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USE OF THE MODIFIED EMOTIONAL STROOP TASK TO DETECT SUICIDE RISK
IN COLLEGE STUDENTS

by

YEUNJOO CHUNG

A dissertation submitted to the Graduate Faculty in Psychology
In partial fulfillment of the requirements of the degree of
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The manuscript has been read and accepted for the
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Abstract

USE OF THE MODIFIED EMOTIONAL STROOP TASK TO DETECT SUICIDE RISK IN COLLEGE STUDENTS

by

YEUNJOO CHUNG

Advisor: Professor Elizabeth L. Jeglic

It is a challenge to detect those who are at potential risk for suicide because the base rate of suicidal behaviors in non-clinical samples is low. The aim of the present study was to investigate the concurrent and predictive validity of the emotional Stroop task (EST) as a behavioral marker for suicidal behaviors in a college population. Eight hundred and twenty students were asked to perform the EST and to respond to suicide-related self-report measures and were followed up with 18 months later. The results indicated that participants with past suicide attempts had longer response latencies to the word “suicide” as compared to non-attempters. Further, those with attentional bias toward suicide-related words at baseline were more likely to report suicidal behaviors during the follow-up period. The EST latencies were not affected by ethnicity, but a possible gender effect was detected. These results are discussed as they pertain to suicide risk assessment among college students.

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I must express my gratitude to my family who have been my support system as well. I am tremendously grateful to my parents, grandparents, uncles, and aunts. Without your emotional support, I would never have made it to this point.

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CHAPTER 1: CHALLENGES FOR SUICIDE ASSESSMENT

Suicidal behavior represents a major public health concern. Each year, approximately 1,100 students die by suicide on college campuses, with suicide being the second leading cause of death among college students after accidents (American Association of Suicidology, 2014). In addition, young people between the ages of 18-24 have the highest incidence of reported suicidal ideation (Crosby, Cheltenham & Sacks, 1999), and are more likely to have made a suicide plan compared to those in any other age group (CDC, 2010). One study found that up to 55% of the college student population has experienced suicidal ideation at some point in their lives (van Heeringen, 2001), while National surveys estimate that during a one year period, 11.4% of college students seriously considered attempting suicide, 7.9% made a suicide plan, and 1.7% attempted suicide (Barrios, Everett, Simon, & Brener, 2000).

Although only a small number of individuals actually act on their suicidal thoughts, suicidal ideation is considered to be an important precursor to later attempted and completed suicide and thus is of major public health significance (Gili-Planas, Roca-Bennasar, Ferrer-Perez & Bernardo-Arroyo, 2001; Lewinsohn, Rohde, & Seeley, 1996; Reinherz, Giaconia, & Silverman, 1995). In addition, current suicidal ideation was positively associated with depressive symptoms in college student populations, and students with suicidal ideation were found to feel more desperate compared to non-suicidal students (Garlow et al., 2008). Therefore, it is important to develop more effective ways through which colleges can identify potentially suicidal students. While this was traditionally thought of as the domain of college counseling services, previous researchers have noted that only approximately 20% of the college students who completed suicide had participated in college counseling services prior to their death (Gallagher, 2004; Kisch, Leino, & Silverman, 2005). Hence, it is imperative to develop more

broad-based screening assessments of this population.

As a result of this concern, Lewinsohn and his colleagues (Lewinsohn, Garrison, Langhinrichsen, & Marsteller, 1989; Garrison, Lewinsohn, Martseller, Langhinrichsen, & Lann, 1991) were commissioned by the National Institute of Mental Health (NIMH) to critically review the literature on the assessment of suicidal behaviors among young people. They concluded that the screening instruments available at the time lacked discriminate and predictive validity. Further, few of them had normative data or data pertaining to gender and ethnic differences. A decade later, Goldston (2000) updated the review as there had been tremendous growth in the interest in suicide assessment among young people. He concluded that while there were many new instruments developed since the Lewinsohn et al (1989) review, most still had insufficient psychometric data and their predictive validity had not been demonstrated as very few had gathered longitudinal data. Additionally, Goldston (2000) noted that many of the assessment instruments had a stated goal to predict completed suicide (or identify individuals who were at elevated risk for completed suicide), yet few of the instruments had demonstrated predictive validity. Furthermore, completed suicide has a very low event base rate (1/10,000/year) and therefore it is hard to develop a psychometrically sound instrument to predict completed suicide. Hence, Goldston (2000) highlighted the need for the development of more effective assessment measures to identify those young people who are engaging in suicidal ideation and attempts.

One of the major concerns when developing a suicide risk screening tool is the heterogeneous characteristics of populations at suicidal risk. Although some factors, such as hopelessness, depression, past history of suicide attempts, and current suicidal ideation, are identified as significant risk factors and used to measure one's potential suicidal risk in many suicide risk assessment tools, these known risk factors are not specific for individuals at suicide

risk but also predictive of other more common mental health problems (Rudd, Joiner, & Rajad, 1996). Hence, the limited specificity of the risk factors negatively affects the predictive validity of the tools that utilize these factors.

CHAPTER 2: SELF-REPORT SUICIDE RISK ASSESSMENTS

To date, self-report suicide risk assessment measures, such as Beck's Hopelessness Scale (BHS; Beck, Weissman, Lester, & Trexler, 1974), Beck Scale for Suicidal Ideation (BSS; Beck & Steer, 1991) and Suicidal Behavior Questionnaire-Revised (SBQ-R; Osman et al, 2001), are widely used for research purposes and also used as a gate keeper in clinical settings.

Beck Scale for Suicidal Ideation

The BSS is widely used as a routine screening tool to detect acute suicidal ideation, as the administration of the BSS takes only about 10 to 15 minutes. Although there is no validated cut-off scores for the BSS, one study found that psychiatric patients who reported suicidal ideation scored 24 or higher (Cochrane-Brink, Lofchy, & Sakinofsky, 2000). In community settings, it was found that females with a lifetime history of at least one suicide attempt scored an average of 15 (Holden, & DeLisle, 2005). In addition, the BSS has good concurrent validity in a community setting. For example, among college students, the BSS score was positively correlated with Beck's Hopelessness Scale and Beck Depression Inventory II scores (Hirsch, Conner, & Dubberstein, 2007). However, empirical data on the predictive validity of the BSS in non-clinical populations is lacking. The major limitation of the BSS is that it assesses only current suicidal ideation, and, thus, it is not useful to detect potential suicide risk.

Beck's Hopelessness Scale

Although the BHS is not specific to detecting suicide risk but rather to measuring the degree of hopelessness, it is used as a suicide risk screening tool because of the high correlation between hopelessness and suicidal ideation (Glanz, Haas, & Sweeney, 1995; Klonsky, Kotov, Bakst, Rabinowitz, & Bromet, 2012; Schotte, & Clum, 1987; Yamokoski, Scheel, & Rogers, 2011). When controlling for past attempts, hopelessness significantly predicted suicidal behavior

among psychiatric inpatients in a ten-year follow-up period above other measures of suicide behaviors (Klonsky et al., 2012). This suggests that BHS is better predictive of suicide attempts in the long term than other suicide risk assessment measures. However, the limitation of the BHS is that hopelessness is also a predictor of other more commonly occurring mental health problems, such as mood disorders. Because of the low base rate of suicide behaviors, it is likely that there are many false positives if the BHS score is used as a sole screening tool.

Suicidal Behavior Questionnaire-Revised

Lastly, the SBQ-R is a four-item self-report questionnaire asking about suicidal behavior in the past and the likelihood of attempting suicide in the future. Osman et al. (2001) found that among college students, a cutoff score of 2 for the item asking about lifetime suicidal ideation provided significant sensitivity (100%) and specificity (100%) in classifying suicidal versus non-suicidal students. In addition, a total score of 7 correctly distinguished students who reported past suicidal behaviors on other questionnaires (Osman, et al., 2001). Since the students' suicidal status was determined based on their self-report on background screening questions, it is not surprising that people who reported their suicidal ideation or behavior on other self-report questionnaires endorsed non-zero items on the SBQ-R as well. Although it has potential as a research tool because it is brief, easy to complete, and the items are worded in a straightforward manner, its clinical utility is limited. To use the SBQ-R as a clinical screening tool, further research on its validity as a suicide risk assessment tool for a more general nonclinical population is necessary.

General Limitations of Self-Report Suicide Risk Assessments

In addition to the limitations that were noted above, many researchers have discussed the limited clinical utility of self-report measures. First, self-report measures are often unreliable,

especially for those who wish to conceal their suicidal ideation or who have poor insight (Busch, Fawcett & Jacobs, 2003). For example, the respondents' misinterpretation of the questionnaire items could undermine the accuracy. Specifically, individuals might not report their past suicide attempts if they reflected that the attempts had not been serious (Ploderl, Kralovec, Yazdi, & Fartacek, 2011). In addition, non-verbal cues, such as behavioral responses to suicide-related questions, cannot be recorded using a self-report measure. Furthermore, only a few studies have tested predictive validity of current self-report measures, and even fewer tested them with a non-clinical population, limiting the clinical utility of those self-report measures as a suicide risk screening tool.

Finally, a lack of cultural and ethnic consideration when developing a suicide risk assessment was discussed as a limitation of both interviewer-assessed measurements and self-report measurements (Westefeld, Range, Greenfeld, & Kettmann, 2008). It has been widely acknowledged that ethnic minorities are exposed to varied risk for suicidality (CDC, 2010, 2012). Ethnic minorities who experience discrimination and increased life stress due to recent immigration and acculturation are at increased risk for suicidal ideations and behaviors. In one study, ethnic minorities who immigrated to the U.S. were found to be at higher risk for suicidality compared to those who were born in the U.S (Borges, Orozco, Rafful, Miller, & Breslau, 2012). For both Hispanic and Asian American youth, acculturation-related stress after immigration and familial conflicts were identified as the most important risk factors (Langhinrichsen-Rohling, Friend, & Powell, 2009). Further, life stress was found to increase the risk of suicidal behaviors among Hispanic individuals with poor social problem solving (Hirsch, Chang, & Jeglic, 2012). For African American youth, discrimination-related stressors were one of the major risk factors (Langhinrichsen-Rohling et al., 2009). In addition, negative interaction

with significant others and low emotional support from family increases the suicidal risk among African Americans and Caribbean blacks (Lincoln, Taylor, Chatters, & Joe, 2012). Ethnic minorities tend to feel reluctant to report their suicidality either to European American interviewers or on self-report questionnaires possibly because of fear that it would result in unfair treatment due to discrimination (Westefeld et al., 2008). Westefeld et al. (2008) also noted that interpretation of questions could be varied depending on the culture respondents are from. However, current suicide risk assessment tools are often not developed or standardized using a culturally and ethnically diverse sample. Chu et al. (2013) discussed that few attempts to synthesize cultural and ethnic factors in risk assessment have been unsuccessful because there was no guideline aiding clinicians or practitioners on how they could identify and interpret culture-specific suicide risk factors. As noted before, the suicidal population is heterogeneous, and each suicidal individual is “characterized by a unique constellation of dispositional vulnerability factors” (Wenzel & Beck, 2008, p.191). For this reason, developing one comprehensive suicide risk assessment tool that is sensitive to the needs of each individual is unrealistic. Thus, it may be more efficient to develop a measure that is independent of those dispositional factors.

CHAPTER 3: BEHAVIORAL MEASURES

Researchers have suggested that behavioral tests may better help to understand and predict future suicidal thoughts or attempts (Nock et al., 2010). Behavioral assessments were developed based on the assumption that individuals at potential suicidal risk respond in a different way when they are presented with suicide-related cues as opposed to neutral cues (Nock, & Banaji, 2007, Nock et al., 2010). Limited ability of attentional control among suicide attempters was discussed by Wenzel and Beck (2008). Wenzel and Beck (2008) suggested that there is a vicious cycle in cognitive processing that makes a person more prone to engage in suicidal thoughts. According to this cognitive model, some dispositional factors, such as neurotic or perfectionistic personality, impulsivity, or problem solving deficits, exacerbate psychiatric disturbance and hopeless feelings when a person attempts to deal with life stress. Thus, suicidal individuals are likely to experience hopeless feelings, and think that there is no solution but suicide to relieve their stress or pain, which is referred as *suicide schema*. Once suicide schema is activated, they become preoccupied with thoughts that suicide is the only option to solve their problems. They, in turn, focus on the information that can feed their suicidal thoughts. And the more they show selective attention toward suicide-related cues, the more they believe that suicide is the only solution. Their fixation on suicide, consequently, worsens their state of hopelessness and exacerbates suicidal ideation. Therefore, Wenzel and Beck (2008) noted that suicidal ideation is a product of both a state of hopelessness and suicidal cognitive processing. According to this cognitive model, biased cognitive processing toward suicide-related cues could be a behavioral marker to discriminate those who engage in suicidal ideation, if accurately measured.

There are two behavioral measures that have been modified to detect one's potential

suicidal risk: the computerized Implicit Association Test (IAT) and the computerized Emotional Stroop Task (EST). The IAT (Nock et al., 2010) was developed to assess one's attitude toward suicide, and the EST (Cha, Najami, Park, Finn & Nock, 2010) was developed to measure one's attentional bias toward suicide-related words. One of the strengths of a behavioral measure is that it can overcome some of the limitations of self-report measures. It is a more objective measure than self-report tools as it is less subject to respondents' bias, it does not rely upon one's verbal response, and it surpasses the time- and cost-effectiveness of self-report measures. Yet, the development of behavioral measures to detect suicide risk is in naissance, and few have been tested for their potentials as a screening measure.

Implicit Association Test

Nock et al. (2010) explored the validity of detecting suicide risk using the IAT in an adult clinical sample based on the assumption that those who are at potential risk for suicide would show biased responses toward suicide-related cues. It was found that patients who were admitted for their suicidal behaviors were more likely to associate “me” with death/suicide-related words than those who were in the psychological emergency department for non-suicide-related reasons (Nock et al., 2010). The validity of the IAT has also been tested with a college population. A recent study conducted in Australia (Harrison, Stritzke, Fay, Ellison, & Hudaib, 2014) showed that the IAT score added significantly to the prediction of suicide risk in a sample of college students. However, one's protective life-oriented belief mediated the predictive power of the IAT (Harrison et al., 2014). Despite these promising findings, the IAT currently has very limited utility, as there has been no prospective research conducted to test the predictive validity of the IAT to date. In addition, it is possible that one's implicit attitude toward suicide is influenced more by recent exposure to suicide, than by one's implicit acceptance of suicide as a possible

means to resolve conflicts.

Emotional Stroop Task

Another behavioral measure that has been recently developed to screen suicidal individuals is the Emotional Stroop Task (EST). The EST measures reaction time to name the color of a negative emotional word presented on a computer screen. In the classic Stroop task, the delayed response time is used to measure cognitive interference when a participant is shown incongruent stimuli (i.e., mismatch between the presented color and the semantic property of a color word. For example, the word 'blue' would be written in red font) as compared to congruent stimuli (i.e., match between the presented color and the semantic property of a color word. For example, the word 'blue' would be written in blue font). In the EST, interference is created when a participant responds slowly to emotionally valenced words (e.g., sad, upset, depressed) as compared to neutral words (e.g., ball, desk, museum).

The EST has been widely used to study emotional interference among patients with mood disorders (Bremner et al., 2004; Epp, Dobson, Dozois, & Frewen, 2012; Matsubara et al., 2014; Mitterschiffthaler et al., 2008) and patients with high anxiety (Bar-Haim, Lamy, Pergamin, Bakermans-Kranenburg, & van IJzendoorn, 2007; Rutherford, MacLeod, & Campbell, 2004). For example, a recent meta-analysis showed that the severity of depressive symptoms a person experiences were positively correlated with the person's response time (Epp et al., 2012). In another study, it was found that the interaction of high anxiety and poor attention control predicted high cognitive interference by emotional facial expressions (Reinholdt-Dunne, Mogg, & Bradley, 2009). However, very few studies have examined the attentional bias of individuals with suicidal ideas. If fixation on suicide-relevant information is evident among suicidal individuals as Wenzel and Beck (2008) proposed, those who engage in suicidal ideation are

likely to have difficulties inhibiting task-irrelevant information if the information is suicide-related.

Two studies that used a card version of the EST with clinical populations showed similar, yet not identical results. Williams and Broadbent (1986) found that those who attempted suicide before responded slower to non-neutral words, while Becker, Strohbach, and Rinck (1999) reported suicide-specific attentional bias among past suicide attempters. The comorbid symptoms of depression were controlled for only in Becker et al.(1999)'s study. However, in both studies, one major methodological limitation was the accuracy of the measurement since it was manually timed. In addition, the proximity of suicidal ideation or the last suicide attempt which could affect the response latency was not explored.

Almost a decade later, Keilp and his colleagues (2008) explored the dysfunctional attentional inhibition of depressed patients with past suicide attempts using the computerized original Stroop task. Not only the lethality of the attempt, but also the frequency of lethal attempts and the proximity of the most recent lethal attempt were associated with slower response time. Authors concluded that such interference may increase the susceptibility to engage in suicidal behaviors, and the deficit of attentional control combined with dysfunctions of emotion-regulation could predict suicidal risk (Keilp, Gorlyn, Oquendo, Burke, & Mann, 2008). In a more recent study, Keilp and his colleagues (2013) found that psychiatric patients both with and without a history of suicide attempts who were free of medication and had never been diagnosed with any neurological disorder showed delayed responses on a classic computerized Stroop task compared to non-patient comparison individuals without a history of suicidal behaviors. However, deficit in executive functioning was not observed (Keilp et al., 2013). In order to further examine if the attentional fixation could be a behavioral marker for suicidal

behaviors and predict future attempts, Cha and her colleagues (2010) explored suicide-specific attentional bias among a sample of patients in a psychiatric emergency department using the EST.

In Cha et al.(2010)'s study, each participant was presented with four types of words (suicide-related words, negatively valenced words, positively valenced words and neutral words). After completing the EST, participants were asked to complete the BSS (Beck& Steer, 1991). In addition, each participant's primary clinician in the emergency department was asked to answer a brief questionnaire assessing the clinician's prediction of the patient's suicidal behavior within the next six months. Six months following their initial interview, patients were contacted by telephone and asked about their suicidal behaviors during the previous six months. Cha et al. (2010) found that those patients with a history of suicidal behaviors had attentional bias to suicide-related words (as opposed to neutral words) compared to those who had never made suicide attempts. This attentional bias was strongest for those who had made suicide attempts within the preceding 6 months. Further, they found that this suicide-specific attentional bias added significantly to the prediction of who would make a subsequent suicide attempt in the 6-month follow-up period when used with other clinical measures, including the BSS.

While these results were very promising, it is unknown if these research findings can be generalized to a non-psychiatric sample in which most people have never made a serious suicide attempt. In addition, it is unknown from the previous research findings if the EST, as a predictor of current and future suicidal behavior among college students, outperforms commonly used self-report measures to assess suicidal ideation and behaviors such as BHS, BSS, SBQ-R, as well as Beck's Depression Inventory II (BDI-II; Beck, Steer, & Brown, 1996). Finally, previous

studies have not explored how ethnic or cultural differences are expressed in the EST among suicidal populations. Exploring ethnic or cultural differences in Stroop performance has been lacking. In previously mentioned studies, the ethnicity of the subjects was not mentioned at all (Becker et al., 1999; Keilp et al., 2008; Keilp et al., 2013; Williams & Broadbent, 1986) or predominantly white (Cha et al., 2010). However, in one study using 210 college students, it was showed that Kuwaiti undergraduates were slower in responding to both color-congruent and color-incongruent stimuli as compared to their British counterparts (Alansari & Baroun, 2004). However it should be noted that the Arabic version of the Stroop task was not normed, and thus the response time of the Kuwaiti participants might not be comparable to the response time of the British participants. Doan and Swerdlow (1999) compared the Stroop performance of 30 Vietnamese Americans whose first language was Vietnamese and 30 individuals from other ethnic groups (predominantly Whites) whose first language was English, and found no group difference in cognitive interference. Further, they found that bilingual Vietnamese participants were responding as fast as monolingual Vietnamese participants on the Vietnamese-version Stroop task (Doan & Swerdlow, 1999). However it is unclear whether race and/or ethnicity impacts performance of the EST to detect suicidal risk as to date this has not been examined and the study participants in Cha et al. (2010) were predominantly White (73.5% in suicide attempter group and 83.9% in non-attempter group).

CHAPTER 4: THE CURRENT STUDY

This research examined whether diverse college students with suicidal ideation would show similar bias toward suicide-related stimuli. For this purpose, the words used for the EST and its procedure were adapted from the Cha et al. (2010) study. There were three aims of the present study: (1) assess the generalizability of Cha et al.'s findings using a non-psychiatric ethnicity diverse sample, and examine whether attentional bias toward suicide-related stimuli is found among college students, (2) assess the concurrent validity of the EST by correlating it with performance on self-report measures associated with suicidal ideation and behavior, and (3) assess the predictive validity of the EST and see if it would outperform traditional self-report suicide risk assessment measures.

To this end, it was hypothesized that:

- (1) Attentional bias toward suicide-related words would be shown among students who had had previous suicidal behaviors, and such bias would be strongest among those who made the most recent suicide attempt.
- (2) The suicide-specific attentional bias would be positively correlated with scores on the self-report measures of current suicidal ideation, and the correlation between the suicide-specific attentional bias and a history of suicidal behaviors would be stronger than the correlation between scores on the self-report measures and a history of suicidal behaviors.
- (3) Reaction time to suicide-related words would be a stronger predictor of suicidal behaviors in the eighteen-month follow-up than attentional bias toward negatively valenced words and self-report suicide risk assessments.
- (4) There would be no significant effect of ethnicity on the Stroop latencies for either negatively valenced words or suicide-related words.

CHAPTER 5: METHOD

Participants

A total of 820 students who enrolled in the research experience pool of an urban college in New York City (252 males and 568 females) participated in the study (mean age = 20.04, $sd = 4.04$) in exchange for course credit. Any student who was 18 years old or older was eligible to participate. The sample was comprised of predominantly Latino/Latina students (45.1%), followed by African American (18.2%), White (17.6%), Asian (12.2%), and American Indian/Alaskan Native (.4% students). Among those who indicated "Other" (6.4%), 26 participants (3.2% of the sample) were multi-racial.

Procedures

Baseline Interview

Participants were asked to complete the EST after reviewing the informed consent form and agreeing to participate in the study (see Appendix A). A battery of self-report questionnaires (described below) was completed on-line following the EST. The entire procedure took less than 1 hour to complete. Finally, participants were asked to provide their name and contact information if they wanted to be invited to the follow-up study which would take place eighteen months after their participation in the initial interview, for which they would receive compensation (see Appendix B). At the conclusion of the study, all participants were debriefed and given a list of local mental health services and resources. Completed questionnaires were examined and those who reported current suicidal ideation were contacted by a licensed psychologist who provided additional resources (see Appendix C). For the baseline interview, there was no monetary compensation for their participation, but all participants received 2 credits toward their psychology 101 research requirement.

Follow-Up Interview

All students who agreed to participate in the follow-up were contacted via e-mail by a trained graduate level research assistant 18 months after their initial participation. The invitation e-mail contained a hyperlink to an online survey website (see Appendix D). On the website, after agreeing to participate and signing the informed consent form (see Appendix E) participants were asked to complete the same questionnaires at the initial interview. In addition, all participants were asked to complete the Suicidal History Self-Rating Screening Scale (SHSS; Innamorati et al., 2011). Those participants who endorsed suicidal behavior during the 18-month period were also asked to provide information about their behavior (i.e., the number of attempts, seriousness of the attempts, and dates). All participants received a debriefing form containing local mental health service information, as well as contact information for the university counseling center, a suicide crisis line, and a licensed psychologist. Additionally, all participants received 5 dollars in exchange for their participation. The entire procedure was anticipated to take one hour to complete.

For both parts of the study, participants were informed that their responses were confidential, but not anonymous. There were no participants who reported that they were at imminent danger of hurting themselves or others during the course of the study. All procedures were approved by the Institutional Review Board at the college where the study was conducted.

Measures

The Emotional Stroop Task (EST): The EST is an objective measure of attentional bias toward emotionally salient linguistic stimuli. The test materials and test conditions were replicated based upon the methodology used in Cha et al. (2010). The stimuli were presented and recorded using Empirisoft DirectRT v2004 software (Cha et al., 2010). After reading the

instructions, participants were asked to complete eight practice trials, followed by 48 critical trials. Each trial started with a blank white screen for 4 s followed by a centered “+” for 1 s, another blank screen for 1 s, and then the word either in blue or red color. The words remained on the screen until either a blue or a red key was pressed. During the critical trials, neutral (museum, paper, engine), negative (alone, rejected, stupid), suicide-related (funeral, suicide, dead), and positive (happy, success, pleasure) words were presented. Each of the above-listed words was presented four times in a random order during the 48 critical trials. The interference for each category was calculated by subtracting the mean response time for neutral words from the mean response time for suicide-related words (suicide-specific attentional bias) or for negatively valenced words (attentional bias toward negative words). The relevant emotional salience of negatively valenced words, suicide-related words and neutral words in this population was tested using the Self Assessment Manikin (SAM; Bradley & Lang, 1994), a nonverbal assessment tool that measures individuals' affective reactions to linguistic stimuli. On the SAM, individuals are asked to indicate how happy or unhappy they feel when they read a word on a scale that shows nine figures ranging from a smile (coded 1) to a frown (coded 9). The middle picture (coded 5) is marked if the person does not feel either happy or sad. It was found that suicide-related words were more associated with unhappy feelings compared to negatively valenced words ($t(285)=5.62, p<.01$) and neutral words ($t(285)=37.82, p<.01$). Affective ratings of neutral words were slightly biased towards pleasant feelings, but close to the middle score ($m=4.09, sd=1.48$). The average affective ratings of positively valenced words ($m=1.65, sd=.96$) were significantly different from the average of neutral words, $t(285)=25.34, p<.01$. As the aim of this study was to replicate Cha et al.'s (2010) findings, the attentional bias toward positively valenced words were not used in further analysis.

For analysis, the incorrect responses (i.e., pressing a color key that was incongruent to the color shown) were excluded. If a person made too many errors (2 SD above the mean number of mistakes in the sample), the participant's responses were eliminated from analysis ($n=13$, 1.6% of the total sample). In addition, any trial in which a participant responded either too fast (2 SD below the individual's mean reaction time) or too slow (2 SD above the individual's mean reaction time) was eliminated. Finally, those whose mean reaction time was higher or lower than 2 SD from the group mean were not included in the analysis ($n=31$, 3.8% of the total sample). There were also 39 participants who were excluded from the analysis, as they could not complete the test due to a computer malfunction while they were performing the EST.

Beck's Hopelessness Scale (BHS; Beck et al., 1974): The BHS is a 20-item true false scale designed to measure the degree to which one's cognitions are dominated by negative future expectations. Elevated scores on the BHS were found to be related to an eventual suicide attempt (Beck, Brown, Berchick, Stewart & Steer, 1990). Coefficient alpha for the scale in nonclinical samples was .88 (Steed, 2001). Coefficient alpha in this study was .86. Sample items included "I might as well give up because there's nothing I can do about making things better for myself" and "I don't expect to get what I really want". Participants were asked to respond "True" or "False" to each statement.

Beck Depression Inventory-II (BDI II; Beck et al., 1996): The BDI II is a 21 item self-report questionnaire designed to measure the severity of depressive symptoms. It has been found to have high convergent, discriminate, and construct validity among college students (Dozois, Dobson, Ahnberg, 1998). The internal consistency of the BDI-II in this sample was high ($\alpha=.89$).

Beck Scale for Suicidal Ideation (BSS; Beck & Steer, 1991): The BSS is a 21 item self-

report questionnaire designed to measure thoughts of suicide and suicidal intention. The BSS has high construct, discriminative, predictive, and concurrent validity (Rudd & Rajab, 1995; Lennings, 1994).

Suicidal Behavior Questionnaire-Revised (SBQ-R; Osman et al., 2001): The SBQ-R is a 4-item self-report questionnaire designed to assess different dimensions of suicidality. It was reported that the SBQ-R has high discriminate validity among college students. All items are rated on a Likert Scale. For instance, the item "How likely is it that you will attempt suicide someday?" can be rated from "Never" (0) to "Very likely" (6). Coefficient alpha in this study was .77.

Demographic Variables: Demographic information that may affect the variables of interest in this study, including prior suicide attempts as well as gender, ethnicity, and age, were collected using a demographic survey questionnaire. The question asking about past suicide attempt was dichotomized (see Appendix F).

The following questionnaire was used only for the follow-up interview.

The modified version of the Suicidal History Self-Rating Screening Scale (SHSS; Innamorati et al., 2011): The SHSS is a recently developed self-report instrument used to identify individuals with a higher propensity for suicide in the near future. It is a 16-item measure assessing death thoughts, suicidal ideation and behavior in the last 12 months and in their lifetime. Since the current study examines suicidal behavior during the eighteen-month period following the initial interview, the scale was modified to fit the purpose of the current study. The SHSS had good concurrent validity and predictive validity (Innamorati et al., 2011). The coefficient alpha of the SHSS in this study was .77.

CHAPTER 6: RESULTS

Participant Characteristics

Of the total sample ($N=736$), 635 participants (86.3%) indicated at the time of the baseline interview that they had never thought of attempting suicide or that their suicidal ideation was only a passing thought, 55 participants (7.5%) reported that they have planned to kill themselves but did not carry out the thought, and 46 participants (6.3%) reported a lifetime history of suicide attempts. We did not find any differences in age among these three groups. However, there were more females in the past suicidal behavior (SB) group (combining past suicide ideators and suicide attempters) (81.2% within the group) than the non-attempter group (66.6% within the group), $\chi^2(1, N=736)=8.59, p < .01$. Thus, further analyses were conducted controlling for gender.

One of the first hypotheses of the present study was that there would be no significant effect of ethnicity on Stroop latencies. It was found that ethnicity had a significant effect on the overall response time when we compared the response time of African American, Latino/Latina, Caucasian, and Asian groups, $F(3, 672)=3.73, p=.01$. Bonferonni Post hoc comparisons revealed that the mean response time for Whites was significantly shorter than Latinos/Latinas ($d=-37.49\text{ms}, p=.05$). No other group difference was observed. However, as hypothesized, there was no significant difference among ethnic groups when we tested the effect of ethnicity on the Stroop latency, which is measured by subtracting each individual's average response time for neutral words from his or her average response time for emotionally valenced words. Thus while a racial/ethnic difference on response times was found, this was no longer evident when response latency was assessed and therefore racial/ethnic background was not controlled for in subsequent analyses.

Across the sample, the mean response time for suicide-related words, $M=581.99\text{ms}$ ($SD=142.33\text{ms}$), negatively valenced words, $M=584.13\text{ms}$ ($SD=141.29\text{ms}$), and neutral words, $M=580.78\text{ms}$ ($SD=138.62\text{ms}$) did not significantly differ from one another ($ds = -3.35 \sim 2.14\text{ms}$, $ps > .05$).

Past Attempts and Suicide-specific Latency

It was hypothesized that the SB group would have slower reaction times to the suicide-related words compared to the Non-SB group. Independent sample t tests revealed that there was no group difference in latency for either suicide-related words or negatively valenced words between the SB group and the Non-SB group. However, the SB group showed significantly greater interference specifically for the word “suicide” ($M= 12.80$, $SD=69.64$) compared to the Non-SB group ($M=-3.32$, $SD=68.73$), $t(734)=-2.18$, $p=.02$. However, after controlling for the current levels of depressive symptoms as assessed by the BDI, the effect did not sustain.

Further, a logistic regression was conducted to examine if the EST could be used to predict the odds of reporting a lifetime history of suicidal behaviors after controlling for gender. We found that gender and the attentional bias toward the word “suicide” predicted reporting of past suicidal ideation or behavior. Females, as compared to males, were 2.14 times more likely to report past suicide-related behaviors, and each increase of 1-ms in Stroop latency for the word "suicide" increased the likelihood of a lifetime suicide report by .3%, Model $\chi^2=4.46$, Nagelkerke $R^2 = .03$, $p=.03$.

It was further hypothesized that the interference for the suicide-related words would be predicted by the recency of the last attempt. A one way analysis of covariance (ANCOVA) was run to test the hypothesis controlling for gender, and we found no significant effect of recency of the last suicide attempt on attentional bias toward suicide-related cues, $F(3,731)= 2.06$, $p>.05$,

partial $\eta^2=.00$, or negatively valenced words, $F(3,731)= 1.40, p>.05$, partial $\eta^2=.00$. However, when we ran an ANCOVA to test the effect of recency on attentional bias toward the word “suicide” only, there was a significant effect after controlling for gender, although it explained only 1% of the variance, $F(3,731)= 3.19, p<.05$, partial $\eta^2=.01$. The LSD post hoc test showed that, among females, the more recently a person attempted suicide, the slower the person reacts to the word “suicide”. Specifically, females who reported suicidal behaviors within one year responded more slowly to suicide related words as compared to those who attempted suicide within 3 years ($M_d=37.33, SD=18.55, p=.04$) and those who attempted suicide 6 or more years ago ($M_d=37.27, SD=15.34, p=.01$). There was no significant difference in response latencies among males.

Next, it was hypothesized that the attentional bias toward suicide-related cues would be positively correlated with the self-report measures of suicidal ideation. As a sample was taken from a non-clinical college population, distribution of scores on the self-report measures were positively skewed. Thus, Spearman’s rho was used to examine the relationship between the EST latencies and BDI, BHS, SBQ-R and BSS scores. Bivariate correlations between variables as well as mean and standard deviation for each variable across genders are presented in Table 1. Among male participants, there were no significant correlations between the EST latencies and self-report measures. However, among females, the interference for the word “suicide” ($r_s=.09, p=.02$) and the interference for negatively valenced words ($r_s=.09, p=.02$) was significantly correlated with the SBQ-R. The interference for negatively valenced words also had a significant correlation with BDI ($r_s=.08, p=.05$). In addition, it was found that the interference for the word “suicide” was significantly correlated with the BSS score ($r_s=.12, p<.01$) among female participants.

It was also hypothesized that the proximity of the most recent suicide attempt would be more strongly related with the EST latencies than with the scores on the self-report measures. Contrary to the hypothesis, the strength of the relationship was stronger for the self-report measures than for the EST latencies. Among males, there was no significant correlation between the EST latencies and the recency of the last attempt found. However, there were positive correlations between recency and the BSS ($r_s = .50, p < .01$), followed by SBQ-R ($r_s = .39, p < .01$), BHS ($r_s = .21, p < .01$) and BDI ($r_s = .13, p = .03$). Among females, the relationship was the strongest for the BSS ($r_s = .55, p < .01$), followed by SBQ-R ($r_s = .49, p < .01$), BDI ($r_s = .19, p < .01$), BHS ($r_s = .13, p < .01$), and then the interference for the word “suicide” ($r_s = .12, p < .01$). There was no significant relationship found between the proximity of the last attempt and the interference for suicide-related words or negatively valenced words.

Suicide-Specific Latency and Future Suicide Risk

Of the 590 participants who provided their email addresses at the time of the baseline interview, 197 participants (33.38%) participated in the follow-up study conducted approximately 18 months after the initial interview. Twenty of those who participated in the follow-up study were excluded from the further analysis as their EST response times were either individual outliers or group outliers. There were no group differences in age or ethnicity between those who participated in the follow-up study and those who did not participate. However, females were more predominant among those who participated in the follow-up study (78.0 % within the group) than those who did not participate (65.7% within the group), $\chi^2(1, N=736)=9.47, p < .01$. As there were only 39 males who participated in the follow-up study, gender differences could not be explored further. Among those who participated in the follow-up study, 24 participants reported some level of suicidal ideation and planning, and four participants

reported one or more suicide attempt(s).

Finally, it was hypothesized that suicide-specific attentional bias would predict suicide-related behaviors during the 18-month follow-up period. In order to test this hypothesis, a three stage hierarchical multiple regression was conducted with the SHSS total score as the dependent variable. The BDI, SBQ-R, BHS scores as well as dichotomized BSS total scores (zero v. non-zero) at the baseline interview were entered at stage one. As mentioned above, the results of self-report measures were positively skewed. Thus, in order to meet the assumptions of normality, square roots transformations of the BDI, SBQ-R and BHS were used for further analysis. Since no transformation improved the normality of the BSS, BSS scores were dichotomized (zero v. non-zero) to discriminate those who reported non-zero level of suicidal ideation and those who did not. The EST response time toward the negatively valenced words was entered at stage two and the EST response time toward suicide-related words was entered at stage three. Prior to conducting the analysis, the relevant assumptions were tested. The collinearity statistics were all within acceptable limits, so the assumption of multicollinearity was not met. Four multivariate outliers were excluded from further analysis. As shown in Table 1, it was found that BDI, BHS, SBQ-R, and BSS were correlated with suicidal behaviors during the 18-month follow-up period which was measured by SHSS. Regression results are summarized in Table 2. The hierarchical multiple regression revealed that at Stage one, SBQ-R significantly contributed to the model, $F(4,159)=4.66, p<.01$, and accounted for 10.5% of the variance in SHSS (adjusted $R^2=.08$). Adding the Stroop latency toward negatively valenced words did not improve the model, $F(5,158)=3.70, p<.01$, and there was no change of R^2 (adjusted $R^2=.07$). As hypothesized, introducing the suicide-specific attentional bias explained an additional 2.0% of the variation in SHSS and this change in R^2 was significant, $F(6,157)=3.74, p<.01$ (adjusted $R^2=.09$). When all

independent variables were included in the last stage, SBQ-R ($t(161)=1.98, p=.04$) and suicide-specific attentional bias ($t(161)=1.89, p=.05$) were the only significant predictors of SHSS. None of the other predictors significantly contributed to the model. This indicates that past suicidal thoughts and behaviors along with biased attention toward suicide-related cues could be used to predict future suicidal behaviors.

CHAPTER 7: DISCUSSION

This study extended the work of Cha et al. (2010) by assessing if attentional bias toward suicide-related stimuli would be found among diverse college students with suicidal ideation and past suicide attempts, and if suicide-specific attentional bias could predict future suicide behaviors. When the relationship between suicide-specific attentional bias and past suicidal behaviors was tested, no significant differences between the reaction times to the set of suicide-related words was found between past suicide attempters and non-attempters, but it appears that their response was significantly more delayed when they were shown the word “suicide” specifically. Further, a gender difference in attentional bias toward suicide-related cues was found. While male participants did not react differently to suicide-related words, female participants with a history of suicidal behaviors showed significantly slower responses toward the word “suicide”. It was also explored if the recency of the last suicide attempt would be associated with attentional bias toward suicide-related stimuli and found that the response time toward the word “suicide” was related to the proximity of the last attempt, with those who made suicide attempts within the past 12 months exhibiting the longest response latencies. This relationship was found among females only. In addition, females who showed a delayed response to the suicide-related words were more likely to report past, present, and future suicidal ideation. This effect was not observed in males. Further, as anticipated, we found that EST latencies were not affected by race or ethnicity even though group differences were found in reaction times. In addition, we assessed whether the proximity of the most recent suicide attempt would be more associated with the suicide-specific attentional bias than high scores on the suicide-related self-report measures. Contrary to the hypothesis, it was found that the recency of the last suicide attempt was not more strongly associated with suicide-specific attentional bias as

compared to traditional self-report scores for either females or males. It appeared that the traditional self-report measures outperformed the EST in detecting those who have attempted suicide before. Finally, the present study revealed that at 18 month follow-up, suicide-specific attentional bias predicted suicidal behavior during the follow-up period beyond traditional self-report measures.

Potential of the EST

These findings suggest that the EST has potential as a behavioral marker of suicidal behaviors in four ways. First, the present study revealed that, in line with the finding of Cha et al. (2010), suicide-specific attentional bias predicted future suicidal behaviors beyond traditional self-report measures. Except for SBQ-R, which assesses the magnitude of past suicidal thoughts and behaviors as well as likelihood of attempting suicide in the future, none of the other self-report measures predicted future suicidality. As noted previously, the EST is based on the assumption that those who use suicide schema exhibit cognitive inflexibility which results in delayed responding when they are shown suicide-related stimuli. Previous research found that cognitive inflexibility is predictive of suicidal ideation among past suicide attempters at 6-month follow-up (Miranda, Gallagher, Bauchner, Vaysman, & Marroquin, 2012) and at 2-3 year follow-up even after controlling for suicidal ideation at baseline (Miranda, Valderrama, Tsypes, Gadol, & Gallagher, 2013). In this study, it was found that attentional bias toward negatively valenced words did not predict suicidal behaviors during the 18-month follow-up period. This indicates that the cognitive inflexibility of suicidal individuals is specific for suicide-related cues. Such suicide-specific cognitive interference could outperform self-report measures that assess the state of hopelessness, depressive feelings, and current suicidal thoughts in detecting those who might consider suicide in the future.

Second, past attempters in this sample showed some level of attentional bias toward the word “suicide”. The other words “death” and “funeral” did not predict any group differences. Therefore, although this study did not support Cha et al.’s (2010) findings that past suicide attempters respond slower to suicide-related cues as compared to non-attempters, the present study revealed that those with suicidal behaviors tend to show some level of suicide-specific attentional bias. One possible explanation of the differences could be the target populations. The sample in Cha et al. (2010) consisted of those who were admitted to a psychiatric emergency department, and it is unknown how many of the participants were hospitalized for suicidal behavior. In the current study, participants were college students with none of the participants reporting engaging in active suicidal behavior within the week preceding the study. The potential recency of the suicidal behaviors in the Cha et al.(2010), study could explain the stronger attentional bias toward suicide-related words. Thus, it could be speculated that the words “death” and “funeral” are related to death and dying more generally but not suicide specifically and thus would be less salient than the word “suicide”. Therefore, it is recommended that future research include a different set of words that is more related to suicidal ideation and tests if individuals who are potentially suicidal would show attentional bias toward words that are more closely linked to suicide than "death" or "funeral".

Third, similar to other research suggesting that females engage in more suicidal behavior (ideation and attempts) than males, we found that this gender difference was also evident in the behavioral assessment. In the present study, it was found that females, as compared to males, are more than twice likely to report a lifetime history of suicide-related behaviors, and females with a history of suicidal behaviors showed suicide-specific attentional bias, but not males. It has been widely accepted that males are more likely than females to make fatal suicide attempts, but that

females are more likely than males to think of attempting suicide (Joiner, 2005; Qin et al., 2000). Further, in a recent study with an adolescent inpatient sample, it was found that suicidal ideation is predictive of suicide attempts only among girls (King, Jiang, Czyz, & Kerr, 2014). In addition, females are more likely to ruminate on their stressful situations than males, which consequently make females more prone to depressive symptoms (Johnson & Whisman, 2013). As rumination mediates the effect of cognitive inflexibility on future suicidal ideation (Miranda et al., 2013), gender might work as a proxy for rumination, and the gender effect in the current study might suggest the mediating role of rumination. Thus, the findings of this present study may indicate that cognitive interference for suicide-related words is a behavioral marker for suicidal ideation, and potential suicide attempters without prolonged suicidal rumination are unlikely to be detected using the EST. However, the caveat for this interpretation is that male suicide attempters represented only 5% of the entire sample and thus there was not a significant number of cases to conduct some of the analyses.

Finally, it was found that possible differences in cognitive processing among diverse ethnic groups could be controlled by assessing the Stroop latencies instead of response time to incongruent stimuli. As discussed by Westefeld et al. (2008), emotionally valenced words and suicide-related words might have different emotional salience depending on a respondent's ethnic/cultural background, as well as his or her socioeconomic status. In addition, a respondent's socioeconomic status, primary language, or level of education, might affect his or her reading level, which might consequently influence the EST performance, as the assumption of the EST with linguistic stimuli is that cognitive interference occurs when a person interprets the lexical meaning of the stimulus relevant to their current mood. However, such static factors must affect one's overall EST performance, and there is no reason to assume that emotional

stimuli are more affected by those static factors as compared to neutral stimuli if the length and difficulty of words are controlled. In essence, the EST latencies compare the individual to themselves and hence variability in reaction time between groups becomes moot. Furthermore, previous research found that immigrants whose first language is not English showed equivalent level of cognitive interference in comparison to those who were born in the U.S. and monolingual (Doan & Swerdlow, 1999). Thus, this study underlined the usefulness of the EST for ethnically diverse populations.

Limitations and Future Directions

There were several limitations to the current study. First, we are unsure of the accuracy of suicide attempt history as it was based upon self-report and was not corroborated by another source or medical records. However it should be noted that the majority of these attempts did not result in hospitalization and not everyone reported the suicide attempt to another individual. Thus, self-report may be the only way to determine whether an attempt was made. Second, it was noticed during the data collection of our study that participants appeared distracted during the 4-second break between trials in the EST, and those who appeared distracted failed to notice instantly that a new word appeared on the screen. The methodology in our study was adapted from that of Cha et al. (2010) which used a psychiatric sample. Although the level of education of the participants in Cha et al. (2010) was not specified, other static factors, such as age and ethnicity between the two studies are dissimilar. Those static factors could have affected computer literacy of the two samples differently. It is recommended for future research to test whether shorter breaks between trials could increase participants' sustained attention to the task. Finally, only a small number of participants agreed to participate in the follow-up study, and gender effects found at baseline could not be explored any further at follow-up. Future studies

exploring gender effects may consider using a stratified sample to ensure a significant number of cases to conduct analyses to compare male attempters and female attempters.

Despite these limitations, this study provides empirical support for using a behavioral measure to detect potentially suicidal individuals in non-clinical young adult populations. While self-report measures were better at detecting those with past suicide attempts compared to Stroop latencies, more importantly we found that the EST latencies for suicide-related cues predicted future suicide risk above self-report measures. This indicates that those who score low on the self-report measures are not significantly different compared to those who score high on the same measures in their risk for suicidality in the future. Therefore, if an individual's suicide risk is assessed solely by self-report measures, there may be a good number of individuals who have experienced suicidal thoughts who go undetected. Inclusion of the EST could improve the accuracy of the suicide risk assessment and lessen false negatives. Rumination is cross-culturally found to be related to suicidal ideation (Eshun, 2000), and prolonged response to the suicide-related cues among those who are at risk for future suicidal behaviors in an ethnically diverse sample provides significant support for the role of rumination in predicting future risk.

Finally, the current research underlines the importance of developing an actuarial suicide risk assessment tool. In this study, a history of suicidal behaviors, along with suicide-specific attentional bias, prospectively predicted suicidal behaviors during the 18-month follow-up period, whereas dynamic factors, such as a state of hopelessness, depressive symptoms, and current suicidal ideation had non-significant predictive validity in this sample. While such dynamic factors may be useful in detecting those who are at acute suicide risk, static factors and behavioral markers which are less state-dependent and less affected by social desirability than dynamic factors might be more effective in detecting individuals at potential risk for suicide.

The present study has several clinical implications. First, since few students who are suicidal participate in college counseling services (Gallagher, 2004; Kisch, Leino, & Silverman, 2005), it is imperative to develop a routine screening measure that is feasible and can be administered easily to large numbers of participants. Inclusion of a behavioral measure, such as the EST, would improve the accuracy of detection, especially for those who do not respond affirmatively to self-report suicide screening measures. A behavioral measure such as the EST is as cost- and time-efficient as self-report measures, but is less affected by individuals' willingness to disclose suicidality; a limitation of current self-report assessments. The present study showed that the EST outperformed self-report measures in predicting suicidal behaviors over an 18-month follow-up period. Although the base rate of completed suicide is low, there are still significant numbers of students reporting suicidal ideation. Thus, if college students could be routinely screened for suicidal ideations and behaviors with the EST, it would be easier for college counselors to stratify students into therapy-relevant groups by urgency for intervention.

This study provides preliminary evidence for the predictive validity of the EST in non-clinical samples. However, the findings should be interpreted with caution. There was a significant gendered effect in the present study, and previous research suggested that age could affect one's response time to the EST stimuli (Doan & Swerdlow, 1999). Furthermore, there is a need to study whether the concurrent and predictive validity of the EST could be improved by adapting other words that are more relevant to suicide. This study replicated the effects in Cha et al. (2010) which used a predominantly white clinical sample and showed that the EST could be used with a non-clinical ethnically diverse population in which the base rate of suicidal behaviors is significantly lower than in a clinical population. Thus, it would be important to replicate these findings and refine the measure for better predictive power, including larger and more diverse

samples and longer follow-up periods.

Lastly, as the ultimate goal of developing a suicide risk assessment tool for use with a non-clinical population is to reach out to those who are unwilling to ask for help themselves, future directions could include the development of an online version or a smartphone application of the EST. An online survey is often preferred as it is less intrusive and more time- and cost-efficient than some other types of traditional data collection methods, which require respondents' physical attendance. Considering that the EST is an objective measure and that the computerized version of the EST has already been utilized, it is a reachable goal to develop an online version or a smartphone application with future empirical support on the test validity of the self-administered EST. Furthermore, if the testing results could be automatically transferred to college counseling or social services, the time- and cost-efficiency of the test could be maximized.

Table 1

Intercorrelations Between the Variables

Variable (N)	<i>M</i>	<i>SD</i>	1	2	3	4	5	6	7	8
1. SHSS (165)	.70	1.37	1	.29** _a	.23** _a	.32** _a	.36** _a	.00 _a	.12 _a	.14 _a
2. BDI (736)	11.14	8.23		1	.60** _a	.45** _a	.38** _a	.07* _a	.01 _a	.01 _a
3. BHS (736)	3.29	3.57			1	.38** _a	.35** _a	.02 _a	-.00 _a	.00 _a
4. SBQ-R (736)	4.63	2.33				1	.48** _a	.05 _a	.02 _a	.05 _a
5. BSS (736)	1.11	3.04					1	.02 _a	.02 _a	.08** _a
6. Attentional bias toward negatively valenced words (736)	3.35	46.98						1	.56** _b	.40** _b
7. Attentional bias toward suicide-related words (736)	1.21	47.66							1	.70** _b
8. Attentional bias toward the word "suicide" (736)	-1.11	69.03								1

Note. *N*=164; **p* < .05; ***p* < .01; a=Spearman's correlation coefficient; b=Pearson's product-moment correlation coefficient

Table 2

Hierarchical Multiple Regression Model

Variable	β	t	R	R^2	ΔR^2
Step 1			.32	.10	.10
BDI	.05	.57			
BHS	.05	.57			
SBQ-R	.20	2.08*			
BSS	.08	.94			
Step 2			.32	.10	.0
BDI	.05	.56			
BHS	.05	.57			
SBQ-R	.20	2.07*			
BSS	.08	.94			
Attentional bias toward negatively valenced words	.00	.04			
Step 3			.35	.12	.02*
BDI	.05	.53			
BHS	.04	.45			
SBQ-R	.19	1.98*			
BSS	.08	.92			
Attentional bias toward negatively valenced words	-.08	-.98			
Attentional bias toward suicide-related words	.17	1.89*			

Note. $N=164$; * $p < .05$

Appendix A

Informed Consent (Baseline Interview)

You are invited to participate in a research study entitled “Mental Health of College Students.” The purpose of this research is to explore the cognitive ability and psychological wellbeing of college students. We plan to enroll approximately 1000 participants into this study. If you decide to participate, you will be asked to indicate different colors of presented words, and to complete questionnaires about present and past feelings, thoughts, and emotions. Participation should take about two hours for duration of one day.

The foreseeable risks of participation in this study are minimal. In order to minimize these risks we will have a licensed psychologist on call during and immediately after the participation. In addition, you will be given a debriefing form at the end of the interview which will include mental health and emergency contacts if you feel that you need to talk to someone or that you are at risk for hurting yourselves, or if you become upset after the interviewer has left. The licensed psychologist may contact you if she deems that you are in imminent danger of hurting yourself. The possible benefits to you are learning different types of psychological assessments and developing insights into your own thoughts and emotions. The potential benefits to society are developing better methods to identify individuals at mental health risk.

Your participation in this study is completely voluntary. You have a right to refuse to participate without consequences. If you decide not to participate your decision will not affect your relationship with John Jay College or the investigators.

If you decide to participate you may discontinue participation at any time. You may refuse to answer any specific questions or refuse to engage in any task at any time during the study. Withdrawal or refusing to answer specific questions or engage in specific tasks will not result in any consequences to you and will not affect your relationship with John Jay College or the investigators.

Information gathered from you will be kept strictly confidential and only viewed by researchers conducting this project. Your personal information, linked with the identification number, will be kept separately from your responses. And your responses will only contain subject numbers. Data and the participants’ personal information for this project will be kept for five years in secure data files on computers belonging to the Principal Investigator, Dr. Elizabeth Jeglic. The data files will only be accessible with passwords which only researchers involved in this project will have knowledge of.

Your signature below means that you have read this consent form, that you fully understand the nature and consequences of participation and that you have had all questions regarding participation in this study answered satisfactorily. If you have further questions about this research please feel free to contact the Principal Investigator, Dr. Elizabeth Jeglic at ejeglic@jjay.cuny.edu.

If you have any questions regarding your rights as a research participant please feel free

to contact the John Jay Institutional Review Board Office at
jj-irb@jjay.cuny.edu, or (212) 237-8961.

Participant Name

Participant Signature

Principal Investigator/Research Staff
Witness Signature

Date

Appendix B

Informed Consent for Follow-Up Invitation

Thank you for your participation today.

Your participation today will help us better understanding the mental health of college students.

Approximately 18 months later, the researchers involved in this study will conduct a follow-up study in which you will be asked to perform the same task you did today. Your participation in the follow-up study will be completely voluntary, and you have a right to refuse to participate without consequences. If you decide not to participate your decision will not affect your relationship with John Jay College or the investigators. Your participation in the follow-up study will be monetarily compensated.

Your consent today will not require your commitment. You will have a right to refuse to participate in the study when you receive an invitation 18 months later.

If you agree to participate in the follow-up study, an invitation will be sent to your e-mail address. Your personal information, linked with the identification number, will be kept separately from your responses. And your responses will only contain subject numbers. Data and the participants' personal information for this project will be kept for five years in secure data files on computers belonging to the Principal Investigator, Dr. Elizabeth Jeglic. The data files will only be accessible with passwords which only researchers involved in this project will have knowledge of.

Please check the box below and leave your e-mail address **if you agree to participate in the follow-up study**.

If you have any questions regarding your rights as a research participant please feel free to contact the John Jay Institutional Review Board Office at jj-irb@jjay.cuny.edu, or (212) 237-8961.

- ☐ I agree to participate in the follow-up study. Please contact me at _____ (e-mail address).
- ☐ I do not agree to participate in the follow-up study.

Participant's Name

Date

Appendix C

Debriefing Form

This study will help us understand more about the relationship between negative thoughts and cognitive functioning in an undergraduate population. This is a correlational study. The questionnaires you have completed today have asked about various problems that people might have including depression.

Depression is an illness characterized by having either a depressed mood or loss of interest in things that you normally enjoy. These feelings last most of the day, nearly every day for at least 2 weeks. It often lasts several months, and can last for years. During this period, people with depression experience 4 of the following symptoms:

- Change in appetite, weight loss or weight gain
- Difficulty falling asleep, staying asleep or sleeping too much
- Feeling restless and agitated or feeling slowed down
- Low energy
- Feelings of worthlessness or guilt
- Trouble concentrating or making decisions
- Thoughts of death or suicide

If you feel you meet criteria for depression or are having a difficult time right now, we encourage you to call the counseling center, your primary care physician or another mental health provider. There are effective treatments available. Sometimes when people are depressed they think about harming themselves. In the event that you are feeling suicidal or unsafe, call the Counseling Center (212)237-8111, or the New York City Help Line at (212) 532-2400. If you have additional questions about this study, contact Dr. Elizabeth Jeglic at (212)484-1195. Thank you for your participation.

Appendix D

Invitation Script for Follow-up Interview

This is an invitation to participate in the web-based follow-up to the study :Mental Health of College Students: which you participated approximately 18 months ago as part of the Research Experience Program.

You received this email because you provided us with your name and contact information at the time of the interview.

Your participation is not mandatory. You may not decide not to participate without any consequences.

And if you agree to participate, your decision today will not limit your right to decide not to participate at the time of the interview.

The total duration of the follow-up will be less than 1 hour, and in exchange for your participation you will receive 5 dollars in cash through paypal or a 5 dollar gift card.

If you would like to participate in this study, please click the link below or copy the link and paste it in the address bar of your internet browser.

Your participation will be greatly appreciated.

Appendix E

Informed Consent for Follow-Up Interview

You are invited to participate in a research study entitled “Mental Health of College Students.” The purpose of this research is to explore the psychological wellbeing of college students. We plan to enroll approximately 700 participants into this study. If you decide to participate, you will be asked to complete questionnaires about present and past feelings, thoughts, and emotions. Participation should take about one hour for duration of one day.

The foreseeable risks of participation in this study are minimal. In order to minimize these risks we will have a licensed psychologist review your responses following your participation. In addition, you will be given a debriefing form at the end of the interview which will include mental health and emergency contacts if you feel that you need to talk to someone or that you are at risk for hurting yourselves, or if you become upset following the completion of the questionnaires. The licensed psychologist may contact you if she deems that you are in imminent danger of hurting yourself. The possible benefits to you are learning different types of psychological assessments and developing insights into your own thoughts and emotions. The potential benefits to society are developing better methods to identify individuals at mental health risk.

Your participation in this study is completely voluntary. You have a right to refuse to participate without consequences. If you decide not to participate your decision will not affect your relationship with John Jay College or the investigators.

If you decide to participate you may discontinue participation at any time. You may refuse to answer any specific questions or refuse to engage in any task at any time during the study. Withdrawal or refusing to answer specific questions or engage in specific tasks will not result in any consequences to you and will not affect your relationship with John Jay College or the investigators.

Information gathered from you will be kept strictly confidential and only viewed by researchers conducting this project. Your personal information, linked with the identification number, will be kept separately from your responses. And your responses will only contain subject numbers. Data and the participants’ personal information for this project will be kept for five years in secure data files on computers belonging to the Principal Investigator, Dr. Elizabeth Jeglic. The data files will only be accessible with passwords which only researchers involved in this project will have knowledge of.

In lieu of signature, you will be asked to indicate whether you agree or disagree to participate in this study. If you check the box “I agree”, it means that you have read this consent form, that you fully understand the nature and consequences of participation and that you have had all questions regarding participation in this study answered satisfactorily. If you have further questions about this research please feel free to contact the Principal Investigator, Yeunjoo Chung at jjcyeunchung@gmail.com.

If you have any questions regarding your rights as a research participant please feel free to contact the John Jay Institutional Review Board Office at jj-irb@jjay.cuny.edu, or (212) 237-8961.

You are making a decision whether or not to participate. Your affirmation indicates that you have decided to participate having read the information provided above.

☐ **I agree to participate.**

☐ **I do NOT agree to participate.**

Appendix F

Demographic Questionnaire

1. Age: _____
2. Gender: _____
3. Ethnicity:
☐ Black, not of Hispanic origin
☐ Hispanic
☐ Caucasian, not of Hispanic origin
☐ American Indian or Alaskan Native
☐ Asian or Pacific Islander
☐ Other _____
4. Please indicate what year in college you are:
☐ Freshman
☐ Sophomore
☐ Junior
☐ Senior
5. Please indicate the number of family members in your household (check all that apply):
☐ Grandfather
☐ Grandmother
☐ Father
☐ Step-Father
☐ Mother
☐ Step-Mother
☐ Brother (including step-brother)
☐ Sister (including step-sister)
☐ Husband
☐ Wife
☐ Son
☐ Daughter
☐ Uncle
☐ Aunt
☐ Other _____
6. Have you ever attempted suicide before?
☐ Yes
☐ No
7. If yes to #6, when was the last time? (if you answered No to #6, please check Never)
☐ Never
☐ Within 1 week

- ___ 1 month
- ___ 3 months
- ___ 6 months
- ___ 1 year
- ___ 3 years
- ___ 6 years
- ___ more than 6 years

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