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Running Head: Expressive Writing in Hispanics

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Abstract

Objective: Although expressive writing (EW) appears efficacious for treating a range of posttraumatic stress (PTS) symptoms including diagnosed PTSD, little is known about its efficacy when offered online and for ethnic/cultural minority populations such as Hispanic individuals. The current study examined the longitudinal effects of two online EW tasks for treating PTS symptoms in a Hispanic student sample. Design: Seventy-one participants who had experienced a traumatic event were randomly assigned to either an emotion-focused (EM) writing group or a fact-focused (FC) writing group and completed online writing sessions for three consecutive days. Participants completed online assessments at 1-week, 1-month, and 3-month follow-ups. The PTSD Checklist–DSM-5 version was used to assess PTS symptoms. Results: Both groups reported statistically significant reductions in severity of PTS symptoms at 1-week follow-up with the EM group demonstrating statistically significantly greater symptom reductions than the FC group. Differential longitudinal effects over the 3-month follow-up periods were found for some PTS domains, with the EM group showing superior improvements relative to the FC group. Conclusion: EW delivered online can be useful for Hispanic individuals with PTS symptoms following traumatic life events. Further, the current findings align with an inhibitory learning model for explaining EW's mechanism of action.

Keywords: expressive writing, posttraumatic stress symptoms, online, Hispanics, emotion

A Longitudinal Investigation of the Efficacy of Online Expressive Writing Interventions for Hispanic Students Exposed to Traumatic Events: Competing Theories of Action

In the decades since the first study of expressive writing (EW) (Pennebaker & Beall, 1986), research has demonstrated the benefits of EW approaches for treating subclinical to clinical levels of posttraumatic stress (PTS) symptoms. The typical EW paradigm requires individuals to write about a traumatic/stressful experience and their emotional reactions to the event for three or more sessions (Pennebaker & Beall, 1986; Sloan, Marx, & Greensberg, 2011; Sloan, Marx, Epstein, & Lexington., 2007). Several meta-analytic and review studies (Frattaroli, 2006; Kuester, Niemeyer, & Knaevelsrud, 2016; Sloan, Sawyer, Lowmaster, Wernick, & Marx, 2015; van Emmerik, Reijntjes, & Kamphuis, 2013) reported largely positive effects of EW approaches for treating various levels of PTS symptoms including PTSD, while a few studies reported no significant symptom reductions in response to EW tasks given within a day (Brown & Heimburg, 2002; Smyth, Hockemyer, & Tullock, 2008) or a lack of superiority of EW to neutral writing when treating students with PTSD (Sloan et al., 2011) or women with a history of childhood sexual abuse (Batten, Follette, Rasmussen Hall, & Palm, 2002).

Although EW appears an important therapeutic technique to treat PTS symptoms and PTSD, its application to ethnic/cultural minority individuals is limited. Frattoroli's (2006) meta-analytic study of EW noted that Hispanic individuals represented only 5% of participants in EW research. The percentage of Hispanic Americans has increased by 43 % within the last decade and accounts for 16 % of the total US population (U.S. Census Bureau, 2011). Further, the prevalence rates of PTSD and severity levels of PTS symptoms among Hispanic adults are similar to or higher than those among non-Hispanic White adults (e.g., Alcántara et al., 2013; Marshall et al., 2009; Pole, et al., 2008; Roberts et al., 2011). EW approaches may be particularly

promising for Hispanic individuals with PTS symptoms, since Hispanics, compared to other racial and ethnic groups, may use expressing negative emotions as a particularly effective coping strategy (Culver, Arena, Antoni, & Carver, 2002; Gloria, Castellanos, Scull, &Villegas, 2009; Vaughn & Roesch, 2003). For example, a positive relationship between venting negative emotions and positive psychological outcomes was found among Mexican American youth, but not African American or Asian American youth (Vaughn & Roesch, 2003). For Latino college students, emotion-focused coping strategies including expressing negative feelings was found as the strongest predictor of psychological well-being (Gloria et al., 2009).

Hispanic individuals are underserved for their mental health issues. Some barriers have been identified, including instrumental barriers (e.g., time, transportation) (Cardmil et al., 2007; Eisenberg, Golberstein, & Gollust, 2007) and attitudinal barriers, such as mental health stigma (Hirai, Vernon, Popan, & Clum, 2015; Shea, Wong, Nguyen, & Gonzalez, 2019). Online administrations of EW handle such barriers by offering flexible accessibility and privacy. Importantly, among the past EW studies, only a limited number of studies have examined online versions of EW instructions for civilian traumatic events. Specifically, a meta-analytic study (Kuester et al., 2016) reported only five EW studies that varied significantly in terms of sample characteristics (e.g., students, patients, women only), target traumatic events (e.g., diverse events, medical conditions only), and designs (e.g., sample sizes, assessment instruments, types of control groups, treatment durations). Although some support was found for the efficacy of online EW protocols when compared to control conditions (Hirai, Skidmore, Dolma, & Clum, 2012; Possemato, Ouimette, & Geller, 2010), the limited number of online EW studies does not permit any conclusions on the efficacy of this approach. It is, thus, imperative to continue examining benefits of online EW approaches particularly for this underserved population.

To date, only one online EW study has targeted Hispanic individuals (Hirai et al., 2012). In this study, Hispanic college students with subclinical levels of PTS symptoms performed writing tasks that focused on facts or emotions for three consecutive days and reported their PTS symptoms at 1-week and 1-month follow-up. Hirai et al. (2012) found PTS symptom reductions in both groups, but the emotion-focused group was superior to the fact-focused group at 1-month follow-up, yielding effect sizes ranging from 0.28 to 0.55 for different target symptoms. These preliminary results demonstrate the potential benefits of EW for Hispanic individuals' PTS symptoms. Given psychology's replicability crisis (Open Science Collaboration, 2015), a replication of these findings is clearly paramount, particularly in an online format and for this cultural group. More importantly, longitudinal ameliorative effects of EW for Hispanic trauma survivors are still an open question.

There is also a need to examine competing theories about the underlying mechanisms of EW approaches for PTS with Hispanics. One potential therapeutic mechanism proposed is that EW promotes modifications in trauma-related information structures. According to emotional processing theory (Foa & Kozak, 1986), first proposed to explain the efficacy of exposure treatments, a fear network with erroneous pathological information (e.g., an overestimate of danger) and/or strong physiological or emotional responses to stimuli associated with a traumatic event (e.g., a fear in response to neutral trauma-related stimuli, such as a car) needs to be activated so that it can be reconstructed. An activation of the fear network was theorized to be observed via emotional arousal of the individual. Subsequent decreases in emotional arousal in response to trauma-related stimuli, habituation, indicates modifications in the pathological fear network. Mechanisms of action for the efficacy of EW tasks draw on such exposure treatment theory, suggesting that the writing tasks lead to network reconstruction. Increased physiological

or self-reported emotional arousal levels and habituation within and over the writing sessions have been reported (e.g., Guestella & Dadds, 2006; Hirai et al., 2012; Sloan et al., 2012; Sloan et al., 2007). Yet, whether such emotional processing explains the mechanism of action of EW remains to be further examined, particularly in ethnic/cultural minority populations.

Learning theories provide a counterpoint to emotional processing theory and suggest that emotional activation may not be essential for the efficacy of EW for treating PTS symptoms. Inhibitory learning has been proposed as a mechanism of action of exposure therapy (Craske et al., 2008) and could be readily applied to EW. Craske et al. (2008) theorize that exposure-based therapy promotes the development of non-threat conditioned stimulus- unconditioned stimulus (CS- US) associations in addition to pre-existing CS-US threat associations. The inhibitory learning model posits that acquisition of the new associations is independent from fear levels experienced during exposure sessions. Based on this theory, emphasizing emotion-focused writing and emotional arousal in the EW paradigm may be less important than writing about the traumatic event in great detail regardless of level of emotional arousal, which may eventually lead to inhibitory learning. Examining effects of non-EM writing likely contribute to testing the inhibitory learning scheme of exposure therapy for PTSD.

The current study is only the second study to examine EW outcomes in a Hispanic sample and included a longer follow-up of 3 months to investigate longitudinal gains of EW for PTS symptoms. If the current study with symptomatic Hispanic college students further supports the efficacy of online EW for PTS symptoms, subsequent online EW studies in Hispanic individuals with PTSD would be justified and if EW use is expanded, could help overcome treatment barriers. This study compared two online writing conditions; one instructed participants to include emotions and feelings about a traumatic experience (emotion-focused:

EM group) and the other instructed them to focus on facts about a traumatic experience (fact-focused: FC group). Treatment outcomes were evaluated at 1-week, 1-month, and 3-month follow-ups. The hypotheses tested were: 1) both the EM and the FC groups would report fewer PTS symptoms at 1-week, 1-month, and 3-month follow-ups than at pre-treatment; 2) the EM group would show larger decreases in PTS symptoms at the three follow-ups than the FC group; and 3) the EM group would report more increased emotion activation levels from pre-writing to post-writing and greater habituation levels across the three writing sessions than the FC; and 4) activation and habituation would mediate group differences in symptom changes.

Method

Participants

Participants were undergraduate students (n =149) who self-reportedly had experienced a traumatic event and had trauma-related symptoms (inclusion criteria posted on the online sign-up system). The participants were recruited from the subject pool of a Psychology department at a state university in Texas. Approximately 88 % of the student body of the university are Hispanic. The sample was fluent in English. Of 149 individuals, 75 were assigned to the EM group and 74 to the FC group. Of those, 99 participants (50 in the EM group and 49 in the FC group) began the first writing session. The remaining 50 individuals never started the first writing session. Of the 50 participants in the EM group, 11 dropped out before the 1-week follow-up, none dropped out before the 1-month follow-up, and 4 dropped out before the 3-month follow-up. Of the 49 in the FC group, 8 dropped out before the 1-week follow-up, 3 dropped out before the 1-month follow-up, and 2 dropped out before the 3- month follow-up. Thus, 35 in the EM group and 36 in the FC group completed the three online writing sessions and three online follow-up assessment sessions. Demographics for completers are shown in Table 1. Seventy participants identified

themselves as Hispanic American with Mexican or partially Mexican (e.g., Mexican and German) descent and one self-identified as Hispanic with El Salvadorian decent.

Measures

The Demographic Information Questionnaire asked participants to report demographic information including age, sex, ethnicity, and ancestral descent.

The Stressful Experiences Checklist (SEC; Hirai, Skidmore, Dolma, & Clum, 2012) presented 11 specific traumatic or stressful events that may occur in one's lifetime. Examples of the items include: physical assault as an adult, sexual assault as an adult, natural disaster (e.g., hurricane, tornado), accident (e.g., automobile), medical procedure or illness, childhood physical abuse, childhood sexual abuse, interpersonal stress (e.g., stalking, emotional abuse, violence in the family), and death of a family member. Events that were not listed could be reported in an open-ended manner. Participants were asked to select one traumatic life event to target through this study and then report the time elapsed since the event happened.

The PTSD Checklist–DSM-5 version (PCL-5; Weathers, Keane, Palmieri, Marx, & Schnurr, 2013) is a 20-item self-report questionnaire that assesses PTSD symptom severity, corresponding to DSM-5 criteria. The PCL-5 produces total PTSD symptom severity scores and four factor scores: intrusion, avoidance, negative cognitions and mood, and arousal and reactivity. The respondent was asked to focus on the traumatic event selected via SEC and rated each item based on a 5-point Likert scale where 0 is "not at all" and 4 is "extremely." It can be used to establish a provisional PTSD diagnosis (Blevins, Weathers, Davis, Witte, & Domino, 2015). A strong reliability estimate for the total scale (alpha = .94) has been reported (Blevins et al., 2015). For the current sample Cronbach's alphas were .91 for the total scale, .78 for the Intrusion subscale, .69 for the Avoidance subscale, .80 for the Negative Cognitions and Mood

subscale, and .79 for the Arousal and Reactivity subscale at baseline.

The Positive and Negative Affect Scales (PANAS: Watson, Clark, & Tellegen, 1988) consists of 10 items assessing negative affect (NA) and 10 items assessing positive affect (PA). Respondents rate the extent to which they experience each emotion at the moment on a 5-point Likert scale ranging from 1 (very slightly or not at all) to 5 (extremely). The current study used NA scores to examine negative affect experienced during the writing tasks. Cronbach's alphas ranged from .84 to .87 for the NA scale (Watson et al., 1988). The alpha coefficient for the present sample was .86 for the NA scale at the pre-writing assessment of the first writing session. The Body Sensation Questionnaire (BSQ; Chambless, Caputo, Bright, & Gallagher, 1984) has 18 items measuring bodily sensations that people often experience when feeling anxious or fearful. Symptoms are rated on a 5-point Likert scale ranging from 1 (not at all) to 5 (extremely). Item 18 is optional and asks individuals to record and rate an "other" sensation, which the current study did not use. The BSQ examined physiological experiences during the writing tasks. Cronbach's alpha was .87 (Chambless et al., 1984). The alpha coefficient for the present sample at the pre-writing assessment of the first writing session was .90.

Writing Task Conditions

The current study employed an EM writing task and a FC writing task that had been tested in a previous online study (Hirai et al., 2012) and were adapted from Pennebaker's original EW instructions (Pennebaker & Beall, 1986). The EM writing task instructed participants to focus their writing on emotions and feelings about a traumatic event as well as facts about the traumatic experience. The FC writing task instructed participants to focus only on facts about their traumatic event. Both EM and FC writing tasks instructed participants to write about the same traumatic or stressful experience in all writing tasks.

Procedure

The study was approved by the institutional review board of the university. The online sign-up system hosted by the psychology department was used to recruit participants. The study descriptions stated that the study would target a traumatic experience and associated symptoms. The study consisted of a laboratory visit and six online sessions (three writing sessions and three follow-up assessments) performed remotely. In the lab session, informed consent was obtained from all participants included in the study, and participants reported trauma history. Participants who reported a traumatic event (the time elapsed since the event was open) and agreed to participate were randomly assigned to either the EM or the FC group and received a copy of the instruction form in which the dates for the six online sessions and a unique participant number were placed. The participant used his/her participant number each time for logging onto the sites. Participants received an email to start the first writing session and subsequently received an email with the site address of the next session on the day the session was scheduled.

The online writing tasks were performed for three consecutive days similar to previous studies (e.g., Hirai et al., 2012; Sloan et al., 2007). In the first session prior to the writing task, participants completed the demographic questionnaire, the SEC, and the PCL-5. Participants completed the PANAS and BSQ before and after the writing exercise. In the second and third sessions, participants completed the PANAS and BSQ before and after the writing exercise. At the 1-week, 1-month, and 3-month follow-up assessments, participants completed the PCL-5 online. Participants received research credit as compensation.

Data Analysis Plan

All analyses were conducted using SPSS version 24. A series of t-tests and Pearson chi-squares were performed to compare symptom scores and demographic characteristics at baseline

between the dropouts and the completers. A series of t-tests and Pearson chi-squares were also performed to compare completers in the EW group and those in the FC group on demographic characteristics at baseline.

For a manipulation check, the Linguistic Inquiry and Word Count (LIWC; Pennebaker, Booth, & Francis, 2007) was used to calculate percentages of total words for the negative emotion and positive emotions categories in each written account, for the three writing sessions, separately. The LIWC is a valid and reliable tool for analyzing written accounts (Pennebaker & King, 1999). In addition, two master level psychology graduate students trained by the first author read each written account independently to identify negated expressions. A series of 2 x 3 (group by time) mixed design ANOVAs for percentages were performed to examine manipulation effects. The EW group was expected to produce more expressions of negative emotions than the FC group.

To examine potential effects of within-session activation and between-session habituation of emotion and physiological experiences through the writings on symptom reductions, which might explain mechanisms of writing effects, correlations were computed between symptom scores and within-session and between-session change scores of the PANAS NA and BSQ. Within-session change scores on these scales were calculated by subtracting pre-writing scores from post-writing scores. A positive change score indicated activation. Between-session change scores were calculated by subtracting post-writing scores for the first writing session from post-writing scores for the third writing session. A negative change score indicated habituation.

To examine effects of the writing tasks on trauma and associated symptoms, a longitudinal multilevel modeling approach was applied. The baseline was treated as a covariate and the changes in the three follow-up assessment points were modeled. The 1-week follow-up

assessment point was coded as 0, the 1-month follow-up assessment point was coded as 1, and the 3-month follow-up assessment point was coded as 3.

First, the unconditional means model (UMM) was tested for each of the PCL-5 subscales, separately, to test within-subject variability in severity of trauma symptoms across the three follow-up assessment points and between-subject variability in average trauma symptom severity across the assessment points. Second, the unconditional linear growth model (UGM) from 1-week follow-up to 3-month follow-up was tested for each PCL-5 subscale. This model tested time effects only, assuming that time would have a linear effect on trauma symptom scores. Finally, the conditional growth model (CGM) was tested to examine effects of the writing tasks, while controlling for baseline symptom severity. Treatment group and baseline scores were entered as Level-2 units. The EM group was coded as 1 and the FC group was coded as 0. Baseline traumatic stress symptom scores were mean-centered so that the intercepts would represent subjects with mean scores of baseline traumatic stress symptom levels. The model was examined for each of the PCL-5 subscales separately.

The level-1 submodel testing time effects was:

$$Y_{ij} = \pi_{0i} + \pi_{1i}\,\text{Time}_j + \varepsilon_{ij} \qquad \text{: symptom level score of subject i at time j}$$

The level-2 submodel was:

$$\pi_{0i} = \beta_{00} + \beta_{01}\,\text{Treatment-Group}_i + \beta_{02}\,\text{Centered-Baseline}_i + u_{0i}$$

$$\pi_{1i} = \beta_{10} + \beta_{11}\,\text{Treatment-Group}_i + \beta_{12}\,\text{Centered-Baseline}_i + u_{1i}$$

Results

Completers vs. dropouts

A series of t-tests and chi-square tests revealed no significant differences between completers (*n*=71) and dropouts (*n*=28) for age, gender, or severity of PTS symptoms at baseline.

Manipulation check on group instructions

Results from the manual coding performed by the two graduate coders detected no negated expressions in the written accounts. Thus, no corrections in the percentages of emotion word categories obtained from the LIWC were made. Two 2 x 3 (group by time) mixed design ANOVAs found that effects of time ($F(2, 68)=3.40$, $p<.05$), group ($F(1, 69)=31.65$, $p<.01$), and group by time interaction ($F(2, 68)= 8.85$, $p<.01$) were significant for percentages of negative emotion words. No group, time, or group by time effects were significant for percentages of positive emotion words. The subsequent 2 x 2 (group by time) mixed design ANOVAs for negative emotion words showed significant group effects for the first to the second writing period ($F(1, 69)=12.26$, $p<.01$) and the second to the third writing period ($F(1, 69)=32.37$, $p<.01$). A significant group by time interaction effect from the second to the third writing session was also found ($F(1, 69)=10.50$, $p<.01$). No other group difference was found. These results indicate that participants in the EM group expressed significantly more negative emotions concerning their traumatic experiences than those in the FC group.

Writing group comparisons on baseline variables

As shown in Table 1, no significant group differences in demographic characteristics, types of traumatic life events, and reported time elapsed since the event of full completers were found. Means and standard deviations of the symptom measures for all completers are presented in Table 2. Using Weathers et al.'s (2013) guidelines for interpreting PCL-5 scores, 22 out of the 35 completers in the EM group and 18 out of the 36 completers in the FC group experienced symptoms that were equal to or exceeded the cutoff score of 33 for a provisional PTSD diagnosis at baseline, which showed no significant group difference: $\chi^2(2) = 1.19$, *ns*.

Response to the writing tasks

Three 2 x 2 (group by time) mixed design ANOVAs on the PANAS NA, and the same analyses on the BSQ, were performed for the three writing sessions to examine group differences in emotion and somatic activation levels within each session (from pre to post writing). Time effects were significant for all three sessions (*p's*<.01). Significantly increased negative emotion and somatic symptoms after each of the three writing tasks were found, suggesting activation during the writing tasks. Neither group nor group by time effects were found for any of the writing sessions. To examine group differences in habituation levels (i.e., changes from post-writing scores at the first writing session to post-writing scores at the third writing session, a 2 x 2 (group by time) mixed design ANOVA on the PANAS NA and the same analysis on the BSQ were performed. Significant main effects for time were found for both PANAS NA and BSQ post-writing scores (*p's*<.01). Levels of negative emotions and somatic experiences after writing about a traumatic experience significantly decreased from the first writing session to the third writing session. There was no significant main effect for group or group by time interaction. These results suggest that habituation occurred from the first writing session to the third writing session, regardless of group.

To examine activation effects on traumatic stress symptom reductions, correlations between the four PCL-5 subscale scores at 1-week follow-up, 1-month follow-up, and 3-month follow-up and within-session changes scores of the PANAS NA and BSQ were calculated by group (i.e., 126 correlations per group). Out of the 252 correlations, 22 correlations (8.7%) were significant, suggesting negligible effects of activations on symptom reductions. To examine habituation effects, correlations between the seven subscale scores at the three follow-ups and between-session change scores of the PANAS NA and BSQ were obtained by group (i.e., 42 correlations per group). Out of the 84 correlations, 7 correlations (8.3%) were significant,

suggesting negligible habituation effects on symptom reductions.

Multilevel Linear Growth Model of Posttraumatic Stress Symptom Severity

Results are presented in Table 3. Figure 1 depicts symptom changes over time. Results of the UMM's and those of the UGM's on all symptom scores justified the subsequent CGM's. The fit indices showed the CGM's as the most improved models.

CGM on the PCL-5 Intrusion: The CGM was tested to examine the effects of the two different writing tasks, EM and FC, on variability in intrusion scores, while controlling for the effects of baseline intrusion levels. Two level-2 variables, treatment group and baseline symptom levels, were included in the model. Mean-centered baseline intrusion scores were entered as a covariate. The intercepts (β_{00} and β_{01}) showed significant 1-week effects of both EM and FC writings on intrusion scores, with the EM group producing significantly greater declines than the FC group. The EM group scored on average 2.17 points (β_{01}) lower on the intrusion subscale at 1-week follow-up than the FC group. The difference between the Level-2 intercept variance of the CGM and that of UGM suggests that 51% of the variance in intrusion scores at 1-week follow-up was explained by effects of different writing instructions and baseline intrusion scores. Analyses on the slopes (β_{10} and β_{11}) revealed that the FC group and the EM group showed significant declines in their intrusion scores after 1-week-follow-up: β_{10} = -.61 for the FC group and (-.61)+(-.54) = -1.15 for the EM group. These slopes were not significantly different from each other. When controlling for writing effects, participants with higher intrusion scores at baseline had significantly higher intrusion scores at 1-week follow-up (β_{02}) and dropped their scores significantly more rapidly (β_{12}) than those who had lower baseline intrusion scores.

CGM on the PCL-5 Avoidance: The intercepts (β_{00} and β_{01}) revealed significant short-term (1-week) effects of the two writing tasks on avoidance symptoms, with the EM group

demonstrating significantly greater score reductions (β_{01} = .93 points lower on average) on the avoidance subscale at 1-week follow-up than the FC group. The comparison between the Level-2 intercept variance of the CGM and that of the UGM showed that 34% of the variance in avoidance scores at 1-week follow-up was explained by effects of the different writing tasks and baseline avoidance scores. Analyses on the slopes revealed that both groups maintained their therapeutic gains in avoidance symptoms after 1-week follow-up, but neither group showed significant subsequent declines in avoidance symptoms during the follow-up periods. When controlling for writing effects, participants with higher avoidance scores at baseline had significantly higher avoidance scores at 1-week follow-up (β_{02}), but unlike intrusion scores, rates of avoidance symptom changes after 1-week follow-up were not influenced by baseline avoidance scores, when controlling for writing effects (β_{12}).

CGM on the PCL-5 Negative Cognitions and Mood: The intercepts (β_{00} and β_{01}) revealed that both writing tasks produced significant short-term (1-week) effects on symptoms of negative cognitions and mood, but the EM group showed significantly greater symptom reductions (β_{01} = 2.47 points lower on average) at 1-week follow-up than the FC group. Sixty-one % of the variance of negative cognitions and mood scores at 1-week follow-up was explained by effects of the different writing tasks and baseline negative cognitions and mood scores. Analyses on the slopes revealed that the FC group showed non-significant reductions in symptoms of negative cognitions and mood after 1-week follow-up (β_{10}), whereas the EM group demonstrated significant continuing declines in negative cognitions and mood during the follow-up periods (β_{11}). During the follow-ups, 36% of the variance in the slopes was explained by effects of the different writing tasks and baseline scores. When controlling for writing effects, participants with higher scores of negative cognitions and mood at baseline had significantly

higher scores of negative cognitions and mood at 1-week follow-up (β_{02}) and, similar to intrusion scores, reduced their negative cognitions and mood significantly more rapidly (β_{12}) than those who had lower baseline scores of negative cognitions and mood.

CGM on the PCL-5 Arousal and Reactivity: The intercepts (β_{00} and β_{01}) revealed that both groups produced significant 1-week effects on arousal and reactivity symptoms, but the EM group showed significantly greater symptom reductions (β_{01} = 2.29 points lower on average) at 1-week follow-up than the FC group. Within arousal and reactivity scores, 52% of the variance at 1-week follow-up was explained by effects of the different writing tasks and baseline arousal and reactivity scores. Analyses on the slopes revealed that the FC group showed non-significant reductions in arousal and reactivity symptoms after 1-week follow-up (β_{10}), whereas the EM group produced significant continuing declines in arousal and reactivity symptoms during the follow-up periods (β_{11}). During the follow-ups, 55% of the variance in the slopes was explained by effects of the different writing tasks and baseline scores. When controlling for writing effects, participants with higher arousal and reactivity scores at baseline had significantly higher arousal and reactivity scores at 1-week follow-up (β_{02}) and reduced their scores significantly more rapidly (β_{12}) than those with lower baseline arousal and reactivity scores.

Additional exploratory analyses

PTS symptoms levels and provisional PTSD. The number of individuals with PCL-5 total scores equal to or exceeding the cutoff score of 33 for a provisional PTSD diagnosis per group was compared at each follow-up assessment point. Because this study did not administer a diagnostic interview, these comparisons only report estimated values. Based on PLC-5 scores, at baseline, 22 in the EM group and 18 in the FC group reported PCL-5 total scores equal to or exceeding the cutoff score. The EM group had 8 participants with PCL-5 total scores equal to or

exceeding the cutoff score at 1-week follow-up, 2 at 1-month follow-up and 1 at 3-month follow-up. The FC group had 12 participants with PCL-5 total scores equal to or exceeding the cutoff score at 1-week follow-up, 8 at 1-month follow-up and 9 at 3-month follow-up. No group difference was found for 1-week follow-up ($\chi^2(1) = .96$, *ns*). The EM group had significantly fewer participants with symptom levels for a provisional PTSD diagnosis at 1-month follow-up ($\chi^2(1) = 4.00$, $p<.05$) and 3-month follow up ($\chi^2(1) = 7.19$, $p<.01$) relative to the FC group.

Effects of time elapsed since events. Because 33 out of 71 events (46.5%) had occurred over 1 year before the current treatment started, time elapsed since the event was coded as either 0 (less than 1 year) or 1 (1 or more years) and its effects and interactions with the existing variables were entered in the models. Neither the main effects of time-elapsed nor the interactions with other variables were significant for any of the four outcome domains.

Discussion

The current study examined the efficacy of two online EW interventions, EM and FC, in a Hispanic student sample using a longitudinal design (up to 3-month follow-up). Both EM and FC groups produced 1-week follow-up writing effects, reducing PTS symptoms as well as emotional distress, with significant superiority of the EM group compared to the FC group. Participants in both groups maintained therapeutic gains up to 3 months, with additional superior effects of the EM writing task on continuing recovery in some symptom domains. The greatly declining proportion of individuals with PCL-5 total scores that were equal to or exceeded the cutoff score of 33 for a provisional PTSD diagnosis over time in the EM group demonstrated this writing task's benefits beyond those of the FC task. Overall, the current study, along with one previous study with a Hispanic college sample (Hirai et al., 2012), provides evidence that an EM writing task can be successfully delivered online and is more effective than a FC writing task for

reducing PTS symptoms over an extended follow-up period. In addition, time elapsed since the trauma event did not influence results at any follow-up period, supporting the relative superiority of the EM writing task to the FC writing task for PTS symptoms including chronic PTS symptoms. Given the cultural preference of Hispanics for expressing negative emotions as a coping strategy which is associated with improved psychological well-being (e.g., Gloria et al., 2009; Vaughn & Roesch, 2003), writing exercises, particularly those promoting expressing emotions, may be favorable for this cultural group.

In regard to longitudinal outcomes, one encouraging finding was the stability of benefits reported by participants in both groups up to 3 months following the writing sessions. Neither writing group reported significant symptom relapse over the 3-month follow-up period. Different outcome patterns between the two groups were found for some symptom domains. For example, only the EM group demonstrated continuing reductions in levels of negative cognitions and those of arousal during the extended follow-up period. Both groups continued to report decreasing intrusion scores over 3 months, but after 1-week follow-up no further declines were found for either group in avoidance symptoms. The absence of avoidance symptom declines after 1-week follow-up may be partially attributed to the low reliability of the Avoidance subscale. This subscale consists of only two items and their broadly addressed symptom descriptions may have failed to capture changes in levels of a wide variety of avoidance symptoms. Although the mechanisms for these differential longitudinal effects need to be explored, the current results suggest that expressing trauma-associated emotions in an online writing format might have long-lasting powerful influences on specific PTS domains.

Contrary to the predictions of emotional processing theory, the current study found no evidence for emotion and somatic activation and habituation effects as potential therapeutic

mechanisms of EW. There was no group difference in levels of activation and habituation across the writing sessions and no relationship between outcome scores and either activation or habituation levels across the groups. The absence of these relationships was consistent with the previous study of a Hispanic sample (Hirai et al., 2012) and did not support activation and habituation effects as change mechanisms. These findings are contrary to previous findings reporting associations between emotion responses assessed via self-report and physiological measures and symptom reductions among predominantly non-Hispanic White Americans (e.g., Sloan et al., 2007; Sloan et al., 2012). Several differences across studies, such as sample characteristics, writing delivery methods (e.g., paper-pencil vs. online), symptom measures, and arousal and habituation measures, may explain these differences. The therapeutic mechanisms of EW among Hispanic individuals may differ from those of non-Hispanic individuals, further underscoring the importance of EW research with Hispanic populations. It should be noted that potential pretest sensitization in the current study would make comparisons between the current results and results from studies without a pre-writing arousal measure somewhat problematic.

The current findings that the FC group also produced significant therapeutic effects align with an inhibitory learning model (Craske et al., 2008). Both EM and FC writing tasks can be considered exposure-based interventions, which promote the development of non-threat CS-US associations, while the original CS-US threat associations still exist. According to Craske et al. (2008), acquisition of the new CS-US associations is independent of fear levels experienced during exposure sessions. The writing of both groups likely helped individuals develop new non-threat CS-US associations leading to inhibitory learning. This potential therapeutic mechanism of writing exercises suggests that writing about traumatic experiences, regardless of its content of emotion expression, can yield some therapeutic gains. The FC group was instructed to focus only

on facts of a traumatic event, yet the group also expressed some negative emotions, which suggests possible emotional processing in this group. Improvements of the FC group is encouraging, as writing tasks can be employed with a wide range of trauma victims including those who may be hesitant to express emotions or reject it entirely. Yet some superiority of the EM group exists, suggesting that writing about the event in great detail, including both emotions and facts, may lead to powerful inhibitory learning, compared to the FC approach.

The current sample characteristics might also account for the lack of group differences. Specifically, participants were students who experienced traumatic life experiences consisting of those who had signed up for the study presumably due to their interests in the writing approaches and motivations for research credit. Their interests and attitudes toward the study might have brought the benefits of writing evident in both groups similarly.

The attrition rate at 1-month follow-up was 22%, same as reported in Hirai et al.'s study (2012), and that at 3-month follow-up was 28%. These rates are not necessarily high compared to the attrition rates found in recent online EW studies (e.g., 38% attrition in Stockton, Joseph, & Hunt, 2014) and cognitive behavioral treatment outcome studies (up to 62.5% in a review by Simon, McGillivray, Roberts, Barawi, Lewis, & Bisson, 2019).

It should be noted that the present study has several limitations. The current findings were from a highly educated, interested, English-fluent convenient student sample, consisting of individuals whose levels of PTS symptoms varied from subclinical to clinical levels. These sample characteristics may have influenced therapeutic outcomes, and therefore, the current findings may not be fully generalizable to clinical samples. The absence of diagnostic interviews made it impossible to determine whether participants had PTSD. Yet, 56% (40 out of 71) completers experienced PTS symptoms equal to or exceeding the cutoff score for a provisional

PTSD diagnosis at baseline and the percentage dropped to 14% (10 out of 71) at 3-month follow-up. Importantly, the current results along with previous findings (Hirai et al., 2012) support the assertion that the EW paradigm can be applicable to Hispanic young adults with different types of traumatic life events. Hispanic populations have been underrepresented in research in general and EW studies in particular. The positive outcomes of the current study with highly symptomatic Hispanic college students justify subsequent EW studies in Hispanic individuals with PTSD. In line with the frequent gender imbalance in those who seek out and participate in therapeutic interventions, the sample of the current study included more females than males.

Future research should include larger numbers of male Hispanic participants, particularly in community settings. It will also be important to examine individual difference variables as moderators of EW treatment outcomes. Investigating the influence of variables such as severity and frequency of traumatic events, acculturation, and willingness to disclose emotions would help identify individuals who might particularly benefit from the EW paradigm. In addition, effects of language on EW in bilingual individuals and delivery avenues (e.g., online vs. paper-pencil) will be important areas of future research.

The current study replicated previous findings of the efficacy of the EW paradigm delivered online for treating Hispanic college students with PTS symptoms and added information that therapeutic gains were maintained and extended over a 3-month period of time. The current findings offer theoretical and clinical implications. Though inhibitory learning appeared to be able to explain the current findings, research in further examining theoretical mechanisms of the EW paradigm is warranted. Online delivery of EW interventions can be resource-expanding treatment options for underserved individuals such as minority people who might otherwise not reach psychological interventions for their traumatic stress symptoms.

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Table 1. Characteristics of Participants by Writing Group

Variable		EM group (n = 35)	FC group (n = 36)	Group comparisons
Age *M* (*SD*)		20.0 (2.68)	20.4 (4.31)	$t(69) = 0.49$, *ns*
Sex	Male	2	7	$\chi^2(1) = 3.02$, *ns*
	Female	33	29	
Education	Freshman	14	16	$\chi^2(3) = 3.54$, *ns*
	Sophomore	10	14	
	Junior	6	5	
	Senior	5	1	
Event	Physical assault as an adult	1	2	$\chi^2(8) = 3.93$, *ns*
	Sexual assault as an adult	1	3	
	Childhood physical abuse	2	3	
	Childhood sexual abuse	5	2	
	Accident	4	4	
	Illness/Medical stress	4	4	
	Death/suicide of significant other, family member	10	13	
	Interpersonal stress (e.g., stalked, abusive relationship, abuse due to sexual orientation)	6	4	
	Legal (e.g., family deportation, arrest)	2	1	
Time elapsed	Within 1 month	3	1	$\chi^2(4) = 5.12$, *ns*
	More than 1 month to 3 months	4	10	
	More than 3 months to 6 months	3	2	
	More than 6 months to 1 year	6	9	
	More than 1 year	19	14	

Note: EM = Emotion-focused; FC = Fact-focused.

Table 2. Means and Standard Deviations of Outcome Measures of Completers

		Baseline	1-week	1-month	3-month
Measure	Group	*M (SD)*	*M (SD)*	*M (SD)*	*M (SD)*
PCL-5 Intrusion	EM	10.7 (4.45)	5.7 (4.94)	2.9 (4.16)	1.7 (1.78)
	FC	9.0 (4.57)	7.0 (4.70)	5.1 (4.47)	5.0 (4.44)
PCL-5 Avoidance	EM	5.3 (2.01)	3.0 (2.85)	1.8 (1.88)	1.8 (2.14)
	FC	4.5 (2.21)	3.3 (1.99)	2.9 (2.08)	2.9 (2.19)
PCL-5 Negative Cognitions	EM	13.9 (7.32)	7.4 (6.29)	4.4 (5.25)	4.1 (4.99)
	FC	12.9 (6.62)	8.7 (5.88)	8.1 (6.44)	8.8 (6.02)
PCL-5 Arousal and Reactivity	EM	10.7 (6.35)	6.0 (5.93)	3.0 (4.62)	2.3 (2.99)
	FC	8.5 (5.58)	6.7 (4.83)	6.1 (4.92)	6.5 (4.81)

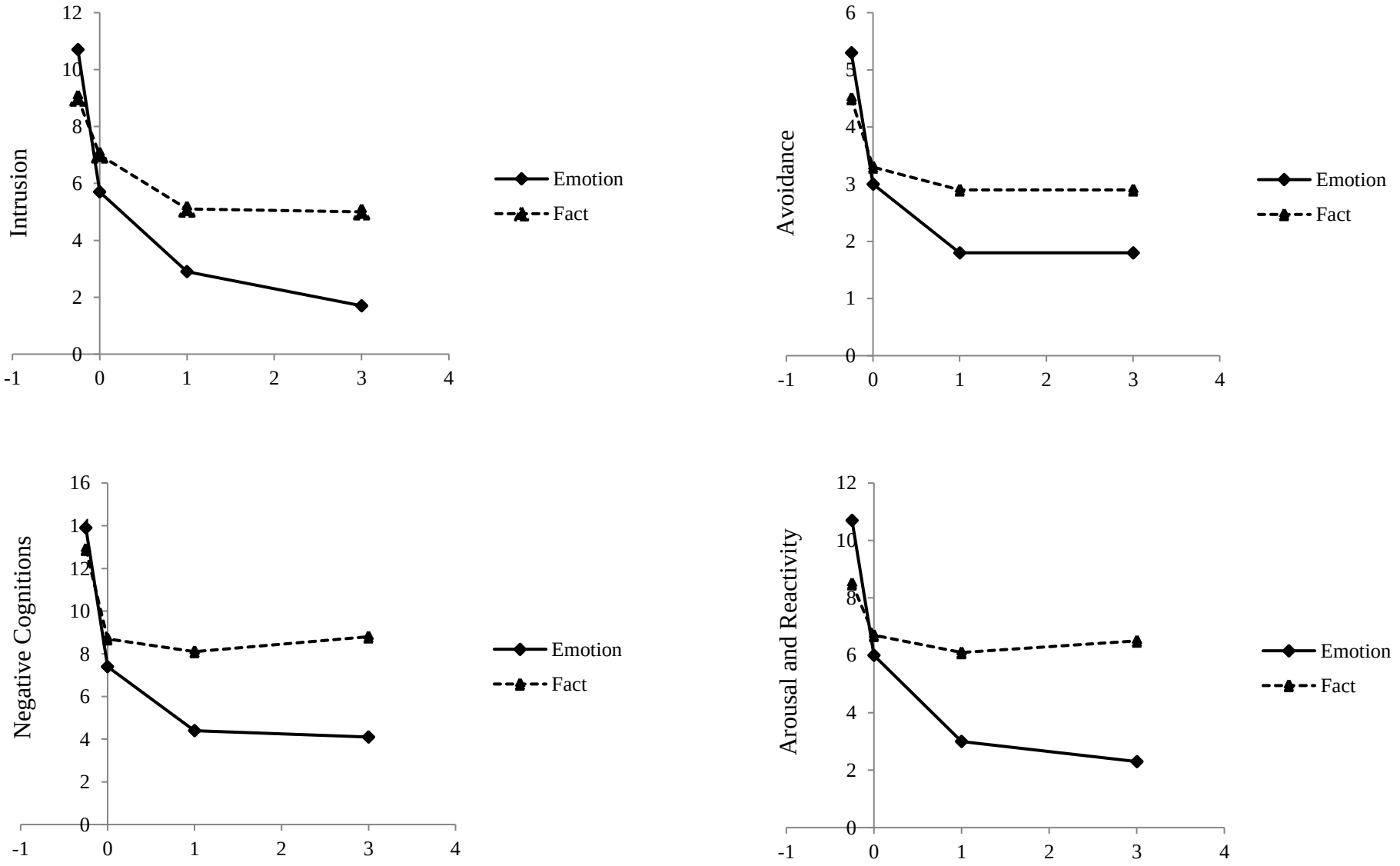
Note: PCL-5= PTSD Checklist – DSM-5 version; EM = Emotion-focused; FC = Fact-focused.

Table 3. Results of the Longitudinal Multilevel Linear Model

		PCL-5 Intrusion			PCL-5 Avoidance			PCL-5 Negative Cognitions			PCL-5 Arousal and Reactivity		
	Parameter	UMM	UGM	CGM	UMM	UGM	CGM	UMM	UGM	CGM	UMM	UGM	CGM
Fixed effects													
Initial status	π_{0i}												
Intercept	β_{00}	4.45** (0.41)	5.54** (0.49)	6.68** (0.55)	2.60** (0.20)	2.86** (0.24)	3.31** (0.30)	6.82** (0.57)	7.24** (0.65)	8.53** (0.68)	5.19** (0.46)	5.85** (0.57)	7.12** (0.64)
Treatment	β_{01}	-	-	-2.17** (0.78)	-	-	-0.93* (0.44)	-	-	-2.47* (0.98)	-	-	-2.29* (0.91)
Baseline	β_{02}	-	-	0.56** (0.09)	-	-	0.41** (0.10)	-	-	0.56** (0.07)	-	-	0.51** (0.08)
Rate of change (slope)	π_{1i}												
Intercept	β_{10}	-	-0.87** (0.17)	-0.61** (0.23)	-	-0.20* (0.09)	-0.11 (0.13)	-	-0.33 (0.24)	-0.16 (0.32)	-	-0.53* (0.21)	-0.14 (0.27)
Treatment	β_{11}	-	-	-0.54 (0.32)	-	-	-0.19 (0.18)	-	-	-1.02* (0.45)	-	-	-0.87* (0.39)
Baseline	β_{12}	-	-	-0.09* (0.04)	-	-	-0.06 (0.04)	-	-	-0.07* (0.03)	-	-	-0.09** (0.03)
Variance Components													
Level-1 residual	σ_ε^2	11.43** (1.33)	8.98** (1.38)	8.07** (1.13)	2.96** (0.34)	2.78** (0.45)	2.78** (0.45)	16.72** (1.94)	13.07** (2.16)	13.05** (2.15)	13.30** (1.54)	10.09** (1.63)	10.14** (1.64)
Level-2 initial status	σ_0^2	9.04** (2.13)	12.61** (3.09)	6.18** (2.00)	2.24** (0.54)	2.47** (0.78)	1.63* (0.66)	19.66** (4.09)	24.36** (5.56)	9.50** (3.36)	11.79** (2.67)	18.36** (4.22)	8.85** (2.82)
Level-2 rate of change	σ_1^2	-	0.20 (0.46)	0.18 (0.41)	-	0.03 (0.26)	-0.009 (0.24)	-	1.46 (0.86)	0.94 (0.32)	-	1.12 (0.64)	0.50 (0.56)
Level-2 covariance	σ_{01}	-	-1.58 (0.97)	-1.06 (0.76)	-	-0.08 (0.14)	0.002 (0.14)	-	-2.23 (1.64)	-0.97 (0.04)	-	-2.90* (1.33)	-1.52 (1.01)
Fit statistics													
Deviance		1296.3	1268.1	1217.9	985.7	980.7	958.1	1406.2	1400.4	1337.6	1337.2	1323.5	1265.4
AIC		1302.3	1280.1	1237.9	991.7	992.7	978.1	1412.2	1412.4	1357.6	1343.2	1335.6	1285.4
BIC		1312.6	1300.7	1272.2	1002.0	1013.3	1012.4	1422.5	1433.0	1391.8	1353.5	1356.1	1319.7

PCL-5= PTSD Checklist – DSM-5 version. UMM = Unconditional Means Model; UGM = Unconditional Growth Model; CGM = Conditional Growth Model; $^{**}p < .01$; $^{*}p < .05$.

Figure 1. Changes in PCL-5 Scores.



Note: The x-axis represents time (months)