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## Suicide in Older Adults: The Role of Emotions and Cognition

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### Abstract

Suicide in older adults is a significant clinical concern. In this review of recent findings, we concentrate on the role of emotions and cognition in suicide risk and behavior in older adults. We discuss the epidemiology of suicide in older adults, integrate recent findings on non-psychotic major depression, schizophrenia and suicidal ideation, explore the relationship of emotion regulation with suicide, present recent advances on suicide in demented patients, and describe the latest developments on cognition and decision processes in suicide.

### Keywords

Suicide; older adults; suicidal ideation; emotion regulation; decision making; cognitive control deficits; major depression; schizophrenia; dementia; high lethality

## INTRODUCTION

Suicide is a major public health concern with devastating effects on families and the community. There were 39,518 suicides in the US in 2011, an average of 108 suicides per day. A workshop in 2008 supported by the National Institutes of Health and the American Foundation for Suicide Prevention (AFSP) reviewed and summarized research on the impact of suicide on family members and social networks [1]. Suicide survivors need to deal with the aftermath of the suicide, feelings of guilt, blame, helplessness, despair, and tension within the family. Survivors are also at high risk for mental disorders and for future suicides [1].

Our review focuses on suicide in older adults, whose suicide rates are alarmingly high. It highlights new avenues of investigation and does not intend to be comprehensive. To better understand the processes that lead to suicide, we also explore recent research on the role of emotions, cognition and decision making in suicide in the elderly. This understanding may help design interventions to reduce modifiable risk factors for suicide and non-lethal attempts, which is an NIMH research priority [2].

## EPIDEMIOLOGY OF SUICIDE IN OLDER ADULTS

According to the Center for Disease Control, the suicide rates in all ages in the US have steadily increased from 2000–2011, reaching 12.7/100,000 in 2011 [3]. Among different age groups, the suicide deaths of adults aged 50–74 years old almost doubled from 2000 to 2011, while the highest risk group for suicide is still older white males 85 years or older (Suicide rate in 2011: 47.3/100,000). The increase in suicides of 50–74 year old adults may be a cohort effect, since “baby boomers” have traditionally higher rates of suicide than earlier or subsequent birth cohorts [4]. Therefore, we may expect the suicide rates of older adults to increase as this cohort becomes older. Taken together, these statistics highlight the importance of understanding and preventing suicide in middle-aged and older adults.

Gender and race differentially affect suicide risk and behavior. Men have fewer [5] but more medically serious suicide attempts, report stronger suicide intent and use more lethal means, including hanging and use of firearms [6, 7]. In a recent systematic review, suicide behavior is differentially affected by gender and marital status [6]. Even though married men and women have the lowest suicide risk, marital status influences suicide rates of men and women differently; widowed men had 3.3 times as high suicide risk as married men whereas married and widowed women had comparable rates [6]. The highest rates of suicide in women were for divorced or separated women and the lowest was for married women [6, 8]. Regarding race, Caucasians have the highest suicide rates [4], while Asians and Caucasians have the highest rate of suicidal ideation and African-Americans the lowest [9].

## RECENT FINDINGS ON MAJOR DEPRESSION, SCHIZOPHRENIA, AND SUICIDAL IDEATION

### Major Depression

Psychiatric disorders are present in most suicides, and in some studies they have been identified in up to 97% of suicide deaths [4]. Mood disorders and especially major depression are the most consistently found psychiatric illnesses in suicide completers, with psychotic and anxiety disorders at lower risk [4]. In the National Epidemiologic Survey “On Alcohol and Related Conditions (NESARC) Wave 1 Study” on older patients with major depression, 42% felt that they wanted to die, 25% thought a lot about suicide, and 4.7% attempted suicide [10].

Suicide rates in middle-aged and older patients who are on antidepressants vary with age and gender [11, 12]. The mean suicide rate in a Danish cohort of men and women aged 50–59 who redeemed antidepressant prescriptions is 185 and 82 per 100,000 respectively, whereas for men and women aged 80 years old and older it was 119 and 28 per 100,000

[12]. Whereas suicide rates in both men and women who redeemed antidepressant prescriptions decreased by 2 and 3% respectively for any additional year of age, suicide rates in patients who were not on antidepressants increased from 28 in 100,000 (50–59 years old) to 68 in 100,000 (80 years old and older) [12]. The results were similar for SSRI's, TCA's and other types of antidepressants. The study did not examine the efficacy of antidepressants and the findings need to be further explored, because a high proportion of older adults 80 years old and older have comorbid cognitive impairment, which is associated with poor or slow response to antidepressants.

### Schizophrenia

Suicide and suicidal ideation is prevalent in middle-aged and older adults with schizophrenia. Compared to a community sample of middle-aged and older adults without a history of schizophrenia or schizoaffective disorder, middle-aged and older schizophrenics have a higher prevalence of current (10% vs. 2%) and lifetime (56% vs. 7%) suicidal ideation, as well as past suicide attempts (30% vs. 4%) [13]. In a nationwide cohort study in Denmark, the relative risk for suicide for middle-aged and older adults with schizophrenia vs. those without schizophrenia is elevated in both men (RR=3.5 [3.0–4.2]) and women (RR=7.9 [6.6–9.5]). The suicide rate ratio of those adults with vs. those without schizophrenia declines with increasing age [14]. Risk factors for suicide for schizophrenic older adults include multiple hospitalizations, previous and recent suicide attempts, comorbid mood and personality disorders and substance abuse [13, 14]; specifically, the risk of suicide in those with dual diagnoses of mood disorder and schizophrenia is twice as high as those with diagnosis of schizophrenia alone [14].

### Suicidal Ideation

Suicidal ideation is a consistent predictor of suicide attempts and completed suicides [15]. However suicidal ideation expressed to health care providers is less frequent in older compared to younger adults [16], but the suicide rates in older adults are much higher than those in younger adults [15]. The rate of suicidal ideation in women is twice as high as in older men, even though the suicide rate for older men is much higher than older women [16]. The relationship of gender with suicidal ideation is more complicated, however, as gender interacts with age. In a study in Canada, women younger than 75 years were 1.6 times more likely to report suicidal ideation than women 75 years old or older, whereas men 75 years old or older were twice as likely to report suicidal ideation than men younger than 75 years old [17].

Suicidal ideation occurs mostly in the context of psychiatric illness. In the PRISMe Study (Primary Care Research in Substance Abuse and Mental Health for the Elderly), 46% of patients with either depression or anxiety and 61% of those with co-occurring depression and anxiety reported suicidal ideation, ranging from thoughts that life is not worth living and wishes of being dead to thoughts of killing oneself [9]. Major depression and generalized anxiety disorders are the strongest predictors of suicidal ideation in combat and non-combat older veterans, while PTSD is independently associated with both groups [18]. In depressed older adults, suicidal ideation is associated with higher severity of depression, previous suicide attempts, greater medical and psychiatric comorbidity (i.e. panic disorder and

alcohol abuse), loneliness, and lower subjective social support [19–21]. In a study of Korean elders, depression mediated the relationship of social support and low income with suicidal ideation [22]. The course of suicidal ideation in late-life depression is predicted by depression severity [20, 23], a previous attempt, and seriousness of suicidal intent [20]. Finally, persistent suicidal ideation is independently predicted by depressive symptoms and life stressors [24].

Suicidal ideation is associated with non-suicide mortality. Suicidal ideation at the beginning of a longitudinal study was associated with a 23% increase in the risk of non-suicide mortality, mainly cardiovascular deaths, within the ensuing 17 years after controlling for demographic variables, medical health, symptoms of depression and anxiety, and possible dementia [25]. The Prevention of Suicide in Primary Care Elderly: Collaborative Trial (PROSPECT) documented that older adults with a “wish to die” receiving Usual Care, but not to the PROSPECT intervention, were 1.6 to 1.7 times more likely to die within the following 5 years, independent of their depression status (no depression, minor or major depression) [26].

Suicidal ideators may differ from suicide attempters. Compared to middle-aged and older inpatient suicide ideators, middle-aged and older suicide attempters have lower social support, an older age of onset of mood disorders (< 46 years), and lower incidence of pharmacotherapy during the index episode [27]. Compared to inpatient and outpatient non-attempters, older adults who attempted suicide had an earlier age at onset of depression, greater number of depression episodes, more severe depression, greater number of psychotic symptoms and more left-sided white matter lesions [28].

## DEMENTIA AND SUICIDE

Suicide in dementia is under-investigated and reports on suicide risk and behavior in demented patients are inconclusive. In a recent study of demented older adults in VA healthcare settings, there were 81 suicides per 100,000 subjects [29]. In a large longitudinal study in Denmark, adults aged 50–69 years old with dementia had an 8–10-fold higher risk of suicide than those without dementia, whereas the risk decreased in those aged 70 years old and older (3-fold higher suicide risk) [30]. In a study comparing patients with early semantic dementia (N=25) and those with Alzheimer’s Disease (N=111) [31], 5 patients with semantic dementia had suicidal behavior and two of those committed suicide, whereas only one patient with Alzheimer’s Disease attempted suicide but did not kill himself. Three patients with semantic dementia and suicidal behavior had a history of suicidal behavior prior to the dementia diagnosis. Patients with semantic dementia and suicidal behavior had more depression and greater insight into their deficits [31].

The methods of suicide in demented patients differ in reports from the US vs. the UK. In a study of US veterans with dementia who died by suicide (99% males) [29], the preferred methods were firearms (72.6%), self-poisoning and hanging (9.5% each), sharp object (2.9%), jumping from a high place or moving object (2.4%), and drowning (1.2%). In a study of suicide completers (53% males) who were diagnosed with dementia in England and

Wales [32], the preferred methods were self-poisoning (28%), drowning (19%), hanging (17%), and jumping (8%); firearms were used in less than 1% of suicides.

Suicide declines with increased cognitive impairment, but there are conflicting reports on whether recently diagnosed demented patients are at higher risk [30, 32–34]. The presence of a major depression in these patients may contribute to increased suicide risk [35]. Predictors of suicide in older VA patients suffering from dementia include white race, depression, history of inpatient psychiatric hospitalizations and prescriptions for antidepressants and anxiolytics, whereas nursing home stay was associated with lower suicide risk [29].

Suicidal ideation occurs in about 40% of older adults with major depression and of cognitive impairment, ranging from mild cognitive deficits to moderate dementia [36]. Suicide intent in cognitively impaired older adults may also be expressed as passive self-harm behaviors, including refusal to eat, drink or take medications [37]. Future research needs to focus on these passive self-harm behaviors that are more prevalent in demented patients, are unlikely to be recorded as suicides, and are associated with mortality [33, 27].

## EMOTION REGULATION AND SUICIDE

Negative emotions (including sadness, hopelessness, anxiety, guilt, worthlessness, anger and irritability) and lack of positive emotions (anhedonia, apathy) are common in psychiatric disorders but may also present in the absence of a clinical diagnosis.

Most studies on the relationship of negative emotions and suicide in older adults focus on hopelessness. Hopelessness is a risk factor for both suicidal ideation and behavior in older adults [23, 38–42]. Correlation rates of hopelessness with suicidal ideation range from 0.5 to 0.7. Suicide attempters express greater hopelessness after remission of depression than suicide ideators and non-suicidal patients [42]. Taken together, these findings highlight the importance of hopelessness as a proximal risk factor for suicidal ideation and suicidal behavior in older adults.

In addition to hopelessness, other negative emotions have been associated with suicidal thoughts and behavior. In a study of suicide attempters vs. non-attempters, suicide attempters reported lower positive emotions than non-attempters, with anxiety being the most significant emotional predictor of suicide attempts [43]. Within the group of attempters, higher negative emotions, including anger and guilt, and lower positive emotions were associated with a greater number of attempts [43]. In depressed older adults, guilt and worthlessness were associated with over six times greater odds of having suicidal ideation [44]. Reduction of negative emotions (such as depression, pessimism, anxiety, self-reproach) preceded and predicted a reduction in suicidal ideation in older adults with major depression, cognitive impairment and disability receiving home-delivered psychosocial treatments [36].

Maladaptive emotion regulation is a suicide risk factor in older adults. Elevated emotional coping (including emotion regulation strategies such as ruminating, blaming oneself, and venting of negative emotions), avoidance coping and thought suppression is associated with

increased suicide risk beyond depressive symptoms [45]. Problem- and emotion-focused coping is associated with reasons for living and reduced suicidal ideation [46]. Patients with low extraversion and high neuroticism, variables associated with maladaptive emotion regulation, distinguished suicide attempters from non-suicide attempters [47]. Emotional interference when making decisions responding to stress may increase the risk for suicide behavior [48]. Cognitive impairment may also interfere with older adults' ability to regulate emotions. Depression and hopelessness mediate the association of cognitive impairment with increased suicidal ideation suggesting that cognitively impaired older adults may have difficulty modulating negative emotions and, as a result, become suicidal [39].

The high co-occurrence of negative emotions with diagnoses of depression and anxiety disorders calls for research to examine whether negative emotions in the absence of psychiatric diagnoses constitute a risk for suicidal ideation or behavior. Separating the effects of negative emotions from the effects of other depression and anxiety symptoms is challenging because negative emotions may have a direct and indirect effect on other depression and anxiety symptoms, such as somatic, cognitive and vegetative symptoms.

## COGNITION AND DECISION PROCESSES

Suicide is a heterogeneous behavior resulting from a convergence of individual vulnerability, state related brain changes and environmental pressures. Neither the traditional medical model, which emphasizes the role of psychopathology (especially depression, psychosis, and alcohol and drug abuse), nor the psychosocial models that emphasize the role of social isolation and burdensomeness adequately explains the age-related increase in suicide rates. Accelerated age-related cognitive changes may contribute to the inability to solve problems, and to the ultimate decision to take one's life. The importance of different vulnerability factors relative to suicidal behavior may change across the lifespan. Decision making deficits due to cognitive decline, and in particular poor cognitive control, are more common in old age, while the pathway involving impulsive aggression is more common in young adulthood [49].

An emerging literature suggests that the tendency to make disadvantageous decisions is the link between some aspects of the diathesis and suicidal behavior. Extending the stress-diathesis model originally described by J.J. Mann [50], Szanto and colleagues propose that the trait-like diatheses -- impaired cognitive control, deficits in social processing, and impulsivity -- are expressed in poor decisions.

### Decision-making biases as a link between the stable diathesis and the suicidal crisis

Impaired decision-making on the Iowa Gambling Task has been reported in euthymic younger suicide attempters with mood disorders. In particular, suicide attempters failed to switch from high-initial payoff, high-loss options to low-initial payoff, long-term winning options [51]. In a similar decision-making task without working memory demands (Cambridge Gambling Task), older suicide attempters exhibited impaired performance compared to depressed non-suicidal and healthy controls [52]. While these findings support the notion of altered decision making in suicide attempters, the mechanisms of impairment on such a complex task remain unclear.



## **Cognitive aging, decision processes, and suicidal behavior**

Population studies have linked poor cognitive abilities [53, 54] to suicidal behavior. It remains unclear to what extent accelerated cognitive aging explains higher suicide rates in older adults [34]. There may be a certain phase of cognitive decline or a particular cognitive profile that predisposes one to suicidal behavior. For example, a Danish population study found a marked increase in suicide rates in dementia patients after an inpatient admission [30]. It is likely that age-related neurodegenerative and vascular changes [55, 56] modify older adults' vulnerability to suicide. The ability to make cognitively demanding decisions declines in old age even in non-demented elderly [57]. Older adults are more likely to be the victims of misleading advertising or other scams, and also make less advantageous decisions in the laboratory than younger individuals [58, 59]. This is partly explained by an age-related decline in cognitive control [60], related to the disproportionate effect of aging on the prefrontal cortex [61].

## **Cognitive control deficits and high-lethality suicide attempts**

Deficits in cognitive control represent the most consistent finding in both middle-aged [62–67] and older [68–70] suicide attempters, as well as in euthymic first-degree relatives of suicide victims [71]. Interference control (active suppression of task-irrelevant processing) is very sensitive to aging and has been linked to attempted suicide [70, 72, 73], in particular to higher lethality suicide attempts [62, 63, 72]. Another basic deficit in cognitive control, which undermines decision-making in complex environments, is linked to high-lethality suicide attempts [69]. Using a probabilistic reversal learning task, we have also found that older suicide attempters showed deficits in learning compared not only to depressed non-suicidal patients, but also compared to suicide ideators [74]. It is unclear, however, whether these deficits are selective, and whether attention and working memory are also affected [63, 75]. Poor decision making can result from several distinct decision-making biases, suggesting the existence of different pathways en route to suicidal decisions, one of which has been linked to impulsivity.

## **Decision-making deficits related to impulsivity in late-life suicide**

Impulsivity is a complex, multidimensional construct [75–77] inclusive of several components: response initiation prior to complete processing (lack of premeditation), response inhibition (ability to cease or delay an action), and myopic choice (the preference for immediate reward over larger delayed reward) [78, 79]. Risk-taking impulsivity is also often considered as a separate component. It is possible that the importance of these components vary across the life-cycle in suicidal individuals, given the larger co-occurrence of substance abuse and conduct disorder in younger compared to older suicide attempters. Using Kirby's Monetary Choice Questionnaire [80], Dombrovski and colleagues [81] found that the preference for immediate reward over larger delayed reward differentiated between low lethality (mostly impulsive) and high lethality (mostly premeditated) suicidal acts. We have also reported that older suicide attempters neglected key information when making decisions [82], linking specific decision making patterns to low-medical lethality, poorly planned attempts [81, 82]. The neural expression of cognitive control deficits and impulsive

traits and their consequent effects on decision-making that may facilitate suicide are only beginning to be understood [82].

### **Social cognition and social decision making**

Abnormal responses to social stimuli had been described in younger people vulnerable to suicidal behavior [83]. Lack of feeling connected to others [84] and poor social problem solving [85] can amplify the risk for suicide. Szanto and colleagues reported that older suicide attempters committed significantly more errors in social emotion recognition and showed poorer global cognitive performance than elders with no psychiatric history [86]. Attempters had restricted social networks: they were less likely to talk to their children, had fewer close friends, and did not engage in volunteer activities, compared to non-suicidal depressed elders and those with no psychiatric history.

Economic bargaining games can model social influences on decision-making. Using an economic bargaining game that involves unfairness (the Ultimatum Game), Szanto and colleagues showed that high-medical lethality suicide attempters, had disadvantageous tendencies in resolving conflicts on this game [48]. In contrast to the control groups and low-medical lethality suicide attempters, they did not adjust their responses to unfairness based on the money at stake. One of the deficits that may contribute to these patterns of suboptimal social decision-making is interference of emotions with reward prediction. Indeed, maladaptive interference of social emotions in striatal reward responses during an economic exchange have been described [87].

## **CONCLUSION**

Suicide in older adults is a major public concern, as the suicide rates in this population are alarmingly high. Compared to the suicide rate in US in all ages (Year 2011: 12.7/100,000), the suicide rate for 85 year old or older white males is almost four times higher (47.3/100,000). Investigating the role of emotions, cognition, and decision making in suicidal behavior will help identify modifiable risk factors.

For example, the stress-diathesis model of suicide emphasizes the importance of the individual's diathesis as the target for both detection of risk and therapeutic interventions. Over the last decade there has been an accumulation of evidence that understanding cognitive deficits and decision processes associated with suicidal behavior and their relationship to other risk factors may help to identify people at risk for suicide, and facilitate the development of individualized treatment strategies. Extending the stress-diathesis model, Szanto and colleagues propose that the trait-like diatheses -- impaired cognitive control, deficits in social processing, emotion dysregulation, and impulsivity -- are expressed in poor decisions. Deficits in the proposed domains may contribute to suicidal behavior. Personalized treatment may reduce suicide risk and behavior by intervening in these domains [88].

## **REFERENCES**

1. Cerel J, Jordan JR, Duberstein PR. The impact of suicide on the family. *Crisis*. 2008; 29(1):38–44. [PubMed: 18389644]



2. National Action Alliance for Suicide Prevention: Research Prioritization Task Force. A prioritized research agenda for suicide prevention: An action plan to save lives. Rockville, MD: National Institute of Mental Health and the Research Prioritization Task Force; 2014.
3. Centers for Disease Control and Prevention, National Center for Injury Prevention and Control. [Accessed 6/27/2014] Web-based Injury Statistics Query and Reporting System (WISQARS) [online]. Available from [http://www.cdc.gov/injury/wisqars/fatal\\_injury\\_reports.html](http://www.cdc.gov/injury/wisqars/fatal_injury_reports.html)
4. Conwell Y, Van Orden K, Caine ED. Suicide in older adults. *Psychiatr Clin North Am.* 2011; 34(2): 451–468. [PubMed: 21536168]
5. Chan J, Draper B, Banerjee S. Deliberate self-harm in older adults: a review of the literature from 1995 to 2004. *Int J Geriatr Psychiatry.* 2007; 22(8):720–732. [PubMed: 17310495]
6. Fung YL, Chan ZC. A systematic review of suicidal behaviour in old age: a gender perspective. *J Clin Nurs.* 2011; 20(15–16):2109–2124. [PubMed: 21535272]
7. Leadholm AK, Rothschild AJ, Nielsen J, Bech P, Ostergaard SD. Risk factors for suicide among 34,671 patients with psychotic and non-psychotic severe depression. *J Affect Disord.* 2014; 156:119–125. [PubMed: 24388683]
8. Li G. The interaction effect of bereavement and sex on the risk of suicide in the elderly: an historical cohort study. *Social Science and Medicine.* 1995; 40:825–828. [PubMed: 7747217]
9. Bartels SJ, Coakley E, Oxman TE, Constantino G, Oslin D, Chen H, Zubritsky C, Cheal K, Durai UN, Gallo JJ, Llorente M, Sanchez H. Suicidal and death ideation in older primary care patients with depression, anxiety, and at-risk alcohol use. *Am J Geriatr Psychiatry.* 2002; 10(4):417–427. [PubMed: 12095901]
10. Chou KL, Cheung KC. Major depressive disorder in vulnerable groups of older adults, their course and treatment, and psychiatric comorbidity. *Depress Anxiety.* 2013; 30(6):528–537. [PubMed: 23423971]
11. Kalmar S, Szanto K, Rihmer Z, Mazumdar S, Harrison K, Mann JJ. Antidepressant prescription and suicide rates: effect of age and gender. *Suicide Life Threat Behav.* 2008; 38(4):363–374. [PubMed: 18724785]
12. Erlangsen A, Conwell Y. Age-related response to redeemed antidepressants measured by completed suicide in older adults: a nationwide cohort study. *Am J Geriatr Psychiatry.* 2014; 22(1):25–33. [PubMed: 23567434]
13. Cohen CI, Abdallah CG, Diwan S. Suicide attempts and associated factors in older adults with schizophrenia. *Schizophr Res.* 2010; 119(1–3):253–257. [PubMed: 20382505]
14. Erlangsen A, Eaton WW, Mortensen PB, Conwell Y. Schizophrenia--a predictor of suicide during the second half of life? *Schizophr Res.* 2012; 134(2–3):111–117. [PubMed: 22018943]
15. 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):149–157. [PubMed: 18297490]
16. Conwell Y, Duberstein PR, Caine ED. Risk factors for suicide in later life. *Biol Psychiatry.* 2002; 52(3):193–2004. [PubMed: 12182926]
17. Vasiliadis HM, Gagné S, Prévaille M. Gender differences in determinants of suicidal ideation in French-speaking community living elderly in Canada. *Int Psychogeriatr.* 2012; 24(12):2019–2026. [PubMed: 22809829]
18. Fanning JR, Pietrzak RH. Suicidality among older male veterans in the United States: results from the National Health and Resilience in Veterans Study. *J Psychiatr Res.* 2013; 47(11):1766–1775. [PubMed: 23992768]
19. Alexopoulos GS, Reynolds CF 3rd, Bruce ML, Katz IR, Raue PJ, Mulsant BH, Oslin DW, Ten Have T. PROSPECT Group. Reducing suicidal ideation and depression in older primary care patients: 24-month outcomes of the PROSPECT study. *Am J Psychiatry.* 2009; 166:882–890. [PubMed: 19528195]
20. Raue PJ, Meyers BS, Rowe JL, Heo M, Bruce ML. Suicidal ideation among elderly home care patients. *Int J Geriatr Psychiatry.* 2007; 22(1):32–37. [PubMed: 16955449]
21. Bogers IC, Zuidersma M, Boshuisen ML, Comijs HC, Oude Voshaar RC. Determinants of thoughts of death or suicide in depressed older persons. *Int Psychogeriatr.* 2013 Nov; 25(11): 1775–1782. [PubMed: 23927927]

22. Kim S, Ha JH, Yu J, Park DH, Ryu SH. Path analysis of suicide ideation in older people. *Int Psychogeriatr*. 2014; 26(3):509–515. [PubMed: 24331368]
23. Cukrowicz KC, Duberstein PR, Vannoy SD, Lynch TR, McQuoid DR, Steffens DC. Course of suicide ideation and predictors of change in depressed older adults. *J Affect Disord*. 2009; 113(1–2):30–36. [PubMed: 18617271]
24. Kang HJ, Stewart R, Jeong BO, Kim SY, Bae KY, Kim SW, Kim JM, Shin IS, Yoon JS. Suicidal ideation in elderly Korean population: a two-year longitudinal study. *Int Psychogeriatr*. 2014; 26(1):59–67. [PubMed: 24067580]
25. Batterham PJ, Calear AL, Mackinnon AJ, Christensen H. The association between suicidal ideation and increased mortality from natural causes. *J Affect Disord*. 2013 Sep 25; 150(3):855–860. [PubMed: 23618327]
26. Raue PJ, Morales KH, Post EP, Bogner HR, Have TT, Bruce ML. The wish to die and 5-year mortality in elderly primary care patients. *Am J Geriatr Psychiatry*. 2010; 18:341–350. [PubMed: 19910882]
27. Pompili M, Innamorati M, Di Vittorio C, Sher L, Girardi P, Amore M. Sociodemographic and clinical differences between suicide ideators and attempters: a study of mood disordered patients 50 years and older. *Suicide Life Threat Behav*. 2014; 44(1):34–45. [PubMed: 23937195]
28. Sachs-Ericsson N, Hames JL, Joiner TE, Corsentino E, Rushing NC, Palmer E, Gotlib IH, Selby EA, Zarit S, Steffens DC. Differences between suicide attempters and nonattempters in depressed older patients: depression severity, white-matter lesions, and cognitive functioning. *Am J Geriatr Psychiatry*. 2014; 22(1):75–85. [PubMed: 23933424]
29. Seyfried LS, Kales HC, Ignacio RV, Conwell Y, Valenstein M. Predictors of suicide in patients with dementia. *Alzheimers Dement*. 2011; 7(6):567–573. [PubMed: 22055973]
30. Erlangsen A, Zarit SH, Conwell Y. Hospital-diagnosed dementia and suicide: a longitudinal study using prospective, nationwide register data. *Am J Geriatr Psychiatry*. 2008; 16(3):220–228. [PubMed: 18310552]
31. Sabodash V, Mendez MF, Fong S, Hsiao JJ. Suicidal behavior in dementia: a special risk in semantic dementia. *Am J Alzheimers Dis Other Dement*. 2013 Sep; 28(6):592–599. [PubMed: 23821774]
32. Purandare N, Voshaar RC, Rodway C, Bickley H, Burns A, Kapur N. Suicide in dementia: 9-year national clinical survey in England and Wales. *Br J Psychiatry*. 2009; 194(2):175–180. [PubMed: 19182182]
33. Draper B, Peisah C, Snowden J, Brodaty H. Early dementia diagnosis and the risk of suicide and euthanasia. *Alzheimers Dement*. 2010; 6:75–82. [PubMed: 20129322]
34. Haw C, Harwood D, Hawton K. Dementia and suicidal behavior: a review of the literature. *Int Psychogeriatr*. 2009; 21(3):440–453. [PubMed: 19368760]
35. Nowrangi MA, Rao V, Lyketsos CG. Epidemiology, assessment, and treatment of dementia. *Psychiatr Clin North Am*. 2011; 34(2):275–294. [PubMed: 21536159]
36. Kiosses, DN.; Alexopoulos, GS. AAGP 2014 Annual Meeting. Orlando, Florida: Suicide ideation in older adults with major depression, cognitive impairment and disability.
37. Draper B, Brodaty H, Low LF, Richards V. Prediction of mortality in nursing home residents: impact of passive self-harm behaviors. *Int Psychogeriatr*. 2003 Jun; 15(2):187–196. [PubMed: 14620077]
38. Conwell Y, Thompson C. Suicidal behavior in elders. *Psychiatr Clin North Am*. 2008; 31(2):333–356. [PubMed: 18439452]
39. Heisel MJ, Flett GL, Besser A. Cognitive functioning and geriatric suicide ideation: testing a mediational model. *Am J Geriatr Psychiatry*. 2002; 10(4):428–436. [PubMed: 12095902]
40. Lynch TR, Cheavens JS, Morse JQ, Rosenthal MZ. A model predicting suicidal ideation and hopelessness in depressed older adults: the impact of emotion inhibition and affect intensity. *Aging Ment Health*. 2004; 8(6):486–497. [PubMed: 15724830]
41. Hill RD, Gallagher D, Thompson LW, Ishida T. Hopelessness as a measure of suicide intent in the depressed elderly. *Psychol Aging*. 1988; 3:230–232. [PubMed: 3268263]

42. Szanto K, Reynolds CF III, Conwell Y, Begley AE, Houck P. High levels of hopelessness persist in geriatric patients with remitted depression and a history of attempted suicide. *J Am Geriatr Soc.* 1998; 46(11):1401–1406. [PubMed: 9809762]
43. Seidlitz L, Conwell Y, Duberstein P, Cox C, Denning D. Emotion traits in older suicide attempters and non-attempters. *J Affect Disord.* 2001; 66(2–3):123–131. [PubMed: 11578664]
44. Lynch TR, Johnson CS, Mendelson T, Robins CJ, Ranga K, Krishnan R, Blazer DG. Correlates of suicidal ideation among an elderly depressed sample. *J Affect Disord.* 1999; 56(1):9–15. [PubMed: 10626775]
45. 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):149–157. [PubMed: 18297490]
46. Marty MA, Segal DL, Coolidge FL. Relationships among dispositional coping strategies, suicidal ideation, and protective factors against suicide in older adults. *Aging Ment Health.* 2010; 14(8):1015–1023. [PubMed: 21069608]
47. Duberstein PR, Conwell Y, Seidlitz L, Denning DG, Cox C, Caine ED. Personality traits and suicidal behavior and ideation in depressed inpatients 50 years of age and older. *J Gerontol B Psychol Sci Soc Sci.* 2000; 55(1):P18–P26. [PubMed: 10728121]
48. Szanto K, Clark L, Hallquist M, Vanyukov P, Crockett M, Dombrowski AY. The cost of social punishment and high-lethality suicide attempts in the second half of life. *Psychol Aging.* 2014; 29(1):84–94. [PubMed: 24660798]
49. 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):407–417. [PubMed: 17803833]
50. Mann JJ. Neurobiology of suicidal behaviour. *Nature Reviews Neuroscience.* 2003; 4(10):819–828.
51. Jollant F, Bellivier F, Leboyer M, Astruc B, Torres S, Verdier R, Castelnaud D, Malafosse A, Courtet P. Impaired decision making in suicide attempters. *Am J Psychiatry.* 2005; 162(2):304–310. [PubMed: 15677595]
52. Clark L, Dombrowski AY, Siegle GJ, Butters MA, Shollenberger CL, Sahakian BJ, Szanto K. Impairment in risk-sensitive decision-making in older suicide attempters with depression. *Psychology and Aging.* 2011; 26(2):321–330. [PubMed: 21443349]
53. Andersson L, Allebeck P, Gustafsson JE, Gunnell D. Association of IQ scores and school achievement with suicide in a 40-year follow-up of a Swedish cohort. *Acta Psychiatrica Scandinavica.* 2008; 118(2):99–105. [PubMed: 18331576]
54. Gunnell D, Löfving S, Gustafsson JE, Allebeck P. School performance and risk of suicide in early adulthood: Follow-up of two national cohorts of Swedish schoolchildren. *J Affect Disord.* 2011; 131(1–3):104–112. [PubMed: 21296426]
55. Alexopoulos GS, Meyers BS, Young RC, Campbell S, Silbersweig D, Charlson M. 'Vascular depression' hypothesis. *Arch Gen Psychiatry.* 1997; 54(10):915–922. Epub 1997/10/24. [PubMed: 9337771]
56. Chan SS, Lyness JM, Conwell Y. Do cerebrovascular risk factors confer risk for suicide in later life? A case-control study. *Am J Geriatr Psychiatry.* 2007; 15(6):541–544. [PubMed: 17545453]
57. Denburg NL, Cole CA, Hernandez M, Yamada TH, Tranel D, Bechara A, Wallace RB. The orbitofrontal cortex, real-world decision making, and normal aging. *Annals of the New York Academy of Sciences.* 2007; 1121:480–498. [PubMed: 17872394]
58. Fein G, McGillivray S, Finn P. Older adults make less advantageous decisions than younger adults: Cognitive and psychological correlates. *Journal of the International Neuropsychological Society.* 2007; 13(3):480–489. [PubMed: 17445297]
59. Brown SBRE, Ridderinkhof KR. Aging and the neuroeconomics of decision making: A review. *Cognitive, Affective and Behavioral Neuroscience.* 2009; 9(4):365–379.
60. MacPherson SE, Phillips LH, Della Sala S. Age executive function and social decision making: A dorsolateral prefrontal theory of cognitive aging. *Psychology and Aging.* 2002; 17(4):598–609. [PubMed: 12507357]

61. Raz N, Lindenberger U, Rodrigue KM, Kennedy KM, Head D, Williamson A, Dahle C, Gerstorff D, Acker JD. Regional brain changes in aging healthy adults: general trends, individual differences and modifiers. *Cereb Cortex*. 2005; 15(11):1676–1689. [PubMed: 15703252]
62. Keilp JG, Sackeim HA, Brodsky BS, Oquendo MA, Malone KM, Mann JJ. Neuropsychological dysfunction in depressed suicide attempters. *Am J Geriatr Psychiatry*. 2001; 158(5):735–741.
63. Keilp JG, Goryn M, Oquendo MA, Burke AK, Mann JJ. Attention deficit in depressed suicide attempters. *Psychiatry Res*. 2008; 159(1–2):7–17. [PubMed: 18329724]
64. Marzuk PM, Hartwell N, Leon AC, Portera L. Executive functioning in depressed patients with suicidal ideation. *Acta Psychiatrica Scandinavica*. 2005; 112(4):294–301. [PubMed: 16156837]
65. Nock MK, Park JM, Finn CT, Deliberto TL, Dour HJ, Banaji MR. Measuring the suicidal mind: implicit cognition predicts suicidal behavior. *Psychol Science*. 2010; 21(4):511–517. An important paper highlighting the connection between implicit cognition and suicide.
66. Raust A, Slama F, Mathieu F, Roy I, Chenu A, Koncke D, Fouques D, Jollant F, Jouvent E, Courtet P. Prefrontal cortex dysfunction in patients with suicidal behavior. *Psychol Med*. 2007; 37(03):411–419. [PubMed: 17049103]
67. Keilp JG, Sackeim HA, Brodsky BS, Oquendo MA, Malone KM, Mann JJ. Neuropsychological dysfunction in depressed suicide attempters. *Am J Psychiatry*. 2001; 158(5):735–741. [PubMed: 11329395]
68. Gujral S, Dombrovski AY, Butters M, Clark L, Reynolds CF 3rd, Szanto K. Impaired Executive Function in Contemplated and Attempted Suicide in Late Life. *Am J Geriatr Psychiatry*. 2013 Feb 6. [Epub ahead of print].
69. McGirr A, Dombrovski AY, Butters M, Clark L, Szanto K. Deterministic learning and attempted suicide among older depressed individuals: Cognitive assessment using the Wisconsin Card Sorting Task. *J Psychiatric Res*. 2012; 46(2):226–232.
70. Richard-Devantoy S, Jollant F, Kefi Z, Turecki G, Olie JP, Annweiler C, Beauchet O, Le Gall D. Deficit of cognitive inhibition in depressed elderly: a neurocognitive marker of suicidal risk. *J Affect Disord*. 2012; 140(2):193–199. [PubMed: 22464009]
71. McGirr A, Jollant F, Turecki G. Neurocognitive alterations in first degree relatives of suicide completers. *J Affect Disord*. 2013; 145(2):264–269. [PubMed: 22840615]
72. Keilp JG, Goryn M, Russell M, Oquendo MA, Burke AK, Harkavy-Friedman J, Mann JJ. Neuropsychological function and suicidal behavior: attention control, memory and executive dysfunction in suicide attempt. *Psychol Med*. 2013; 43(3):539–551. [PubMed: 22781400]
73. Richard-Devantoy S, Annweiler C, Beauchet O, Camus V, Le Gall D, Garre JB. P03-470 - Cognitive inhibition in suicidal depressed elderly. *European Psychiatry*. 2011; 26(1):1640.
74. Dombrovski AY, Clark L, Siegle GJ, Butters MA, Ichikawa N, Sahakian BJ, Szanto K. Reward/Punishment reversal learning in older suicide attempters. *Am J Psychiatry*. 2010; 167(6):699–707. [PubMed: 20231320]
75. Dougherty DM, Mathias CW, Marsh DM, Papageorgiou TD, Swann AC, Moeller FG. Laboratory measured behavioral impulsivity relates to suicide attempt history. *Suicide Life Threat Behav*. 2004; 34(4):374–385. [PubMed: 15585459]
76. Klonsky ED, May A. Rethinking impulsivity in suicide. *Suicide Life Threat Behav*. 2010; 40(6): 612–619. [PubMed: 21198330]
77. Kirby KN, Finch JC. The hierarchical structure of self-reported impulsivity. *Personality and Individual Differences*. 2010; 48(6):704–713. Epub 2010/03/13. [PubMed: 20224803]
78. Dougherty DM, Mathias CW, Marsh-Richard DM, Furr RM, Nouvion SO, Dawes MA. Distinctions in Behavioral Impulsivity: Implications for Substance Abuse Research. *Addictive Disorders and their Treatment*. 2009; 8(2):61–73. [PubMed: 20535237]
79. Dougherty DM, Richard DM, James LM, Mathias CW. Effects of Acute Tryptophan Depletion on Three Different Types of Behavioral Impulsivity. *International Journal of Tryptophan Research*. 2010; 3:99–111. Epub 2010 June 10. [PubMed: 22084592]
80. Kirby KN. Bidding on the future: Evidence against normative discounting of delayed rewards. *Journal of Experimental Psychology-General*. 1997; 126(1):54–70.
81. Dombrovski AY, Szanto K, Siegle GJ, Wallace ML, Forman SD, Sahakian B, Reynolds CF 3rd, Clark L. Lethal Forethought: Delayed Reward Discounting Differentiates High- and Low-

- Lethality Suicide Attempts in Old Age. *Biol Psychiatry*. 2011; 70(2):138–144. [PubMed: 21329911]
82. Dombrovski AY, Szanto K, Clark L, Reynolds CF, Siegle GJ. Reward Signals, Attempted Suicide, and Impulsivity in Late-Life Depression. *JAMA Psychiatry*. 2013 Aug 7. [Epub ahead of print]. A paper highlighting the relationship of neural circuit abnormalities that underlie disadvantageous choices in people at risk for suicide with impulsivity.
  83. Jollant F, Lawrence N, Giampietro V, Brammer M, Fullana M, Drapier D, Courtet P, Phillips M. Orbitofrontal cortex response to angry faces in men with histories of suicide attempts. *Am J Psychiatry*. 2008; 165(6):740–748. [PubMed: 18346998]
  84. Duberstein PR, Conwell Y, Conner KR, Eberly S, Evinger JS, Caine ED. Poor social integration and suicide: fact or artifact? A case-control study. *Psychol Med*. 2004; 34(7):1331–1337. [PubMed: 15697059]
  85. 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):1396–1404. [PubMed: 19405045]
  86. Szanto K, Dombrovski AY, Sahakian BJ, Mulsant BH, Houck PR, Reynolds CF 3rd, Clark L. Social Emotion Recognition, Social Functioning, and Attempted Suicide in Late-Life Depression. *Am J Geriatr Psychiatry*. 2012; 20(3):257–265. [PubMed: 22354116]
  87. Delgado MR, Frank RH, Phelps EA. Perceptions of moral character modulate the neural systems of reward during the trust game. *Nature Neuroscience*. 2005; 8(11):1611–1618.
  88. Alexopoulos G, Arean P. A model for streamlining psychotherapy in the RDoC era: the example of ‘Engage’. *Mol Psychiatry*. 2014 Jan; 19(1):14–19. [PubMed: 24280983] A recent article describing a new psychotherapy linked to RDoC constructs.