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USING NUDGES TO INCREASE ENGAGEMENT WITH SUICIDE PREVENTION RESOURCES IN AN ONLINE SAMPLE OF UNITED STATE MILITARY VETERANS

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USING NUDGES TO INCREASE ENGAGEMENT WITH SUICIDE PREVENTION RESOURCES IN AN ONLINE SAMPLE OF UNITED STATE MILITARY VETERANS

by

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ABSTRACT

Suicide rates have continually increased from 1999 to 2019 in the United States, with populations such as military Veterans showing substantially higher suicide death and attempt rates than civilians. Behavioral economics researchers have demonstrated that people regularly make decisions that are not aligned with their own self-interests (i.e., irrational decisions). These irrational decisions often stem from humans having bounded rationality (i.e., limited computational power), which produce reliable cognitive biases that occur outside of people's awareness and influence the decisions they make. There are many important decisions leading up to a suicide attempt (e.g., whether to engage with suicide prevention resources), and it is likely that these same biases pervade suicide-relevant decisions. This study tests a behavioral economic intervention - nudges - as a potential way to increase engagement with suicide prevention resources in a sample of US military veterans ($N = 457$) using Amazon's Mechanical Turk. Results showed that overall, nudges were no more effective than control messages at increasing engagement with crisis resources. Only Social Norms were more effective than control messages and one other nudge group (using a Veteran suicide story). Further, findings indicated that participants were more likely to engage with crisis lines compared to safety plans. Exploratory analyses revealed that depression scores and higher delayed discounting scores were two correlates associated with crisis resource engagement overall. Limitations of this study included high data loss due to poor quality, suggesting that Amazon's Mechanical Turk may be an inappropriate platform for testing the effect of nudges on behavior. Future studies should consider using social media to test nudges so that researchers can more adequately test and refine messages in a naturalistic setting.

Keywords: nudges, cognitive biases, suicide, behavioral economics, military

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DEDICATION

I dedicate this to my parents, John and Debbie Bauer, my grandparents Harold Ward, Sheila Ward, Jan Swanson, and Harry Swanson, and my sisters, Chanda and Pamela Bauer. I would not be able to have done this without your sacrifices, hard work, and constant support. I also want to dedicate this to my nephew, Jamie, who inspires me by being the most joyful person on the planet. And of course, to my editor-in-chief, Kristy Larsen.

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CHAPTER I – INTRODUCTION

Suicide is the tenth leading cause of death worldwide claiming over 800,000 lives each year (Naghavi et al., 2017). In the United States (US), during 2018 alone, suicide was responsible for over 48,000 deaths (Centers for Disease Control and Prevention [CDC], 2020). This figure does not take into account the estimated 1.4 million Americans who attempt suicide (CDC, 2020), or the 10.6 million Americans who experience suicidal ideation (Drapeau & McIntosh, 2018) each year. Further, suicide deaths and attempts can create an estimated national cost of up to $93.5 billion during a single year (Shepard, Gurewich, Lwin, Reed, & Silverman, 2016). A recent meta-analysis in the field of suicide research found that the past 50 years of research has been largely unproductive in improving our understanding of why people die by suicide as well as predicting who will attempt or die by suicide (Franklin et al., 2017). Despite a concerted effort from policymakers, researchers, healthcare systems, and other organizations, the US suicide rate has increased substantially over the past 15 years (Gibbons, Hur, & Mann, 2017). Furthermore, suicide research is underfunded relative to other leading causes of death. These facts indicate a dire need for novel, time and cost-effective strategies to help decrease the rate of suicide.

US military Veterans are one group especially at risk for suicide. Suicide rates for US Veterans are over double that of the US civilian population rate (30.1/100,000 vs. 14.2/100,000; Department of Veteran Affairs, 2016; CDC, 2020) and certain Veteran subgroups have suicide rates that are triple the US civilian rate (i.e., Veterans ages 18-34, 45/100,000; Department of Veteran Affairs, 2016). Military suicide has been deemed a national priority under executive order (Department of Defense, Department of Veterans

Affairs, Department of Health and Human Services, & Department of Education, 2013) with the Department of Defense funding over 900 suicide-related initiatives - including prevention, outreach, treatment interventions, and general suicide-related research (Brewin, 2013). Surprisingly, military-specific experiences (e.g., number of deployments) do not appear to be drivers of the elevated suicide rates in military and Veteran populations (Reger et al., 2015; Ursano et al., 2016), suggesting that both US civilian and Veteran populations may benefit from similar treatment strategies. Given the low-base rates of suicidal behaviors in the US civilian population, the US Veteran population may be an ideal group for piloting novel interventions for suicide prevention.

Because rates of suicide death continue to rise despite significant preventative efforts, it is worthwhile to expand current interventions and incorporate strategies that have been successful in reducing harmful human behavior (and promoting desired behaviors) from other fields of science. The following argument provides an overview of two major economic theories (i.e., neoclassical economics, behavioral economics) and outlines how knowledge of such theories may be helpful for understanding human behavior and choice selection in the context of suicide. By understanding human decision making through the lens of economic theory, we may then apply the effective interventions developed from those theories (e.g., behavioral economics).

Selected Theories of Decision Making

Individuals make decisions that occur both distally (e.g., “How should I store my firearm?”) and proximally to a suicide attempt (e.g., “Should I reach out for help?” “Would I be better off dead?”) that can impact their suicide risk; therefore, understanding how people make decisions is an important aspect of suicide research. Theories from the

field of economics may provide crucial insight into how people make decisions. Neoclassical economics has been the dominant theory for understanding human decision making and behavior (Davis, 2006), and posits that humans are unemotional, calculating, economical maximizers with unbounded rationality, willpower, and selfishness that enables them to behave in ways that maximize their long-term self-declared goals (Berg & Gigerenzer, 2010). This framework argues that people only make irrational decisions due to having imperfect or incomplete information (Bernoulli, 2011; Friedman & Savage, 1948), However, decades of research from cognitive psychology, social psychology, and economic literature indicates that people regularly depart from perfect rationality, and in fact, people can be reliably poor at making decisions that are in their own self-declared best interests (Knoll, 2010; Hilbert, 2012; Kahneman & Tversky, 1979; Shapiro, 1994; Stanovich, West, & Tokplak, 2013; Tversky & Kahneman, 1974; Wilson & Gilbert, 2003).

Competing with the neoclassical model, behavioral economics merges behavioral science with economic principles (Camerer, Loewenstein, & Rabin, 2004) and embraces the fact that people make decisions that are not perfectly rational. Behavioral economics hypothesizes that irrational choices stem from humans having bounded rationality; that is, organisms do not have unlimited time, computational power, and knowledge to make perfectly rational decisions (Simon, 1972). Thus, people rely on mental shortcuts (e.g., cognitive biases, cognitive heuristics) to ameliorate information gaps and form beliefs about probabilities of uncertain events, and to qualify the values of uncertain quantities (Tversky & Kahneman, 1974).

Brief Overview of Cognitive Biases and Heuristics

The mental shortcuts (heuristics) people employ (often outside of awareness) to make decisions when perfect information is unavailable are often useful (Gigerenzer, Hertwig, & Pachur, 2011; Gigerenzer & Selten, 2002), but when misapplied, can lead to reliably biased beliefs, predictions, and decisions (Kahneman & Tversky, 1979). To illustrate this concept, Tversky and Kahneman (1974) provided the example of people estimating the size and distance of objects using their visual senses without complete information (i.e., the numerical measurements for distance and size of an object). They note that an object's distance is often estimated by its clarity - whereby the sharper the object appears, the closer it appears to be. More often than not, this approach works well for humans and is largely an accurate and helpful heuristic (i.e., shortcut) to ascertain size and distance when precise measurement data are unavailable. However, an overreliance or misapplication of this rule can lead to systematic (i.e., nonrandom) errors in estimating distance, such as when visibility is poor and objects appear blurred, and have disastrous results (e.g., shipwrecks). The visual and information processes occurring outside of awareness in this example is referred to as a cognitive heuristic, and the *outcome* of these processes refers to the cognitive bias. Cognitive biases can thus interfere with rational choice by distorting perceptions, disrupting probabilistic inferences, and/or creating illogical interpretations (Kahneman & Tversky, 1979; Tversky & Kahneman, 1974; Tversky & Kahneman, 1981). Important for suicide research, biases in decision making become more prevalent when choices involve delayed and/or uncertain outcomes (Johnson & Bickel, 2002; Tversky & Kahneman, 1974), when decisions are made during

highly emotional times (Tversky & Kahneman, 1992), and/or when decisions are novel (Wilson & Gilbert, 2003).

Evidence of Irrational Decision Making in Suicide Relevant Choice Selection

There is evidence indicating that people are both able and likely to make irrational, biased decisions. Cognitive biases appear to be - at least in part - due to an overreliance on cognitive heuristics when complete information is unavailable, with cognitive heuristics stemming from humans possessing bounded rationality. Given that humans are universally endowed with bounded rationality, it is likely that these mental errors are also disrupting rational choice-making within the context of decisions related to suicide. Furthermore, given that suicide-relevant decisions are novel, involve delayed outcomes, incomplete information, and can take place during highly emotional periods (e.g., suicidal crises), cognitive heuristics may be used more often, thereby leading to more biased and irrational actions.

The extant literature on suicide (e.g., means safety, qualitative accounts, rates of suicide death after a suicide attempt) suggests that the decision to die by suicide is predominately not the choice that yields maximial long-term subjective utility (i.e., rational). Qualitative reports of suicide attempt survivors recounting their attempt reveal that attempt survivors often recall realizing that had made a mistake moments after initiating their attempt (Godlasky & Dastagir, 2018). In addition, there is robust evidence rejecting the common myth that individuals who want to die by suicide eventually will (Joiner, 2010). In several large samples of suicide attempters, approximately 90% of attempters did not go on to die by suicide, but instead died by other causes later in life (Owens, Horrocks, & House, 2002; Runeson et al., 2016; Seiden, 1978; Tidelmalm et al.,

2008). Furthermore, in a longitudinal study following previous attempters, approximately 75% of individuals who attempted suicide did not go on to make another attempt (Owens, Horrocks, & House, 2002; Seiden, 1978). An emerging line of research also shows that when lethal means (e.g., firearms, toxic chemicals) are made less available or more difficult to access, overall suicide rates decrease (Anestis & Anestis, 2015; Beautrais, Fergusson, & Horwood, 2006; Leeraars, Moksony, Lester, & Wenckstern, 2003; Lubin et al., 2010; Loftin, McDowall, Wiersema, & Cottey, 1991; Nodentoft, Qin, Helweg-Larsen, & Juel, 2006). Importantly, the overwhelming majority of people do not substitute with other suicide methods (Amos, Appleby, & Kiernan, 2001; Daigle, 2005). That is, if a dangerous method is made less available, the rates of suicide death lower (Amos, Appleby, & Kiernan, 2001; Daigle, 2005). If it were true that most people who wanted to kill themselves eventually will, or if suicide brought maximal subjective utility, it is more likely that the field would see higher rates of means substitution and lower survivor rates. Instead, the combination of these findings suggest that people retrospectively find greater utility in continuing to live their life after a suicidal crisis has ended, compared to the prospect of ending their life (i.e., irrational).

The possibility that many suicides deaths may qualify as irrational is further highlighted by countries that incorporate decision-making procedures that are more likely to produce rational choice selections. For example, countries that allow applications for euthanasia due to psychiatric illnesses alone (e.g., Netherlands; Kim, De Vries, & Peteet, 2016; Regional Euthanasia Review Committees [RERC], 2014) mandate several separate requests from the patient (usually distanced by weeks to months) in different variations (e.g., verbal, written) with evidence of consensus for adequate cognitive capacity and a

poor prognosis from several independent health professionals (Pereira, 2011). Yet, even when the decision to die is made available through this process, there are far less suicide deaths that occur by euthanasia compared to suicide deaths that happen without such procedures (Kim, De Vriest, & Peteet, 2016; RERC, 2014; World Health Organization [WHO], 2018). These figures indicate that when individuals are forced to wait long periods and garner feedback from several individuals regarding their desire to die, only a small portion of people die by suicide. In sum, if suicide was the choice that truly maximized subjective utility, there would likely be higher rates of death by medically-assisted suicide.

Distal decisions relevant for suicide may also heavily rely on heuristics and lead to biased, irrational decisions. Choices that occur further out from an attempt before people experience a suicidal crisis (or even suicidal thoughts) can affect later suicide risk, such as how individuals choose to store their firearm(s) as well as if they choose to learn coping skills. For example, people tend to overestimate the probability that bad events will happen to other people and underestimate the probability that those same bad events will happen to them (optimism bias; Sharot, 2011). Biases of this nature may be problematic because it could suggest that even when individuals are presented with accurate information from reliable and trusted sources on firearm storage or coping skills, they may not engage with those resources or change their personal practices if the information is targeting the individual – because they believe that it will not apply to them. This may be particularly important when considering suicide risk over time – that is, with individuals who are currently at low risk, but will (unknowingly) have later increased suicide risk.

The decision-making processes proximal to a suicide attempt appear markedly different from the processes involved in other major life decisions, and may foster increased vulnerability for relying on heuristics, which ultimately leads to biased decisions. Most notably, although people may have increased suicide risk (e.g., suicidal ideation) for several years, the *actual* decision to attempt suicide tends to occur quickly (Millner, Lee, and Nock, 2017; Simon et al., 2001; Williams, Davidson, & Montgonmery, 1980); often within an hour, and many (25-40%) occurring within a five-minute period prior to initiating the attempt (Millner, Lee, and Nock, 2017; Simon et al., 2001; Williams, Davidson, & Montgonmery, 1980). Making decisions quickly, where both risk and prospects are uncertain, is associated with the activation and employment of implicit cognitive systems that rely more heavily on heuristics and automatic processes (Kahneman, 2011; Stanovich & West, 2000). Thus, suicide-relevant decisions made proximal to an attempt may be prone to utilizing cognitive heuristics, thereby increasing the likelihood of biased choice selection.

Another important factor to consider is that many decisions proximal to a suicide attempt are made during highly emotional times and often after a stressor has occurred (e.g., job loss, relationship loss; Hedegaard, Curtin, & Warner, 2018; Dempsey et al., 2018). Significant psychological pain is a necessary – but not sufficient - condition cited within nearly all classical and modern theories of suicide (Baumeister, 1990; Klonsky & May, 2015; O'Connor, 2011; Shneidman, 1993; Van Orden et al., 2010). Due to the accumulating research on phenomena occurring proximal to an attempt, two new diagnostic entities have been proposed (i.e., Acute Suicidal Affective Disturbance; Tucker et al., 2016; Suicidal Crisis Syndrome; Galynker et al., 2017) that are centrally

defined by an acute, pre-suicidal state of limited duration that involves significant emotional, cognitive, and physiological arousal and dysregulation (Galynker et al., 2017; Tucker et al., 2016, Stanley et al., 2016; Yaseen et al., 2018). Importantly, significant elevations in emotion can interfere with decision-making processes (Brosch, Scherer, Grandjean, & Sander, 2013) especially when outcomes are delayed (Wilson & Gilbert, 2003). In particular, researchers have found that individuals use affect to guide decision making - with affect operating as currency/utility (e.g., reward, punishment) and a motivator (Mellers & McGraw, 2001; Peters, Västfjäll, Garling, & Slovic, 2006). For example, during highly emotional situations such as a suicidal crisis, individuals may inaccurately predict how they will feel in the future ("I will never feel better") due to contamination from their current emotional state (DeSteno, Petty, Wegenery, & Rucker, 2000). Or, they may focus only on the present hardship and emotion and neglect future positive events (focalism; Wilson, Wheatley, Meyers, Gilbert, & Axsom, 2000), and/or inaccurately forecast future emotion because they do not have prior experience with decisions of this nature (i.e., novel decision-making; Wilson & Gilbert, 2005). Because suicidal crises are characterized by a marked increase in emotional distress, such periods likely increase the probability of making decision-making errors that lead to inaccurate, biased decisions.

There is also evidence that deficits in decision-making abilities are associated with suicidal behaviors, further suggesting that decision making may be an important factor in understanding why people die by suicide. People with past suicide attempts show deficits in problem-solving/decision-making tasks (Dombrovski & Hallquist, 2017) - as well as higher rates of risky behaviors (e.g., addiction, gambling; Vijayakumar,

Kumar, & Vijayakumar, 2011; Wong, Cheung, Conner, Conwell, & Yip, 2010) related to irrational decision making. Individuals who have previously attempted suicide tend to make poor decisions during laboratory-based decision-making tasks compared to controls (e.g., Iowa Gambling Task, Cambridge Gambling Task; Jollant et al., 2005; Jollant et al., 2010; Richard-Devantory, Berlim, & Jollant, 2014) by disregarding crucial information (e.g., probabilities, decision-relevant information) and/or feedback (Ackerman et al., 2015; Clark et al., 2011; Dombrovski et al., 2010). These findings are hypothesized to be, in part, due to the presence of emotional dysfunction (Jollant et al., 2005). Furthermore, these decision-making deficits are reflected in the disruption of expected value signals in certain regions of the brain (e.g., vmPFC; Dombrovski et al., 2013) and are similar to those found in patients with limited cognitive capacity or impaired decision-making (e.g., dementia, Deakin et al., 2004). Studies have also found that individuals who have a history of suicidal behaviors show decreased activation in the lateral orbitofrontal cortex when making risky choices under uncertainty (Jollant et al., 2010). Such findings add credence to the notion that individuals with a history of suicidal behaviors may be neurocognitively vulnerable to disadvantageous decision making (Jollant et al., 2011). Lastly, research examining the relationship between cognitive abilities in domains related to accurate decision making (e.g., intelligence, executive functioning, memory, attention) show stable (albeit modest) effects in their ability to discern individuals with a history of suicidal ideation from those with previous suicide attempts (Saffer & Klonsky, 2018; Szanto, 2017). In sum, decision-making research indicates that factors related to impaired decision making likely create additional vulnerabilities for enacting a lethal or near-lethal

suicide attempt when a person enters a suicidal crisis and/or creates a higher likelihood of making suboptimal decisions throughout the lifetime that leads to worse outcomes.

Summary of Argument

The aforementioned argument and evidence indicates that decisions related to suicide (both distally and proximally) may be susceptible to heuristics commonly found across human choice selection that ultimately increases the risk of biased, irrational decision making. Countless studies have found evidence that runs counter to the neoclassical economic position for explaining human behavior (i.e., evidence suggesting that that humans are in fact not maximal rationalizers who always perform actions aligned with their long-term subjective utility). Further, neoclassical theory appears to offer no utility for the problem of suicide. Namely, in the neoclassical view, individuals who die by suicide have acted with perfect rationality. A behavioral economic view of suicide may help explain irrational decision making and behaviors by positing that people will act irrationally due to bounded rationality. By taking such propositions into account, behavioral economics thereby offers explanations for why suboptimal decision making may exist in the context of suicide (i.e., an overreliance on heuristics which leads to biased, irrational choice selection) and most importantly, provide specific targets for interventions.

Nudges as a Behavioral Economic Intervention

By taking cognitive errors and irrationality into account when attempting to explain human decision-making and behaviors, behavioral economics has discovered and implemented interventions that anticipate and manipulate cognitive biases to influence people towards making decisions that align with their own self-interests. “Nudges” are

the most widely studied and implemented behavioral economic intervention. Nudges are small alterations within a decision-making environment that attract an individual's attention and increase the probability of the individual performing a desired behavior, without changing incentives (i.e., rewards or punishments) or limiting choice (Thaler & Sunstein, 2008). Nudges are based on the notion that people should be free to make decisions that are in their own self-declared interests, and in turn helps people select the choices they would make if they had perfect information (i.e., libertarian paternalism; Thaler & Sunstein, 2008). Nudges differ from de-biasing interventions (an attempt to educate an individual about biases to reduce their existence) and are perhaps more effective because nudges often go unnoticed by the individual (Bruns, Kantorowicz-Reznichenko, Klement, Jonsson, & Rahali, 2018). Although several areas of study (e.g., cognitive psychology, economics, social psychology) have found stable cognitive biases, people still have difficulty recognizing biases within themselves (though they can often recognize the impact of these cognitive errors on *others'* judgments; Pronin, Lin, & Ross, 2002). Despite occurring outside of conscious awareness, nudges are transparent and most often take the form of providing additional information or making behaviors easier to accomplish (Sunstein, 2018).

Nudges have proven to be effective interventions for increasing desirable behaviors in several different areas such as retirement savings (Carroll et al., 2009), college enrollment (Bettinger et al., 2012), energy conservation (Allcott, 2011), and influenza vaccinations (Milkman et al., 2011). Several governments (e.g., US, United Kingdom) have created "nudge units" due to the cost-benefit ratio of nudge interventions (Benartzi et al., 2017; Carroll et al., 2009; Duflo et al., 2007; (Duflo & Saez, 2003; Duflo

et al., 2006). Scalable and cost-effective interventions are sorely needed in suicide prevention, as suicide rates continue to rise (Hedegaard, Curtin, & Warner, 2018) and the field of suicide research remains underfunded compared to other leading causes of death (Godlasky & Dastagir, 2018). Although nudges have been abundantly implemented in economic and public health sectors, very few areas of mental health have used nudges. In the past, mental health studies have mainly used nudges to help curb college drinking (Perkins, 2002) and increase enrollment in behavioral health interventions (Albarracin, Durantini, Earl, Gunnoe, & Leeper, 2008; Albarracin, Wilson, Durantini, Sunderrajan, & Livingood, 2016; Wilson, Durantini, Albarracin, Crause, & Albarracin, 2013). Due to the substantial evidence supporting the effectiveness of nudges, using well-studied nudges in the context of suicide prevention may help individuals make choices that are in alignment with their own utility.

Thus far, initial evidence indicates that individuals display similar systematic deviations from rationality in the context of decisions relevant to suicide and can reliably be influenced towards desired behaviors by using nudges (e.g., engaging with suicide prevention resources; Bauer & Capron, 2019; Bauer, Tucker, & Capron, 2019; Jaroszewski et al., 2019). Suicide prevention organizations such as the National Strategy for Suicide Prevention (NSSS) and Suicide Prevention Resource Center (SPRC), as well as military organizations, have called for peer-support interventions to play an increased role in suicide prevention efforts (Reed, 2013). In addition, suicide prevention faces unique challenges such as low treatment seeking rates (Luoma, Martin, Pearson, 2002) and difficulty disseminating evidenced-based practices and skills to the public (King et al., 2015). Using well-known nudges could be helpful in supporting these ongoing

initiatives and overcoming several challenges in suicide prevention work. However, more evidence is needed to validate the utility of nudges this field, how best to use nudges in the context of suicide prevention, and how to optimize their effectiveness.

Social norms nudges

One well-known nudge is using social norm techniques. Social norms can be divided into injunctive and descriptive norms. Injunctive norms are what the individual perceives others think they *ought* or *should* do, and descriptive norms are what other people *actually* do (Rivis & Sheeeran, 2003). According to one influential theory for predicting health and social behaviors – the Theory of Planned Behavior (TPB; Ajzen, 1991) - attitudes, social norms, intentions, and perceived behavioral control make up a sizeable portion of the variance in predicting behaviors. Norm results from meta-analytic work shows that attitudes and subjective norms (what the individual perceives others think they *ought* or *should* do) predict approximately 33 to 50 percent of intention, where intentions represent 19 to 38 percent of variance in prospective behavior studies (Azjezn, 1991; Armitage & Conner, 2001; Sheeran & Orbell, 2001). Further, a meta-analysis on descriptive norms and subjective norms showed significant, discrete relationships with attitudes, behavioral control, and intentions, which ultimately increased the variance explained in behavior above and beyond other TPB variables (i.e., behavioral control, intentions, attitudes; Rivis & Sheeran, 2003).

Social norms have been used to help correct misinformation to influence people's attitudes and promote changes in their behaviors (Borsari & Carey, 2003; Cialdini, 2003; Reid & Aike, 2013). Social norms are thought to have a powerful impact on attitudes and behaviors because humans have a strong desire to be liked by others (Cialdini &

Goldstein, 2004). Thus, individuals often strive to not deviate too far from how others act, or what others perceive to be appropriate. This is further evidenced by long lines of research conducted on group conformity (Asch, 1951), social comparison processes (Festinger, 1954), and belief acquisition/formation of reference group norms (Newcomb, 1943). Social norms have been shown to predict behavior such as drinking patterns among fraternity and sorority members, such that those who perceive their peers to be drinking more (descriptive norm) and perceive greater group acceptability around drinking (injunctive norm) predict baseline and future drinking behavior (Larimer, Turner, Mallett, & Geisner, 2004). In suicide research, one correlational study found that people holding elevated attempt and ideation descriptive norms was associated with higher rates of suicidal thoughts and behaviors among adolescents (Reyes-Portillo, Lake, Kleinman, & Gould, 2018). These results are similar to those found in alcohol studies, such that people who hold exaggerated views regarding the frequency of such actions/behaviors are more likely to enact them. Because displaying social norms nudges has been shown to impact future behaviors (Perkins, 2002), it is plausible that using social norms could increase help-seeking behaviors for suicidal thoughts and behaviors. Recently, a study by Bauer, Tucker, and Capron (2019) found that presenting social norms nudges in a sample of college undergraduates increased engagement with an online treatment intervention by 164%. However, limitations of that study include no information on suicide-related correlates (e.g., current/past suicide risk) and only sampled the general population. These findings provide initial evidence that leveraging people's desire to not deviate too far from what others perceive to be appropriate (Cialdini & Goldstein, 2004) and the tendency for people to overweigh attitudes/opinions held by the

majority (Bond & Smith, 1996) may be a useful tool in increasing treatment-seeking behavior and providing suicide prevention materials.

Framing techniques

Framing manipulations are used to highlight either positive or negative aspects of an option, which ultimately impacts the attractiveness of that option to the individual (Kahneman & Tversky, 1979). Framing techniques have been effectively implemented as a nudge in numerous different studies involving healthcare (O'Connor, 1989), tax compliance (Hasseldine, Hite, James & Toumi, 2007), and work performance (Hossain & List, 2012). In a classic example by Kahneman and Tversky (1984), the researchers posed two choices to two different groups, with the only difference being whether the outcomes were stated as positives or negatives (percentages of participants [N = 155] are in parentheses):

> "Imagine that the U.S. is preparing for the outbreak of an unusual Asian disease, which is expected to kill 600 people. Two alternative programs to combat the disease have been proposed. Assume that the exact scientific estimates of the consequences of the programs are as follows:
>
> **Group 1**
>
> 1) If Program A is adopted, 200 people will be saved (72%)
>
> 2) If Program B is adopted, there is a one-third probability that 600 people will be saved and a two-thirds probability that no one will be saved. (28%)
>
> **Group 2**
>
> 1) If Program C is adopted, 400 people will die (22%)

2) If Program B is adopted, there is a one-third probability that nobody will die, and a two-thirds probability that 600 people will die. (78%)" (p. 343)

Although these options do not differ in probability, participants chose differently based on the presentation of these probabilities. In an effort to employ framing techniques in suicide prevention work, Bauer and colleagues (2019) asked one group of participants if they would be interested in learning more about how to help *themselves* if they were to go through a suicidal crisis by clicking on a link, whereas the other group was given the same link but asked if they would be willing to learn more about how to help *others* if they were to go through a suicidal crisis. The authors found that the *others* group was 167% more likely to click on a link that provided information about coping skills. Bauer et al. (2019) hypothesized that this framing technique may have helped circumvent the optimism bias (i.e., the tendency for humans to underrate their chances of risk for themselves; Sharot, 2011) and/or reduced stigmatization. Although people were learning the same skills (i.e., outcomes) in both conditions, when the intention of helping others was highlighted, it increased the probability that an individual would click on the resource overall. Similarly, at least two studies have found that using framing strategies (i.e., focusing on temporariness of means removal) or language substitution (i.e., "means safety" instead of "means restriction") can increase a person's willingness to engage in means safety counseling (e.g., temporarily removing access to lethal means; Stanley, 2019; Stanley, Hom, Rogers, Anestis, & Joiner, 2017). Thus, simple alterations within the choice environment, such as framing strategies, appear to be a cost and time-effective strategy for producing small positive effects.

Potentially effective nudges for suicide prevention

Psychological numbing (i.e., collapse of compassion, compassion fade) is one bias that may be valuable for better understanding decisions in the context of suicide prevention research. Psychological numbing is the diminishing sensitivity in valuing life-saving interventions when there is an increasing number of lives at risk, and can been represented by a collapse of compassion model. A normative model of valuing human life assumes that people should care more about two people compared to one, three people compared to two, and that people would highly value large numbers (e.g., 48,000 deaths). However, research shows that the valuation of life-saving decreases, rather than increases, when there is a large number of lives at stake (Slavic et al., 1997). It has been postulated that this effect occurs because people's valuation of lives are strongly associated with affective feelings (Vastfjall, Slovic, Mayorga, & Peters, 2014). In addition, people are much more willing to aid identified individuals (i.e., personalized) compared to statistical victims (Kogus & Ritov, 2005; Small, Loewenstain, & Slovic, 2007). Based on these findings, a personal story alongside details of a single individual's suicide death may be more influential on a person's decision to engage with suicide prevention resources compared to learning about the scope of the suicide problem (i.e., statistics).

Conclusion

Nudges have been a highly effective, scalable, and economical intervention throughout several areas of industry, academia, and government (Halpern, 2015; Sunstein, 2014; Whitehead et al., 2017), showing that small changes can have large impacts on society (Agarwal et al., 2013). In addition to being time and cost-effective

(Benartzi et al., 2017), nudges are relatively easy to understand, interpret, and communicate across disciplines. Further, results from studies using nudges often make cost-benefit analyses readily available for others to interpret, which may be helpful for policymakers and grant-funding bodies. As an example of the aforementioned points, the combination of three recent nudge experiments cost less than $1,000 and resulted in approximately 100 recent suicide ideators filling out a safety plan, 100 suicide ideators putting the Suicide Prevention Lifeline into their phones, 90 people receiving education on coping skills, 80 people entering a local crisis line into their phone, and 20 individuals increasing their means safety practices (e.g., separated ammunition from firearm storage; Bauer & Capron, 2019). Given the many decisions leading up to a suicide attempt, and the data stating that suicidal crises are relatively brief, small, scalable options such as nudges could be beneficial for increasing rational decision making processes and behaviors in the context of suicide.

Study Aims

The current study has four major aims. The first aim is to replicate past studies involving nudges in distal decisions that could potentially impact a future suicide attempt in a population with an elevated suicide rate - US Veterans. Second, although nudges have been found to be effective in certain aspects of suicide prevention, it is unknown which nudges are *most* effective. Testing popular nudges together against the same outcome could help providers, organizations (e.g., military), and other researchers identify the most effective nudges. The current study will test three popular nudges (i.e., social norm rates, framing techniques, and psychological numbing) to determine which is the most influential across two outcomes (e.g., engaging with suicide prevention

materials). Third, it is unknown if nudges work similarly across outcomes. Therefore, two unique outcomes that are in line with current calls to action in suicide prevention from organizations such as the National Strategy for Suicide Prevention (NSSS) and Suicide Prevention Resource Center (SPRC) (Reed, 2013) will be used. Namely, educating peers about prevention (e.g., learning how to fill out a safety plan) and having access to crisis resources (e.g., local crisis line numbers). Safety plans and access to crisis lines have been associated with a reduction in suicide risk (Gould et al., 2018; Stanley & Brown, 2012). Each outcome has wide-applicability across Veteran populations and is behaviorally observable; See Figure 1 for study flow chart. Fourth, given the dearth of research focused on nudges and suicide (and mental health/clinical psychology more broadly), the current study will perform exploratory analyses regarding potential correlates (e.g., demographics, stigma towards suicide) that may be impacting the probability of someone putting a crisis line number into their phone or filling out a safety plan.

Hypotheses

1. Participants who receive a social norms nudge will be more likely to enter a crisis line number into their phones significantly than those who do not receive a nudge.

2a. Participants who receive a framing nudge aimed at helping *others* will enter a crisis line number into their phones significantly more than those who did not receive a nudge.

2b. Participants who receive a framing nudge aimed at helping *others* will be more likely to enter a crisis line number into their phones significantly than those who receive wording to help *themselves*.

3a. Participants who receive a psychological numbing nudge with a Veteran's story will be more likely to enter a crisis line number into their phones significantly than those who do not receive a nudge.

3b. Participants who receive a psychological numbing nudge with a Veteran's story will be more likely to enter a crisis line number into their phones significantly than those who are given a message regarding Veteran data.

4. Participants who receive a social norms nudge will be more likely to complete a safety plan than those who do not receive a nudge.

5a. Participants who receive a framing nudge aimed at helping *others* will be more likely to complete a safety plan than those who do not receive a nudge.

5b. Participants who receive a framing nudge aimed at helping *others* will be more likely to complete a safety plan than those who receive wording to help *themselves*.

6a. Participants who receive a psychological numbing nudge with a Veteran's story will be more likely to complete a safety plan than those who do not receive a nudge.

6b. Participants who receive a psychological numbing nudge with a Veteran's story will be more likely to complete a safety plan than those who are given a message regarding Veteran data.

CHAPTER II – METHOD

Participants

Participants were recruited using Amazon's Mechanical Turk (MTurk) and the data was recorded using Qualtrics' Research Services and Project Management systems for each unique outcome (i.e., crisis line input, safety plan). Participants were US military Veterans (as listed by Mturk as having military experience), at least 18-years-old, and currently living in the United States. To determine the necessary sample size for a two-tailed logistic regression model to detect an Odds Ratio of 1.5 (small effect), G*Power 3.1 was used. It was determined that 503 participants are required. Due to the high possibility of missing data and errors on validity checks, a total of 600 veterans were recruited for this study. To detect moderate effects (w = .3) between two groups using a chi-square analysis with power = .80, 88 participants are needed to detect this effect. Using the same parameters 143 participants are needed to detect an effect between all groups (df = 5).

Interventions

The interventions were three nudges: a social norms nudge, a framing technique, and a psychological numbing nudge. For the social norms nudge, Veterans were given the following statement, "In a recent survey, 98% of US Veterans thought that other Veterans should seek help if they are having thoughts of suicide." This statistic was previously collected by the Anxiety and Trauma Research Program (ATRP). Participants will then be told, "If you would like, please select the crisis number you will put into your phone, and put that number into your phone now. Otherwise, press the continue button at the bottom of the page."

The second intervention is a framing technique. The first group was asked, "Would you be willing to learn how you could help other Veterans navigate thoughts of suicide or times of distress?" The second group was asked, "Would you be willing to learn how you could help yourself navigate thoughts of suicide or times of distress?"

The third intervention used a psychological numbing nudge. The first group read a personal story of a Veteran who died by suicide whereas the second group was given statistics on Veteran suicide deaths (see Figure 3). Each vignette had approximately the same word count and exactly five sentences to help control for the amount of information given.

Lastly, the control group was asked, "Would you like to learn more about how to navigate suicidal thoughts or times of distress?" This message controls for subject preference (self vs. other) by not specifying any one person(s) as a target for this intervention, and is intentionally left ambiguous. In addition, this statement does not offer any additional information about Veteran suicide in any form to help isolate the possible effects of the social norms and psychological numbing nudges. If participants answer "Yes" to any of these questions they were provided with directions on how to fill out a safety plan using the template provided by Stanley and Brown (2008; See Figure 4) or enter a local crisis line number into their phones.

Outcomes and Validity Checks

Crisis Lines

Participants were given the option to enter a local crisis line into their phones, mainly using crisis lines associated with the National Suicide Prevention Lifeline (*https://suicidepreventionlifeline.org/our-crisis-centers/*). As a validation check for crisis

lines, later in the survey, participants were asked to re-enter the crisis line number they selected prior. The crisis line numbers options provided earlier in the study were one per state and will be randomly selected crisis lines. This is to prevent participants from simply searching for the National Suicide Prevention Lifeline or typing in their state followed by "crisis line." Whenever possible, crisis lines were not the first search result returned when entered into the Google search engine. Crisis line centers (no matter which location) have all crisis line numbers on hand for each state and are able to transfer a caller to any of those locations.

Safety Plans

The safety plan that participants were asked to fill out is the template published by Stanley and Brown (2008). This template asks the participant to list things they can do to help cope ahead and plan for how to mitigate potential harm during a suicidal crisis. The template includes listing warning signs that a crisis may be developing, internal coping strategies (actions the participant can do without contacting another person), people/places for distraction, people an individual can ask for help, clinician and emergency contact information, how to make the environment safer, and one thing that is most important and worth living for. Participants were given a short two-question validity check to ensure that they read and completed the safety plan.

Materials

Demographic Information

A self-report questionnaire modeled after the Military Suicide Research Consortium's (MSRC) common data elements gathered information on military history

(e.g., branch, length of service, deployment history, rank), past mental health treatment, age, sex, race, marital status, occupational history, and education.

Self-Injurious Thoughts and Behaviors Interview-Short Form (SITBI-Short Form; Nock, Holmberg, Photos, & Michel, 2007)

The SITBI-Short form identifies individuals at risk for suicide. The measure includes multiple items assessing the following areas: suicidal ideation, suicide planning, suicide gestures, suicide attempts, thoughts of non-suicidal self-injury (NSSI), and NSSI. For each of these areas, several items are used to garner information about the history of experiences (both past and present), intensity, and qualitative descriptions (e.g., what method did you think about using to attempt suicide?). The SITBI has been shown to have strong interrater reliability (r = 1.0) and retest reliability (k = .70), with strong correspondence with measure of ideation (k = 54) NSSI (k = .87) and suicide attempts (k = .65) (Nock et al., 2007).

Stigma of Suicide Scale – Short Form (SOSS-SF; Batterham Calear, & Christensen, 2013)

The SOSS-SF is a self-report measure designed to measure a person's stigma against suicide. The SOSS-SF is comprised of 16 adjectives that represent a "typical" person who dies by suicide and is divided into three subscales: Isolation/Depression, Stigma, and Glorification/Normalization. Items use a 5-point Likert-type item scale (1 'Strongly Disagree' to 5 'Strongly Agree'), with higher scores indicating greater agreement that the adjective accurately represents a "typical" person who dies by suicide. Previous studies have found that the SOSS-SF demonstrates discriminant and convergent validity with related constructs, and all three subscale factors have demonstrated strong

internal consistency (Batterham et al., 2013; Williams, Cero, Gauthier, & Witte, 2018). Reliability for this measure in the current sample was excellent (ω = .92, 95%CI [.91, .94]).

Suicide Behaviors Questionnaire-Revised (SBQ-R; Osman et al., 2001)

The SBQ-R was used to measure suicide-related thoughts and behaviors. The SBQ-R is a 4-item questionnaire that contains one item for frequency of suicidal ideation over the previous twelve months, one item for lifetime suicide ideation and/or attempt, one item for assessing self-reported likelihood of suicidal behavior in the future, and one item to evaluate the threat of suicide attempt. Reliability for the SBQ-R in the current sample was excellent (ω = .90, 95%CI [.91, .94]).

Inventory of Depression and Anxiety Symptoms-II (IDAS-II; Watson et al., 2012)

The IDAS-II is a self-report measure assessing specific depression and anxiety symptoms. Participants are presented with a list of sensations, feelings, experiences, and problems, and asked to rate how well each item describes recent experiences during the past two weeks from 1 (“not at all”) to 5 (“extremely”). The IDAS-II contains several subscales including General Depression, Dysphoria, Lassitude, Insomnia, Suicidality, Appetite Loss, Appetite Gain, Well-Being, Ill Temper, Mania, Euphoria, Panic, Social Anxiety, Claustrophobia, Traumatic Intrusions, Traumatic Avoidance, Checking, Ordering, and Cleaning, The IDAS-II has evidenced strong psychometric properties (Watson et al., 2012). In this sample, the reliability for the Depression subscale was excellent (ω = .96, 95%CI [.96, .97]) and the reliability for the Well-Being subscale reliability was good (ω = .85, 95%CI [.82, .87]).

The Depression Severity Index – Suicide Subscale (DSI-SS; Metalsky & Joiner, 1997)

The DSI-SS is a four-time self-report measure designed to identify the frequency and intensity of suicidal ideation and impulses during the past two weeks. Specifically, items assess suicidal ideation frequency, Item scores range from 0 to 3 (total scores from 0 to 12) with high scores reflecting greater suicidal ideation severity. Past research using the DSI-SS have found acceptable results for construct validity and internal consistency (Joiner, Pfaff, & Acres, 2002; Metalsky & Joiner, 1997). The reliability in this sample for the DSI-SS was excellent (ω = .90, 95%CI [.88, .92]).

Monetary Choice Questionnaire (MQC; Kirby & Marakovic, 1996)

The MCQ is a 27-item self-report assessment that measures delayed reward discounting. More specifically, the MCQ measures an individual's preference for smaller immediate rewards compared to larger delayed rewards. The MCQ contains 27 questions, each with two options: a smaller immediate amount of money or a and a larger delayed amount. The rewards are comprised of small ($25-35), medium ($50-60), and large ($75-85) monetary amounts. A hyperbolic equation (Mazur, 2000) is used to calculate the discount rate, with higher rates suggesting a preference for smaller, immediate rewards. In this sample, the overall consistency for the MCQ was .81.

Adult Decision-Making Competence (A-DMC; Bruine de Bruin et al., 2007)

The A-DMC contains seven self-report decision making tasks to assess Resistance to Framing, Recognizing Social Norms, Under/overconfidence, Applying Decision Rules, Consistency in Risk Perception, Resistance to Sunk Costs, and Path Independence. The current study only used the Recognizing Social Norms component. The Recognizing Social Norms task measures an individual's ability to assess peer norms based on studies by Jacobs et al. (1995) and Loeber (1989). In this task, participants are first asked to

judge if "it is sometimes OK" to engage in any of the 16 listed undesirable behaviors (e.g., stealing). Later in the survey, participants are then asked to estimate how many people out of 100 endorse each of the same 16 behaviors. The first set is computed as a grand average and then a difference score is calculated between the actual and estimated percentage, resulting in a z-score. The reliability for the A-DMC in this study was excellent (ω = .98, 95%CI [.97, .98]).

Procedures

All aspects of study were conducted online. Veterans/participants were instructed that the survey is asking about mental health and treatment seeking behaviors. Participants will be paid $3.25 for a thirty-five-minute survey. Participants were told in the description of the study that this study uses screener questions and attention checks, and if participants do not meet the study eligibility criteria or fail attention checks that they will be terminated from the study and not receive compensation. Following consent and CAPTCHA verification, participants completed a short 3-question screener based on the suggestions of Lynn and Morgan (2016) for using Mturk to recruit military veterans. The screener-questions were: 1) What is the acronym for the locations where final physicals are taken prior to shipping off for basic training? (four letters); 2) What is the acronym for the generic term the military uses for various job fields? (three letters); 3) Have you ever served in the United States military? Participants who fail to answer 2/3 of these questions correctly will be terminated from the study. Participants who passed the screening eligibility were randomized into one of two conditions (n = 300 each) and then further randomized into one of six subgroups (n = 50 per group), each containing a specific nudge (or control) to test which nudge is most effective in increasing the

probability of performing one of the unique outcomes (i.e., completing a safety plan, entering a local crisis line). Participants then completed a survey consisting of possible correlates (e.g., suicide risk) and demographic information.

CHAPTER III - RESULTS

Preliminary Analyses

Data Screening

Based on current recommendations for screening potential low-quality data and suspected bots, multiple screening methods that vary in difficulty and type of careless responding were used (Bauer et al., 2020). These methods include a low-difficulty and high-difficulty instructional manipulation check (Berinsky et al., 2014; Berinsky et al., 2019), incongruent information across the study (i.e., identifying as US military servicemember at start of survey but not at the end), qualitative screening of open-ended questions, and a self-created bot screener that asks participants to re-order prizes in order of preference (see Figure 5). The high-difficulty instructional manipulation check (IMC; Oppenheimer, Meyvis, & Davidenko, 2009) has been shown to increase statistical power without biasing samples (Thomas & Clifford, 2017). During the IMC, participants are given 2-3 sentences of content regarding a topic and then in the 3rd or 4th sentence told, "We also want to know that you are paying attention to this question. To show that you've read this much, please select A and B as your two answers." This is followed by the last sentence, which asks them to pick an answer according to the content of the passage. Based on recommendations for erring towards low false-positive rates (Curran, 2016), participants who failed three or more validity checks were removed from all analyses.

Data Analytic Plan

To test the hypotheses, three types of analyses were conducted. First, zero-order correlations across all study variables were examined to understand the magnitude of the

relationships between the variables. Second, Pearson Chi-square tests were used to examine group differences (using count data) to determine if individuals in the nudge group or the control group responded differently to each unique outcome. In addition, Chi-square tests were used to compare if nudges worked differently depending on the crisis outcome. Third, the nudge conditions were collapsed into binary groupings: unengaged (did not complete safety plan) and engaged (completed safety plan). For this, a logistic regression model tested if receiving a nudge of any kind made an individual more likely to engage with evidence-based resources. In addition, post-hoc exploratory analyses were performed to examine possible correlates using logistic regression and Pearson Chi-square analyses. Effect sizes for Chi-square analyses are reported as Odds Ratios (OR) for 2x2 tables and Cramer's *V* for tables larger than 2x2; 95% confidence intervals are denoted after effect sizes in brackets.

Primary Analyses

Demographic characteristics can be found in Tables 1 and 2, and intercorrelations between all study variables are listed in Table 3. A total of 96 (21%) of participants endorsed having thoughts of killing themselves three or more times in the past year and 46 (10.1%) endorsed attempting suicide in their lifetime. The flow of participants through this study is outlined in Figure 6. There was substantial data loss due to low-quality data and suspected bots (see Figure 7), with 63 participants being excluded from all analyses due to failing screening checks. A total of 46.9% were lost in the control conditions and 44.9% were lost in the experimental conditions. A chi-square test indicated that these losses between conditions were not statistically different $\chi^2(1) = .66$, $p = .42$, [95%CI = .40, .50]. Further, there were no differences in data loss between outcome conditions

(safety plan = 205; crisis line = 186). The remaining participants had less than one percent missing data across study variables and thus pairwise deletion was used for all analyses (Cohen, 1987). Skew was acceptable (<2.0) for all continuous variables. Multivariate outliers were assessed using Mahalonobis's Distance using the *careless* package (Yentes & Wilhelm, 2018). Three participants were flagged as multivariate outliers and removed from analyses, leaving a total of 457 participants for analysis. The Variance Inflation Factor (VIF) was used to assess multicollinearity within multinomial logistic regression models; all VIF scores were acceptable (Range = 1.02 – 3.18; Cutoff = 5 [Stine, 1995]).

Chi-square analyses testing engagement with a crisis line by nudge group

There was not a significant overall effect of nudge group on engaging with a crisis line $\chi^2(5) = 10.04$, $p = .074$, $V = .21$, [.14 .37]; see Figure 8). Within the direct comparisons, social norms outperformed the control group ($\chi^2[1] = 4.50$, $p = .033$, OR = 3.12 [1.07, 9.14]). The Helping Others versus Helping Self group also did not differ ($\chi^2[1] = .42$, $p = .513$, OR = .72 [.27, 1.94]), nor were there differences between the Data group versus the Veteran Story group ($\chi^2[1] = 1.33$, $p = .249$, OR = 1.83 [.65, 5.18]).

Chi-square analyses testing engagement with a safety plan by nudge group

There was no overall effect of nudge group on engaging with a safety plan $\chi^2(5) = 6.70$, $p = .244$, $V = .17$, [.12, .34]; see Figure 9). Social norms were associated with more safety plan engagement than the control group ($\chi^2[1] = 5.01$, $p = .025$, OR = 2.93 [1.12, 7.63]). The Helping Others group did not significantly differ from the Helping Self group

($\chi^2[1] = .86$, $p = .353$, OR = 1.59 [.59, 4.29]), nor did the Data group versus the Veteran Story group ($\chi^2[1] = .497$, $p = .481$ OR = .70 [.26, 1.88]).

Chi-square analysis testing nudge effectiveness on engagement overall

There was not a significant difference between receiving any nudge (nudge engagement = 26.4%, $n = 60$) and no nudge (no nudge engagement = 21.5%, $n = 50$) for engaging in any crisis resource ($\chi^2[1] = 1.56$, $p = .211$, OR = 1.31 [.86, 2.02]).

Exploratory Analyses

Chi-square analysis testing differences between nudge conditions

There was a significant overall difference when testing if certain nudge conditions were more effective at increasing engagement than others $\chi^2(2) = 7.45$, $p = .024$, $V = .18$, [.07 .32]; see Figure 10). Pairwise comparisons using the Benjamini-Hochberg procedure revealed that those who received social norms messaging had 2.5x greater odds of engaging with a crisis resource compared to those who received a Veteran story ($\chi^2[1] = 7.45$, $p = .037$, OR = 2.49 [1.26, 4.91]. The Social norms condition did not outperform the Helping Others condition ($p = .642$) nor did the Helping Others condition outperform the Veteran Story condition ($p = .177$).

Chi-square analysis testing crisis resource and rate of engagement

There was not a significant difference in engaging with a crisis line (crisis line engagement = 30.5%, $n = 69$) compared to a safety plan (safety plan engagement = 30.8%, $n = 72$; $\chi^2[1] = .01$, $p = .956$, OR = .99 [.67, 1.47]) regarding the rate of engagement.

Chi-square analyses testing nudge effectiveness by crisis outcome

Social norms were no more effective at increasing engagement with crisis lines compared to safety plans ($\chi^2[1] = .01$, $p = .986$, OR = 1.01 [.41, 2.47]). Similarly, the Helping Others condition was no more effective at increasing engagement with a particular crisis outcome ($\chi^2[1] = .25$, $p = .618$ OR = .62 [.27, 2.16]), nor was the Veteran Story condition ($\chi^2[1] = .91$, $p = .339$ OR = .61 [.22, 1.70]).

Logistic regression testing moderating effects of study variables on engagement

Full information on logistic regression models is in Table 4. Receiving a nudge was not associated with engaging with any crisis resource (OR = 1.28 [.83, 1.97]. When the type of outcome (i.e., safety plan or crisis line) and nudge/no nudge was included as an interaction term (Outcome X NudgeNoNudge), the odds of engaging in the safety plan group were 50.1% higher relative to the crisis line group (OR = .50 [.27, .97]); however, the product of these two terms was not significant (OR = .74 [.30, 1.84]).

Next, sex, age, military rank, number of combat tours, IDAS-Depression scores, IDAS-Well Being scores, SBQR scores, MCQ scores, SOSS scores, and A-DMC Social Norms scores were added to the model. Several meaningful differences emerged. Participants with higher depression scores ($b = .029$, SE = .01, $p = .012$) was associated with engaging with a crisis resource and higher discounting rates ($b = -.19$, SE = .00, $p = .049$) was associated with being less likely to engage with a crisis resource. Further, the safety plan group remained significantly associated with crisis resource engagement, with the odds of engaging in a crisis resource being over twice as likely in the safety plan group relative to the crisis line group [OR = 2.07; [1.05, 4.21]).

CHAPTER IV – DISCUSSION

Nudges have been used as cost- and time-effective interventions to influence behaviors across several domains (Benartzi et al., 2017), including suicide prevention (Bauer et al., 2019). This study attempted to replicate previous findings showing that nudges can be effective at influencing individuals to engage with suicide prevention crisis materials (Bauer et al., 2019). In addition, to try and increase the effectiveness of using nudges for mental health, the current study examined if certain nudges are more effective than others, if nudges work differently across outcomes, and explore potential correlates that could impact the probability of engaging with crisis resources. Overall, hypotheses were largely unsupported. However, the results from this study provide important information for future suicide prevention nudge studies and highlights the limitations of conducting nudge studies under controlled experimental conditions with crowdsourcing platforms.

The hypothesis that results would replicate prior nudge findings (Bauer et al., 2019) was partially supported. Receiving a social norms nudge, relative to a control message, increased the likelihood of engaging in both a crisis lines and safety plans, and was more effective than at least one other nudge (i.e., Veteran Story). These results are similar to previous results from one suicide prevention study using social norms (Bauer et al., 2019) as well as the many studies using social norms to influence behaviors in an array of areas such as curbing college drinking rates (Borsari & Carey, 2003), reducing littering (Kallgreen et al., 2000), and increasing sun protection (Reid & Aike, 2013). Social norms are posited to increase behavioral compliance through an individual's goal of being accurate, maintain affiliation with meaningful social relationships, and maintain

a positive self-concept (Cialdini et al., 2004), which impacts intention probabilities and ultimately decision likelihoods (Azjezn, 1991; Armitage & Conner, 2001; Sheeran & Orbell, 2001). Future suicide prevention studies that use social norms nudges should seek to identify which compliance constructs are most impacted by suicide prevention messaging to better understand potential mediation effects.

The study failed to replicate prior findings showing that messages asking participants to engage with crisis resources to help *others* were more effective than messages asking them to engage to help *themselves* (Bauer, et al., 2019). In the current study, there were no significant differences between Helping Self and Helping Others messages in either condition (i.e., safety plan, crisis line). The hypothesized mechanism of change for using this framing technique was to circumvent potential optimism biases and stigma surrounding suicide prevention materials. Stigma was not associated with engaging, or not engaging, with one of the crisis resources. Although many studies have cited US Veteran stigma towards suicide and suicide prevention treatment as significant barriers (Nichter et al., 2020), there have been fewer studies that have examined if stigma is a barrier for online suicide prevention materials. It is possible that resources that can be pursued anonymously without others' knowledge, such as safety plans and crisis line entry, are less stigmatized than traditional forms of care. If true, this would suggest that nudges designed to combat stigma in such situations may be somewhat unnecessary. Similarly, although not assessed in the current study, Veterans may have less optimism bias than other groups studied in the past due to the high rates of suicide exposure within the military and the impact of these suicide deaths on Veterans (Hom et al., 2017). To assess the possible mechanisms of framing nudges such as Helping Others more

accurately, it is imperative that future work measure stigma about the targeted outcome as well as baseline optimism bias levels prior to the nudge intervention. Alternatively, the null results could be due to different populations being studied (e.g., college students versus military) or differences in the nature of the outcome (e.g., naturalistic versus crowdsourcing survey).

Contrary to the hypotheses, the Veteran Story condition did not outperform the Veteran Suicide Data condition for increasing crisis resource engagement. Affect can be a primary motivator for making decisions (Loewenstein & Lerner, 2003; Slovic et al., 2005), but can be easily biased by many different factors such as social proximity, novelty, vividness, etc. (Slovic, 2007). Because of this, the nudge message that was created for the Veteran Story may not have contained details that were novel, vivid, or elicited the attention needed to produce a strong affective response that might influence engagement behavior. Input from Veterans and military members on how to refine this message to be more effective, and whom the message should be delivered from (Anestis et al., 2021), may help refine this nudge to make it more productive. In addition, future studies should measure emotional states before and after using stories to better understand the role of emotion and decision making.

Psychologically numbing/compassion collapse is hypothesized to be due to active self-regulation that attempts to inhibit our moral impulse when many victims are involved to preserve our own self-interests (Cameron & Payne, 2011). Most work on Veteran and military self-regulation has investigated this construct in the context of mental disorders, such as Posttraumatic-Stress Disorder and suicidal behaviors (Albanese et al., 2019; Rabinak et al., 2014). However, few (if any) studies have compared emotion regulation

abilities in healthy Veterans/military personnel to healthy civilian counterparts to examine population-level differences. Given the malleability of self-regulation ability (Berking et al., 2013), it is possible that healthy Veterans and military personnel have greater self-regulation abilities compared to civilians in the particular area of morality, potentially due to military experiences and training. In this study, the low engagement rates and null results from comparing a Veteran Story to Veteran Data may be due to high levels of emotion regulation towards moral issues reducing affect in the data condition and an ineffectual story in the Veteran Story condition.

The exploratory results suggested that people who displayed a preference for smaller, more immediate monetary rewards (higher MCQ scores) were less likely to engage in crisis resources and those endorsing more depressive symptoms were more likely to engage with crisis resources. These results may suggest that those with higher discounting scores did not view crisis resources as more immediately rewarding to them, which could be especially true as most of our sample did not endorse current or past-year ideation (79% no past-year ideation). However, it is currently unclear in decision-making research how presenting options numerically translates to non-numerical options, with some studies indicating little overlap (Huber et al., 2014). Those with higher depression scores were also more likely to engage with crisis resources, which intuitively makes sense as those experiencing depressive symptoms may have a more immediate need for safety plans and crisis lines. However, it is interesting that suicide risk scores (SBQ-R scores) were not significantly associated with resource engagement. It is possible the suicidal ideation rates in this sample represented more transient suicidal thoughts, whereas depressive symptoms were more stable and thus salient. This saliency of

depressive symptoms and negative mood may have created a more robust link towards the need for mental health resources. Although there is ample evidence showing a negative correlation between depressive symptoms and mental health help-seeking (Barney et al., 2006; Magaard et al., 2017; Schomerus et al., 2009), there are far fewer studies examining if this relationship holds for nontraditional mental health resources, such as those that do not require face-to-face interaction with a mental health professional.

From the exploratory analyses, after accounting for covariates, participants in this sample were more likely to engage with a crisis line compared to a safety plan after accounting for nudge group status (i.e., receiving a nudge condition or not receiving a nudge condition). Two main reasons might exist for this discrepancy. First, participants on MTurk are likely more interested in completing surveys efficiently – that is, ensuring that they are provided a high approval rate by their surveyors while also finishing as many surveys/tasks as possible. Therefore, people may have entered crisis lines more than completing safety plans because it was less time consuming. Second, this sample (e.g., Veterans, Military Personnel) may have been more familiar with crisis lines – due to the Veterans Crisis Line - and were thus more willing to engage. Given the importance of past behavior and past exposure to options in predicting future decisions (Bamberg et al., 2003), those who are aware of crisis lines and their legitimacy (being endorsed by the military) may have been more likely to enter the crisis line into their phone because they are more familiar and confidence in the efficacy of crisis lines relative to safety planning. Future suicide prevention nudge studies should examine perceived efficacy and exposure

to an intervention between resources prior to testing to investigate how these variables relate to engagement outcomes.

There are several possibilities for the general lack of significant results within this study, including: 1) Nudges being ineffective; 2) Nudges being ineffective for suicide prevention and/or mental health; 3) and MTurk being an ineffective platform for testing nudges. To the first point, it is unlikely that nudges are ineffective overall, given the many different naturalistic and experimental designs across disciplines that show their effectiveness (Thaler & Sunstein, 2008). Further, it also appears unlikely that resource engagement for suicide prevention is an area immune to the effects of nudges, given that nudges have been successful in similar areas (e.g., stigmatized topics, prevention resources) such as HIV prevention and interventions (Albarracín et al., 2008; Albarracín et al., 2016). Further, suicide prevention studies have shown that reframing messages (Stanley et al., 2020) and making engagement easier (Jaroszewski et al., 2019) – two commonly used nudges – can be effective strategies. Rather, it seems more likely that suicide prevention nudges need to undergo further testing and refinement to be consistently effective. In other areas of implementation science, researchers have adopted rapid cycle approaches with a "fail fast and learn quickly" goal to develop and refine innovation quickly without investing heavy resources (Asch & Rosin, 2015; Asch et al., 2014; Boustani et al., 2018). This type of development process could help develop optimal nudges for suicide prevention quickly and economically.

Another notable possibility in understanding the current results is that MTurk may not be an effective platform for testing nudges. First, there has been a marked decrease in the quality of MTurk data over time (Chmielewski & Kucker, 2020; Kennedy et al.,

2020), likely because of a mixture of "bots" and fraudulent users outside of the US posing as American MTurk workers (Moss et al., 2021). A recent study found that even after using best practices to ensure data quality, up to 28% of participants misrepresent their qualifications (MacInnis et al., 2020). Second, one survey found that approximately 40% of MTurk workers list MTurk as their primary source of income (Brawley & Pury, 2016), with additional workers requiring income from MTurk to satisfy basic needs (Ross et al., 2010). Necka and Colleagues (2016) found that participants who use MTurk as their primary source of income are more likely to falsify information (e.g., false reporting). Together, these studies suggest that completing an MTurk task/survey quickly is a primary motivator for many MTurk workers, and that engaging in extra tasks that require time and no additional monetary compensation are routinely bypassed.

Limitations and Future Directions

There are several limitations that warrant caution when interpreting these results. First, the data loss lowered the sample size considerably, causing analyses to be underpowered to detect moderate effects in many direct group comparisons. Second, several important theoretical variables were not assessed. One commonly used theory for explaining behaviors is The Theory of Planned Behavior (Ajzen, 1991), which emphasizes variables such as previous engagement with a behavior, normative beliefs about the behavior, and the strength of these variables. Because nudges are most powerful in instances of uncertainty (e.g., prior beliefs are not strongly held), it will be important for future nudge research in suicide prevention to assess these variables for potential moderating effects, as those who have strong beliefs about a resource (e.g., believing crisis lines are ineffective) may be less willing to engage with that specific

resource rather than being resistant to nudge effects overall. Third, although we used a screener to help reduce misrepresentation (i.e., participants with no military history), it is likely that several participants misrepresented their information to gain entry to this study, possibly making this sample an inaccurate reflection of US Veterans. Future studies piloting messages on specific populations – such as US Veterans – should consider using panel data from crowdsourcing platforms other than MTurk where credentials can be more appropriately verified. Fourth, the current study used a crowdsourcing platform rather than a more naturalistic design. Although proof of concept designs are needed, encountering nudges in real-world designs will likely have different effects compared to those found in laboratory-based experiments (Lichters et al., 2015).

Finally, a notable limitation of the current study is that the data quality in this sample was poor. Although best practices for ensuring data quality were used, nearly half of the data were unusable due to failed validity and attention checks. Further, the crisis line verification was less error-prone to false-negatives (bots or poor-quality workers) than the qualitative checks for the open-ended safety plan questions. Although open-ended questions have been useful in detecting poor quality responses (Moss & Litman, 2018), there are no specific cut-offs that determine high-quality versus poor-quality answers. Despite similar amounts of participants being removed from both outcomes, it is possible that the true frequency statistic for engagement with safety plan outcomes was inaccurate.

Instead of using crowdsourcing platforms, social media may be better environment to develop effective nudge messages moving forward. Many popular social media platforms (e.g., Facebook, Twitter) allow researchers to pilot nudges using a quasi-

experimental naturalistic design. Using social media platforms circumvents the limitation of having MTurk workers who are primarily motivated to finish tasks for monetary compensation, occurs in a setting where decisions are often made (i.e., online), allows for comparison between groups (exposed versus unexposed), and is relatively inexpensive. However, there are important tradeoffs if researchers choose this method. Chiefly, using social media platforms with a naturalistic design makes it more difficult to analyze potential mechanisms due to no survey data being collected.

Conclusion

In conclusion, the current study tested if nudges were more effective than not receiving a nudge, if some nudges were more effective than others, and if nudges worked differently across outcomes. This study also explored potential correlates of engaging with a crisis resource in an online sample of US Veterans. Findings suggest that social norms may be more effective than some other types of nudges (i.e., Veteran Story), which partially replicates previous findings (Bauer et al., 2019). The nudges did not perform better for any one crisis resource (i.e., crisis line, safety plan) and overall, nudges were no more effective than control conditions at increasing engagement rates. People who preferred smaller, immediate rewards were *less* likely to engage in crisis resources, indicating that these individuals may put off engaging with resources until it becomes immediately beneficial to them (i.e., when they have active suicidal thoughts). The results of this study were limited by poor data quality within the sample, ultimately constraining the sample size and decreasing power to detect planned effect sizes. To develop effective nudge messages for suicide prevention efficiently, testing nudges on social media

platforms rather than crowd-sourcing platforms may be more suitable and allow researchers to observe naturalistic effects.

APPENDIX A – TABLES AND FIGURES

Table 1. Demographics

	Overall		Nudge (*n* = 227)		Control (*n* = 233)	
Variable	**Frequency**	***%***	**Frequency**	***%***	**Frequency**	***%***
Sex						
Male	268	58.30%	135	59.47%	133	57.08%
Female	192	41.70%	92	40.53%	100	42.92%
Race/Ethnicity						
White/Caucasian	362	78.70%	180	79.30%	182	78.11%
Black/African American	78	17.00%	38	16.74%	40	17.17%
Native American/Native Alaskan	16	3.50%	4	1.76%	12	5.15%
Asian	15	3.30%	7	3.08%	8	3.43%
Pacific Islander	1	0.20%	0	0.00%	1	0.43%
Ethnicity						
Non-Hispanic/Latino	326	70.80%	161	70.93%	165	70.82%
Hispanic/Latino	134	29.10%	66	29.07%	68	29.18%
Education						
<9th Grade	0	0.00%	0	0.00%	0	0.00%
9-12th Grade, no diploma	0	0.00%	0	0.00%	0	0.00%
High School Diploma	9	2.00%	5	2.20%	4	1.72%
Some college, no degree	21	4.60%	13	5.73%	8	3.43%
Associate degree	11	2.40%	2	0.88%	9	3.86%
Bachelor's Degree	263	57.20%	129	56.83%	134	57.51%
Master's Degree	152	33.00%	76	33.48%	76	32.62%
Doctoral Degree	4	0.90%	2	0.88%	2	0.86%
Homosexual/Gay/Lesbian	50	10.90%	21	9.25%	29	12.45%
Heterosexual/Straight	293	63.70%	147	64.76%	146	62.66%
Bisexual	114	24.80%	57	[illegible]1%	57	24.46%
Not Sure	1	0.20%	0	0.00%	1	0.43%
Decline to respond	1	0.20%	1	0.44%	0	0.00%
Other	1	0.20%	1	0.44%	0	0.00%
Relationship Status						
Married, living together	377	82.00%	183	80.62%	194	83.26%
Married, geographically separated	21	4.60%	10	4.41%	11	4.72%
Single	44	9.60%	22	9.69%	22	9.44%
Cohabitating	10	2.20%	6	2.64%	4	1.72%
Widowed	1	0.20%	1	0.44%	0	0.00%

(Table 1 continued)

Divorced/Separated	7	1.50%	5	2.20%	2	0.86%
Children						
Yes	367	79.80%	183	80.62%	184	78.97%
No	93	20.20%	44	19.38%	49	21.03%
Household Income						
<$10,000	7	1.50%	1	0.44%	6	2.58%
$10k - $24.9k	37	8.00%	27	11.89%	10	4.29%
$25k - $49.9k	107	23.30%	52	22.91%	55	23.61%
$50k - $74.9k	159	34.60%	75	33.04%	84	36.05%
$75k - $99.9k	110	23.90%	48	21.15%	62	26.61%
>$100k	40	8.70%	24	10.57%	16	6.87%

Note. k = dollars in thousands.

Table 2. Military Demographics

	Overall		Nudge (*n* = 227)		Control (*n* = 233)		
Variable	**Frequency/*M***	**% or *SD***	**Frequency/*M***	***%***	**Frequency/*M***	***%***	***p***
Currently Serving							0.42
Yes	291	63.3	139	61.20%	152	65.20%	
No	159	32.6	88	38.80%	81	34.80%	
Time Since Last Deployment							0.04
<1 Month	11	2.39	4	1.90%	7	3.20%	
1-6 Months	53	11.5	22	10.20%	31	14.00%	
6+ Months - 1 Year	86	18.7	44	20.50%	42	18.90%	
1-2 Years	122	26.5	59	27.40%	63	28.40%	
2-3 Years	58	12.6	29	13.50%	29	13.10%	
>3 Years	107	23.3	57	26.50%	50	22.50%	
Military Branch							0.53
Air Force - Active Duty	31	6.70%	17	7.50%	14	6.00%	
Air Force Reserve	19	4.10%	10	4.40%	9	3.90%	
Air National Guard	8	1.70%	7	3.10%	1	0.40%	
Army Active Duty	129	28.00%	66	29.10%	63	27.00%	
Army National Guard	69	15.00%	28	12.30%	32	13.70%	

(Table 2 continued)

Army Reserve	66	14.30%	37	16.30%	29	12.40%	
Coast Guard - Active Duty	17	3.70%	7	3.10%	10	4.30%	
Coast Guard Reserve	10	2.20%	4	1.80%	6	2.60%	
Marine Corps - Active Duty	20	4.30%	11	4.80%	9	3.90%	
Marine Corps Reserve	17	3.70%	6	2.60%	11	4.70%	
Navy - Active Duty	26	5.70%	10	4.40%	16	6.90%	
Navy Reserve	10	2.20%	3	1.30%	7	3.00%	
Public Health Service	26	5.70%	11	4.80%	15	6.40%	
Rank							0.2
Enlisted	153	35.10%	76	35.80%	79	34.80%	
Non-Commissioned Officer	66	15.10%	28	13.20%	38	16.70%	
Warrant Officer	106	24.30%	62	29.20%	49	21.60%	
Officer	111	25.50%	46	21.70%	61	26.90%	
Times Deployed	3.79	13.96	4.56	19.62	3.26	4.02	0.43
Combat Tours	3.41	6.25	2.96	2.85	3.83	8.24	0.13

Note. *M* = Mean. *SD* = Standard Deviation.

Table 3. Correlations, means, standard deviations, and rages for study variables.

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. SP Engage	—													
2. CL Engage	0	—												
3. No Nudge Engage	1	1	—											
4. Nudge Engage	1	1	0	—										
5. Engagement	1	1	1	1	—									
6. Sex	0.085	-0.087	0.032	-0.014	0.011	—								
7. Age	-0.021	0.027	0.052	-0.037	0.005	0.03	—							
8. Combat Tours	-0.117	0.025	0.006	-0.13	-0.029	-0.055	0.024	—						
9. MCQ	0.164*	-0.043	0.131*	0.03	0.078	0.011	-0.035	-0.011	—					
10. SOSS	-0.058	-0.051	-0.089	-0.009	-0.052	0.016	0.079	0.141**	0.126**	—				
11. SBQR	0.039	-0.067	0.01	-0.038	-0.013	-0.018	0.104*	0.083	0.227***	0.438***	—			
12. ADMC	-0.01	0.099	0.019	0.048	0.032	-0.015	-0.065	-0.166***	-0.143**	-0.476***	-0.476***	—		
13. Depression	-0.08	0.126	-0.108	-0.083	-0.097	.112*	0.07	.119*	.167***	.643***	.609***	-.659***	-	
14. Well-Being	-0.045	-0.063	-0.086	0.013	-0.041	-0.048	0.077	.137**	.134**	.579***	.281***	-.419***	.409***	-
Mean	0.31	0.17	0.26	0.22	0.24	0.42	38.05	3.42	3.69	24.85	7.31	-0.05	56.95	26.81
SD	-	-	-	-	-	-	10.26	6.27	1.79	8.13	4.44	0.86	18.09	6.44
Range	0 - 1	0 - 1	0 - 1	0 - 1	0 - 1	0 -1	18 - 73	0 - 25	1.39 - 8.75	8-40	3-18	-3.56	20 - 93	8-40

Note. * p < .05, ** p < .01, *** p < .001. Sex represents male coded as "1." SP = Safety Plan. CL = Crisis Line. MCQ = Monetary Choice Questionnaire. SOSS = Stigma of Suicide Scale - Short Form. SBQR = Suicide Behaviors Questionnaire - Revised. ADMC = Adult Decision-Making Competence. Means of binary variables reflect proportions.

Table 4. Logistic and multinomial logistic regression models

Variable	*b*	*SE*	*OR* (95% CI)	*p*	*McFadden* R^2
Model 1					
Nudge Group	-0.246	0.361	.78 (.51, 1.20)	0.264	0.002
Model 2					
Nudge Group	-0.109	0.32	.90 (.3.28, 9.30)	0.763	0.02
Outcome Group	-0.674	0.334	.51 (.26, .97)	0.043	
Nudge*Outcome	-0.295	0.46	.74 (.30, 1.84)	0.521	
Model 3					
Nudge Group	-0.345	0.303	.71 (.39, 1.28)	0.256	0.07
Outcome Group	0.727	0.352	2.07 (1.05, 4.21)	0.039	
Sex	-0.076	0.246	.91 (.56, 1.48)	0.697	
Age	-0.004	0.012	1.00 (.97, 1.02)	0.78	
Rank	0.104	0.115	1.11 (.91, 1.35)	0.298	
Combat Tours	-0.002	0.021	1.06 (.96, 1.20)	0.918	
MCQ	-0.187	0.095	.83 (.69, 1.00)	0.049	
SOSS	0.126	0.167	.88 (.63, 1.22)	0.451	
SBQR	-0.035	0.036	.97 (.90, 1.04)	0.331	
ADMC	0.177	0.197	1.19 (.81, 1.76)	0.368	
Depression	0.029	0.011	1.03, (1.01, 1.05)	0.012	
Well-Being	0.015	0.022	1.00 (.95, 1.06)	0.498	
Nudge*Outcome	0.214	0.489	1.23 (.47, 3.23)	0.662	
MCQ*Nudge Group	0.104	0.131	1.11 (.86, 1.44)	0.427	
Depression* MCQ	0	0.003	1.00 (.99, 1.01)	0.997	

Note For 'Nudge Group' 1 = Nudge; 0 = No Nudge. Outcome = Safety plan ("0") or crisis line group ("1"). MCQ = Monetary Choice Questionnaire. MCQ = Monetary Choice Questionnaire. SOSS = Stigma of Suicide Scale - Short Form. SBQR = Suicide Behaviors Questionnaire - Revised. ADMC = Adult Decision-Making Competence. Well-being = Inventory of Depression and Anxiety Symptoms - II (IDAS-II) Well-Being subscale. Depression = IDAS-II Depression subscale.

Figure 1: Participant Flow Chart

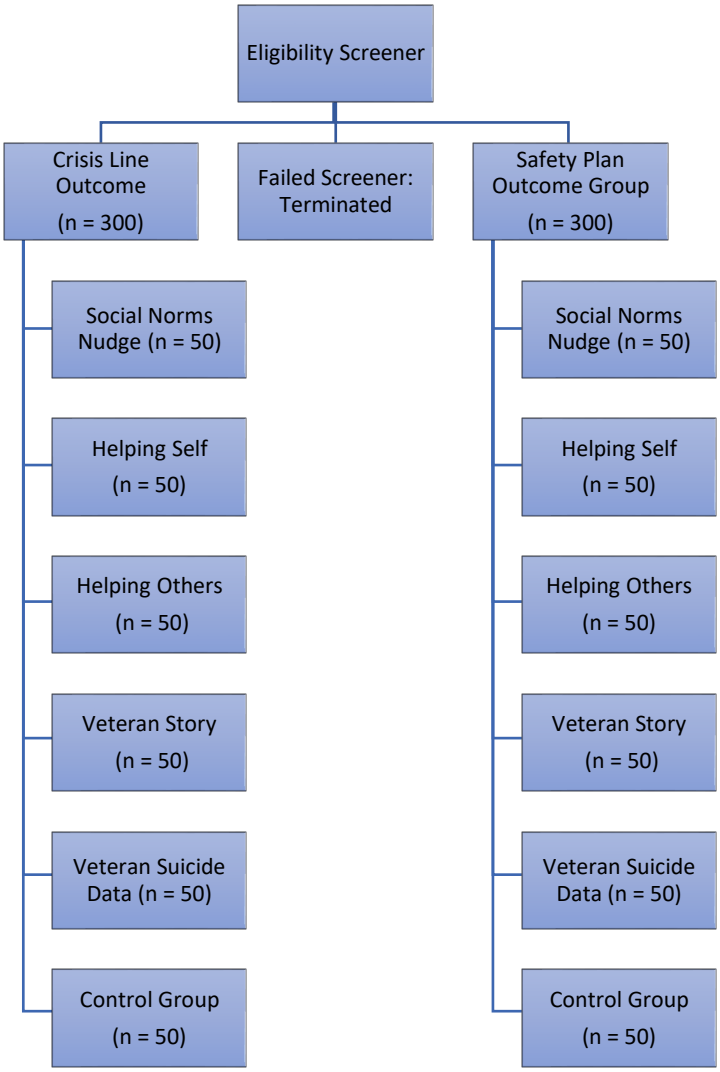


Figure 2. Psychological Numbing/Collapse of Compassion Conditions

Statistic Group

Suicide has risen over 30% over the last 20 years. Currently, suicide is the 10th leading cause of death in the United States. US military Veterans are one group especially at risk for suicide, with suicide rates for US Veterans being well over double that of the US civilian population rate (30.1/100,000 vs. 14.2/100,000). That is equal to about 22 US Veterans dying each day.

Personal Story Group

Brandon was born in Snoqualmie, Washington in 1988 to his mother and father. Brandon entered the Navy at age 20 to serve his country. Brandon enjoyed hunting every year with his father and uncles, and played in several bands with his friends. Shortly after completing his last tour in the Navy, Brandon killed himself. His mother, father, and sisters miss him dearly.

Figure 3. Safety Plan Instructions and Validity Check

Instructions: This is called a Safety Plan, and is often used by clinicians, doctors, and other health professionals to help people get through a suicidal crisis. When reading the following items, you can think of what would be helpful for a friend or loved one who may go through a suicidal crisis. The answers/items generated from this safety plan can be kept by you, or someone else, to rely on during a suicidal crisis. The questions move from what people should try first to what they should try last (e.g., professionals, agencies, urgent care).

1. What are some warning signs (e.g., thoughts, images, behaviors) that a crisis may be developing? List two or three warning signs.

2. What can you do to take your mind off of your problems without contacting another person (e.g., relaxation technique, distraction, physical activity). List two or three ideas.

3. Who are some people who you would feel comfortable talking to/calling to distract you? What social settings could you reasonably move (e.g., coffee shop, library) to, to help distract you? Generate two or more people or locations (for locations, also write down telephone numbers if you have them available).

4. Who are some people you can call to ask for help? These are people you feel comfortable talking to about what is going on, the difficulties you are having, etc. List two or three people you could call (e.g., close friends, family members, spouse/partner) and their phone numbers if you have them available.

5. If a person you are seeing a clinician (e.g., psychologist, psychiatrist, counselor/therapist) write their name(s) and phone number(s). Also, list an urgent care center (e.g., hospital emergency room), address, and phone number, and/or write down the National Suicide Prevention Lifeline phone number (1-800-273-8255) if these are not currently available.

6. List one or two ways the person could make their environment safer (e.g., asking someone to hold their firearm, remove sharp knives from being easily accessible).

7. Write one thing that is most important and worth living for.

Validity Checks:

I. Which of the following topics was not explicitly part of the safety plan (Choose one)?

a. Making the environment safe
b. Identifying warning signs
c. Calling the police
d. Listing an urgent care facility's address
e. All were topics within the safety plan

II. The safety plan suggests that people should try taking their mind off of their problems before calling a clinician (e.g., psychologist, psychiatrist, counselor/therapist):

a. True
b. False

Figure 4. Instructional Manipulation Check

When people are having thoughts of suicide, or are in a state of extreme distress, there are several different resources and skills people can utilize. We want to know which resources people are most likely to actually use in these situations. We also want to know that you are paying attention to this question. To show that you're reading each question closely, please select Local Crisis Line and Safety Plan as your two answers. If you were having thoughts of suicide, which resource are you most likely you use? (Please only choose one)

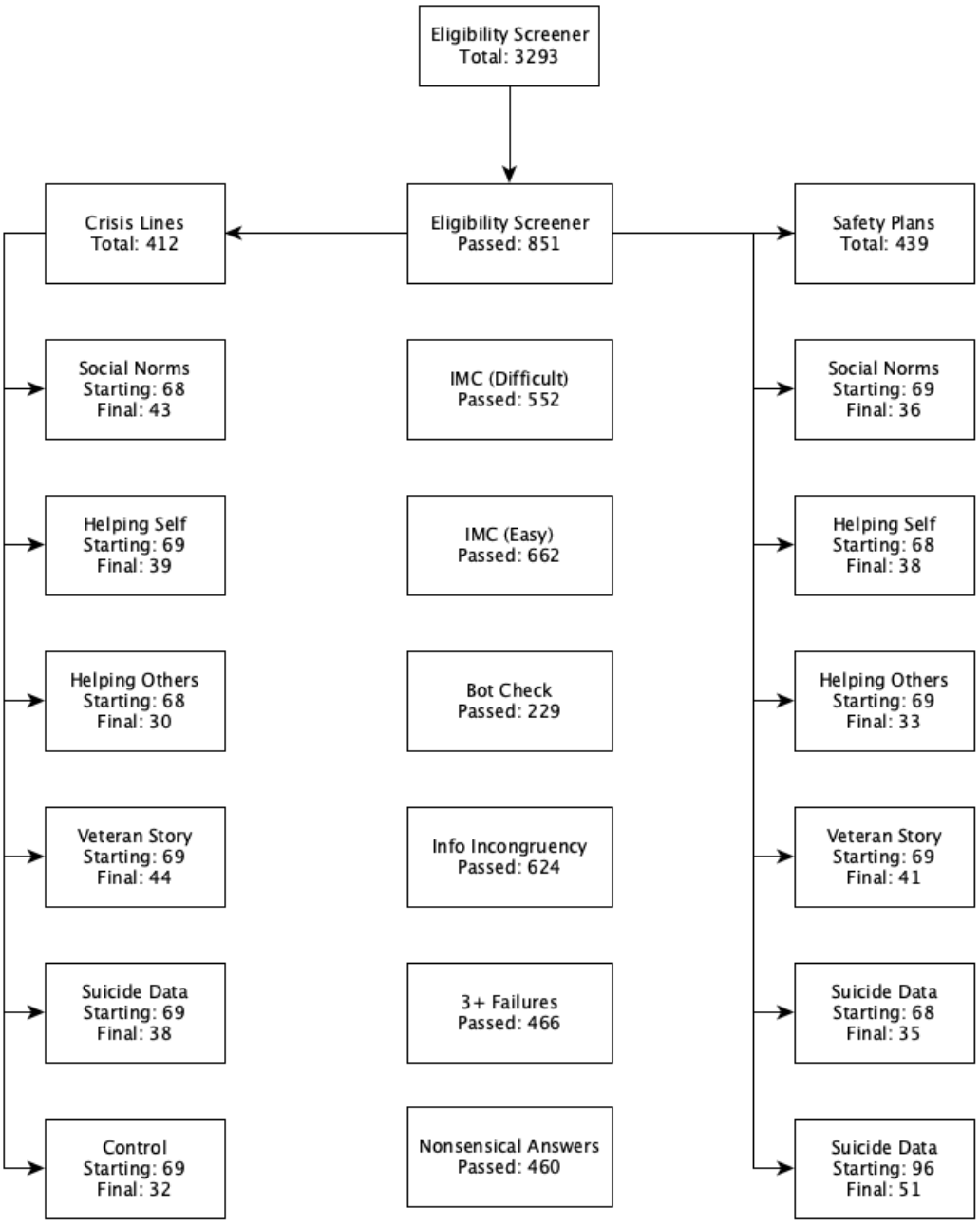
c. National Suicide Prevention Lifeline
d. Distraction
e. Change Location
f. Local Crisis Line
g. Safety Plan
h. Call Therapist
i. Call a Friend or Family Member
j. Go to the Emergency Room
k. Deep Breathing
l. Exercised

Figure 5. Prize reorder – bot screener

Please put the following prizes in order, starting with the prize which you would want to receive the most (#1) to the one you would want to receive the least (#4).

1. A book
2. A new car
3. $100,000
4. Previously chewed gum

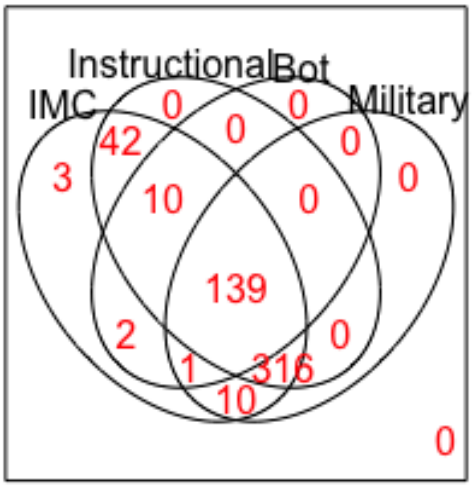
Figure 6. Flow of participants through study.



Caption. Total sample size was 46 after quality checks. A total of 46.9% were lost in the control conditions and 44.9% were lost in the experimental conditions. A chi-square test indicated that these losses were not statistically different χ^2 (1) =.66, p = .42, [95%CI = .40, .50].

Figure 7. Low-quality data examination

A.

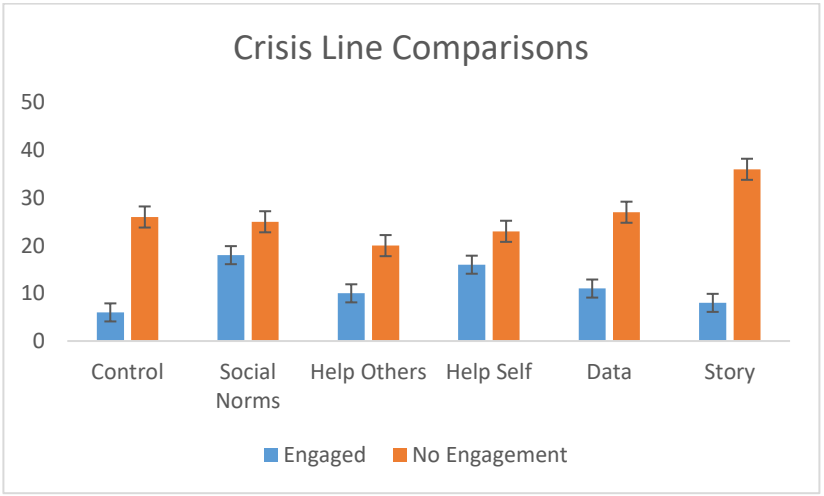


B.

Group 1	Group 2	Group 3	Group 4	Counts
0	0	0	0	0
0	0	0	1	0
0	0	1	0	0
0	0	1	1	0
0	1	0	0	0
0	1	0	1	0
0	1	1	0	0
0	1	1	1	0
1	0	0	0	3
1	0	0	1	10
1	0	1	0	2
1	0	1	1	1
1	1	0	0	42
1	1	0	1	316
1	1	1	0	10
1	1	1	1	139

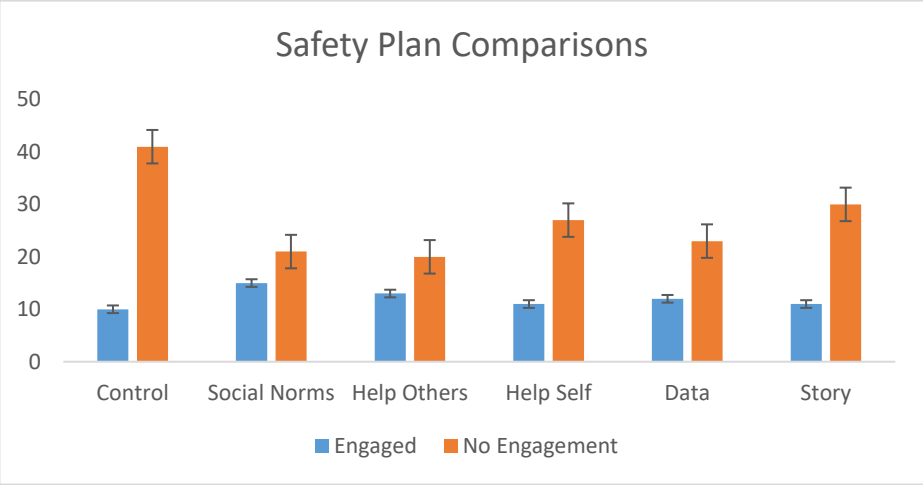
Caption. 'A' is a Venn Diagram displaying the amount of overlap between all four low-quality examinations. IMC = high-difficulty instructional manipulation check. Instructional = low-difficulty instructional manipulation check. Bot = prize reorder bot check. Military = incongruent answers on military history question. 'B' is a table displaying these groupings numerically

Figure 8. Chart and table for crisis line comparisons



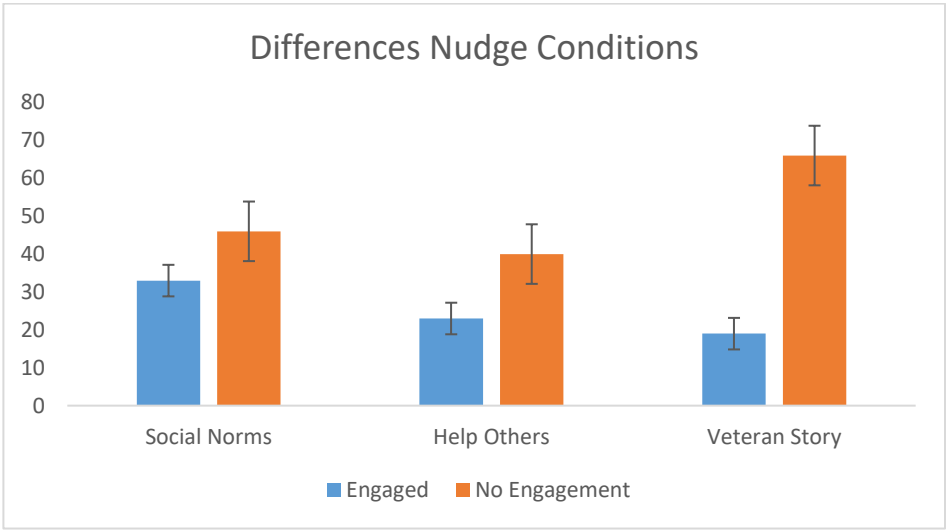
Group	Engaged	No Engagement	χ^2	*p*	*V* [95%CI]
			10.04	0.07	.21 [.14, .37]
Control	6	26			
Social Norms	18	25			
Help Others	10	20			
Help Self	16	23			
Data	11	27			
Story	8	36			

Figure 9. Chart and table for safety plan comparisons.



Group	Engaged	No Engagement	χ^2	*p*	*V* (95%CI)
			6.7	0.24	.17 [.10, .33]
Control	10	41			
Social Norms	15	21			
Help Others	13	20			
Help Self	11	27			
Data	12	23			
Story	11	30			

Figure 10. Comparisons between different nudge conditions



Group	Engaged	No Engagement	χ^2	*p*	*V* (95%CI)
			7.45	0.024	.18 [.07, .32]
Social Norms	33	46			
Help Others	23	40			
Veteran Story	19	66			

APPENDIX B –IRB Approval Letter

Office of Research Integrity
THE UNIVERSITY OF SOUTHERN MISSISSIPPI
118 COLLEGE DRIVE #5125 • HATTIESBURG, MS | 601.266.6576 | USM.EDU/ORI

NOTICE OF INSTITUTIONAL REVIEW BOARD ACTION

The project below has been reviewed by The University of Southern Mississippi Institutional Review Board in accordance with Federal Drug Administration regulations (21 CFR 26, 111), Department of Health and Human Services regulations (45 CFR Part 46), and University Policy to ensure:

- The risks to subjects are minimized and reasonable in relation to the anticipated benefits.
- The selection of subjects is equitable.
- Informed consent is adequate and appropriately documented.
- Where appropriate, the research plan makes adequate provisions for monitoring the data collected to ensure the safety of the subjects.
- Where appropriate, there are adequate provisions to protect the privacy of subjects and to maintain the confidentiality of all data.
- Appropriate additional safeguards have been included to protect vulnerable subjects.
- Any unanticipated, serious, or continuing problems encountered involving risks to subjects must be reported immediately. Problems should be reported to ORI via the Incident template on Cayuse IRB.
- The period of approval is twelve months. An application for renewal must be submitted for projects exceeding twelve months.
- FACE-TO-FACE DATA COLLECTION WILL NOT COMMENCE UNTIL USM'S IRB MODIFIES THE DIRECTIVE TO HALT NON-ESSENTIAL (NO DIRECT BENEFIT TO PARTICIPANTS) RESEARCH.

PROTOCOL NUMBER: IRB-20-330
PROJECT TITLE: Using Nudges to Increase Engagement with Suicide Prevention Resources in an Online Sample of United States Military Veterans
SCHOOL/PROGRAM: School of Psychology, Psychology
RESEARCHER(S): Brian Bauer, Daniel Capron

IRB COMMITTEE ACTION: Approved
CATEGORY: Expedited
7. Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies.

PERIOD OF APPROVAL: July 16, 2020

Donald Sacco Jr.

Donald Sacco, Ph.D.
Institutional Review Board Chairperson

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