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Examining Posttraumatic Growth and Mental Health Difficulties in the Aftermath of Hurricane Sandy

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Introduction

Hurricane Sandy made landfall in the northeastern United States as a post-tropical cyclone on October 29, 2012, causing the damage or destruction of over 650,000 homes, many in New York State (Blake et al., 2012). High flood waters inundated many low-lying areas, including the Rockaways within Queens, NY where two measurements of 5.4 feet above ground level were made. This flooding caused damage and limited the ability of first responders to access a large fire in Breezy Point, Queens, a neighborhood of the Rockaways. As a result, the fire destroyed over 100 homes before it was contained (Blake et al., 2012). After its landfall, Hurricane Sandy triggered long-lasting mental health effects still present four years after the storm (Schwartz, Liu, et al., 2016; Schwartz et al., 2015; Schwartz, Rothenberg, Kerath, Liu, & Taioli, 2016). The impact of hurricanes and other natural disasters on mental health has been well documented (Dekel, Ein-Dor, & Solomon, 2011; Lowe, Manove, & Rhodes, 2013). High degrees of exposure to a natural disaster have been shown to increase the risk of developing anxiety, depression and/or posttraumatic stress disorder (PTSD) immediately and later in life (Fergusson, Horwood, Boden, & Mulder, 2014; Maclean, Popovici, & French, 2016; Thienkrua et al., 2006). Similarly, in the aftermath of Hurricane Sandy, there was a significant positive association between hurricane exposure and mental health difficulties (MHD), particularly in terms of symptoms of PTSD

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and depression (Boscarino, Hoffman, Adams, Figley, & Solhkhah, 2014; Gruebner, Lowe, Sampson, & Galea, 2015; Schwartz et al., 2015).

Despite the abundance of negative mental health outcomes observed after a natural disaster, positive emotional growth has also been documented (Lowe et al., 2013). The concept of posttraumatic growth (PTG) has been defined as a positive psychological change as a result of cognitive processing after a traumatic event (Tedeschi & Calhoun, 1996). Such positive changes include a greater appreciation of life, improved interpersonal relationships, a greater attunement to spiritual matters, a heightened sense of new possibilities, and increased personal strength (Tedeschi & Calhoun, 1996). PTG is often measured using the Posttraumatic Growth Inventory (PTGI) (Tedeschi & Calhoun, 1996), a valid 21-item questionnaire used in many previous studies (Brunet, McDonough, Hadd, Crocker, & Sabiston, 2010; Ho et al., 2013; Mack et al., 2015; Morris, Wilson, & Chambers, 2013; Shakespeare-Finch & Barrington, 2012; Taku, Cann, Calhoun, & Tedeschi, 2008). PTGI has been used to measure PTG after a variety of traumatic events, including cancer diagnoses (Gianinazzi et al., 2016; Holtmaat, van der Spek, Cuijpers, Leemans, & Verdonck-de Leeuw, 2017; Mystakidou et al., 2008), accidents (Nishi, Matsuoka, & Kim, 2010) and natural disasters (Bianchini et al., 2015; Cieslak et al., 2009; Eren-Koçak & Kiliç, 2014; García, Cova, Rincón, & Vázquez, 2015; Harville et al., 2011; Jin, Xu, Liu, & Liu, 2014; Karanci et al., 2012; Lowe et al., 2013; McCanlies, Mnatsakanova, Andrew, Burchfiel, & Violanti, 2014).

Studies have demonstrated varying relationships between PTG and mental health diagnoses. Some showed that poorer mental health is associated with less PTG (Gianinazzi et al., 2016; Holtmaat et al., 2017; Lieberman et al., 2003; Mystakidou et al., 2008; Yun et al., 2010), while others demonstrated an indeterminate (Cormio, Romito, Giotta, & Mattioli, 2015; Feder et al., 2008), or a positive relationship where poorer mental health is associated with greater growth (Lowe et al., 2013; Nishi et al., 2010). Findings were also mixed when specifically examining the relationship between PTSD and PTG. A meta-analysis of 63 studies on various traumas, including natural disasters, found that linear increases in PTSD symptoms increased PTG (Liu, Wang, Li, Gong, & Liu, 2017). Another study found that PTG is positively associated with PTSD until a critical point is reached and then the association becomes negative in direction (Shakespeare-Finch & Barrington, 2012).

The ambiguity in the relationship between PTG and PTSD is also seen in the natural disaster literature. McCanlies and colleagues (2014) found no relationship between PTG and PTSD symptoms among police officers after Hurricane Katrina; however, a study of low income mothers who survived Hurricane Katrina found that higher subscale scores for posttraumatic stress were associated with greater PTG both 1 and 3 years post-Hurricane Katrina (Lowe et al., 2013). Similar findings were seen among Hurricane Katrina survivors living with HIV showing an association between greater PTSD symptoms and higher levels of PTG (Cieslak et al., 2009). Similarly, Dekel et al (2012) found in their longitudinal study that, over time, people who had PTSD showed higher PTG levels than those who did not have PTSD. Although authors have conjectured, investigators have yet to test a mediational model that contains explanatory variables linking PTG and PTSD in the context of natural disasters. The posttraumatic stress – PTG relationship could potentially be bidirectional. Among

participants exposed to earthquakes in Turkey, Karanci et al. (2012) revealed that PTG subscales, scales that reflect sub domains of PTG, were positively affected by personality traits such as conscientiousness. In addition, extroversion was found to increase PTG under high posttraumatic stress conditions (Karanci et al., 2012). PTG may also be affected by other characteristics which may moderate how PTSD affects growth. For example, among Hurricane Katrina survivors with HIV, coping self-efficacy moderated the effect of PTSD on PTG (Cieslak et al., 2009). Dekel et al. (2012) and Lowe et al. (2013) also found that non-Hispanic Blacks had significantly higher PTG and posttraumatic stress symptom scores as compared to other races.

This variability in findings regarding the nature of the PTG and MHD association may be a result of studying different sample populations, including populations as different as Swiss childhood cancer survivors (Gianinazzi et al., 2016) and prisoners of war (Feder et al., 2008). Even amongst natural disaster survivors, several different cultures and types of disasters have been studied which could explain contradictory findings from college students in Italy after an earthquake having less PTG with more substance use (Bianchini et al., 2015) to low income mothers in Louisiana after Hurricane Katrina exhibiting greater PTG with more PTSD (Lowe et al., 2013).Unlike PTSD, there is a paucity of literature exploring the relationship between PTG and depression and/or anxiety after a natural disaster; however, there is evidence of a mediating role of PTG in associations between coping styles and psychological outcomes. For example, PTG mediated the relationship between problem-focused coping and depression as well as between meaning-focused coping and both well-being and positive affect (Guo, Gan, & Tong, 2013). Moderate depression has also been linked to an increase in PTG (Bianchini et al., 2015). It has also been suggested that PTG may play a modifying role in other behavioral associations. One study found that PTG modified the association between quality of life and posttraumatic stress such that the association was stronger among those with lower levels of PTG (Siqveland, Nygaard, Hussain, Tedeschi, & Heir, 2015). It has been found that, among assault survivors, the greatest growth is exhibited by those with the least and most depressive symptoms, forming a curvilinear relationship (Kleim & Ehlers, 2009). Anxiety was not found to be related to PTG in a study looking at students who were survivors of the 2009 L'Aquila earthquake (Bianchini et al., 2015). To our knowledge, there are no studies explicitly focusing on the relationship between PTG and anxiety post-hurricanes.

The role of depression in the association between PTG and PTSD could be a result of illusory growth, which can promote PTG. Illusory growth is the self-deceptive aspect of PTG (Maercker & Zoellner, 2004), as opposed to functional growth, which is the self-transcending aspect of PTG (Maercker & Zoellner, 2004). Lowe et al. (2013) found that of the various PTSD symptom clusters, avoidance was most strongly associated with PTG, which they propose may result from illusory growth. The intrusive domain of PTSD symptoms can cause intrusive cognitive processing, which (Dekel et al., 2011) researchers argue is helpful when working through a trauma and can ultimately result in functional growth. On the other hand, illusory growth is often associated with self-deception, avoidance, and positive illusions usually represented by "avoidance" and "hyperarousal" (Dekel et al., 2011). Various studies have demonstrated positive correlations between PTG and all three aspects (avoidance, re-experiencing, and hyperarousal) of PTSD (Dekel et al.,

2011; Lowe et al., 2013; Maercker & Zoellner, 2004); therefore, the PTG measure might be capturing only illusory growth, or a combination of both illusory and functional growth.

To date, no published studies have examined mental health and PTG in the context of Hurricane Sandy. The current study seeks to elucidate the associations between PTG and MHD by testing the hypothesis that increased MHD will be positively associated with PTG in a sample of adult residents with varying degrees of exposure to Hurricane Sandy.

Method

Participants and Procedure

Participants were recruited in two studies approved by the Human Research Protection Program Institutional Review Board, Leaders in Gathering Hope Together (Project LIGHT) and Project Restoration (PR), both of which focused on the mental health impact of Hurricane Sandy, and used the same research protocol. Recruitment for LIGHT and PR occurred from 10/23/2013 – 2/25/2015 and 6/5/2014 – 8/9/2016, respectively. Both cross-sectional studies employed convenience sampling to recruit adult participants that completed a self-report questionnaire including a wide variety of exposure from none to high levels of exposure to the Hurricane (Liu et al., 2017; Schwartz et al., 2016; Schwartz et al., 2015, 2016). LIGHT recruited from Long Island, Queens, and Staten Island; PR recruited from the Rockaways in Queens. Exclusion criteria included cognitive impairment which prevented a valid consent process, and individuals who did not speak English or Spanish. Only participants who completed the Post-Traumatic Growth Inventory (PTGI) were included. As the PTGI instrument was added to the questionnaire after data collection had begun for Project LIGHT, only participants from LIGHT who completed the instrument were included in our study sample (n=345, 52.4%). All participants from PR (n=l,011) were given the PTGI instrument. Recruitment was monitored to ensure demographic representation consistent with census data for each region. The study population (N = 1,356) was 55.3% female, 44.7% male, 51.7% non-White, 48.3% White, 18.8% Hispanic, 81.2% Non-Hispanic, and had a mean age of 43.10 years (SD = 17.34).

Measures

Questionnaire.—The self-report survey was completed by the participant. If a participant had literacy or vision concerns, the questionnaire was read aloud by project staff in a confidential setting. The survey included questions regarding demographics, such as age and gender, and behavioral health, such as alcohol abuse, history of mental illness, and mental health treatment. The survey also included hurricane-specific measures, such as number of hurricane exposures. Exposure to other types of traumatic experiences was not assessed.

Patient Health Questionnaire 4 (PHQ-4).—Anxiety and depression symptoms were assessed using the self-report PHQ-4 and each was summed with range = 0 – 6 for anxiety as well as for depression. The PHQ-4 is a validated tool (Kroenke, Spitzer, Williams, & Löwe, 2009) and has been used in previous disaster studies (Galea, Tracy, Norris, & Coffey, 2008; Pietrzak et al., 2012; Pietrzak, Van Ness, Fried, Galea, & Norris, 2013; Schwartz et al., 2016; Schwartz et al., 2015). Cronbach's alpha was .868 for anxiety and .833 for

depression. Anxiety and depression symptom scores were dichotomized as probable anxiety or probable depression using validated cutoffs of ≥ 3 (Kroenke, Spitzer, & Williams, 2003; Kroenke, Spitzer, Williams, Monahan, & Löwe, 2007). Anxiety and depression were used as independent variables.

Posttraumatic Stress Disorder Checklist-Specific (PCL-S).—PTSD symptom scores were assessed by summing all items (range = 17 - 85) from the self-reported PCL-S. The measure contains 17 questions about PTSD symptoms in reference to a traumatic occurrence, in this case Hurricane Sandy. The PCL-S is a validated (Weathers, Litz, Herman, Huska, & Keane, 1993), widely-used and psychometrically sound tool (Cerdá et al., 2013; Gros, Price, Magruder, & Frueh, 2012; Harville et al., 2011; Hyre et al., 2008; Leon, Hyre, Ompad, DeSalvo, & Muntner, 2007; Pietrzak et al., 2012, 2013). Cronbach's alpha for PTSD symptoms was .961. PTSD was used as an independent variable.

Post Traumatic Growth Inventory (PTGI).—Post Traumatic Growth (PTG) score was determined by summing the ten items (range = 0 - 50) of the short version of the PTGI (Tedeschi & Calhoun, 1996). The PTGI is a valid and widely used tool to understand growth due to trauma (Linley, Andrews, & Joseph, 2007; Shakespeare-Finch & Barrington, 2012; Taku et al., 2008). This self-report survey measures the extent to which the participant has grown as a direct result of a trauma in areas such as relating to others, having a greater appreciation for life, new possibilities, spirituality, and personal strength. The tool was customized for use with Hurricane Sandy as the traumatic event. Cronbach's alpha for PTGI score was .955. PTG was used as a dependent variable.

Additional Study Variables.—Demographics included age, gender, race (white/non-white), Hispanic ethnicity (Yes/No), and level of education (completed high school (HS) or above/some HS or below). Alcohol abuse was defined using the National Institute on Alcohol Abuse and Alcoholism (NIAAA) guidelines. For males, the consumption of 5 of more drinks in a single day on a monthly basis qualified as alcohol misuse; for females, the cutoff was 4 or more drinks in a single day on a monthly basis (NIAAA, 2011). Drug abuse was defined using the National Institute on Drug Abuse guidelines, with a threshold of drug use monthly or more frequently within the last year (NIDA, 2012). Current smoking status was assessed using a question from the Global Adult Tobacco Survey Collaborative Group (2011). History of mental health illness was categorized by indication of having been diagnosed with a mental health condition prior to the hurricane, and current mental health treatment status was measured using a Yes/No question. Elapsed time since Sandy was the time in months from Hurricane Sandy to the completion of the survey. Hurricane exposure was measured using a checklist for hurricane exposure which included 30 items (Harville et al., 2011; Norris, Perilla, Riad, Kaniasty, & Lavizzo, 1999) of possible hurricane experiences. These items included personal exposure measures such as injury/death of a friend or family member and property exposure such as a damaged/destroyed home (Schwartz et al., 2015). This measure was derived from Hurricane Katrina (Harville et al., 2011) and Hurricane Andrew (Norris et al., 1999) exposure tools and has been used in previous research (Schwartz et al., 2016; Schwartz et al., 2015, 2016).

Data Analysis

Descriptive statistics comparing PTG score with all study variables were calculated. As some variables may contain missing values, the frequency of all study variables is reported. Significant relationships between PTG score and independent variables were assessed by Mann-Whitney Rank Sum Tests, using a large sample Z approximation to the Mann-Whitney U distribution, or Spearman's rank correlation coefficient (ρ), as appropriate. Nonparametric tests were used because the PTG results did not have a normal distribution.

For the primary analysis, a multiple weighted least squares (WLS) regression was performed to assess the association between PTG score and MHD (probable anxiety, probable depression, PTSD symptom score), adjusting for all clinically significant study variables. WLS regression was applied to correct for heteroscedasticity in PTG score residuals. First, the standard deviation function was estimated using the absolute residuals from an unweighted least squares regression on the predictors. Second, a regression of the standard deviations on the predictors was performed to obtain the fitted values. The weights were the reciprocal of the fitted values squared (Neter, Wasserman, & Kutner, 1990).

Probable anxiety and depression were positively associated with PTGI in the unadjusted analyses, but this relationship did not remain significant in the main multivariable model. Therefore, a secondary post hoc analysis was also conducted to explore whether these variables modified the effect of PTSD on PTG score. As such, WLS regression was performed to measure the association between PTG score and interactions between depression and PTSD, as well as between anxiety and PTSD symptoms. Significant interactions from the model building phase were then included in the multivariable WLS model with adjustments. As a sensitivity analysis, PTSD and depression were regressed onto a quadratic PTGI score in order to evaluate a potential curvilinear relationship found in other studies (Kleim & Ehlers, 2009; Shakespeare-Finch & Barrington, 2012). The coefficient of variation (R^2) was compared to the model with the linear PTGI.

Adjusted parameter estimates (B), standard errors (SE), t statistics and p-values are reported. For PTSD, parameter estimates are expressed in units of 10 to be more clinically relevant and to allow for comparison between effect sizes of different variables. Results are considered significant if $p < .05$. As variables in the analysis may contain missing values, the frequency of all study variables is reported. Multiple regressions utilized participants with complete covariate information ($N = 1,226$, 90.4%).

Missing data patterns were evaluated and comparison between complete cases vs. cases with missing data were conducted with respect to study variables. Participants with missing data ($n = 130$) had a higher proportion of alcohol use (43.7% vs. 27.9%) and had lower mean age ($M = 42.63$, $SD = 17.37$ vs. $M = 47.77$, $SD = 16.37$) than those with complete data. To assess whether there was any bias in mental health outcomes, regressions from the primary and the post-hoc analyses were fitted to exclude education and current treatment status (which accounted for 70.8% of the missing data), and results were found to be similar to the original analyses. All analyses were conducted using SAS software, version 9.4 (SAS Institute, Cary, NC, USA).

Results

Higher mean PTG scores were associated with non-White race, completing HS, current smoking, having a positive history of mental illness, and current mental health treatment, but not with engaging in alcohol misuse or drug use. Hurricane exposure and PTSD symptom scores had significant positive correlations with PTG score (Table 1).

In the primary multiple WLS regression (Table 2), 10-unit increases in PTSD symptom scores were significantly associated with a 2.0 point increase in PTG score ($t = 6.05$, $p < .001$); however, probable depression and anxiety were not associated with PTG score. Being non-White and being Hispanic were associated with a 5.90 ($t = 6.49$, $p < .001$) and 3.38 ($t = 2.89$, $p = .004$) point increase in PTG score, respectively. Being a current smoker was also positively associated with PTG score ($t = 3.28$, $p = .001$). Each additional hurricane exposure item was associated with a 0.70 point increase in PTG score ($t = 7.11$, $p < .001$).

In the secondary post hoc analysis, when regressing interactions between probable depression and probable anxiety and PTSD symptoms on PTGI, depression was a significant effect modifier of PTSD ($t = 2.00$, $p = .046$), while anxiety was not ($t = 1.43$, $p = .153$). Therefore, the post hoc multiple regression analysis included only the interaction between probable depression and PTSD, which was also found to be significant ($t = -3.82$, $p < .001$). Among those without probable depression, a 10-unit PTSD increase was associated with a 3.24 point increase in PTG score; however, among those with depression, PTG score only increased at a rate of 1.04 points for every 10-unit PTSD increase (Figure 1). All other covariate adjustments had similar effects on PTG score compared to the primary regression analysis (Table 3). In the sensitivity analysis, models with the quadratic PTGI outcome had lower R^2 compared to that of the linear PTGI (Supplemental Material).

Discussion

This was the first study to examine PTG in the context of Hurricane Sandy. Main study findings included a positive relationship between PTSD and PTG, but no significant associations between probable depression nor anxiety and PTG. In addition, participants who were non-White, Hispanic, smokers, and with greater hurricane exposure had higher PTG scores. Although there is a lack of consensus in the literature (Cieslak et al., 2009; Liu et al., 2017; Lowe et al., 2013; McCanlies et al., 2014; Shakespeare-Finch & Barrington, 2012), we tried to clarify previous studies' findings in that our results are consistent with previous studies that reported significantly greater PTG with higher PTSD symptoms (Cieslak et al., 2009; Liu et al., 2017; Lowe et al., 2013; Maercker & Zoellner, 2004; Nishi et al., 2010). Further, our findings are similar to hurricane-specific trauma studies that found this relationship as well (Cieslak et al., 2009; Lowe et al., 2013). These findings suggest that exposure to trauma could be a basis from which to experience growth, however, given the cross-sectional nature of the data, it is not possible to determine whether the association between trauma experiences and growth or between PTSD and growth are causal. We can only state that they are correlational.

Those who were depressed or anxious had significantly higher mean PTG scores in the univariable model; however, these relationships were not significant in the multivariable model. Results of the few studies that have been published on these relationships show that anxiety has not been found to be correlated with PTG (Shand, Cowlishaw, Brooker, Burney, & Ricciardelli, 2015), whereas depression has been shown to have a positive association with hurricane exposure, but not with PTG (Bianchini et al., 2015; Harville et al., 2011). In this study, although anxiety and depression weren't significantly correlated with PTG, results from the post-hoc analysis elucidated a more nuanced association between PTSD, depression, and PTG. Though depression has no significant association with PTG, among those with higher depression symptoms, the association between PTSD and PTG is weaker as compared to those without symptoms of depression, indicating decreased resilience among those with co-occurring PTSD and depression symptoms.

A curvilinear relationship between PTG and PTSD or depression was not found; however, Kleim et al (2009) used different scales (PTSD Symptom Scale Interview and the Beck Depression Inventory) for their analyses. Also, in the meta-analysis from Shakespeare-Finch et al (2014), for studies specific to natural disasters, the correlation coefficient was not significantly different between the quadratic and linear terms.

It is possible that the PTGI could be measuring illusory growth, not functional growth, which could potentially explain the moderating role of depression in the current study. There are two potential ways in which depression could be affecting posttraumatic growth. First, it is possible that participants suffering from depressive symptoms are less likely to utilize positive illusions of self as a coping mechanism. Second, it is possible that people with greater depressive symptoms are not able to experience functional posttraumatic growth because they might be too realistic and may be unable to put a positive spin on their traumatic experience. Perhaps people that do not have depressive symptoms, but do have PTSD symptoms, are able to engage in illusory growth which, in combination with functional growth, results in greater overall PTG. This study had several limitations. The cross sectional design does not allow for causal inferences. Convenience sampling was also used; however, efforts were made to ensure that the study population reflected the demographics of the overall population of the region. Further, the PTSD and PTG measures were specific to Hurricane Sandy, whereas the measures for anxiety and depression were more geared towards general anxiety and depression symptoms. This lack of specificity may have contributed to the lack of direct associations between depression, anxiety, and PTG.

Future research should focus on further understanding the moderating role of depression in the PTSD-PTG relationship. Further, PTGI subscales and their associations with mental health outcomes should also be explored as they may provide some insight into the responsible mechanisms.

Given the positive association between PTSD and PTG, it is difficult to derive clear implications for clinical intervention from the current study findings. It is possible that psychosocial first aid may have greater importance for vulnerable populations, such as those with multiple MHD. Our findings also point to the need for clinicians to focus on decreasing depression symptoms post-trauma, as they may prevent growth among those with PTSD

symptoms. While addressing PTSD symptoms, clinicians can focus on operational definitions of growth to help foster the natural development of growth post-trauma. There are very few empirically validated interventions aimed at fostering PTG. A meta-analysis aimed at exploring whether psychosocial interventions foster PTG found that none of the 12 interventions were specifically designed with PTG as the primary outcome, and that moderation analyses revealed little about the intervention factors that increase PTG (Roepke, 2015). Although randomized controlled trials (RCTs) in this area are lacking, the findings of one RCT suggested that a four-session intervention enhanced PTG while decreasing PTSD among HIV infected men (Ye, Yu, Zhu, Chen, & Lin, 2017). However, to truly determine whether interventions that foster PTG can reduce psychological distress among hurricane survivors, specifically, prospective randomized controlled trials that focus on this population are needed.

Conclusion

This study examined PTG after Hurricane Sandy and found that those with PTSD symptoms were significantly more likely to experience PTG. The strength of this relationship was attenuated by the presence of depression symptoms. Clinical applications include assisting natural disaster survivors by decreasing their depressive burden and allowing natural PTG to aide in the recovery process as other symptoms are targeted within a clinical setting.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

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Impact Statement:

Posttraumatic Growth (PTG) is one aspect of a potentially positive response to trauma. When conducting post-trauma clinical intervention, it would be beneficial for mental health professionals to focus on the treatment of depression symptoms in addition to PTSD as those with symptoms of both disorders are less likely to demonstrate post-traumatic growth in the face of trauma.

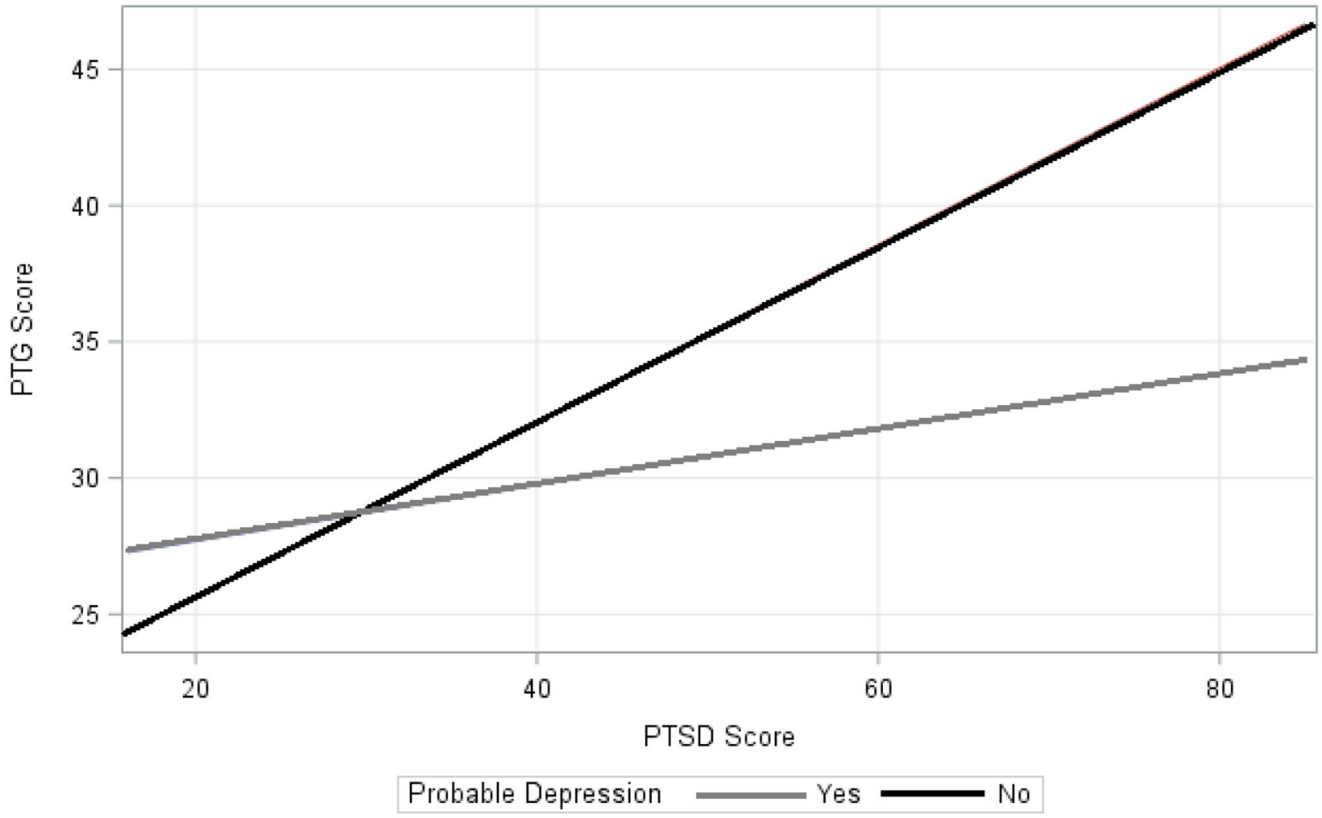

Figure 1.

Adjusted effect of PTSD score on PTG score, stratified by probable depression. Results are from the post-hoc multiple linear regression model including the interaction between PTSD score and probable depression, adjusted for mean values of all other covariates in the model.

Table 1

Description of Study Population and PTG Score

Characteristic	*n* [a]	%	*M*	*SD*	$Z_{M\text{-}W}$
Gender					
Male	606	44.7	22.23	15.71	−2.01*
Female	749	55.3	23.91	15.90	
Race					
White	643	48.3	20.56	15.11	−5.66***
Non-white	689	51.7	25.53	16.08	
Hispanic Ethnicity					
No	1082	81.2	22.93	15.76	0.90
Yes	250	18.8	23.96	16.02	
Education					
< HS	221	16.9	26.2	15.83	3.29***
≥ HS	1089	83.1	22.39	15.71	
Alcohol Misuse					1.14
No	783	57.8	22.74	16.42	
Yes	572	42.2	23.73	14.98	
Recreational Drug Use					1.49
No	1085	81.7	22.78	16.03	
Yes	243	18.3	24.43	14.69	
Smoking					
No	993	73.8	21.71	16.08	5.58***
Yes	353	26.2	27.22	14.32	
History of Mental Illness					
No	971	71.8	22.44	16.14	2.48*
Yes	381	28.2	24.86	14.91	
Currently in Treatment					
No	1082	82.7	22.39	15.94	2.88**
Yes	226	17.3	25.72	14.63	
Probable Depression					
No	1014	74.8	22.02	16.18	4.50***
Yes	342	25.2	26.51	14.24	
Probable Anxiety					
No	969	71.5	22.13	16.45	3.71***

Characteristic	***n*** [a]	***%***	***M***	***SD***	$Z_{M\text{-}W}$
Yes	387	28.5	25.7	13.85	
Correlation between Continuous Study Variables and PTG Score					
Characteristic	*M*	*SD*			ρ
Age (years)	43.1	17.34			.08**
Elapse time (months) since Sandy	29.18	10.17			.09**
Exposure (checklist)	5.21	4.39			.32***
PTSD symptoms	29.21	14.67			.37***

Note. N = 1,356. M = mean; SD =standard deviation; ρ = Spearman's rank correlation coefficient; $Z_{M\text{-}W}$ = Large sample Z approximation to the Mann-Whitney U distribution; HS = high school; PTSD = posttraumatic stress disorder.

[a]Frequencies may not add to total due to missing values.

*$p < .05$,

**$p < .01$,

***$p < .001$.

Table 2

Multiple Linear Regression Analysis Predicting Post Traumatic Growth (PTG) Score

Variable	*B*	*SE*	*t*
Intercept	7.88	2.24	3.52***
Probable Depression, Yes vs. No	−1.90	1.24	−1.53
PTSD Score[a]	2.04	0.34	6.05***
Probable Anxiety, Yes vs. No	−1.29	1.13	−1.14
Race, Non-white vs. white	5.90	0.91	6.49***
Gender, Female vs. Male	1.21	0.81	1.49
Education, ≥ HS vs. < HS	0.02	1.17	0.02
Hispanic Ethnicity, Yes vs. No	3.38	1.17	2.89**
Alcohol Misuse, Yes vs. No	0.11	0.85	0.13
Smoking, Yes vs. No	3.18	0.97	3.28**
History of Mental Illness, Yes vs. No	−0.35	1.02	−0.34
Currently in Treatment, Yes vs. No	−1.19	1.19	−1.00
Recreational Drug Use, Yes vs. No	−1.30	1.06	−1.22
Age, years	0.00	0.03	0.09
Elapse time (months) since Sandy	0.05	0.04	1.26
Exposure (checklist)	0.70	0.10	7.11***
R^2	.17		

Note. N=1,226. SE = standard error; PTSD = posttraumatic stress disorder; HS = high school. Probable depression ≥ 3 and probable anxiety ≥3 on PHQ-4 Questionnaire. PTSD symptom score summed from PCL-S Questionnaire.

[a]PTSD *B* expressed in units of 10.

*$p < .05$,

**$p < .01$,

***$p < .001$.

Table 3

Post Hoc Multiple Linear Regression Analysis Predicting Post Traumatic Growth (PTG) Score

Variable	*B*	*SE*	*t*
Intercept	5.20	2.33	2.23*
Probable Depression, Yes vs. No	6.52	2.52	2.58**
PTSD Score[a]	3.24	0.46	7.05***
PTSD Score *Probable Depression	−2.22	0.58	−3.82***
Probable Anxiety, Yes vs. No	−1.55	1.13	−1.38
Race, Non-white vs. white	5.74	0.91	6.34***
Gender, Female vs. Male	1.22	0.81	1.51
Education, ≥ HS vs. < HS	−0.15	1.17	−0.13
Hispanic Ethnicity, Yes vs. No	3.30	1.16	2.84**
Alcohol Misuse, Yes vs. No	0.26	0.85	0.31
Smoking, Yes vs. No	2.97	0.97	3.06**
History of Mental Illness, Yes vs. No	−0.55	1.02	−0.54
Currently in Treatment, Yes vs. No	−1.19	1.19	−1.01
Recreational Drug Use, Yes vs. No	−1.22	1.06	−1.15
Age, years	0.00	0.03	0.14
Elapse time (months) since Sandy	0.05	0.04	1.27
Exposure (checklist)	0.66	0.10	6.64***
R^2	.18		

Note. N=1,226. *SE (B)* = standard error; PTSD = posttraumatic stress disorder; HS = high school. Probable depression >=3 and Probable anxiety >=3 on PHQ-4 Questionnaire. PTSD symptom score summed from PCL-S Questionnaire.

[a]. PTSD *B* expressed in units of 10.

* $p < .05$,

** $p < .01$,

*** $p < .001$.