Research paper

Attentional bias toward suicide-relevant information in suicide attempters: A cross-sectional study and a meta-analysis

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A B S T R A C T

Objective: Previous studies using a modified Stroop test suggested that suicide attempters, in contrast to depressed patients with no suicidal history, display a particular attentional bias toward suicide-related cues. However, negative results have also been reported. In the present study, we collected new data and pooled them as part of a meta-analysis intended to shed further light on this question.
Method: We conducted 1) a cross-sectional study comparing performance on the modified Stroop task for suicide-related, positively-valenced and negatively-valenced words in 33 suicide attempters and 46 patient controls with a history of mood disorders; 2) a systematic review and a meta-analysis of studies comparing performance on the modified Stroop task among patients with vs. without a history of suicidal acts in mood disorders.
Results: The cross-sectional study showed no significant difference in interference scores for any type of words between suicide attempters and patient controls. A meta-analysis of four studies, including 233 suicide attempters and 768 patient controls, showed a significant but small attentional bias toward suicide-related words (Hedges'g=0.22, 95%CI [0.06–0.38], Z=2.73, p=0.006), but not negatively-valenced words (Hedges'g=0.06, 95%CI [−0.09–0.22], Z=0.77, p=0.4) in suicide attempters compared to patient controls.
Limitations: Positively-valenced words and healthy controls could not be assessed in the meta-analysis.
Conclusion: Our data support a selective information-processing bias among suicide attempters. Indirect evidence suggests that this effect would be state-related and may be a cognitive component of the suicidal crisis. However, we could not conclude about the clinical utility of this Stroop version at this stage.

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1. Introduction

Neuropsychology has shed new light on our understanding of suicidal behavior. Patients with histories of suicidal acts often show a series of cognitive deficits, including risky decision-making, deficient cognitive control, reduced memory abilities and over-general autobiographical memory (Jollant et al., 2011; Richard-Devantoy et al., 2014b, 2014a). Whether trait-like or state-related, these deficits would reduce the ability of individuals to respond adequately to stress (e.g., significant negative life event, depression, alcohol or drug intoxication) and place them at greater risk of experiencing suicidal ideas and committing a suicidal act in these conditions. They also represent potentially interesting predictive markers of suicide risk and intervention targets.

In addition to these deficits, suicide attempters also showed a higher sensitivity to interference (Richard-Devantoy et al., 2014a). In the classical version of the Stroop task, suicide attempters tend to take more time when asked to name the color of words describing colors than patient controls with no history of suicidal acts. Building on these findings and based on the idea that suicidal individuals may present a particular state of mind characterized by excessive attention to suicidal thoughts and suicide-related information in their environment, some authors hypothesized that these suicidal patients would present more interference under conditions involving suicide cues. A modified version of the Stroop task was therefore developed. It included words related to suicide (e.g., suicide, dead, funeral) but also negative (e.g., alone, rejected, stupid), positive (e.g., happy, success, pleasure) and neutral words (e.g., museum, paper, engine). To date, four studies have examined this question (see review method in Section 2).

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Williams and Broadbent (1986) assessed 25 recent suicide attempters (overdosing, median=39 h [1–96 h]) with a fixed-order card task, then 18 additional suicide attempters in a second experiment using a randomized-order card task, and compared them to 25 patient controls without histories of suicidal acts and 25 healthy controls matched for gender, age and education. They found that, while all groups took more time in naming emotional words (both suicide and negative) compared to neutral words, suicide attempters (irrespective of the panel presentation) took more time in naming the color of suicide-related words relative to neutral words (interference index) than negatively-valenced words, which was not the case in depressed controls. Of note, suicide-related interference scores were positively correlated with depression level.

Becker et al. (1999) compared 31 patients suffering from various affective disorders who attempted suicide during the previous year to 31 controls composed of healthy individuals and patients. Suicide attempters took significantly longer to name the color of suicide-related words than neutral, positive, or negative words, whereas there were no differences between the different types of words among the controls. Moreover, suicide attempters differed significantly from controls in the amount of time they took to read suicide-related words in contrast to other words.

Cha et al. (2010) used a computerized version of the modified Stroop task in 124 patients (mean age about 34) with various diagnoses (mainly mood disorders, anxiety disorders, and alcohol and substance abuse) visiting the Emergency Department. They found that the 68 patients with a history of attempted suicide took significantly longer time to read suicide-related words relative to neutral words than the 56 non-attempters, while no group difference in interference for negatively-valenced words was found. The interference effect was negatively associated with the time interval since the last suicide attempt, notably less than one week. Importantly, this suicide-specific interference, with a small effect size, predicted which people would attempt suicide again during the subsequent six-month period (10 out of 60 patients followed; OR=1.02 [1.00–1.03]), beyond other clinical predictors, including history of mood disorder, history of multiple suicide attempts, severity of suicidal thoughts, and both patient and clinician prediction of a future suicide attempt.

Finally, Chung and Jeglic (2016) assessed a population of 820 college students (mean age about 20, 80% females) enrolled in research in exchange for course credits, including 51 who had previous suicidal plans, and 55 who had attempted suicide. They found no group difference in reaction times to suicide-related words or negatively-valenced words between the "suicidal behavior" group (n=101, composed of both suicide attempters and ideators) and the non-suicidal group (n=635). However, the suicidal group showed significantly greater interference specifically for the word "suicide" as compared to non-suicidal group, but this result did not survive after controlling for the current levels of depressive symptoms. The interference effect seemed to be more strongly associated with recent attempts in women (less than 12 months), although the low number of male participants may explain the lack of effect in males. Moreover, there was an association, among women, between the interference effect for suicide-related words and suicidal ideation.

Results on the modified "suicidal" Stroop task are therefore mixed. In the present study, we sought to clarify the existence of a specific attentional bias among suicide attempters. First, we collected new data using the modified Stroop task in suicide attempters and patient controls with a mood disorder, and then we carried out a meta-analysis of all published studies in order to confirm a specific interference effect of suicide-related cues among individuals with a history of suicidal acts.

2. Methods

2.1. Case-control study

2.1.1. Population and clinical assessment

Two groups of participants aged 18–65 were recruited: 33 patients with a history of attempted suicide and mood disorders, and 46 patient controls with a history of mood disorders with no personal history of suicidal acts. Most participants suffered from a major depressive disorder, while seven (8.9%) had a bipolar disorder. Seventy-five percent of participants were in a mild to moderate depressive state, with 24-item Hamilton Rating Scale for Depression scores (HAMD-24) (Hamilton, 1960) overall ranging from 7 to 44 (out of 52). Patients with neurological disorders, a history of brain injury, schizophrenia, alcohol or substance abuse in the previous six months, or a history of electroconvulsive therapy in the previous two years, were not included. Informed written consent was obtained from all participants prior to enrollment. This study was conducted at the Douglas Mental Health University Hospital, Montreal, Canada, and was approved by the local Ethics Committee.

A suicide attempt was defined as a self-directed injurious act committed with a clear intent to end one's own life (Mann, 2003). Psychiatric diagnoses were carried out according to DSM-IV criteria with the MINI 5.0.0 (Sheehan et al., 1998) or the Structured Clinical Interview for Axis I DSM-IV (SCID I) (First et al., 2002). Level of anxiety was rated using the Hamilton Rating Scale for Anxiety (HAM-A) (Hamilton, 1959).

Suicidal history was assessed using the Colombia Suicide History Form (Posner et al., 2007), while suicide intent and current ideation were assessed using the Suicide Intent Scale (SIS) (Beck et al., 1974) and the Scale for Suicidal Ideation (SSI) (Beck et al., 1979), respectively.

2.1.2. Neuropsychological assessment

We used a modified version of the Stroop task (Stroop, 1935) similar to that used by Cha et al. (2010), with Empirisoft DirectRT v2004 software (Jarvis, 2004). Instructions were first presented on the screen at the beginning of the task. Participants were asked to indicate the color of each presented word as quickly and accurately as possible by pressing a red or blue key on the computer keyboard. Each trial started with a white screen for four seconds, followed by the presentation of a centered cross for one second. The cross was then replaced by a blank screen for one second, followed by a word printed in red or blue, which remained on the screen until a response was recorded. The program automatically records response latencies in identifying the color of the words. Longer response latencies were interpreted as representing greater interference and higher attentional bias in relation to the semantic content of the presented words.

Participants first completed eight practice trials, followed by 48 experimental trials. For the experimental trials only, participants were presented with 12 suicide-related words (e.g., suicide, dead, funeral), 12 negatively-valenced words (e.g., alone, rejected, stupid), 12 positive words (e.g., happy, success, pleasure), and 12 neutral words (e.g., museum, paper, engine). Suicide-related and negatively-valenced words were selected based on previous studies (Nock et al., 2010). The order of presentation was randomly generated from one participant to the next.

We calculated three interference index scores for each participant by subtracting latencies for neutral words from latencies for suicide-related words, negatively-valenced words and positively-valenced words (interference indices).

We also used the WAIS-IV (Wechsler, 2008) Digit Span Test (forward and backward) to assess working memory, and the National Adult Reading Test (NART) (Beardsall and Brayne, 1990;