
178.• Courtet P, Giner L, Seneque M, Guillaume S, Olie E, Ducasse D. Neuroinflammation in suicide: toward a comprehensive model. The world journal of biological psychiatry : the official journal of the World Federation of Societies of Biological Psychiatry. 2015:1–23. doi:10.3109/15622975.2015.1054879. **A review of neuroinflammation and suicidal behavior and its possible relation to mental pain. This model may help to identify new targets in characterization and prevention**.
179. Murrough JW, Soleimani L, DeWilde KE, Collins KA, Lapidus KA, Iacoviello BM, et al. Ketamine for rapid reduction of suicidal ideation: a randomized controlled trial. Psychol Med. 2015;45(16):3571–80. doi:10.1017/S0033291715001506.
180. Zanos P, Moaddel R, Morris PJ, Georgiou P, Fischell J, Elmer GI, et al. NMDAR inhibition-independent antidepressant actions of ketamine metabolites. Nature. 2016. doi:10.1038/nature17998.
181. Kurdi MS, Theerth KA, Deva RS. Ketamine: current applications in anesthesia, pain, and critical care. Anesth Essays Res. 2014;8(3):283–90. doi:10.4103/0259-1162.143110.