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NEUROPSYCHOLOGICAL FUNCTIONING IN PRISONERS WITH AND WITHOUT SELF-INJURIOUS BEHAVIORS:

Implications for the Criminal Justice System

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Abstract

Neuropsychological functioning has not yet been investigated among prisoners who engage in self-injurious behaviors, specifically attempted suicide and nonsuicidal self-injury (NSSI). The purpose of this study was to investigate neuropsychological functioning in prisoners with and without histories of NSSI and attempted suicide. The sample consisted of 173 male prisoners referred for neuropsychological evaluation. Of participants, 56% reported a history of self-injury. Performance on the neuropsychological domains of intelligence, memory, attention, motor functioning, and executive functioning was assessed. No group differences were found among those with NSSI, with NSSI and suicide attempts, and with no history of deliberate self-harm, although functioning was poor in all domains. Implications of the high prevalence of self-injury in this prison sample, as well as implications of impaired functioning on the treatment of self-injurious behaviors, are discussed.

Keywords

neuropsychology; neurocognitive; self-injury; nonsuicidal self-injury; suicide attempt; prisoner

Self-injurious behaviors involve deliberate harm to the body and are performed with or without intent to die; these behaviors are known as attempted suicide and nonsuicidal self-injury (NSSI), respectively. Both behaviors are prevalent in and present challenges to the

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correctional system, as they tap into limited resources and pose a threat to safety and security for fellow inmates and correctional staff alike (DeHart, Smith, & Kaminski, 2009; Fagan, Cox, Helfand, & Aufderheide, 2010; Jeglic, Vanderhoff, & Donovan, 2005). Official statistics state that 16% of state prisoners reported a suicide attempt in the past year (Mumola, 2005). Little research has focused specifically on NSSI in correctional settings (DeHart et al., 2009), but researchers have reported rates of NSSI during incarceration ranging from 11.3% of adult male offenders in a forensic mental health facility (Franklin, 1988) to 30% of clinically referred adolescents in the justice system (Penn, Esposito, Schaeffer, Fritz, & Spirito, 2003). Approximately 50% of female prisoners report at least one episode in their lifetime (Borrill et al., 2003; Roe-Sepowitz, 2007).

Although both attempted suicide and NSSI involve direct injury to the body, they differ in several important ways, including suicidal intent, chronicity, and lethality (Muehlenkamp, 2005). Despite these differences, the behaviors often co-occur (Andover & Gibb, 2010; Langbehn & Pfohl, 1993). Those who engage in NSSI while incarcerated are likely to have a history of NSSI (Lohner & Konrad, 2007; Penn et al., 2003), and individuals who engage in NSSI are more likely to engage in suicidal behavior while incarcerated than those without an NSSI history (Jones, 1986; Penn et al., 2003). Prior suicide attempts were known in half of prison deaths by suicide, and nearly 40% of those who died by suicide had reported suicidality prior to the death (Fruehwald, Frottier, Matschnig, & Eher, 2003). Awareness of prisoners' suicide attempt and NSSI histories is essential, as past suicide attempts are the most significant predictor for future suicide attempts (Joiner et al., 2005). In addition, NSSI may habituate individuals to the physical and emotional pain necessary to die by suicide, thus increasing suicide risk (Van Orden, Merrill, & Joiner, 2005). The differences between NSSI and suicidal self-injury mandate that they be considered distinct despite their co-occurrence (Lohner & Konrad, 2006; Muehlenkamp, 2005); although much of the literature specific to the correctional system focuses on attempted suicide, few studies address NSSI.

Research has begun to investigate risk factors for NSSI that are specific to the correctional system. Self-injury during incarceration has been associated with bullying victimization while incarcerated, isolation or segregation, disciplinary infractions, personal loss, prior incarceration, incarceration for a violent offense, and the early phase of custody (Jeglic et al., 2005; Jones, 1986; Livingston, 1997; Lohner & Konrad, 2007; McKee, 1998; Smith & Kaminski, 2010). Prisoners who engage in NSSI are also likely to have a childhood onset of psychiatric symptoms (Fulwiler, Forbes, Santangelo, & Folstein, 1997), history of drug use (Penn et al., 2003), and, among females, a history of childhood abuse, risk-taking behaviors, and prostitution (Roe-Sepowitz, 2007). Exposure to self-injury by others is associated with self-injury during incarceration (Lohner & Konrad, 2007); self-injury in an individual may lead to contagion of the behavior.

Although NSSI in correctional settings has often been perceived as manipulative (i.e., to seek attention or change circumstances; DeHart et al., 2009; Fulwiler et al., 1997; Heycock, 1989), recent research has supported four behavioral functions of NSSI: automatic positive and negative reinforcement when the function of the behavior is intrapersonal, and social positive and negative reinforcement when the function of the behavior is interpersonal (Nock & Prinstein, 2004, 2005). These reinforcement principles are reflected in recent research on

the functions of NSSI in correctional settings as the most frequently cited reasons for NSSI among adolescents in the juvenile justice system included stopping bad feelings (automatic negative reinforcement), needing to feel something, even pain (automatic positive reinforcement), and self-punishment (Penn et al., 2003). Similarly, DeHart et al. (2009) reported that 85% of professionals believed that inmates self-injured as a method to cope with stress, and Fulwiler et al. (1997) reported that the majority of inmates who engaged in NSSI reported doing so to relieve anxiety or tension, whereas only 31% reported using NSSI for manipulation. However, any self-injury—even when performed for manipulation—cannot be ignored, although the potential for lethality may be disregarded when the function of the behavior appears to be manipulative (Jeglic et al., 2005). Few self-injurious behaviors are concurrently manipulative, of low lethality, and performed with low or no suicidal intent (Dear, Thomson, & Hills, 2000). Even when performed to manipulate others or the system, self-injurious behaviors can be performed with suicidal intent and may result in death or serious injury.

Intervention for self-injurious behaviors presents a particular challenge in correctional settings. Although it is important that every instance of self-injury be addressed (Dear et al., 2000), other inmates may perceive the intervention as rewarding, thus creating the possibility of a contagion effect (DeHart et al., 2009). Deficits in neuropsychological functioning are common in prisoners with mental health problems (Williams, Zamora, & Donovan, 2011), which further complicates the issue of treatment. Neuropsychological deficits will affect an individual's ability to learn, plan, and control behavior, and inhibit inappropriate or previously learned responses, thus affecting the success of interventions for self-injury.

Few published studies have investigated the neuropsychological functioning of prisoners with self-injurious behaviors. To our knowledge, only one published study has investigated the association between neuropsychological functioning and NSSI specifically; the sample for this study consisted of community adolescents (Fikke, Melinder, & Landrø, 2011). Neuropsychological deficits have been identified in individuals with histories of attempted suicide (i.e., LeGris & van Reekum, 2006). Although NSSI and attempted suicide are distinct behaviors (Muehlenkamp, 2005), it is important to consider the more extensive literature on this associated behavior.

Given the cognitive rigidity evident in suicidal behavior (i.e., Weishaar & Beck, 1992), existing studies have focused on the role of executive functioning in attempted suicide (LeGris & van Reekum, 2006) and have reported deficits on several measures of executive functioning among psychiatric patients with a history of suicide attempts. Deficits in measures of executive functioning, including verbal and design fluency, reasoning, failure to maintain set on the Wisconsin Card Sort Test (WCST), and A-not-B reaction time—where individuals are required to respond to one stimulus but inhibit responses to another—have been reported among psychiatric inpatients with a recent suicide attempt (Bartfai, Winborg, Nordström, & Åsberg, 1990) and depressed patients with a history of high-lethality suicide attempts (Keilp et al., 2001). Jollant et al. (2005, 2010) reported impairments on decision making, a specific aspect of executive functioning as measured by the Iowa Gambling Task, among individuals with a suicide attempt history when compared to nonattempters. Their

findings suggest that under uncertain conditions, individuals with a suicide attempt history may have difficulty appropriately evaluating response options, particularly in evaluating risky options (Jollant et al., 2010). Although few studies address neuropsychological deficits outside of executive functioning, Keilp et al. (2001) found that patients with a high-lethality attempt exhibited significantly more deficits on composite scores of intelligence, attention, and memory measures than nonattempters.

Deficits in executive functioning are also evident in depressed adults experiencing suicidal ideation as measured by number of perseverative errors on the WCST, Trail Making Test Parts B minus A, and the Mazes subtest of the Wechsler Intelligence Scale for Children (Marzuk, Hartwell, Leon, & Portera, 2005). Researchers suggest that suicidal ideation may be an important factor in understanding the relationship between executive functioning and attempted suicide among psychiatric inpatients with a recent suicide attempt (Westheide et al., 2008).

However, reports of executive functioning deficits among suicide attempters have not been consistent. Researchers have noted equivalent performance between suicide attempters and nonattempters on several measures of executive functioning, including the Stroop Test, WCST, Perceptual Maze Test, verbal and figural fluency, and attention and concentration as measured by the Wechsler Memory Scale–Revised (Bartfai et al., 1990; Keilp et al., 2001; King et al., 2000). However, a pattern of worsening performance on Part B of the Trail Making Test with increasing age was found among suicide attempters but not among nonattempters (King et al., 2000). Although Ellis, Berg, and Franzen (1992) reported no difference in executive functioning as measured by the WCST and Trail Making Test between suicide attempters and nonattempters in a psychiatric sample, a significant percentage of each group was impaired compared to standardized norms.

Although not unanimous, the majority of findings support impairments in executive functioning among individuals with a suicide attempt history or who are currently experiencing suicidal ideation. Researchers suggest that the cognitive inflexibility associated with impaired executive functioning may underlie suicidal ideation and behavior (Marzuk et al., 2005), as suicidal individuals have difficulty generating alternate solutions and are often inflexible in their thinking (Bartfai et al., 1990; Marzuk et al., 2005; Weishaar & Beck, 1992). Research suggests that the pattern of impaired executive functioning may be consistent for individuals who have engaged in NSSI. Fikke et al. (2011) found that among community adolescents, those who engaged in low severity NSSI (based on number of NSSI methods used and potential for tissue damage of each method) demonstrated impaired inhibitory control as measured by the Stop Signal Task and those with high severity NSSI were impaired on working memory as measured by the Spatial Working Memory Test.

The purpose of the current study was to investigate neuropsychological functioning among a sample of adult male prisoners with and without self-injurious behaviors who were referred for neuropsychological evaluation. We hypothesized that prisoners with histories of attempted suicide or NSSI would evidence greater deficits in executive functioning compared to prisoners with no history of self-injurious behaviors. Because little research has investigated neuropsychological functioning and NSSI, these analyses were exploratory, and

we did not hypothesize as to the relationship between the NSSI and suicide attempt only groups. Understanding neuropsychological functioning in self-injury with and without suicidal intent will enable researchers to further our understanding of the mechanisms underlying self-injurious behaviors as well as to develop more appropriate interventions for the behaviors that incorporate patients' cognitive strengths and weaknesses.

METHOD

PARTICIPANTS

The data for this study were derived from neuropsychological evaluations performed at two forensic facilities in the northeastern United States. Participants consisted of 173 men from a maximum-security prison (40.5%) or a maximum-security forensic psychiatric facility (59.5%). Participants for the study were referred for a neuropsychological evaluation; referrals were typically in response to a prisoner's failure to comply with regulations, disruptive behavior, disorientation, or dramatic changes in daily functioning in the facility. The mean age of participants was 39.37 years ($SD = 11.66$), ranging from 16 to 69 years. One third ($n = 58$) of participants self-identified as Caucasian, 38.7% ($n = 67$) as African American, 18.5% ($n = 32$) as Latino, and 6.9% ($n = 12$) as another ethnicity. Information on ethnicity was unavailable for 2.3% ($n = 4$) of the sample. Participants reported 10.30 mean years of education ($SD = 2.55$), ranging from second grade education to graduate school. Data were unavailable for index crime or crimes and psychiatric or medical history.

MEASURES

Demographic information such as ethnicity, education, and age was obtained from each participant. History of self-injury was assessed by asking the participant, "Have you ever tried to kill yourself?" and "Have you ever hurt yourself on purpose without trying to kill yourself?"

Standard neuropsychological tests were used to assess the domains of intelligence, executive functioning, attention, motor functioning, and memory. Intelligence was assessed with the Wechsler Adult Intelligence Scale–III (WAIS-III; Psychological Corporation, 1997), a standard measure of general intellectual functioning in adults that yields verbal, performance, and full-scale IQ scores.

The Trail Making Test (TMT; Reitan, 1955) was used to assess the domains of attention (Part A) and executive functioning (Part B), specifically cognitive flexibility. Part A of the TMT correlates with tests of attentional abilities (O'Donnell, MacGregor, Dabrowski, Oestreicher, & Romero, 1994; Royan, Tombaugh, Rees, & Francis, 2004), and Part B correlates with measures of cognitive flexibility (Kortte, Horner, & Windham, 2002) and set switching (Arbuthnott & Frank, 2000). The Controlled Oral Word Association Test (COWA; Benton, Hamsher, & Sivan, 1994) was also used to assess cognitive flexibility, an aspect of executive functioning. The COWA consists of three trials, each lasting 1 minute, during which the participant is asked to list as many words as possible that begin with one of three specific letters. The participant is then asked to name as many animals as possible in 1 minute.

The Purdue Pegboard Test (Tiffin, 1968; Tiffin & Asher, 1948) was used to assess motor functioning, specifically unimanual and bimanual dexterity. Verbal memory was assessed using the Immediate Recall, Delayed Recall, and Recognition subtests of the California Verbal Learning Test–II (CVLT-II; Delis, Kramer, Kaplan, & Ober, 2000), whereas the Immediate Recall, Delayed Recall, and Recognition subtests of the Rey Complex Figure Test (RCFT; Meyers & Meyers, 1995) were used to assess visual memory.

PROCEDURE

An archival database of neuropsychological evaluations was analyzed for this study. All identifying information was removed from the database prior to analysis. Neuropsychological evaluations were requested by the correctional facility and performed by advanced graduate students trained in neuropsychological evaluations and supervised by a doctoral-level neuropsychologist. Assessments took approximately 8 hours to complete and were generally completed over 2 days. All participants provided informed consent that their deidentified data could be used for research purposes. This study was approved by the relevant institutional review boards.

STATISTICAL ANALYSES

The pattern of missing data was examined and found to be missing completely at random (MCAR) among participants, and maximum likelihood estimates were computed for missing data and used in all analyses. Group differences were analyzed using multivariate analyses of covariance and chi-square analyses when appropriate. All data analyses were performed using SPSS Version 17.

RESULTS

Nearly half of participants (46.8%) reported a history of only attempted suicide, and 28.0% reported a history of only NSSI. History of both NSSI and attempted suicide was reported by 16.8% of the sample. For the purposes of the current study, participants were categorized as NSSI with or without history of suicide attempts ($n = 45$), suicide attempts only ($n = 52$), and no history of NSSI or attempted suicide ($n = 76$).

Given that missing data were observed for each of the measures, we examined whether the pattern of missing data justified the use of data imputation methods (cf. Schafer & Graham, 2002). Specifically, we conducted Little's MCAR test (Little & Rubin, 1987), which was nonsignificant, $\chi^2(1108) = 1144.38, p = .22$. Therefore, maximum likelihood estimates of missing data were computed and used in all analyses (see Schafer & Graham, 2002).

Raw scores for all neuropsychological tests were standardized based on the appropriate normative data for that measure. Five neuropsychological domains were assessed: intelligence, memory, attention, motor functioning, and executive functioning. WAIS-III full-scale IQ, performance IQ, and verbal IQ scores composed the domain of intelligence. The memory domain consisted of the Short Term, Long Term, and Recognition scales of the CVLT and the Immediate Recall, Delayed Recall, and Recognition scales of the RCFT. The attention domain consisted of TMT Parts A and B. The motor functioning domain was composed of the dominant, nondominant, and bimanual performance scores of the Purdue

Pegboard. Finally, executive functioning was assessed using the COWA and Part B of the TMT. Preliminary analyses revealed that dominant, nondominant, and bimanual standardized scores on the Purdue Pegboard showed significant skew. To satisfy assumptions of normalcy, log 10 transformations were performed on dominant and bimanual scores, and a square root transformation was performed on the nondominant scores.

Descriptive statistics for our sample by group are presented in Table 1. The NSSI, suicide attempt only, and no self-injury groups did not differ significantly from each other in terms of handedness, ethnicity, or age. They did, however, differ on prison facility, $\chi^2(2) = 11.11$, $p = .004$, $\phi = .25$, and level of education, $F(2) = 4.72$, $p = .01$, $\eta^2_{\text{Partial}} = .05$. Thus, location and level of education were included as covariates in all analyses.

Participants as a whole performed poorly on measures of intelligence, memory, attention, motor functioning, and executive functioning, scoring 1 to 2 standard deviations below the mean on nearly all measures. To determine whether the identified groups differed significantly on neuropsychological domains and specific tests administered, a series of MANOVAs was conducted (see Table 2). The NSSI, suicide attempt only, and no self-injury groups did not differ significantly in intelligence; specifically, groups did not differ on full-scale IQ, performance IQ, or verbal IQ. The NSSI, suicide attempt only, and no self-injury groups did not differ in any measures assessing memory. The NSSI, suicide attempt only, and no self-injury groups did not differ significantly in the domains of attention or motor functioning. Finally, there were no significant group differences in the domain of executive functioning; specifically, the NSSI, suicide attempt only, and no self-injury groups did not differ on Trails B, COWA letters, or COWA animals.

DISCUSSION

The purpose of this study was to investigate the neuropsychological functioning of prisoners with and without histories of self-injury. Contrary to previous research (i.e., LeGriss & van Reekum, 2006) and to our hypothesis, we found no significant differences in neuropsychological functioning among prisoners with histories of NSSI, attempted suicide alone, or with no history of self-injury. However, this study found that self-injury is alarmingly prevalent in correctional settings, as nearly half of the participants reported a history of attempted suicide. A significant number of prisoners in this study reported a history of NSSI (28.0%), and 64.4% of prisoners with an NSSI history also reported a suicide attempt history. The prevalence of self-injurious behaviors found in this study is similar to that reported in clinical samples (i.e., Andover & Gibb, 2010; Briere & Gil, 1998). Little is known about the prevalence of NSSI in correctional settings (DeHart et al., 2009), and reports of self-injury prevalence range from 11.3% to 50.0% (Franklin, 1988; Roe-Sepowitz, 2007). This study emphasizes the importance and necessity of suicide prevention and intervention efforts, given the high prevalence of attempted suicide in our sample.

Although group differences in neuropsychological functioning were not found, significant impairments in neuropsychological functioning were evident across all groups. Scores were between 1 and 2 standard deviations below the mean on all neuropsychological measures, including tests of intelligence, executive functioning, memory, attention, and motor

functioning. This finding is consistent with research in prison samples (Williams et al., 2011) and with previous findings that individuals with intellectual disabilities are overrepresented in the criminal justice system (Cashin, Butler, Levy, & Potter, 2006; S. C. Hayes, 1997).

Deficits in neuropsychological functioning such as those reported in this study impact learning, attention, behavior control, and decision making. Prisoners' poor neuropsychological performance may lead to difficulties understanding and attending to complex concepts such as those addressed in therapy, and deficits in executive functioning and information processing may impair and delay learning and behavior modification (Fertuck, Lenzenweger, & Clarkin, 2002). It is imperative that prevention and intervention programs for self-injury are developed with these deficits in mind. An example of a self-injury prevention program in prisons that considers cognitive deficits is the Real Understanding of Self-Help program (RUSH; Eccleston & Sorbello, 2002). An adaptation of dialectical behavior therapy (DBT; Linehan, 1993), the RUSH program targets prisoners with characteristics of borderline personality disorder such as recurrent self-injury, affective instability, and impulsivity. The program uses cognitive and behavioral interventions and acceptance-based practices to teach prisoners adaptive skills for managing stressful situations and reducing suicide and self-injury incidents. Importantly, given the cognitive limitations of prison samples and participants' difficulties in understanding DBT's complex concepts, the RUSH program utilizes modified techniques, such as visual exercises and games, to consolidate concepts and increase skill acquisition (Eccleston & Sorbello, 2002).

Several factors may account for the lack of significant findings in this study. First, all three groups exhibited generally low functioning. Although this is consistent with previous research on prison samples (e.g., Cashin et al., 2006; S. C. Hayes, 1997; Williams et al., 2011), this floor effect likely made it difficult to detect significant group differences. Many neuropsychological tests lack the norms and items to measure adequately the performance of severely impaired adults, making it difficult to detect meaningful differences (Lezak, Howieson, & Loring, 2004). Thus, future studies may choose to include neuropsychological measures that are more sensitive at detecting variability in low functioning samples. Second, studies have consistently found high levels of traumatic brain injury (TBI) among prisoner populations (i.e., Barnfield & Leathem, 1998; Schofield et al., 2006; Turkstra, Jones, & Toler, 2003), and researchers have speculated a causal link among TBI, the resulting neuropsychological deficits, and criminal behavior (i.e., Schofield et al., 2006). However, history of TBI was not uniformly reported in our archival data set and therefore not accounted for in the analyses. Third, both depression and borderline personality disorder are associated with self-injury and impaired neuropsychological functioning (i.e., LeGris & van Reekum, 2006; McClintock, Husain, Greer, & Cullum, 2010). However, this study did not assess for these or other psychological symptoms that may have influenced neuropsychological performance. Finally, participants were referred by correctional staff for neuropsychological evaluation. This clinically referred sample may not be representative of prisoners with self-injurious behaviors in general. Given these limitations and a robust literature supporting deficits in executive functioning among suicide attempters, future studies are necessary to better understand the associations between neuropsychological functioning and self-injurious behaviors in the correctional system before definitive

conclusions can be drawn. Researchers should address the limitations of the current study by utilizing community samples and assessing other factors related to neuropsychological performance, such as TBI and psychiatric symptoms. In addition, future research may investigate the relations between neuropsychological deficits and functions of self-injury, as self-injury may be used to regulate emotional or social experiences (Nock, 2009) that may be associated with underlying neuropsychological deficits, thus indicating a potential target of treatment.

Despite its limitations, this study has important implications for research on self-injurious behaviors, particularly among incarcerated individuals. This study's male, ethnically diverse sample broadens our understanding of the prevalence of self-injury in general and within correctional settings specifically. To our knowledge, this is the first study to examine neuropsychological functioning in adults with a history of NSSI. Although prisoners with a history of self-injury did not perform more poorly on measures of neuropsychological functioning than prisoners without a self-injury history, participants in all groups evidenced deficits in neuropsychological functioning. Although additional research is necessary to overcome the limitations of this study, the high prevalence of suicide attempts and NSSI and the low neuropsychological functioning of prisoners hold important implications for the treatment of self-injury in correctional settings.

Suicide is the second leading cause of death in jails and the third in prisons (Metzner, 2002). Given the high prevalence of NSSI and attempted suicide among prisoners reported in this study, specific programs are needed to prevent and treat self-injurious behaviors in prison settings. Although programs have been developed to specifically address suicide in correctional settings (i.e., A. J. Hayes, Shaw, Lever-Green, Parker, & Gask, 2008), programs specifically focused on NSSI are necessary given the high prevalence of NSSI in correctional settings, its challenges within the correctional system (DeHart et al., 2009), and the potential association between NSSI and suicide death (Van Orden et al., 2005). It is essential that the neuropsychological deficits of prisoners are considered when developing such programs. The majority of prisoners in this sample had significant deficits in intelligence, attention, memory, and executive functioning. Thus, those targeted for clinical services may have difficulty attending to, understanding, and remembering the complex concepts involved in many prevention and treatment programs. Clinicians may wish to specifically address the difficulties with problem solving, decision making, and cognitive flexibility that are often associated with impaired executive functioning. With proper modification, such as shorter sessions, use of simple language, and more visual aids, programs may be more successful at treating and preventing NSSI and suicide among prisoners.

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References

- Andover MS, Gibb BE. Non-suicidal self-injury, attempted suicide, and suicidal intent among psychiatric inpatients. *Psychiatry Research*. 2010; 178:101–105. [PubMed: 20444506]
- Arbuthnott K, Frank J. Trail Making Test, Part B as a measure of executive control: Validation using a set-switching paradigm. *Journal of Clinical and Experimental Neuropsychology*. 2000; 22:518–528. [PubMed: 10923061]
- Barnfield TV, Leatham JM. Incidence and outcomes of traumatic brain injury and substance abuse in a New Zealand prison population. *Brain Injury*. 1998; 12:455–466. [PubMed: 9638323]
- Bartfai A, Winborg IM, Nordström P, Åsberg M. Suicidal behavior and cognitive flexibility: Design and verbal fluency after attempted suicide. *Suicide and Life-Threatening Behavior*. 1990; 20:254–266. [PubMed: 2238017]
- Benton, AL., Hamsher, KD., Sivan, AB. *Multilingual Aphasia Examination*. 3. San Antonio, TX: Psychological Corporation; 1994.
- Borrill J, Burnett R, Atkins R, Miller S, Briggs D, Weaver T, Maden A. Patterns of self-harm and attempted suicide among White and Black/mixed race female prisoners. *Criminal Behavior and Mental Health*. 2003; 13:229–240.
- Briere J, Gil E. Self-mutilation in clinical and general population samples: Prevalence, correlates, and functions. *American Journal of Orthopsychiatry*. 1998; 68:609–620. [PubMed: 9809120]
- Cashin A, Butler T, Levy M, Potter E. Intellectual disability in the New South Wales inmate population. *International Journal of Prisoner Health*. 2006; 2:115–120.
- Dear GE, Thomson DM, Hills AM. Self-harm in prisons: Manipulators can also be suicide attempters. *Criminal Justice and Behavior*. 2000; 27:160–175.
- DeHart DD, Smith HP, Kaminski RJ. Institutional responses to self-injurious behavior among inmates. *Journal of Correctional Health Care*. 2009; 15:129–141. [PubMed: 19477817]
- Delis, DC., Kramer, JH., Kaplan, E., Ober, B. *California Verbal Learning Test—Second Edition*. Professional manual. San Antonio, TX: Psychological Corporation; 2000.
- Eccleston L, Sorbello L. The RUSH Program—Real Understanding of Self-Help: A suicide and self-harm prevention initiative within a prison setting. *Australian Psychologist*. 2002; 37:237–244.
- Ellis TE, Berg RA, Franzen MD. Neuropsychological performance and suicidal behavior in adult psychiatric inpatients. *Perceptual and Motor Skills*. 1992; 75:639–647. [PubMed: 1408629]
- Fagan TJ, Cox J, Helfand SJ, Aufderheide D. Self-injurious behavior in correctional settings. *Journal of Correctional Health Care*. 2010; 16:48–66. [PubMed: 19861319]
- Fertuck EA, Lenzenweger MF, Clarkin JF. The association between attentional and executive controls in the expression of borderline personality disorder features: A preliminary study. *Psychopathology*. 2002; 38:75–81.
- Fikke LT, Melinder A, Landrø NI. Executive functions are impaired in adolescents engaging in non-suicidal self-injury. *Psychological Medicine*. 2011; 41:601–610. [PubMed: 20482935]
- Franklin RK. Deliberate self-harm: Self-injurious behavior within a correctional mental health population. *Criminal Justice and Behavior*. 1988; 15:210–218.
- Fruehwald S, Frottier P, Matschnig T, Eher R. The relevance of suicidal behavior in jail and prison suicides. *European Psychiatry*. 2003; 18:161–165. [PubMed: 12814848]
- Fulwiler C, Forbes C, Santangelo SL, Folstein M. Self-mutilation and suicide attempt: Distinguishing features in prisoners. *Journal of the American Academy of Psychiatry and Law*. 1997; 25:69–77.
- Hayes AJ, Shaw JJ, Lever-Green G, Parker D, Gask L. Improvements to suicide prevention training for prison staff in England and Wales. *Suicide and Life-Threatening Behavior*. 2008; 38:708–713. [PubMed: 19152301]
- Hayes SC. Prevalence of intellectual disability in local courts. *Journal of Intellectual & Developmental Disability*. 1997; 22:71–85.
- Heycock J. Manipulation and suicide attempts in jails and prisons. *Psychiatric Quarterly*. 1989; 60:85–98. [PubMed: 2813645]
- Jeglic EL, Vanderhoff HA, Donovick PJ. The function of self-harm behavior in a forensic population. *International Journal of Offender Therapy and Cognitive Criminology*. 2005; 49:131–142.

- Joiner TE, Conwell Y, Fitzpatrick KK, Witte TK, Schmidt NB, Berlim MT, Rudd MD. Four studies on how past and current suicidality relate even when “everything but the kitchen sink” is covaried. *Journal of Abnormal Psychology*. 2005; 114:291–303. [PubMed: 15869359]
- Jollant F, Bellivier F, Loboyer M, Astruc B, Torres S, Vertier R, Courtet P. Impaired decision making in suicide attempters. *American Journal of Psychiatry*. 2005; 162:304–310. [PubMed: 15677595]
- Jollant F, Lawrence NS, Olie E, O'Daly O, Malafosse A, Courtet P, Phillips ML. Decreased activation of lateral orbitofrontal cortex during risky choices under uncertainty is associated with disadvantageous decision-making and suicidal behavior. *NeuroImage*. 2010; 51:1275–1281. [PubMed: 20302946]
- Jones A. Self-mutilation in prison: A comparison of mutilators and nonmutilators. *Criminal Justice and Behavior*. 1986; 13:286–296.
- Keilp JG, Sackeim HA, Brodsky BS, Oquendo MA, Malone KM, Mann JJ. Neuropsychological dysfunction in depressed suicide attempters. *American Journal of Psychiatry*. 2001; 158:735–741. [PubMed: 11329395]
- King DA, Conwell Y, Cox C, Henderson RE, Denning DG, Caine ED. A neuropsychological comparison of depressed suicide attempters and nonattempters. *Journal of Neuropsychiatry and Clinical Neuroscience*. 2000; 12:64–70.
- Kortte CB, Horner MD, Windham WK. The Trail Making Test, Part B: Cognitive flexibility or ability to maintain set? *Applied Neuropsychology*. 2002; 9:106–109. [PubMed: 12214820]
- Langbehn DR, Pfohl B. Clinical correlates of self-mutilation among psychiatric inpatients. *Annals of Clinical Psychiatry*. 1993; 5:45–51. [PubMed: 8348198]
- LeGris J, van Reekum R. The neuropsychological correlates of borderline personality disorder and suicidal behaviour. *Canadian Journal of Psychiatry*. 2006; 51:131–142. [PubMed: 16618004]
- Lezak, MD., Howieson, DB., Loring, DW. *Neuropsychological assessment*. 4. New York, NY: Oxford University Press; 2004.
- Linehan, MM. *Cognitive-behavioral treatment of borderline personality disorder*. New York, NY: Guilford; 1993.
- Little, RJA., Rubin, DB. *Statistical analysis with missing data*. New York, NY: John Wiley; 1987.
- Livingston M. A review of the literature on self-injurious behavior amongst prisoners. *Issues in Criminology and Legal Psychology*. 1997; 28:21–35.
- Lohner J, Konrad N. Deliberate self-harm and suicide attempt in custody: Distinguishing features in male inmates' self-injurious behavior. *International Law and Psychiatry*. 2006; 29:370–385.
- Lohner J, Konrad N. Risk factors for self-injurious behaviour in custody: Problems of definition and prediction. *International Journal of Prisoner Health*. 2007; 3:135–161.
- Marzuk PM, Hartwell N, Leon AC, Portera L. Executive functioning in depressed patients with suicidal ideation. *Acta Psychiatrica Scandinavica*. 2005; 112:294–301. [PubMed: 16156837]
- McClintock SM, Husain MM, Greer TL, Cullum CM. Association between depression severity and neurocognitive function in major depressive disorder: A review and synthesis. *Neuropsychology*. 2010; 24:9–34. [PubMed: 20063944]
- McKee GR. Lethal vs. nonlethal suicide attempts in jail. *Psychological Reports*. 1998; 82:611–614. [PubMed: 9621737]
- Metzner JL. Prison litigation in the USA. *Journal of Forensic Psychiatry*. 2002; 13:240–244.
- Meyers, J., Meyers, K. *The Meyers Scoring System for the Rey Complex Figure and the Recognition Trial: Professional manual*. Odessa, FL: Psychological Assessment Resources; 1995.
- Muehlenkamp JJ. Self-injurious behavior as a separate clinical syndrome. *American Journal of Orthopsychiatry*. 2005; 75:324–333. [PubMed: 15839768]
- Mumola, CJ. NCJ Pub. No. 210036. Washington, DC: U.S. Department of Justice; 2005. Bureau of Justice Statistics special report: Suicide and homicide in state prisons and local jails. Retrieved from <http://bjs.ojp.usdoj.gov/content/pub/pdf/shsplj.pdf>
- Nock MK. Why do people hurt themselves? New insights into the nature and functions of self-injury. *Current Directions in Psychological Science*. 2009; 18:78–83. [PubMed: 20161092]
- Nock MK, Prinstein MJ. A functional approach to the assessment of self-mutilative behavior. *Journal of Consulting and Clinical Psychology*. 2004; 72:885–890. [PubMed: 15482046]

- Nock MK, Prinstein MJ. Contextual features and behavioral functions of self-mutilation among adolescents. *Journal of Abnormal Psychology*. 2005; 114:140–146. [PubMed: 15709820]
- O'Donnell JP, MacGregor LA, Dabrowski JJ, Oestreicher JM, Romero JJ. Construct validity of neuropsychological tests of conceptual and attentional abilities. *Journal of Clinical Psychology*. 1994; 50:596–600. [PubMed: 7983209]
- Penn JV, Esposito CL, Schaeffer LE, Fritz GK, Spirito A. Suicide attempts and self-mutilative behavior in a juvenile correctional facility. *Journal of the American Academy of Child and Adolescent Psychiatry*. 2003; 42:762–769. [PubMed: 12819435]
- Psychological Corporation. WAIS-III-WMS-III Technical manual. San Antonio, TX: Author; 1997.
- Reitan RM. The relation of the Trail Making Test to organic brain damage. *Journal of Consulting Psychology*. 1955; 19:393–394. [PubMed: 13263471]
- Roe-Sepowitz D. Characteristics and predictors of self-mutilation: A study of incarcerated women. *Criminal Behaviour and Mental Health*. 2007; 17:312–321. [PubMed: 18004735]
- Royan J, Tombaugh TN, Rees L, Francis M. The Adjusting-Paced Serial Addition Test (Adjusting-PSAT): Thresholds for speed of information processing as a function of stimulus modality and problem complexity. *Archives of Clinical Neuropsychology*. 2004; 19:131–143. [PubMed: 14670386]
- Schafer JL, Graham JW. Missing data: Our view of the state of the art. *Psychological Methods*. 2002; 7:147–177. [PubMed: 12090408]
- Schofield PW, Butler TG, Hollis SJ, Smith NE, Lee SJ, Kelso WM. Traumatic brain injury among Australian prisoners: Rates, recurrence and sequelae. *Brain Injury*. 2006; 20:499–506. [PubMed: 16716996]
- Smith HP, Kaminski RJ. Inmate self-injurious behaviors: Distinguishing characteristics within a retrospective study. *Criminal Justice and Behavior*. 2010; 37:81–96.
- Tiffin, J. Purdue Pegboard: Examiner manual. Chicago, IL: Science Research Associates; 1968.
- Tiffin J, Asher EJ. The Purdue Pegboard: Norms and studies of reliability and validity. *Journal of Applied Psychology*. 1948; 32:234–247. [PubMed: 18867059]
- Turkstra L, Jones D, Toler HL. Brain injury and violent crime. *Brain Injury*. 2003; 17:39–47. [PubMed: 12519646]
- Van Orden KA, Merrill KA, Joiner TE Jr. Interpersonal-psychological precursors to suicidal behavior: A theory of attempted and completed suicide. *Current Psychiatry Reviews*. 2005; 1:187–196.
- Weishaar ME, Beck AT. Hopelessness and suicide. *International Review of Psychiatry*. 1992; 4:117–184.
- Westheide J, Quednow BB, Kuhn KU, Cooper-Mahkorn D, Hawellek B, Eichler P, Wagner M. Executive performance of depressed suicide attempters: The role of suicidal ideation. *European Archives of Psychiatry and Clinical Neuroscience*. 2008; 258:414–421. [PubMed: 18330667]
- Williams BR, Zamora D, Donovan PJ. The relationship of intellectual ability to motor speed and complex processing in incarcerated vs. non-incarcerated individuals. *Clinical Neuropsychologist*. 2011 under review.

TABLE 1

Descriptive Statistics by Group

	Nonsuicidal Self-Injury (<i>n</i> = 45)	Suicide Attempt Only (<i>n</i> = 52)	No Self-Injury (<i>n</i> = 76)	df	χ^2/F	Cramer's V/ϕ^2 Partial
Ethnicity (%)				6	8.06	.15
Caucasian	27.3	40.8	34.2			
Latino	27.3	22.4	11.8			
African American	40.9	28.6	46.1			
Other	4.5	8.2	7.9			
Handedness (%)				2	2.42	.13
Right	82.5	91.5	81.3			
Left	17.5	8.5	18.8			
Location (%)				2	11.11**	.25
Prison A	68.9	40.4	66.7			
Prison B	31.1	59.6	33.3			
Age (years; <i>M, SD</i>)	37.89, 10.21	38.98, 10.63	40.51, 13.09	2	0.76	.01
Education (years; <i>M, SD</i>)	9.33, 2.67	10.49, 2.43	10.73, 2.45	2	4.72**	.05

**
 $p < .01$.

TABLE 2

Summary of Analyses of Variances of Neuropsychological Domains and Measures

	<u>Nonsuicidal Self-Injury (<i>n</i> = 45)</u>		<u>Suicide Attempt Only (<i>n</i> = 52)</u>		<u>No Self-Injury (<i>n</i> = 76)</u>		λ/F	η^2 Partial
	M	SD	M	SD	M	SD	df	
Intelligence	74.02	10.64	76.65	12.17	75.19	8.96	0.97	.02
Full-scale IQ	72.50	11.37	74.95	13.80	73.03	10.07	2	0.95 .01
Performance IQ	75.51	10.38	77.31	12.68	75.64	10.37	2	0.44 .01
Verbal IQ	74.05	11.54	77.68	11.49	76.897	9.61	2	0.47 .01
Memory	62.70	14.72	66.35	15.21	68.37	13.70	0.93	.04
Visual immediate	61.92	17.00	63.66	19.78	65.85	16.78	2	1.41 .02
Visual delayed	59.85	17.16	61.36	19.16	62.93	18.59	2	0.77 .01
Visual recog.	74.60	21.92	74.41	23.01	76.65	16.34	2	0.55 .01
Verbal immediate	57.14	19.00	60.57	17.53	63.98	20.37	2	0.72 .01
Verbal delayed	57.21	18.30	64.23	16.58	65.497	18.51	2	1.46 .02
Verbal recog.	65.45	22.10	73.89	18.00	75.34	19.42	2	2.09 .02
Attention	66.20	28.61	64.97	22.07	63.96	25.95	0.97	.01
Trails A	71.63	30.82	71.06	27.80	73.698	26.69	2	0.07 .001
Trails B	60.77	30.94	58.88	20.78	54.22	33.45	2	1.12 .01
Motor functioning	84.41	49.87	78.36	25.78	84.96	55.23	0.95	.03
Purdue dominant	84.21	54.71	77.65	28.68	85.99	59.10	2	0.10 .001
Purdue nondom.	82.62	39.59	77.67	26.16	84.52	54.41	2	0.09 .001
Purdue both	86.41	56.27	79.76	24.29	84.36	55.57	2	0.13 .002
Executive function	74.25	18.11	76.64	13.65	75.27	13.87	0.63	.02
Trails B	60.77	30.94	58.88	20.78	54.22	33.45	2	1.12 .01
COWA letters	80.28	16.93	83.20	15.20	85.51	14.80	2	0.63 .01
COWA animals	81.69	18.79	87.85	18.96	86.08	15.24	2	1.42 .02

Note. COWA = Controlled Oral Word Association Test. Values in cells represent means and standard deviations for variables before transformation.