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# Consumer Perspectives on Genetic Testing for Psychiatric Disorders: The Attitudes of Veterans with Posttraumatic Stress Disorder and Their Families

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The perspectives of patients with posttraumatic stress disorder (PTSD) on genetic research have not yet been investigated in the genetics research literature. To provide a basis for research on attitudes toward genetic research in PTSD, we surveyed the U.S. Military Afghanistan/Iraq-era veterans with PTSD and their social support companions to investigate the attitudes and knowledge about genetics and genetic testing. One hundred forty-six veterans (76 with PTSD and 70 without PTSD) participated in this study. Each veteran participant had a corresponding companion (primarily spouses, but also relatives and friends) who they identified as a primary member of their social support network. Participants and companions completed self-report measures on knowledge of genetics and attitudes toward genetic testing for PTSD. Results indicated that, relative to veterans without PTSD, veterans with PTSD had similar levels of genetic knowledge, but less-favorable attitudes toward genetic testing. Differences persisted after controlling for age and genetics knowledge. No differences between companions of those with and without PTSD were observed. Results suggest that the perspective of those with PTSD regarding genetic testing is in need of further investigation, especially if potentially beneficial genetic testing for PTSD is to be utilized in the target population.

## Introduction

Although most individuals will be exposed to a traumatic event over the course of their lifetimes (Breslau and Kessler, 2001), only a fraction will subsequently develop posttraumatic stress disorder (PTSD), suggesting the possibility of a genetic contribution. In fact, more than 30% of the variance for PTSD risk is attributed to genetic factors, as evidenced by family and twin-heritability studies (Lyons *et al.*, 1993; Sack *et al.*, 1995; Yehuda *et al.*, 2001; Stein *et al.*, 2002; Kremen *et al.*, 2012). More than 30 candidate gene studies have been performed [for reviews see Cornelis *et al.* (2010) and Yehuda *et al.* (2011)]. These studies have produced inconsistent and sometimes contradictory results. For example, some studies have found associations between PTSD and the dopamine receptor D2 gene as well as the nearby ankyrin-repeat gene *ANKK2* (Comings *et al.*, 1996; Young *et al.*, 2002), whereas other studies have been unable to replicate these findings (Gelernter *et al.*, 1999). Similarly, reports of association to the *5-HTTLPR* polymorphism near the serotonin transporter SLC6A4 have been inconsistent in magnitude and environmental interaction, a situation further complicated by whether studies scored this variant as biallelic or triallelic. Other investigations have focused on genes in the hypothalamic–pituitary–adrenal axis (*FKBP5*, *GCCR*, and *CNR1*) and the locus coeruleus–noradrenergic systems (*NPY*, *DBH*, *COMT*, and *GABRA2*). Binder reported association with variants in FKBP5 in African Americans (Binder *et al.*, 2008), and this was replicated in an independent dataset (Xie *et al.*, 2010). It is likely that the mixed results of these association studies arise from variations in the study design and relatively low power. Real progress in understanding the genetic basis of PTSD and the development of robust diagnostic genetic tests will likely require the performance of well-powered genome-wide association studies in multiple racial and ethnic populations.

Although genetic research has the potential to contribute significantly to understanding of the PTSD risk, development, and course, there are also possible treatment implications for genetic testing among individuals with PTSD. For example,

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genetic testing could potentially be used to match patients with PTSD to medications, most likely to be effective. Carriers of genes associated with an increased risk of PTSD could potentially benefit from preventive strategies, such as choosing professions with a less risk of traumatic event exposure. However, in general, it has been noted that genetic testing also carries the potential risk of psychological distress, stigmatization, and discrimination; and misapplication of preventive strategies (Mitchell *et al.*, 2010).

As genetic research on psychiatric disorders progresses, the need to understand the issues involved in genetic counseling for these disorders increases. With this end in mind, it is important to consider attitudes toward genetic testing in people with psychiatric disorders. These attitudes could prove useful in determining how to utilize and implement genetic research to best benefit those who are diagnosed with PTSD. In fact, with the emergence of direct-to-consumer genetic tests that provide information about genetic risks of psychiatric illness, often without genetic counseling or information about the scientific evidence for these results, the need to understand perspectives of target groups is critical (Mitchell *et al.*, 2010). The authors are not aware of direct-to-consumer tests of the PTSD risk that are available as of the submission of this article. However, the availability of test for other psychiatric disorders and emergence of genetic research findings in PTSD suggest the possibility that direct-to-consumer tests for the PTSD risk could be developed in the near future. Due to the prominence of support from friends and family in medical decision making (Arora *et al.*, 2007) and the implications of genetic testing for family members' risk of a disorder that affects the patient, it is also important to evaluate the attitudes of a support person (e.g., spouse or family member) toward genetic testing decisions.

Unfortunately, the perspectives of patients with PTSD and their families on genetic research have yet to be investigated. Patient perspectives could be invaluable in helping design information about genetic testing and use of genetics in informing treatment. Although data on attitudes to genetic testing in PTSD are lacking, a few studies in samples comprised of individuals with other psychiatric disorders are available. For example, data from a large phone survey indicated that a history of psychiatric illness and a perceived vulnerability to depression were both related to increased interest in genetic testing for the risk of depression (Wilde *et al.*, 2011). Those who endorsed statements about the benefits of genetic testing were more than three times more likely to indicate interest in receiving genetic testing for depression risk (Wilde *et al.*, 2011). Among family members of individuals diagnosed with schizophrenia, 83% indicated interest in a test of genetic risk if it were available (DeLisi and Bertisch, 2006). Another report found that interest in genetic testing was endorsed by a majority of participants with anxiety disorders (76%), bipolar disorder (83%), schizophrenia (77%), and depression (87%) (Laegsgaard *et al.*, 2009). There is evidence that favorable attitudes toward genetic testing could translate into behavior, as people at a familial risk of bipolar disorder reported an interest in taking action to reduce the risk of psychiatric disorder (Meiser *et al.*, 2008). In addition, a study of participants from a genetic study of depression risk found that 66% chose to learn their individual genotype information (Wilhelm *et al.*, 2009). Taken together, these studies suggest that many psychiatric patients, family members of those with psychiatric disorders, and members of the general population are interested in receiving genetic testing to estimate their risk for psychiatric disorders. In addition, personal and family history of psychiatric disorders appears to be relevant to genetic test decision making.

Although the scientific groundwork for genetic counseling in PTSD requires research, several trends provide insights into the type of evidence that might be available to patients in the foreseeable future. Several candidate genes implicated in the neurobiology of PTSD have been identified (Cornelis *et al.*, 2010), and future genome-wide association studies may identify additional susceptibility genes. Because the risk for PTSD is multifactorial, and the genetic risk for PTSD is likely based on many genes, the decisions of patients considering genetic testing for PTSD will be complex. Once patients considering genetic testing for the PTSD risk are informed that test results will not be dichotomous, they might be well advised to consider the effect that probabilistic test results will have on their outlook and behavior. This is significant, as those with a family history of bipolar disorder have reported that a higher degree of certainty provided by genetic tests is related to increased interest in genetic testing for the risk of bipolar disorder (Meiser *et al.*, 2005). Even in genetic testing with a high degree of certainty, uptake in genetic testing has been low. In individuals at a risk for Huntington's disease, only ~10–20% of those approached for genetic testing request the procedure (Meiser and Dunn, 2000). Further, the stigma linked to psychiatric disorders such as PTSD significantly alters treatment decision making (Gould *et al.*, 2007). These concerns might also influence attitudes and behaviors related to genetic testing. While the influence of genetic models of psychiatric disorder etiology has several possible consequences, preliminary research using interviews of a small sample of individuals at a familial risk of bipolar disorder has found that they believed a genetic contribution to bipolar disorder decreased its associated stigma (Meiser *et al.*, 2005). However, subsequent research revealed that a genetic model of bipolar disorder was associated with increased stigma, but only in the family members of those with bipolar disorder who had not been diagnosed with bipolar disorder themselves. The latter result could be due to the stronger association with the family member with bipolar disorder brought on by a genetic model of psychiatric disorders (Meiser *et al.*, 2007). In contrast, respondents in a phone survey reported that a genetic link with depression would increase stigma (Wilde *et al.*, 2011). Given the stigma associated with psychiatric disorders, research is needed to more fully appreciate the ultimate effect of genetic research in this patient group.

Genetic research in psychiatric disorders ultimately aims to benefit patients through the use of personalized medicine, the selection of optimal treatment for a given patient based on their genetic profile. This could have implications for several forms of treatment, including medications and psychotherapy. In addition, it is possible that gene therapy will be developed for psychiatric disorders. However, the current treatment implications for patients with PTSD would focus primarily on psychoeducation and planning. For example, a genetic component of a patient's PTSD might ameliorate some of the self-blame and guilt that often accompany PTSD. In addition, patients with a genetic profile that is associated with a low risk of PTSD might be relieved to know that their children are not at increased risk. Patients with a higher-risk genetic profile might be comforted by knowing that higher

risk is far different from a genetic certainty, and that PTSD might be prevented for their children by educating them about common reactions to trauma and the importance of seeking treatment after potentially traumatic events.

The current study was designed to examine attitudes toward genetic testing among those with PTSD. U.S. veterans with PTSD as well as their social support companions were surveyed and compared to a group of veterans with no psychiatric disorders to identify concerns that could influence implementation of genetic testing in this group. This report describes the results of this survey and explores the role of knowledge of genetics in attitudes toward genetic testing. Based on the increased interest in genetic testing for depression in those with a history of psychiatric illness or perceived vulnerability to depression (Wilde *et al.*, 2011), we hypothesized that veterans with PTSD would report more favorable attitudes toward genetic testing.

## Methods

### *Participants and procedures*

Afghanistan/Iraq-era veterans and their support companions completed self-report questionnaires, and veterans participated in a clinical psychiatric interview. A total of 146 veterans participated in the study, with 146 corresponding companions who were identified as a primary member of the veteran's social support. This study was approved by the Durham Veterans Affairs Medical Center Institutional Review Board. To be eligible, participants had to have served in the military since October 2001 and be between ages 18 and 65. Veterans' companions were selected by the veterans and could be a relative (spouse, life partner, parent, grandparent, sibling, uncle, or aunt) or a close friend. Participant sociodemographic characteristics and descriptive statistics for major study measures are presented in Table 1, along with frequencies of relationships of companions to veterans.

Participants were recruited from the registry of the Mental Illness Research, Education, and Clinical Center (MIRECC) at the Durham Veterans' Administration Medical Center. Veterans who consented to be contacted for future studies through the volunteer research Iraq/Afghanistan-era veteran registry of the MIRECC were recruited using the Dillman method (Dillman *et al.*, 2009), which includes sending a series of three invitational letters. The letters explained the nature and the purpose of the research, the study procedures, standard protections for human subjects, and risks and benefits of the study, and invited veterans to contact a research coordinator for additional information.

Veterans who agreed to participate came in for a session at the laboratory in which the veteran and their identified companion provided informed consent and completed self-report questionnaires. Veterans completed the Clinician Administered PTSD Scale to determine the PTSD status (CAPS) (Blake *et al.*, 1995), and the Structured Clinical Interview for DSM-IV (SCID) (First *et al.*, 2002) to diagnose other possible Axis I disorders. Both of these interviews have demonstrated excellent reliability and validity in clinical settings (Weathers *et al.*, 2001), and the Fleiss kappa across interviewers for PTSD diagnosis was 1.0. Veterans' support companions did not complete diagnostic interviews. Diagnostic interview data were used to sort participants into a current PTSD group and a control group with no current Axis I psychiatric disorders.

### *Measures*

**Knowledge of PTSD test.** This measure contains 15 true/false and multiple-choice tests assessing general understanding of PTSD (Pratt *et al.*, 2005). The test includes questions on traumatic stress and recognition of PTSD symptoms and treatment methods. In another study, after a brief psychoeducational intervention for PTSD, this measure noted an increase in understanding of PTSD (Pratt *et al.*, 2005).

**Survey of knowledge of genetics.** This measure asks participants to rate as True or False a series of 16 statements

Table 1. Sociodemographic and Attitude Variables for Veterans and Their Companions

| *Variable* | *PTSD* (n = *76*) | *Control* (n = *70*) | *Test statistics* |
|---|---|---|---|
| Veterans | | | |
| Age (*M*, *SD*) | 38.93 (9.76) | 44.19 (9.92) | $t = -3.19$[a] |
| Years of education (*M*, *SD*) | 13.85 (3.04) | 14.16 (4) | $t = -0.51$ |
| Gender (*N*, %) male seven missing | 58 (81.69%) | 57 (83.82%) | $\chi^2 = 0.11$ |
| Racial minority (*N*, %) | 47 (61.84%) | 46 (65.71%) | $\chi^2 = 0.24$ |
| Employed (*N*, %) | 67 (88.16%) | 66 (94.29%) | $\chi^2 = 1.69$ |
| Married (*N*, %) | 43 (60.56%) | 49 (72.06%) | $\chi^2 = 2.05$ |
| Veterans' companions | | | |
| Age (*M*, *SD*) | 41.18 (13.67) | 44.49 (11.56) | $t = -1.57$ |
| Years of education (*M*, *SD*) | 2.17 (0.80) | 1.88 (0.77) | $\chi^2 = 5.50$ |
| Gender (*N*, %) male | 16 (21.05%) | 8 (11.59%) | $\chi^2 = 2.34$ |
| Racial minority (*N*, %) | 43 (58.11%) | 47 (67.14%) | $\chi^2 = 1.25$ |
| *Relationship to Vet (N, %)* | *PTSD (N = 76)* | *Control (N = 70)* | $\chi^2 = 3.39$ |
| Spouse | 46 (60.53%) | 45 (64.29%) | |
| Sibling | 4 (5.26%) | 5 (7.14%) | |
| Relative | 6 (7.89%) | 9 (12.86%) | |
| Parent | 13 (17.11%) | 6 (8.57%) | |
| Friend | 7 (9.21%) | 5 (7.14%) | |

[a] $p < 0.05$.
PTSD, posttraumatic stress disorder; SD, standard deviation.

about genetics. The measure is designed to assess the participant's level of knowledge about the relationship of genes to diseases and the relationships among genes, chromosomes, cells, and the body (Calsbeek *et al.*, 2007). It includes statements such as "A gene is a disease," "Healthy parents can have a child with a hereditary disease," and "All serious diseases are hereditary." A summary score of correctly answered items was calculated. Missing items were scored as incorrect. Previous research on this measure has resulted in good reliability (Cronbach's alpha = 0.86).

Survey of attitudes toward genetic testing. This is a 13-item questionnaire assessing attitudes related to major issues raised in response to genetic testing, including medical aspects of genetic testing, the pros and cons of testing, and the consequences for relatives, daily life, insurance, and job opportunities (Morren *et al.*, 2007). Items are rated on a 5-point scale ranging from 1 = totally disagree to 5 = totally agree. Of the 13 statements, six express favorable attitudes toward genetic testing, and seven express reserved attitudes toward genetic testing. Preliminary research has supported the factor structure of this measure (Morren *et al.*, 2007). A summary score is calculated by reverse coding the reserved attitude items and then summing the item scores.

Perceived benefits/limitations of genetic testing for PTSD. This is a 19-item measure [adapted from Meiser *et al.* (2008)] on which participants rated the importance of several potential implications of genetic testing on a 5-point scale ranging from "Not at all Important" to "Extremely Important." The measure was developed from participant-generated benefits and limitations of genetic testing provided during qualitative research (Meiser *et al.*, 2005). In the limited research using this measure, Cronbach's alpha has been high ($\alpha = 0.88$–$0.90$). A summary score was calculated by reverse coding the limitation items and then summing the item scores.

### *Statistical analyses*

To describe sample characteristics and facilitate normative comparisons, we calculated frequencies, means, and standard deviations for the sample as a whole and for the PTSD group and the non-PTSD group separately. These descriptive statistics were calculated for sociodemographic variables, knowledge of genetics, and genetic attitudes. To evaluate the association of PTSD with attitudes toward genetic testing, we first calculated independent sample *t*-tests. To account for the potential influences of demographic variables, we calculated a multivariate linear regression equation with age, racial minority status, gender, and years of education as covariates. We also examined the effects of PTSD on attitudes toward genetics across different levels of age, education, and racial minority status.

## Results

Table 1 presents veteran and social support companion sociodemographic statistics by the PTSD status, as well as frequencies for the relationships between veterans and their social support companion. The PTSD group was younger than the non-PTSD group. Summary scores on measures of knowledge of genetics and attitudes toward genetics are presented in Table 2. The knowledge of genetics scores of the PTSD group ($M = 12.12$, $SD = 1.98$) and the control group ($M = 12.20$, $SD = 1.79$) exceed that of published results from samples of participants with asthma ($M = 9.0$, $SD = 4.0$), diabetes mellitus ($M = 7.1$, $SD = 3.8$), and cardiovascular disease ($M = 6.3$, $SD = 3.5$). In addition, the PTSD group had significantly less-favorable attitudes toward genetic testing on both the survey of attitudes toward genetic testing [$t\ (1) = -4.05$, $p < 0.001$] and the perceived benefits/limitations of genetic testing for PTSD [$t\ (1) = -2.36$, $p = 0.020$]. Proportions of participants endorsing individual items on the genetic attitude measures are presented in Tables 3 and 4, presented by the PTSD status. Knowledge of genetics and attitudes toward genetic testing in veterans' social support companions was not significantly different as a function of the veteran's PTSD status.

Table 2. Genetic Attitudes and Knowledge

| *Variable* | *PTSD* (n = *76*) | *Control* (n = *70*) | *Test statistics* (t) |
|---|---|---|---|
| Veterans | | | |
| Genetic knowledge (*M*, *SD*) | 12.12 (1.98) | 12.20 (1.79) | −0.26 |
| PTSD knowledge (*M*, *SD*) | 11.41 (2.46) | 11.76 (2.27) | −0.89 |
| Genetic attitude (*M*, *SD*) | 43.26 (5.92) | 47.2 (5.76) | −4.05[a] |
| Benefits/limitations (*M*, *SD*) | 39.91 (7.17) | 42.5 (6) | −2.36[a] |
| Veterans' companions | | | |
| Genetic knowledge (*M*, *SD*) | 12.08 (1.87) | 12.01 (2.33) | 0.18 |
| PTSD knowledge (*M*, *SD*) | 11.08 (2.77) | 11.11 (2.80) | −0.08 |
| Genetic attitude (*M*, *SD*) | 43.22 (5.85) | 46.77 (6.02) | −3.59 |
| Benefits/limitations (*M*, *SD*) | 41.58 (7.54) | 41.55 (7.06) | 0.02 |

[a] $p < 0.05$.

Consistent with summary score results on the survey of attitudes toward genetic testing, veterans with PTSD were less likely to endorse several of the items describing favorable attitudes toward genetic testing for PTSD and more likely to endorse reserved attitudes. A similar pattern was noted on the perceived benefits/limitations of genetic testing for PTSD, on which veterans with PTSD were less likely to endorse statements describing benefits of genetic testing for PTSD and more likely to endorse limitations.

To further examine the influence of sociodemographic variables on attitudes toward genetic testing, we analyzed attitudes at different levels of age, Caucasian-versus-racial minority, gender, and several levels of education for both PTSD and non-PTSD participants. Results of these analyses are presented in Table 5. Because the PTSD group was younger, we conducted multivariate analyses with age as a covariate. In addition, based on a previous research identifying knowledge of genetics as a significant factor in attitudes toward genetic testing (Calsbeek *et al.*, 2007), we also used genetic knowledge as a covariate. In these models, the presence of PTSD remained significantly related to less-favorable attitudes toward genetic testing [$\beta = -0.30$, $t\ (1) = -3.60$,

Table 3. Proportions of Participants Endorsing Agree or Totally Agree for Items on the Attitudes Toward Genetic Testing Questionnaire

| *Attitudes toward genetic testing* | *Non-PTSD (%)* | *PTSD (%)* |
|---|---|---|
| Favorable attitudes | | |
| 1. I think that the development of DNA research is a positive medical progress. | 96 | 83[a] |
| 3. I would inform my children about the results of a DNA test for a specific disease. | 83 | 78 |
| 5. I want to know whether my disease is hereditary. | 91 | 79[a] |
| 7. I approve of using DNA testing for early detection of diseases. | 94 | 82[a] |
| 11. I would inform my siblings about the results of a DNA test for a specific disease. | 84 | 68[a] |
| 12. I don't worry about the consequences of DNA testing for the chances of finding a job. | 58 | 46[a] |
| Reserved attitudes | | |
| 2. If I had a DNA test done, my family need not know about the result. | 32 | 36 |
| 4. The idea of a DNA test frightens me. | 6 | 13[a] |
| 6. I worry about the consequences of DNA testing for being able to take out insurance. | 25 | 42[a] |
| 8. The possibility of a DNA test will change one's future. | 58 | 54 |
| 9. As long as a disease cannot be treated, I don't want a DNA test. | 6 | 17[a] |
| 10. I don't want a DNA test to tell me that I am at risk for a certain disease. | 10 | 14[a] |
| Complete questionnaire total score (*M*, *SD*) | 43.26 (5.92)[a] | 47.2 (5.76)[a] |

Data on this questionnaire were missing for one non-PTSD participant, so proportions were calculated on the remaining 69 participants.
[a]$p < 0.05$.

$p < 0.001$) and lower scores regarding benefits/limitations [$\beta = -0.19$, $t\ (1) = -2.17$, $p = 0.031$).

## Discussion

This report provides the first data on attitudes toward genetic testing in veterans with PTSD. Compared to veterans without PTSD, veterans with PTSD were less likely to endorse favorable attitudes toward genetic testing and also more likely to endorse reserved attitudes. Both groups had similar scores on the knowledge of genetics measure. This suggests that differences in genetic attitudes were not due to the lack of knowledge about genetics, and that imparting more knowledge to patients with PTSD is likely insufficient to increase favorable perceptions of genetic testing.

Given the high levels of interest in genetic testing endorsed in patients with other psychiatric disorders and in the general population, it is noteworthy that this sample of veterans with PTSD endorsed less-favorable attitudes. Although education about genetics has some promise as a method of informing decision making, attitude differences in our sample were not explained by baseline differences in age or knowledge of

Table 4. Percentage of Participants Endorsing Statements as Quite Important or Extremely Important on Perceived Benefits and Limitations of Genetic Testing for Posttraumatic Stress Disorder Questionnaire

| *Perceived benefits and limitations of genetic testing for PTSD* | *Non-PTSD (%)* | *PTSD (%)* |
|---|---|---|
| Benefits | | |
| 1. Helps my doctor decide the best medication for me. | 69 | 63 |
| 2. Helps research into PTSD. | 71 | 67 |
| 3. Helps people who have genetic risk avoid stressors/traumatic events. | 70 | 64 |
| 4. Can help prevent PTSD. | 67 | 59 |
| 5. Allows PTSD to be diagnosed earlier. | 77 | 68 |
| 6. Can help me plan for the future. | 71 | 62 |
| 7. Helps me know if I am at risk | 77 | 66 |
| Limitations | | |
| 8. Could lead to discrimination by employers. | 57 | 70 |
| 9. Could lead to insurance discrimination. | 61 | 71 |
| 10. Could mean that people who are genetically at risk for PTSD may be more likely to feel vulnerable. | 56 | 55 |
| 11. Could increase worry in people who have a genetic risk who may never develop PTSD. | 51 | 54 |
| 12. Could mean living with uncertainty if genetic testing showed a risk for PTSD. | 49 | 61 |
| 13. Could increase stigma because of labeling. | 57 | 66 |
| Total score (*M*, *SD*) | 39.91 (7.17)[a] | 42.5 (6)[a] |

[a]$p < 0.05$.

Table 5. Summary of Genetic Attitudes by Posttraumatic Stress Disorder Status and Sociodemographic Groups

| | *Non-PTSD Mean (SD)* | *PTSD Mean (SD)* | *Effect size semipartial* $\eta^2$ |
|---|---|---|---|
| Age | | | |
| 18–35 | 47.4 (5.1) ($n=16$) | 42.3 (5.7) ($n=32$) | 0.136[a] |
| 36–50 | 46.5 (5.9) ($n=35$) | 44.0 (6.5) ($n=35$) | 0.040 |
| 51+ | 48.4 (6.1) ($n=18$) | 41.7 (4.6) ($n=9$) | 0.251[a] |
| Race | | | |
| Minority | 47.8 (5.5) ($n=44$) | 42.9 (6.3) ($n=40$) | 0.154[a] |
| Caucasian | 46.1 (6.1) ($n=25$) | 39.5 (8.2) ($n=36$) | 0.041 |
| Gender | | | |
| Female | 48.0 (5.9) ($n=11$) | 44.2 (5.1) ($n=13$) | 0.117 |
| Male | 47.1 (5.8) ($n=57$) | 43.2 (6.3) ($n=58$) | 0.096[a] |
| Education | | | |
| No college (0–12 years) | 48.6 (4.8) ($n=16$) | 42.9 (5.9) ($n=27$) | 0.206[a] |
| Some college (13–15 years) | 48.4 (6.1) ($n=24$) | 43.5 (6.6) ($n=31$) | 0.132[a] |
| College graduate (16+ years) | 45.4 (5.7) ($n=29$) | 43.4 (5.0) ($n=18$) | 0.033 |
| *Perceived benefits and limitations of genetic testing for PTSD* | | | |
| Age | | | |
| 18–35 | 42.6 (4.5) ($n=16$) | 39.8 (7.4) ($n=32$) | 0.041 |
| 36–50 | 43.0 (6.5) ($n=36$) | 40.0 (5.8) ($n=35$) | 0.056[a] |
| 51+ | 41.5 (6.3) ($n=18$) | 40.0 (11.4) ($n=9$) | 0.008 |
| Race | | | |
| Minority | 42.9 (6.2) ($n=44$) | 40.3 (6.2) ($n=40$) | 0.045 |
| Caucasian | 41.8 (5.7) ($n=26$) | 39.54 (8.2) ($n=36$) | 0.024 |
| Gender | | | |
| Female | 41.2 (7.2) ($n=11$) | 40.8 (5.5) ($n=13$) | 0.001 |
| Male | 42.8 (5.8) ($n=57$) | 39.9 (7.7) ($n=58$) | 0.044[a] |
| Education | | | |
| No college (0–12 years) | 42.9 (4.6) ($n=17$) | 39.5 (7.6) ($n=27$) | 0.060 |
| Some college (13–15 years) | 44.0 (5.6) ($n=24$) | 41.5 (5.5) ($n=31$) | 0.049 |
| College graduate (16+ years) | 41.0 (6.8) ($n=29$) | 37.7 (8.6) ($n=18$) | 0.045 |

[a] $p<0.05$.

genetics. Previous research on reasons for reserved attitudes toward genetic testing has identified the trust of researchers and an expectation of being better able to fight the disorder in light of genetic information as significant predictors of intention to seek testing in patients with psychiatric disorders (Laegsgaard *et al.*, 2009). However, patients with PTSD often struggle to trust others, especially those in authority (Resick *et al.*, 2008), and clear options for improved treatment of PTSD in light of genetic testing information are still in development. Although the intention to seek genetic testing in patients with psychiatric disorders has also been linked with parenthood, something with clear relevance for some patients with PTSD, the presence of clear implications for PTSD treatment could result in more-favorable attitudes in these patients. Less-favorable attitudes toward genetic testing in PTSD have the potential to influence medical decision making. It is unknown whether these attitudes are a result of having PTSD or whether these attitudes may precede the development of PTSD. The possibility of PTSD symptoms preventing individuals from choosing genetic testing is potentially concerning, as it could impair the ability of those who might be most in need of this testing from receiving the intended benefits. Future research could focus more closely on intrinsic factors such as trust, attitudes toward medical care or treatment providers, and self-efficacy regarding actions to take in light of information provided by genetic testing.

Patient attitudes toward genetic testing are important in PTSD, because those at risk can utilize a number of behaviors and strategies to prevent and address PTSD. This is in contrast to genetic illnesses with fewer preventive actions (e.g., Huntington's disease). As genetic testing for the risk of PTSD progresses, it will be important to develop preventive treatments for PTSD. These would greatly improve the ultimate effect of genetic testing for PTSD risk, because those at risk would have available behaviors to undertake in response to test results, indicating an increased genetic risk of PTSD. Currently, individuals at risk could enact behaviors such as choosing not to enter into professions with higher traumatic stress frequency, like military service or law enforcement, or learning about common reactions to trauma and being prepared to seek treatment if trauma reactions do not resolve quickly.

The findings of this study are limited in that it is unknown whether (1) attitudes would extend to behaviors for genetic testing and (2) results would generalize to nonveterans. It will be important to build on these findings by determining which factors are related to genetic attitudes in this group and researching the modifiability of these attitudes through intervention. In addition, genetic research in PTSD is a field of research that is still in an early stage of development. At this point, individual genetic polymorphisms have relatively small associations with an increased PTSD risk, though recent estimates place the overall contribution of genetic factors to PTSD at ~30% (Skelton *et al.*, 2012). There are also important ethical considerations in psychiatric research, including the

possibility of future discrimination in insurance, employment, or education (Hoop, 2008). This has potential relevance for PTSD if high-risk professions begin to test for PTSD risk and block those with high-risk genetic profiles from pursuing their chosen profession. Despite these limitations, this study represents a first step toward understanding veteran perspectives in genetic testing among those with PTSD. It will be important to continue this research to maximize the beneficial use of genetic testing in this subpopulation of psychiatric patients.

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### Author Disclosure Statement

The authors have no competing interests to report. The views expressed in this presentation are those of the authors and do not necessarily represent the views of the Department of Veterans Affairs or the National Institutes of Health.

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