

Dispositional Gratitude Predicts the Development of Psychopathology and Suicidal Behaviors: Results from a 7-Year Population-Based Study of U.S. Military Veterans

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Background: Dispositional gratitude has been implicated as a psychological characteristic that may modulate risk for mental health outcomes. Using a population-based sample of U.S. military veterans, this study evaluated the association between dispositional gratitude and the development of psychopathology and suicidal behaviors over a 7-year period. **Methods:** A nationally representative sample of U.S. veterans was surveyed at four timepoints across seven years. Analyses were restricted to veterans without incident outcomes at baseline. Multivariable analyses were conducted to examine the relation between baseline levels of dispositional gratitude and risk of developing (a) major depressive disorder (MDD), generalized anxiety disorder (GAD), or posttraumatic stress disorder (PTSD); (b) suicidal ideation; and (c) suicide attempts. **Results:** A total 9.6% of veterans developed MDD, GAD, and/or PTSD, 9.5% developed suicidal ideation, and 2.8% reported having attempted suicide over the 7-year follow-up period. Among veterans with high levels of dispositional gratitude, incidence was lower for MDD/GAD/PTSD (8.0%), suicidal ideation (6.8%), and suicide attempts (1.5%). Conversely, veterans with low dispositional gratitude were at substantially higher risk of developing MDD/GAD/PTSD (27.7%), suicidal ideation (33.6%), and suicide attempts (20.3%). **Conclusions:** High dispositional gratitude may help protect against the development of psychopathology and suicidal behaviors in U.S. military veterans, whereas low gratitude may increase risk of developing these outcomes. Collectively, these results support the potential utility of enhancing gratitude as part of primary prevention efforts for veterans, service members, and other populations at heightened risk for adverse mental health outcomes.

Keywords: gratitude, psychopathology, suicidal ideation, suicide attempt, prospective, incidence

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1. Introduction

To date, research on adverse mental health outcomes among trauma-exposed populations has largely focused on factors that contribute to the development and chronicity of psychopathology (e.g., Mauritz et al., 2013; Sayed et al., 2015). In recent years, this area of study has expanded to include an increased interest in protective factors that may buffer risk for these outcomes. Notably, there is a growing interest in identifying modifiable protective factors that could be targeted as a part of primary prevention efforts for individuals who may be at risk of trauma exposure and distress (Bolton et al., 2015; Spiro et al., 2016), such as military veterans and service members (Hoge et al., 2004; Prigerson et al., 2002). One protective factor that has received initial support for utility in both clinical and preventive efforts is dispositional gratitude (Jans-Beken et al., 2020; Wood et al., 2010).

1.1 Dispositional gratitude

Dispositional gratitude refers to the tendency to be aware and mindful of situations in which one is a benefactor of some positive outcome, typically caused by the actions of another person, which includes the threshold for experiencing gratitude in the first place and feeling grateful for a wide variety of situations (McCullough et al., 2002; Watkins, 2014). Dispositional gratitude can also be characterized as a trait that highlights between-person differences in how often or likely someone is to feel grateful in a specific instance. Prior research has found that higher dispositional gratitude and more frequent state-level gratitude are associated with a range of positive psychosocial outcomes, including increased prosocial behavior (Ma et al., 2017; Tsang & Martin, 2019), increased affiliation or connectedness with others (Algoe et al., 2016; Froh et al., 2010; Williams & Bartlett, 2015), and hedonic and eudaimonic well-being (Disabato et al., 2016; Kashdan et al., 2006; Wood et al., 2009).

Although there are multiple protective factors that are associated with positive mental health and resilience among individuals at risk for psychological distress, gratitude is particularly important to examine because (a) it is well-established as a *modifiable* protective factor; and (b) there is empirical support for *how* it can be modified. Specifically, structured interventions, such as writing exercises designed to facilitate reflection and enhance state gratitude (e.g., Counting Blessings, Three Good Things, the Gratitude Visit; Lomas et al., 2014), have been shown to increase dispositional gratitude from pre- to post-intervention (Bohlmeijer et

al., 2021; Bono et al., 2020; Lambert et al., 2009; Toepfer & Walker, 2009). In contrast, it is less clear how to enhance other specific protective characteristics that are largely considered innate or stable (e.g., personality traits).

1.2 Evidence of the benefits of gratitude on mental health outcomes

Prior work has highlighted the various psychological benefits of gratitude. For example, gratitude is negatively correlated with psychological distress (Jans-Beken et al., 2020; Wood et al., 2010). Population-based studies with civilian participants show that dispositional gratitude is associated with lower general symptoms of psychopathology (Jans-Beken et al., 2018), as well as lower prevalence of psychiatric disorders including major depressive disorder (MDD), generalized anxiety disorder (GAD), bulimia nervosa, phobias, and alcohol and substance use (Kendler et al., 2003).

Our previous study, which examined a population-based sample of U.S. veterans, observed a “dose-response” relation between greater dispositional gratitude and lower likelihood of psychiatric disorders among veterans (McGuire et al., 2021). Specifically, higher gratitude was associated with lower likelihood of lifetime posttraumatic stress disorder (PTSD), MDD, social phobia, nicotine dependence, and suicide attempts, as well as current PTSD, MDD, GAD, and suicidal ideation. These initial findings were the first, to our knowledge, to demonstrate an association between dispositional gratitude and psychiatric disorders within a population-based sample of veterans, a population at heightened risk for psychopathology and suicidal behaviors (Bryan et al., 2015; Hoge et al., 2004; Prigerson et al., 2002).

1.3 Gaps in understanding prospective effects of gratitude on adverse mental health outcomes

To date, most research on the relationships between gratitude and mental health outcomes has been cross-sectional and retrospective in nature. Consequently, it is unclear whether dispositional gratitude may help protect against the development of adverse mental health outcomes. Characterization of modifiable factors that may help protect against the development of such outcomes is particularly important among populations such as veterans given their high risk for developing these problems following military service or combat exposure (Bryan et al., 2015; Hoge et al., 2004; Ramsey et al., 2017). Furthermore, psychiatric disorders such as PTSD often have a deleterious effect on physical and

mental wellbeing and overall functioning, and may increase risk for life-threatening behaviors (e.g., Asnaani et al., 2014; Holland et al., 2014). Determining whether gratitude is related to incidence of psychopathology and suicidal behaviors is important because it may be a modifiable target for primary prevention efforts designed to mitigate risk for such outcomes.

1.4 Current study

In the current study, we aimed to extend our previous cross-sectional findings on associations between dispositional gratitude and psychiatric disorders (McGuire et al., 2021) by evaluating the prospective association between dispositional gratitude and risk for incident psychopathology (i.e., new-onset MDD, GAD, and/or PTSD) and suicidal ideation and attempts over a 7-year period in a population-based sample of U.S. veterans.

2. Method

2.1 Sample

Participants were drawn from a population-based sample of veterans who completed the National Health and Resilience in Veterans Study (NHRVS), a prospective cohort study of a nationally representative sample of U.S. military veterans. A total of 2,291 veterans completed a baseline assessment and at least one follow-up assessment over a 7-year period with 2-, 4-, and 7-year follow-ups; veterans completed an average of 2.2 follow-ups ($SD = 0.8$, range = 1–3); 41.8% completed all three follow-ups, 31.1% completed two follow-ups, and 27.1% completed one follow-up. The NHRVS sample was drawn from a research panel of more than 50,000 households that is developed and maintained by Knowledge Networks, Inc. (now Ipsos), a survey research firm. Knowledge Networks, Inc. maintains KnowledgePanel—a probability-based, online non-volunteer access survey panel of a nationally representative sample of U.S. adults that covers approximately 98% of U.S. households, including cell phone-only households. Panel members who endorsed a history of military service were asked to participate in the NHRVS. Panel members were recruited through national random samples, by telephone and postal mail. Households were provided with access to the Internet and computer hardware if needed. KnowledgePanel recruitment used dual sampling frames that included both listed and unlisted telephone numbers, telephone and non-telephone households, and cell phone-only households, as well as households with and without Internet access. To permit generalizability of study results to the

entire population of U.S. veterans, post-stratification weights were applied by Ipsos statisticians based on demographic distributions (i.e., age, gender, race/ethnicity, education, Census region, and metropolitan area) drawn from the most contemporaneous Current Population Survey (U.S. Census Bureau, 2011). Participants provided informed consent and the study was approved by the Human Subjects Subcommittee of the VA Connecticut Healthcare System.

2.2 Measures

Table 1 presents the measures analyzed in the current study. Dispositional gratitude was assessed using a single item from the Gratitude Questionnaire-6: “I have so much in life to be thankful for” (GQ-6; McCullough et al., 2002). Single item assessments were used for several trait variables to reduce participant burden in this large, prospective cohort study. The authors elected to use this GQ-6 item over the other five items because of its strong face validity dispositional gratitude as a whole and is not limited to specific facets of gratitude (e.g., “I am grateful to a wide variety of *people*.”).

Table 1

Study measures

Sociodemographic characteristics	The following characteristics were assessed: age (continuous), sex (dichotomous: male, female), race (dichotomous: non-White, White), education (dichotomous: high school diploma or less, more than high school), marital status (dichotomous: unmarried, married or living with partner), retirement status (dichotomous: not retired, retired), income (dichotomous: less than \$ 60,000, \$60,000 or more), and combat veteran (dichotomous: combat veteran, non-combat veteran).
Risk factors	
<i>Number of lifetime traumas</i>	The Trauma History Screen (THS; Carlson et al., 2011) is a self-report measure that was used to assess lifetime trauma exposure at baseline. The THS assesses lifetime occurrence of 14 potentially traumatic events; this study also assessed for exposure to life-threatening illness or injury. Potentially traumatic events endorsed were summed with a range of 0-15.
<i>Lifetime alcohol use disorder and/or drug use disorder</i>	Lifetime alcohol and drug use disorders were assessed using modified self-report modules from the Mini International Neuropsychiatric Interview (Sheehan et al., 1998).
<i>Number of medical conditions</i>	Sum of number of health professional-diagnosed medical conditions: “Has a doctor or healthcare professional ever told you that you have any of the following medical conditions?” (e.g., arthritis, cancer); range = 0-20.
Protective factors	
<i>Dispositional gratitude</i>	Gratitude was assessed using the following item from the Gratitude Questionnaire-6

<i>Social network size</i>	<p>(GQ-6; McCullough et al., 2002), “I have so much in life to be thankful for.” Participants rated that single item on a scale from 1 (<i>Strongly disagree</i>) to 7 (<i>Strongly agree</i>).</p> <p>Number of close friends and supportive relatives was assessed with the question, “How many close friends and relatives do you have? People you feel at ease with and can talk to about what is on your mind.”</p>	<p>(17 items, range 17–85, $\alpha = 0.95$). A PCL-S score of 50 or higher was indicative of a positive screen for PTSD at Wave 1. The PTSD Checklist-5 (PCL-5; Weathers et al., 2013) was used to assess past-month PTSD symptoms (20 items, range 0–80) according to DSM-5 (American Psychiatric Association, 2013) in Waves 2, 3, and 4. Incident PTSD was operationalized as a score ≥ 33 (Bovin et al., 2016). All symptoms were rated in response to veterans' self-reported ‘worst’ traumatic event on the Trauma History Screen. Suicidal ideation (SI) was assessed using item nine from the PHQ-9 (Kroenke et al., 2001). The question asks individuals to rate how often in the past 2 weeks, “Have you experienced thoughts that you would be better off dead or of hurting yourself?” Response options included 0 (<i>Not at all</i>), 1 (<i>Several days</i>), 2 (<i>More than half the days</i>), and 3 (<i>Nearly every day</i>). The presence of current SI was operationalized as a score of 1 or higher.</p>
<i>Perceived social support</i>	<p>The 5-item version of the Medical Outcomes Study–Social Support Scale (Sherbourne & Stewart, 1991) was used to assess perceived social support. Veterans rated their availability of social support (e.g., <i>Someone to confide in or talk to about your problems</i>) on a scale from 1 (<i>None of the time</i>) to 5 (<i>All of the time</i>); Cronbach's $\alpha = .91$.</p>	<i>Suicidal ideation</i>
<i>Dispositional optimism[†]</i>	<p>Optimism was assessed using the following item from the Life Orientation Test-Revised (Scheier et al., 1994), “In uncertain times, I usually expect the best.” Participants rated that single item on a scale from 1 (<i>Strongly disagree</i>) to 7 (<i>Strongly agree</i>).</p>	<i>Suicide attempt(s)</i>
<i>Curiosity/exploration[†]</i>	<p>Curiosity was assessed using the following item from the Curiosity and Exploration Inventory-II (Kashdan et al., 2009), “I frequently find myself looking for new opportunities to grow as a person (e.g., information, people, resources).” Participants rated that single item on a scale from 1 (<i>Strongly disagree</i>) to 7 (<i>Strongly agree</i>).</p>	<p>Suicidal attempts (SA) were assessed using the question, “Have you ever tried to kill yourself?” (<i>Yes or No</i>).</p>
<i>Purpose in life[†]</i>	<p>The Purpose in Life Test-Short Form (PIL-SF; Schulenberg et al., 2011) was used to assess purpose in life with 4 items on a 7-point Likert scale.</p>	<p><i>Note.</i> † = Variables not included in main analyses, but were tested as potential mediators in post-hoc mediation analyses along with social network size and perceived social support.</p>
<i>Resilience[†]</i>	<p>Connor-Davidson Resilience Scale-10 (CDRISC-10; Connor & Davidson, 2003) was used to assess resilience with 10 items (e.g., “I am able to adapt when changes occur”) on 5-point Likert scale from 1 (<i>Not at all true</i>) to 5 (<i>True nearly all the time</i>).</p>	2.3 Data analysis
Psychiatric outcomes	<p>The Patient Health Questionnaire-2 (PHQ-2; Kroenke et al., 2009) is a brief, two-item measure used to assess depressive symptoms in the last two weeks. Previous studies suggest sum scores are highly correlated with scores on the full PHQ-9 and a total score of 3 or greater indicates a positive screen for MDD.</p>	<p>Data analyses proceeded in three steps. First, we conducted independent-samples <i>t</i>-tests and chi-square tests to compare sociodemographic, military, and clinical characteristics of the samples with and without incident psychopathology and suicidal behavior; denominators for each of these analyses were veterans who did not screen positive on these measures at the baseline assessment: psychopathology (MDD/GAD/PTSD; $n=2,006$), suicidal ideation ($n=2,127$), and suicide attempts ($n=2,195$). For the incident psychopathology group, veterans who screened positive on MDD, GAD, or PTSD were aggregated together given the considerable degree of diagnostic overlap among these disorders and because these conditions frequently co-occur among U.S. veterans (Nichter et al., 2019). Second, we conducted three binary logistic regression analyses to determine the relation between dispositional gratitude at baseline and incident psychopathology and suicidal behavior; all of the demographic, military, and clinical variables shown in Table 1 were adjusted for in these regression models. Third, we generated predicted probabilities from these regression models and plotted them as a function of level of dispositional gratitude to quantify the probability of incident psychopathology and suicidal behavior as a function of level of gratitude endorsed at the baseline assessment.</p>
<i>Major depressive disorder</i>		
<i>Generalized anxiety disorder</i>	<p>The Generalized Anxiety Disorder-2 (GAD-2; Kroenke et al., 2009) is a brief, two-item measure used to assess anxiety symptoms in the last two weeks. Past studies suggest sum scores are highly correlated with scores on the full GAD-7 and a total score of 3 or greater indicates a positive screen for GAD.</p>	
<i>Posttraumatic stress disorder (PTSD)</i>	<p>The PTSD Checklist-Specific (PCL-S; Weathers et al., 1993) was used to assess PTSD symptoms according to the Diagnostic and Statistical Manual for Mental Disorders-IV (DSM-IV; American Psychiatric Association, 2000) in Wave 1 of the NRHVS</p>	

Table 2

Wave 1 sociodemographic, military, and clinical predictors of incident psychopathology, suicidal ideation, and suicide attempt over the 7-year study period

	No incident MDD, GAD, or PTSD	Incident MDD, GAD, or PTSD	Bivariate Test of difference	Multivariable Model of Incident MDD, GAD, or PTSD
	<i>n</i> = 1,828 (90.4%)	<i>n</i> = 178 (9.6%)		
	<i>n</i> (weighted %) or weighted mean (<i>SD</i>)	<i>n</i> (weighted %) or weighted mean (<i>SD</i>)	χ^2 or <i>t</i> , <i>p</i>	RRR (95%CI)
Age	63.2 (13.4)	58.7 (14.8)	4.17, <.001	0.98 (0.97-0.99)*
Male sex	1,689 (93.1%)	157 (91.0%)	1.11, 0.29	0.86 (0.48-1.56)
White, non-Hispanic race/ethnicity	1,567 (79.4%)	146 (71.2%)	6.35, 0.012	0.76 (0.52-1.11)
Some college or higher education	1,563 (67.4%)	147 (62.1%)	2.01, 0.16	0.96 (0.68-1.36)
Married/cohabitating	1,477 (77.4%)	139 (68.0%)	8.03, 0.005	0.84 (0.57-1.24)
Retired	966 (49.9%)	71 (39.0%)	7.69, 0.006	1.04 (0.67-1.61)
Household income \$60K or higher	1,020 (48.4%)	92 (40.7%)	3.87, 0.049	0.79 (0.56-1.12)
Combat veteran	601 (30.4%)	60 (33.3%)	0.63, 0.43	1.18 (0.83-1.68)
Number of lifetime traumas	2.8 (2.3)	3.0 (2.4)	1.26, 0.21	1.00 (0.93-1.07)
Lifetime AUD and/or DUD	290 (16.5%)	45 (28.8%)	16.59, <.001	1.88 (1.30-2.73)**
Number of medical conditions	2.5 (1.8)	2.5 (1.8)	0.48, 0.63	1.07 (0.98-1.18)
Social network size	9.1 (9.9)	6.7 (5.1)	3.26, 0.001	0.97 (0.95-0.99)*
Perceived social support	20.1 (4.6)	18.8 (5.4)	3.44, 0.001	0.99 (0.96-1.03)
Dispositional gratitude	6.3 (0.9)	5.9 (1.2)	4.81, <.001	0.80 (0.68-0.93)**
	No incident SI	Incident SI	Test of difference	Multivariable Model of Incident SI
	<i>n</i> = 1,940 (90.5%)	<i>n</i> = 187 (9.5%)		
	<i>n</i> (weighted %) or weighted mean (<i>SD</i>)	<i>n</i> (weighted %) or weighted mean (<i>SD</i>)	χ^2 or <i>t</i> , <i>p</i>	RRR (95%CI)
Age	62.3 (13.9)	61.8 (13.4)	.44, .66	1.02 (1.01-1.04)*
Male sex	1,768 (92.0%)	166 (90.2%)	0.75, 0.39	0.76 (0.42-1.37)
White, non-Hispanic race/ethnicity	1,650 (78.7%)	155 (72.7%)	3.57, .059	0.66 (0.45-0.97)*
Some college or higher education	1,664 (67.8%)	163 (74.9%)	3.84, .061	1.70 (1.16-2.48)**
Married/cohabitating	1,569 (76.8%)	139 (74.5%)	0.49, .48	1.79 (1.18-2.73)**
Retired	989 (48.3%)	83 (41.3%)	3.31, .069	0.63 (0.41-0.97)*
Household income \$60K or higher	1,081 (48.0%)	86 (37.2%)	7.78, .005	0.58 (0.41-0.83)**
Combat veteran	662 (31.3%)	64 (32.8%)	0.16, .68	1.04 (0.73-1.48)
Number of lifetime traumas	2.9 (2.4)	3.5 (2.9)	2.87, .004	0.97 (0.90-1.05)
Lifetime MDD and/or PTSD	238 (12.3%)	53 (23.8%)	18.67, <.001	1.52 (0.94-2.43)
Lifetime AUD and/or DUD	336 (17.6%)	55 (28.4%)	12.82, <.001	1.78 (1.21-2.63)**
Number of medical conditions	2.6 (1.9)	2.6 (1.7)	0.18, 0.86	1.09 (0.99-1.19)
Social network size	9.0 (9.7)	6.2 (5.2)	3.85, <.001	0.97 (0.94-0.99)*
Perceived social support	20.2 (4.6)	17.7 (5.8)	6.82, <.001	0.94 (0.91-0.98)**
Dispositional gratitude	6.3 (0.9)	5.9 (1.3)	2.96, 0.003	0.74 (0.63-0.86)***
	No incident Suicide Attempt	Incident Suicide Attempt	Test of difference	Multivariable Model of Incident Suicide Attempt
	<i>n</i> = 2,144 (97.2%)	<i>n</i> = 51 (2.8%)		

	<i>n</i> (weighted %) or weighted mean (SD)	<i>n</i> (weighted %) or weighted mean (SD)	χ^2 or <i>t</i> , <i>p</i>	RRR (95%CI)
Age	62.3 (13.9)	55.9 (11.8)	3.39, <0.001	0.98 (0.95-1.01)
Male sex	1,962 (92.4%)	46 (94.6%)	0.30, 0.53	1.93 (0.53-6.96)
White, non-Hispanic race/ethnicity	1,824 (77.9%)	42 (71.4%)	1.34, 0.25	1.03 (0.52-2.02)
Some college or higher education	1,840 (68.8%)	40 (54.4%)	5.35, 0.021	0.50 (0.28-0.91)
Married/cohabitating	1,712 (76.1%)	42 (66.1%)	2.99, 0.084	1.19 (0.60-2.34)
Retired	1,079 (47.7%)	25 (26.8%)	9.55, 0.002	0.73 (0.34-1.59)
Household income \$60K or higher	1,166 (47.4%)	25 (39.3%)	1.44, 0.23	1.05 (0.57-1.94)
Combat veteran	736 (32.6%)	15 (26.3%)	1.00, 0.32	0.62 (0.32-1.11)
Number of lifetime traumas	3.0 (2.5)	4.4 (4.0)	4.18, <0.001	1.14 (1.03-1.19)*
Lifetime MDD and/or PTSD	300 (13.4%)	9 (22.8%)	4.10, 0.043	0.70 (0.32-1.54)
Lifetime AUD and/or DUD	395 (18.5%)	12 (30.4%)	4.99, 0.025	1.44 (0.75-2.76)
Number of medical conditions	2.5 (1.9)	2.9 (2.1)	1.46, 0.14	1.13 (0.97-1.33)
Social network size	8.6 (9.5)	5.9 (5.6)	2.10, 0.036	0.99 (0.94-1.03)
Perceived social support	19.8 (4.8)	16.1 (6.4)	5.57, <0.001	0.93 (0.87-0.99)*
Dispositional gratitude	6.2 (1.0)	5.3 (1.9)	6.56, <0.001	0.75 (0.61-0.93)**

Abbreviations: RRR=relative risk ratio; CI=confidence interval; MDD=major depressive disorder; PTSD=posttraumatic stress disorder; AUD=alcohol use disorder; DUD=drug use disorder
Significant association: * $p < .05$; ** $p < .01$.

3. Results

3.1 Sample characteristics

As shown in Table 2, 9.6% ($n=178$) of veterans screened positive for incident psychopathology (MDD/GAD/PTSD) over the follow-up period; 9.5% ($n=187$) reported new-onset suicidal ideation; and 2.8% ($n=51$) reported an incident suicide attempt over the 7-year follow-up period.

3.2 Characteristics of veterans with and without incident psychopathology and suicidal behaviors

Table 2 shows sociodemographic, military, and clinical characteristics of veterans by incident outcome status. Relative to veterans without incident psychopathology, those with incident psychopathology were younger, had a smaller social network, and were more likely to have a history of alcohol or drug use disorder.

Relative to veterans without incident suicidal ideation, veterans with incident suicidal ideation were less likely to be White, married/partnered, or have an annual household income of \$60K or higher; they were also more likely to have obtained a higher education beyond high school and to have a history of alcohol or drug use disorder. They were also younger, had a smaller social network size, and reported lower social support.

Relative to veterans without incident suicide attempt, those with an incident suicide attempt reported lower social support and more lifetime traumas.

3.3 Dispositional gratitude and risk for incident psychopathology and suicidal behaviors

As shown in Table 2, in fully adjusted models, higher dispositional gratitude at baseline were associated with significantly lower likelihood of developing incident psychopathology, and suicidal ideation and attempts over the 7-year follow-up period. Specifically, for each unit increase in dispositional gratitude, the risk of developing psychopathology decreased by 20%, suicidal ideation by 26%, and suicide attempts by 25%.

As shown in Figure 1, the incidence of psychopathology in veterans who endorsed *Strongly Agree* to the gratitude item, "I have so much in life to be thankful for" was 8.0%, while the incidence of psychopathology in veterans who endorsed *Disagree* or *Strongly Disagree* was more than 3 times higher (27.7%)

As shown in Figure 2, the incidence of suicidal ideation in veterans who endorsed *Strongly Agree* on the gratitude item was 6.8%, while the incidence of suicidal ideation in veterans who endorsed *Disagree* or *Strongly Disagree* was nearly 5 times higher (33.6%)

As shown in Figure 3, the incidence of suicide attempt in veterans who endorsed *Strongly Agree* on the gratitude item was 1.5%, while the incidence of suicidal attempt in veterans who endorsed *Disagree* or *Strongly Disagree* was more than 13 times higher (20.3%).

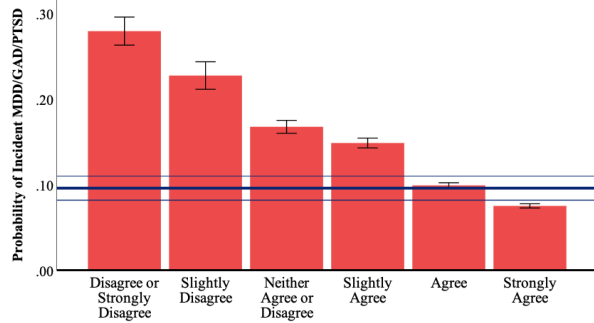


Fig 1. Probability of incident psychopathology as a function of level of dispositional gratitude at Wave 1.

Note. Blue line represents the mean probability and 95% confidence interval of incident MDD/GAD/PTSD in the full sample. Scores represent responses to the following gratitude item: “I have so much in life to be thankful for.” Errors bars represent 95% confidence intervals.

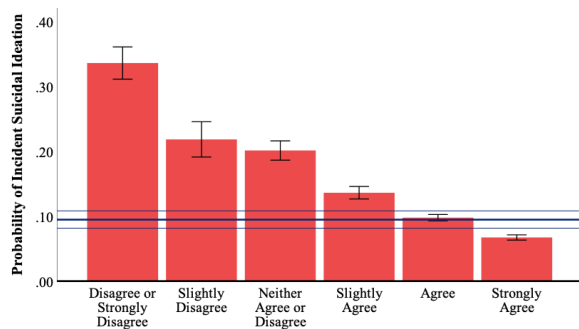


Fig 2. Probability of incident suicidal ideation as a function of level of dispositional gratitude at Wave 1.

Note. Blue line represents the mean probability and 95% confidence interval of incident suicidal ideation in the full sample. Scores represent responses to the following gratitude item: “I have so much in life to be thankful for.” Errors bars represent 95% confidence intervals.

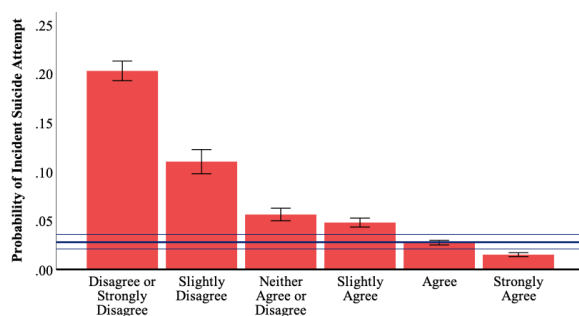


Fig 3. Probability of incident suicide attempt as a function of level of dispositional gratitude at Wave 1.

Note. Blue line represents the mean probability and 95% confidence interval of incident suicide attempt in the full sample. Scores represent responses to the following gratitude item: “I have so much in life to be thankful for.” Errors bars represent 95% confidence intervals.

4. Discussion

To our knowledge, this study is the first to examine the prospective effect of dispositional gratitude on the incidence of psychopathology (i.e., MDD/GAD/PTSD) and suicidal behaviors (i.e., ideation and attempts) in a population-based sample of U.S. veterans. Results revealed that 9.6% of veterans developed MDD, GAD, or PTSD, 9.5% suicidal ideation, and 2.8% attempted suicide over the 7-year follow-up period. Higher dispositional gratitude at the baseline assessment was associated with a substantially decreased risk of developing all three of these outcomes. Conversely, veterans who reported low dispositional gratitude were at considerably higher risk for developing these outcomes.

The incidence of psychopathology and suicidal behaviors for veterans who endorsed the highest or lowest dispositional gratitude represent meaningful differences relative to previous estimates. For example, in previous analyses of NHRVS data, prevalence estimates for MDD and PTSD across the entire sample ranged from 3-8% (Mota et al., 2016; Nichter et al., 2019; Wisco et al., 2014, 2016), whereas in the current study, the incidence of psychopathology for veterans with low dispositional gratitude was markedly higher (27.7%). Estimates of suicidal ideation across the total sample of veterans were as high as 17.4% (Smith et al., 2016), whereas in the current study, the incidence of suicidal ideation was much lower for those with high gratitude (6.8%) and much higher for low gratitude (33.6%). Lastly, the prevalence of lifetime suicide attempts has been estimated at 6.0% (Nichter et al., 2020), but our study found an incidence of 1.5% among veterans reporting high levels of gratitude, and a 20.3% incidence among those who endorsed low levels of gratitude. These findings are important in suggesting that not only are high levels of dispositional gratitude prospectively linked with positive mental health outcomes, as theorized by previous work (e.g., Jans-Beken et al., 2020), but that low levels of this characteristic may contribute to risk for adverse mental health outcomes.

4.1 Potential mechanisms linking gratitude to lower incidence of adverse mental health outcomes

Results of this study, along with theoretical rationale from prior work, suggest four potential explanations for why dispositional gratitude is linked to the development of psychopathology and suicidal behaviors. First, the Broaden-and-Build Theory suggests that positive emotions, such as gratitude, may help facilitate

an expansion of cognitive, behavioral, and social resources that could be called upon during times of distress (Fredrickson, 2013). Given that high dispositional gratitude is associated with more frequent gratitude states and positive appraisals of others (Wood, Maltby, Stewart, et al., 2008), such experiences could have cascading effects on building other protective resources that may help buffer against the development of psychological distress and suicidal behaviors. In line with this theory, results of post-hoc mediation analyses revealed that the association between dispositional gratitude and incident psychopathology was indirectly mediated by perceived resilience (odd ratio [OR]=0.97, 95% confidence interval [CI]=0.94, 0.99]; accounting for 24.9% of the total effect), dispositional optimism (OR=0.88, [0.77, 0.99]; 24.7% of the total effect), and social network size (OR=0.96 [0.94, 0.99]; 17.8% of the total effect). The association between dispositional gratitude and incident suicidal ideation was indirectly mediated by purpose in life (OR=0.90, [0.86, 0.94]; 47.6% of the total effect), perceived social support (OR=0.95, [0.91, 0.99]; 21.1% of the total effect), and social network size (OR=0.97, [0.95-0.99]; 9.4% of the total effect). None of these variables indirectly mediated the association between dispositional gratitude and incident suicide attempt (all p 's>0.16). However, these findings should be interpreted with caution given that dispositional gratitude and potential mediators were assessed concurrently at the baseline assessment; thus, future longitudinal research using serial assessment is needed to evaluate potential mediators of the relation between gratitude and incident mental health outcomes.

Second, individuals with higher dispositional gratitude have greater social resources, which are well-established protective factors for psychopathology and suicidal behaviors (Fanning & Pietrzak, 2013; Kintzle et al., 2018; Kleiman & Liu, 2013; Pietrzak & Cook, 2013). Indeed, bivariate analyses revealed that veterans who did not develop psychopathology or suicidal behaviors had larger social networks and greater levels of perceived social support at the baseline assessment relative to veterans who developed these outcomes. In fully adjusted models, larger social network size was independently linked to lower risk for incident psychopathology and suicidal ideation, and higher perceived social support to lower risk for suicidal ideation and attempts. Thus, it is possible that dispositional gratitude may be associated with greater social connectedness and resources, which have previously been linked to lower likelihood of developing psychopathology and suicidal behavior (Arenson et al., 2021; Neria et al., 2010; Wang et al., 2021). The link between gratitude

and social connectedness is well established in previous literature (e.g., Liao & Weng, 2018; Wood, Maltby, Gillett, et al., 2008), which also aligns with the Broaden-and-Build Theory and results of our post-hoc mediation analyses. Further longitudinal research is needed, such as repeated measure designs that capture individual differences in social connectedness (e.g., ecological momentary assessment), to fully evaluate the role of social resources in mediating the relationship between gratitude and adverse mental health outcomes.

Third, higher dispositional gratitude may help reduce risk for adverse mental health outcomes through greater use of adaptive coping strategies. For example, Wood et al. (2007) found that individuals with higher trait gratitude used more proactive coping strategies when faced with stress, such as seeking out social support, approaching the problem, attempting to reinterpret the situation, and seeking opportunities for growth. Previous work has also noted that gratitude promotes positive reappraisal of negative events—a relevant and potentially useful coping strategy for mental health concerns (Watkins et al., 2008). Furthermore, higher levels of dispositional gratitude may also help buffer risk for psychopathology through reducing negative affect. Indeed, several randomized controlled trials examining the effectiveness of gratitude interventions have found significant decreases in negative affect relative to control groups (O'Connell et al., 2017; Salces-Cubero et al., 2019; Wolfe & Patterson, 2017).

Fourth, several known factors might also explain why high dispositional gratitude would be associated with decreased likelihood of developing suicidal ideation and attempts. For example, one study found that trait gratitude moderated the relationships between hopelessness and depressive symptoms with suicidal ideation (Kleiman et al., 2013), which suggests that high dispositional gratitude may have a buffering effect on risk factors associated with suicidality. Furthermore, the defining features of gratitude could be considered antithetical to the interpersonal theory of suicide, which identifies thwarted belongingness and perceived burdensomeness as significant risk factors (Van Orden et al., 2010). The antecedent of feeling grateful is the cognitive appraisal that someone performed a good deed so one could benefit from that deed, which arguably, contradicts the schema of thwarted belongingness that involves believing one is isolated and disconnected from others. Additionally, the action tendency of receiving a benefit and subsequently feeling grateful is the motivation to do a good deed to repay the benefactor or to pay it forward to someone else, which is inconsistent with

perceptions that one is a burden to others—especially, if someone develops the habit of enacting that action tendency and engages in behaviors that benefit other people.

4.2 Clinical implications

Results of this study have several clinical implications. First, findings indicate a single-item measure of gratitude appears to have strong predictive utility insofar as high and low scores on this item were associated with markedly lower and higher likelihoods of incidence of psychopathology and suicidal behaviors, even after conservative adjustment for a broad range of variables. Therefore, this item might be an effective screening tool to assess whether an individual possesses a notable protective factor (i.e., high gratitude), or if they are at greater risk (i.e., low gratitude) for developing adverse mental health outcomes.

Second, given that dispositional gratitude predicted incident psychopathology among veterans without a psychiatric history, gratitude could be an appropriate target for primary prevention of developing psychiatric morbidities, particularly in populations at greater risk such as veterans. Prevention efforts to help mitigate risk for adverse mental health outcomes could also focus on bolstering dispositional gratitude. For service members specifically, that could take place prior to deployment or combat exposure. Targeted prevention efforts could use known intervention strategies to enhance gratitude, which could include exercises such as Counting Blessings or Three Good Things, and the Gratitude Visit (Lomas et al., 2014). However, further research is needed to determine the most timely and effective approaches to enhancing dispositional gratitude among veterans, active-duty service members, and other populations at heightened risk for adverse mental health outcomes.

Third, although it was not tested directly, given the strength of these findings and the large discrepancies between incident outcomes for high versus low dispositional gratitude, it is possible that targeting gratitude may also be helpful in secondary and tertiary prevention efforts. Specifically, enhancing gratitude may also benefit those who have already developed adverse mental health outcomes or who are recovering, and possibly help those who are experiencing symptom remission to maintain previous gains. However, it is unknown if there is a ceiling effect for changes in dispositional gratitude among individuals who are already experiencing significant distress. Alternatively, perhaps the same “dose” of dispositional gratitude is not as effective as a protective factor among people who

have already developed psychiatric morbidities relative to those who have not. Further research is needed to understand the maximal utility of gratitude-enhancing efforts in populations with psychiatric disorders.

4.3 Limitations and future directions

Results of this study should be interpreted in light of several limitations. First, this sample reported high levels of dispositional gratitude, on average. The disproportionate number of veterans reporting high gratitude could have impacted our ability to detect effects in veterans with lower levels of dispositional gratitude. Second, dispositional gratitude was assessed using a single item from the GQ-6 (McCullough et al., 2002). Although this item is drawn from a unidimensional measure, appears to have strong face validity, and its predictive utility could potentially be considered a strength, there is limited evidence of its psychometric properties as an independent marker of dispositional gratitude. Future studies should validate this single item by testing for similar effects with the full measure or other comprehensive assessments of trait gratitude. Third, our assessment of suicidal ideation was based on the previous two weeks. Thus, it is possible that participants could have denied experiencing suicidal ideation, but experienced ideation prior to the two-week period. Additionally, baseline data regarding suicidal ideation is limited to the previous two weeks and it is unknown if participants had a lifetime history of suicidal ideation before that first assessment, though veterans with lifetime suicide attempt histories were excluded from this analysis. Fourth, post-hoc mediation analyses included variables assessed concurrently with dispositional gratitude at the baseline assessment; therefore, causal inferences cannot be made, and additional prospective work with serial measurements is needed to fully test for mediating effects. Lastly, although this sample is reflective of the U.S. veteran population, which is predominantly older, male, and Caucasian, results may not generalize to civilian or more diverse veteran populations. More research in such samples is needed to evaluate the generalizability of results of the current study.

5. Conclusion

To our knowledge, this is the first study to examine the prospective effect of dispositional gratitude on risk for psychopathology and suicidal behaviors in a population-based sample of U.S. veterans. Results revealed that veterans who reported higher gratitude at baseline

were significantly less likely to develop incident psychopathology, as well as suicidal ideation and attempts, over a 7-year follow-up period. Moreover, veterans who reported low gratitude were at significantly elevated risk for all outcomes, with rates that range from 3 to 13 times higher than the incidence observed in veterans with high levels of gratitude. Further research is needed to replicate these results in more diverse populations, elucidate mechanisms underlying the protective mental health effects of dispositional gratitude, and evaluate the efficacy of gratitude interventions in mitigating risk for adverse mental health outcomes.

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CRedit authorship contribution statement

Adam P. McGuire: Conceptualization, Methodology, Validation, Writing – Original Draft, Writing – Review & Editing; Joanna Fagan: Validation, Writing – Original Draft, Writing – Review & Editing; Jack Tsai: Conceptualization, Investigation, Writing – Review & Editing, Project Administration; Addie N. Merians: Writing – Review & Editing; Brandon Nichter: Writing – Review & Editing; Sonya Norman: Writing – Review & Editing; Steven M. Southwick: Conceptualization, Methodology, Investigation, Writing – Review & Editing, Supervision, Project Administration, Funding Acquisition; Robert H. Pietrzak: Conceptualization, Methodology, Formal Analysis, Investigation, Writing – Original Draft, Writing – Review & Editing, Supervision, Project Administration, Funding Acquisition

Data availability statement

The data that support the findings of this study are available on request from Dr. Robert Pietrzak. The data are not publicly available due to privacy or ethical restrictions.

Declaration of competing interest

The authors report no potential conflicts of interest.

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