



Locating event centrality in associations of emotion regulation with posttraumatic stress disorder symptoms and posttraumatic growth in emerging adults

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ABSTRACT

Previous research suggests that cognitive reappraisal (CR) and expressive suppression (ES) strategies of emotion regulation (ER) are associated with posttraumatic stress disorder (PTSD) and posttraumatic growth (PTG). However, the patterns of these associations may vary in the context of event centrality (EC) however requires investigation to help delineate groups for whom the impact of event centrality may be more salient. We examined whether EC would moderate the associations of CR and ES with PTSD symptoms clusters and PTG domains among 388 emerging adults (18–30 year-olds) of Tiv ethnic group who were survivors of armed attack by Fulani herdsmen and were temporarily sheltered in two internally displaced persons' (IDPs') camps in North-central Nigeria. They completed self-report measures of the variables. Results indicated that EC strengthened the negative associations of CR and the positive associations of ES with avoidance, hyper-arousal and total PTSD symptoms, but not intrusion symptoms. For the PTG domains, EC only strengthened the positive association between CR and personal strength and weakened the association of ES with greater appreciation of life. These findings suggest that primary intervention programs that incorporate training of armed attack survivors in cognitive reappraisal strategy centered on the traumatic event could be effective in controlling PTSD but be less critical in engendering PTG. They also show that the psychological processes that underlie PTSD and PTG are related but involve nuances even within PTSD, and do not seamlessly set into the Janoff-Bulman's "strength through suffering" model of PTG. More research is required to test the model.

1. Introduction

Posttraumatic stress disorder (PTSD) and posttraumatic growth (PTG) are typical posttraumatic reactions (Brewin et al., 2000; Elderton et al., 2017; Helgeson et al., 2006). PTSD is characterized by persistent intrusions or recollections of the traumatic event, avoidance of the event reminders and emotional numbing, hyper-arousal and negative cognitions and emotions associated with the traumatic event (Marshall et al., 2013). PTG, on the other hand, is the emergence of positive behavioral tendencies or transformation within the individual after a traumatic experience (Tedeschi and Calhoun, 1996), but such behavioral tendencies are not part of a typical developmental process (Cook, 2017). The positive change can occur in any or five major domains: greater appreciation of life, greater sense of personal strength, improvements in interpersonal relationships, recognition of new possibilities or paths for

one's life, and enhanced spirituality (Tedeschi and Calhoun, 1996). Some report of PTG may however reflect more of a coping process than verifiable behavioral changes after traumatic experience (Boals et al., 2019; Helgeson et al., 2006; Owenz and Fowers, 2018): time for cognitive processing after the traumatic event (Helgeson et al., 2006; Janoff-Bulman, 2004; Tedeschi and Calhoun, 2004), and the capacity of the traumatic event to challenge the person's assumptive world or core beliefs about one's life story (Berntsen and Rubin, 2006; Boals et al., 2010; Janoff-Bulman, 2004; Tedeschi and Calhoun, 2004) are particularly critical for the emergence of actual PTG.

Although both PTSD and PTG occur after traumatic experiences, it is not clear whether the same or similar psychological processes underlie their emergence. Positive, negative, curvilinear, and null relationships have been reported between PTSD and PTG (Boals et al., 2010; Wang et al., 2020; Ye et al., 2018; Zhou et al., 2016). Correlation coefficients

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reported in a meta-analysis on PTG and adjustment-related variables were small and medium at best (Helgeson et al., 2006). The inconsistency and surprisingly small effect sizes reflect the need to advance current understanding of the relationships among PTSD, PTG, and related psychological variables. Simultaneous investigations of both PTSD and PTG, including comparisons of their determining factors, has been advanced as a unique way to elucidate their relationship (Lee et al., 2020; Wang et al., 2020; Zhou et al., 2016). This direction is our approach in the present study.

The difficulty in clarifying whether PTSD and PTG share the same or related psychological process may derive from the emotional complexity associated with PTSD (McLean and Foa, 2017). Emotion regulation (ER), involving cognitive and emotional processing of the traumatic memory (Gärtner et al., 2019; Gross, 1998; Tull et al., 2018; Zhou et al., 2016), and event centrality (EC), denoting the construal of one's identity in relation to the traumatic event (Berntsen and Rubin, 2006; Lancaster et al., 2013), are important to explain these trauma outcomes (Tedeschi and Calhoun, 2004). The aim of the present study was to examine the direct and interactive roles of emotion regulation and event centrality in PTSD symptoms and PTG.

1.1. Emotion regulation, PTSD and PTG

Emotion regulation involves conscious and unconscious effort to influence the likelihood, intensity, or duration of an emotion (Gross, 1998). Among a wide variety of emotion regulation strategies that individuals use to manage distressing emotions (Chesney and Gordon, 2017; Gärtner et al., 2019; Sheppes et al., 2014; Tull et al., 2018), cognitive reappraisal and expressive suppression appear to be mostly of interest to researchers. These strategies are grounded in the process model (Gross, 1998; Gross and John, 2003), which distinguishes between antecedent-focused and response-focused strategies of emotion regulation, and unites features common to different approaches to emotion (Barrett et al., 2007).

Cognitive reappraisal involves changing how a person thinks about an emotion-eliciting stimulus such that a subjective emotional response is altered, for instance, by generating positive thoughts concerning the implications of a traumatic experience (Cann et al., 2010). It is a more deliberate, effortful cognitive process that can help to relieve PTSD symptoms severity or generate growth, and therefore is considered an adaptive coping strategy (Gross and John, 2003; Salsman et al., 2009). Expressive suppression on the other hand modifies the behavioral aspects of emotion response tendency after the emotional experience has begun. It can be a risk factor for PTSD (Gärtner et al., 2019; Seligowski et al., 2015; Tull et al., 2018) while discouraging PTG because it leads to accumulation of unresolved negative emotions, depletion of cognitive resources, and creates a sense of incongruence or discrepancy between inner experience and outer expression (Gross and John, 2003).

Compared to PTSD, research on the link between emotion regulation and PTG is relatively recent, with inconsistent conclusions. For instance, cognitive reappraisal was associated with PTG in some studies (Boals and Schuettler, 2011; Zhou et al., 2016), but not in another (Larsen and Berenbaum, 2015); and expressive suppression positively predicted PTG in a study (Yu et al., 2014), but not in another (Larsen and Berenbaum, 2015; Zhou et al., 2016). In this study, we expect that higher cognitive reappraisal strategy would be associated with lower PTSD symptoms in all clusters, but greater PTG in all domains. We also expect that higher expressive suppression would be associated with greater PTSD symptoms in all clusters, and lower PTG in all domains.

1.2. Event centrality, PTSD, and PTG

Event centrality, or trauma centrality (Berntsen and Rubin, 2006), is the situation of an event forming a central component of one's personal identity, a turning point in the life story and a reference point for everyday inferences. There is substantial evidence showing that event

centrality is one of the strongest predictors of PTSD symptoms severity (Barton et al., 2013; Chukwuorji et al., 2019; George et al., 2016).

Event centrality can also lead the individual to translate cognitions about the event to action to correct or cope with a traumatic experience, thus increasing the likelihood of growth (Hobfoll et al., 2007). Event centrality was positively related to PTG in samples of undergraduate students (Allbaugh et al., 2016; Boals and Schuettler, 2011; Lancaster et al., 2013) and community-dwelling adults (Cook, 2017; Roland et al., 2014) who had experienced at least one significant traumatic event. However, event centrality did not predict PTG among treatment-seeking adults (Barton et al., 2013), and survivors of 2011 Oslo bombing attack (Blix et al., 2013). Some researchers have suggested a curvilinear relationship between event centrality and PTG, with the greatest amount of PTG taking place at the apex of the curve (Zebrack et al., 2015). Studies on the association between event centrality and PTG in persons exposed to armed attacks in sub-Saharan Africa is however rare, hence the need for the present study. Based on available literature, we expect that higher event centrality would be associated with more severe PTSD symptoms in all clusters, and greater PTG in all domains.

1.3. Event centrality, emotion regulation, PTSD and PTG

Brewin (2001) espouses that remission of PTSD symptomatology is achieved by relearning control over the traumatic reactions. Yet, emotion regulation strategies seem to differ in their trauma-related outcome in different contexts (Aldao and Nolen-Hoeksema, 2012; Allbaugh et al., 2016; Clear and Zimmer-Gembeck, 2017; Levy-Gigi et al., 2016; Zhou et al., 2016), suggesting the interplay of intervening variables. Most of the studies did not incorporate both expressive suppression and cognitive reappraisal as espoused in Gross's process model (Gross, 1998; Gross and John, 2003). Even in Zhou et al. (2016), which had both cognitive reappraisal and expressive suppression, the moderator variable was social support, rather than event centrality. In sum, the extents to which the relationships of expressive suppression and cognitive reappraisal with posttraumatic outcomes change, as a function of event centrality, is not yet clear.

Janoff-Bulman (1992, 2004) proposed that the PTG domains of new possibilities and personal strength might be best explained by a "strength through suffering" model, whereas the domains of relating to others, appreciation of life, and spiritual change might be best explained by an "existential re-evaluation" model (a third model identified as "psychological preparedness" indicates a greater psychological capacity built on an adjusted "assumptive world" to withstand future trauma). This proposition has barely been tested.

Except for Lancaster et al. (2013), most researches on event centrality and PTG have focused on global PTG, with little attention to the domains. Our main interest in this study is on the dimensions of PTSD and PTG. Such distinctions are worthy of investigation because they are likely to yield clearer information on the nature of the associations of emotion regulation and event centrality with PTSD and PTG. Based on Brewin's (2001) proposed relearning control over traumatic responses and Janoff-Bulman's (1992, 2004) model, we expect that event centrality would moderate the associations of cognitive reappraisal and expressive suppression with PTSD symptoms and PTG such that higher cognitive reappraisal would be associated with fewer symptoms of PTSD and higher PTG in individuals experiencing high event centrality, but not for those experiencing low event centrality; and higher expressive suppression would be associated with worse symptoms of PTSD and lower PTG in individuals experiencing high event centrality, but not for those experiencing low event centrality.

1.4. Survivor characteristics, type of traumatic event and trauma outcomes

Participants in most of the studies relating PTSD and PTG were university students (Allbaugh et al., 2016; Boals et al., 2010; Lancaster

et al., 2013). Hence, the extent to which their findings relate to minority populations, who might experience different and systemic forms of trauma and different growth trajectories, remains unknown. The present study involved persons who were exposed to extreme human induced trauma. They were internally displaced persons from the Tiv ethnic group in Nigeria who were sacked from their communities and farmlands by intensive random armed attacks from nomadic Fulani herdsmen. The Tiv are resident farmers in the lush vegetation of Benue State, in North-central Nigeria. The nomadic Fulani herdsmen openly pasture their cows and destroy the crops in Tiv farms. They accuse the Tiv of stealing or killing their cattle and use the excuse to spontaneously kill hundreds of the Tiv and destroy their property. Many of them now live in temporary camps made of tents and thatch houses in the more secure and metropolitan Benue State capital, Makurdi. Material and social support available to them are irregular and mainly come from charity organizations and rarely from government agencies. The implementation of the law against open grazing of animals enacted by the Benue State government (Benue Peoples News, 2017) is yet to effectively enable the Tiv IDPs to return to their farms and communities. The attacks on Tiv communities have also persisted and are not only particularly distressing to the Tiv because of the magnitude of the unanticipated violence but also because of displacement from their land. Besides their use of land for farming, land occupies a special cultural significance in Tiv worldview (Chukwuorji et al., 2018).

Although the Tiv IDPs comprised children, adolescents, younger and older adults (Chukwuorji et al., 2016), studying PTSD and PTG among the emerging adults is very crucial because emerging adulthood (18–29-year-olds) has been noted as a highly fluid and critical period when individuals are most prone to exploration of various possible life directions (Arnett, 2000). PTG is more likely to occur during emerging adulthood than in younger or older age (Boyle et al., 2017; Helgeson et al., 2006). The purpose of the current study therefore was to examine if the pattern of associations between emotion regulation strategies and the symptom clusters of PTSD and the domains of PTG is dependent on the extent to which trauma has become a central component of the identity and life story of emergent adults among Tiv IDPs.

2. Method

2.1. Participants and procedure

Data for this study was part of a larger study of mental health outcomes due to internal displacement in Nigeria. Participants in the present study were 388 emerging adults who were accessed from two major temporary Tiv IDPs' camps in Markurdi, North-central Nigeria. Inclusion criteria for participation in this study were an age of 18 to 30 years in order to approximate Arnett's (2000) delineation of emerging adulthood, and the understanding of Tiv language. The requirement for understanding Tiv language was to ensure a uniform cultural exposure among the participants. Official list of registered IDPs in the camps showed that there were 420 eligible emerging adults, but 32 of them declined to participate in the study, mostly citing disinterest. All participants experienced the same episode of violent attacks although their traumatic experiences may differ. The attacks occurred in the preceding six (6) months and led to their displacement. Details of the participants' demographics are shown in Table 1. Approval for the present research was granted by the relevant institutional research ethics board in the University of Nigeria, Nsukka.

All the measures used in the present research were translated from English into Tiv language using the back-translation method and clarifications with native Tiv IDPs assistants. Details of the translation and adaptation have been discussed in previous research (Chukwuorji et al., 2017). The measures were administered to the identified emerging adults in each of the IDP camps by trained Tiv research assistants who explained the nature of the study to the participants, and what they were required to do. All participants voluntarily signed informed consent.

Table 1

Demographic characteristics of participants and mean scores on study variables (N = 388).

Demographic Variable	Description	Statistic
Age_years, <i>M(SD)</i>	Range = 18–30 years	25.74 (4.29)
Gender, <i>n(%)</i>	Male	187 (48.2)
	Female	201 (51.8)
Marital status, <i>n(%)</i>	Married	184 (47.4)
	Never married	177 (45.6)
	Widow	16 (4.1)
	Divorced/Separated	11 (2.8)
Formal education, <i>n(%)</i>	None/Below primary	72 (18.6)
	Primary school	57 (14.7)
	Junior Secondary school	21 (5.4)
	Senior Secondary school	146 (37.6)
Occupation, <i>n(%)</i>	Higher education	92 (23.7)
	Not currently working	143 (36.9)
	Farmer	164 (42.3)
	Public servant	52 (13.4)
	Trader	26 (6.7)
Religion, <i>n(%)</i>	Artisan	3 (0.8)
	Christian	371 (95.6)
	Muslim	11 (2.8)
	African traditional religion	3 (0.8)
Death of close relative in the attack, <i>n (%)</i>	Other religious groups	3 (0.8)
	Yes	159 (41.0)
Number of dead relatives in the attack, <i>M(SD)</i>	No	229 (59.0)
	Range = 0-11	0.64 (1.14)
Event centrality, <i>M(SD)</i>	Range = 8-35	24.92 (5.52)
Cognitive reappraisal, <i>M(SD)</i>	Range = 9-30	21.44 (4.45)
Expressive suppression, <i>M(SD)</i>	Range = 6-20	14.44 (3.16)
PTSD - Intrusion, <i>M(SD)</i>	Range = 1-12	8.60 (2.57)
PTSD - Avoidance, <i>M(SD)</i>	Range = 2-21	13.50 (4.21)
PTSD - Hyper-arousal, <i>M(SD)</i>	Range = 0-15	9.79 (3.48)
PTSD total, <i>M(SD)</i>	Range = 5-48	31.92 (8.12)
PTG - Appreciation of life, <i>M(SD)</i>	Range = 1-15	8.36 (3.10)
PTG - New possibilities, <i>M(SD)</i>	Range = 5-25	17.21 (4.53)
PTG - Personal strength, <i>M(SD)</i>	Range = 1-20	12.45 (4.37)
PTG - Spiritual growth, <i>M(SD)</i>	Range = 0-10	6.94 (2.51)
PTG - Relationship with others, <i>M(SD)</i>	Range = 8-35	23.35 (5.46)
Global PTG, <i>M(SD)</i>	Range = 28-99	68.30 (12.72)

Note: *n* = number; *M* = mean; *SD* = standard deviation; PTSD = posttraumatic stress disorder PTG = posttraumatic growth

They were encouraged to answer the questions honestly. For illiterate participants, research assistants read out the questions verbally and they indicated their responses appropriately. Literate participants received the questionnaire forms for completion at their leisure and returned them to the research assistants within 48 h. Participants who omitted items were requested to complete the omitted items in the presence of a research assistant. Participants were verbally appreciated for completing the survey.

2.2. Measures

2.2.1. Emotion regulation questionnaire (ERQ)

Emotion regulation was measured with the 10-item ERQ (Gross and John, 2003). It measures the habitual use of cognitive reappraisal (6 items, e.g., “When I want to feel more positive emotion, I change the way I’m thinking about the situation”) and expressive suppression (4 items, e.g., “I keep my emotions to myself”) on a 5-point scale ranging from strongly disagree (1) to strongly agree (5), with separate scores for each subscale. The two-factor structure has been confirmed for the Tiv version of the ERQ in a previous study on Tiv IDPs with acceptable Cronbach’s α of .73 and .75 for cognitive reappraisal and expressive suppression, respectively (Chukwuorji et al., 2017). In the current

sample, Cronbach's α of .78 (cognitive reappraisal) and .81 (expressive suppression) were obtained. Scores on cognitive reappraisal subscale can range from 5 to 30, while scores on expressive suppression can range from 4 to 20. Higher scores indicate higher use of the particular strategy.

2.2.2. Centrality of event scale (CES)

The 7-item version of CES (Berntsen and Rubin, 2006) was used to assess event centrality, which is the extent to which the armed attack and forced displacement formed a central component of the emerging adult IDP's personal identity, a turning point in their life story and a reference point for their everyday inferences. Items are rated on a 5-point scale, ranging from 1 (totally disagree) to 5 (totally agree). In this study, the word "crisis" in the original CES was replaced with "violent attack" in order to specify the trauma of interest. A sample item is: "The violent attack has become a turning point in my life." Total score on the CES ranged from 7 to 35, with higher scores indicating higher event centrality. The measure has been found to have high internal consistency and a one-factor structure (Barton et al., 2013; Berntsen and Rubin, 2006) which has also been replicated with the Tiv version of the CES among Tiv IDPs in Nigeria, with Cronbach's α of .86 (Chukwuorji et al., 2017). For the current study, the Cronbach's α was .88.

2.2.3. Harvard trauma questionnaire (HTQ)

We used Part II of HTQ (Mollica et al., 1992) to measure PTSD symptoms. Respondents rated the extent to which each of the 16 symptoms (e.g., "detachment or withdrawal from others," and "sudden emotional outbursts") has bothered them in the last month on a 4-point response scale of "not at all" (0) to "all the time" (3). The summed score provides a score for symptom severity for each of the three symptom clusters of PTSD, namely, intrusion, avoidance, and hyper-arousal. The HTQ has shown high inter-rater reliability ($r = .98$), high one-week test-retest reliability ($r = .89$), and Cronbach's α of .90 (Mollica et al., 1992). Chukwuorji et al. (2017) confirmed the three-factor structure of the Tiv version of the HTQ with good internal consistency among Tiv IDPs: Cronbach's α of .75, .83, and .83 for intrusion, avoidance, and hyper-arousal, respectively. HTQ's ranges of scores are: 0–12 for intrusion, 0–21 for avoidance, 0–15 for hyper-arousal, and 0–48 for total PTSD symptoms. Higher scores indicate higher PTSD symptoms.

2.2.4. Posttraumatic growth inventory (PTGI)

The 21-item PTGI (Tedeschi and Calhoun, 1996) was used to measure psychological growth from trauma. The PTGI has been considered to adequately capture the social, cognitive, emotional, physical, philosophical, and spiritual gains of trauma (Mystakidou et al., 2008). It assesses PTG on five domains: appreciation of life (AL), new possibilities (NP), personal strength (PS), spiritual growth (SG), and relationship with others (RO). Sample items include, "I established a new path for my life," and "I put more effort into my relationships." All the items are scored on a 6-point Likert scale ranging from 0 (not at all) to 5 (very great degree). High internal consistency coefficients have been reported in previous studies for the PTGI subscales and total scale (Tedeschi and Calhoun, 1996). An overall scale α of .81 for global PTG and a range of .65 to .76 for the five domains were observed for the Tiv version of PTGI among Tiv IDPs (Chukwuorji et al., 2016). Scores on items in each subscale of the PTGI are summed to obtain the domain score, while scores on all the domains are summed to obtain the global PTG score. The global PTG score can range from 0 to 105, while the ranges of domain scores are 0–15, 0–25, 0–20, 0–10, and 0–35 for AL, NP, PS, SG, and RO, respectively. Higher scores on a particular domain or global PTG indicate higher PTG.

Demographic information (such as age, level of education, occupation, and the number of close relatives lost in the attacks) were sought from the participants using questionnaire.

2.3. Statistical analyses

Data on the study variables were obtained on interval scale. Pearson's correlations were computed to test relations between the demographic variables and the study variables. Hayes PROCESS macro (version 3.1) for SPSS (Hayes, 2018), which uses a regression-based random sampling bootstrapping, was employed to test the hypotheses. PROCESS is a widely used regression-based path analysis modeling tool for estimating direct effects as well as interactions in moderation models. The advantages of PROCESS over the traditional approaches in tests of moderation hypothesis explains its wide application by mental health researchers in recent times (Su et al., 2020; Wamser-Nanney et al., 2018). Model 1 of PROCESS was used to test our hypotheses. Hayes PROCESS macro simultaneously tests for direct associations and moderation effects while adjusting for multiple tests among the variables. In order to control for Type 1 error arising from running several regression analyses on the same data, we adopted adjusted significance thresholds for PTSD symptoms at $\alpha < .0125$ and PTG at $\alpha < .0083$ using the Bonferroni method. The adjustment of α by the Bonferroni method is calculated by $.05/m$, where m is the comparison time. Our comparison time for PTSD in this study was 4 (3 clusters and total score), whereas it was 6 for PTG (5 domains and total score). Following recommendations (Hayes and Rockwood, 2017), where the moderation effect was significant, we reported the effect size (change in explained variance, ΔR^2) associated with the interaction term.

3. Results

3.1. Preliminary results

Table 1 shows that both men and women were almost equally represented in the sample. The participants were aged 18–30 years (mean age = 25.74 years, standard deviation = 4.29). A majority of them had formal education. They were mostly Christians. The largest occupation group comprised farmers. A large proportion lost a close relative in the attacks.

Zero-order correlations in Table 2 show that age was positively related with hyper-arousal and total PTSD symptoms, but negatively related with most PTG domains. Gender (men coded as 1 and women as 2) was not related with any of the study variables. We reclassified education into two levels of primary (coded as 1) and higher education (coded as 2) based on Nigeria's education system. Education was positively related with higher cognitive reappraisal and negatively related with expressive suppression. Education was also negatively related with all symptoms clusters of PTSD and total PTSD, but was not related to PTG. Number of dead relatives was negatively related to avoidance symptoms. Correlations among event centrality and emotion regulation and among the clusters of PTSD and domains of PTG were low or at best moderate. Total PTSD had low negative correlation with global PTG.

3.2. Event centrality and associations of emotion regulation strategies with PTSD

Tables 3 and 4 show the results of the Process Macro analysis for testing our hypotheses. Table 3 shows that greater use of cognitive reappraisal was associated with lower PTSD symptoms whereas greater use of expressive suppression was associated with higher PTSD symptoms in all the clusters and total PTSD symptoms. When variance due to cognitive reappraisal or expressive suppression was controlled for, greater event centrality was associated with higher PTSD symptoms in all the clusters and total PTSD symptoms. The variance in PTSD symptoms explained by the contributions of both cognitive reappraisal and event centrality were 24% for avoidance ($R^2 = .24$), 22% for hyper-arousal and intrusion, respectively, and 36% for total PTSD. On the other hand, the variance in PTSD symptoms explained by the contributions of both expressive suppression and event centrality were 26%

Table 2
Correlations of participants' variables with event centrality, emotion regulation, PTSD symptoms and PTG.

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1 Age																
2 Gender	-.06															
3 Education	-.07	-.09														
4 Number of relatives killed	-.03	-.08	.06													
5 Event centrality (EC)	.09	.01	-.09	.00												
6 ER Cognitive reappraisal	-.07	-.04	.19**	.06	-.14**											
7 ER Expressive suppression	.03	.00	-.10*	.01	.21***	.05										
8 PTSD Intrusion	.07	-.05	-.17**	.03	.40***	-.29***	.24***									
9 PTSD Avoidance	.09	.05	-.18**	-.09*	.28***	-.41***	.44***	.35***								
10 PTSD Hyper-arousal	.11*	.03	-.26***	-.06	.42***	-.37***	.49***	.38***	.51***							
11 PTSD total	.11*	.03	-.26***	-.06	.42***	-.37***	.49***	.38***	.85***	.82***						
12 PTG Appreciation of life	.00	.03	-.03	.06	.27***	.39***	.15**	.02	-.05	.04	-.01					
13 PTG New possibilities	-.15**	.02	.00	.07	.07	.25***	-.15**	-.07	-.21***	-.13**	-.19**	.49***				
14 PTG Personal strength	-.12*	.01	.05	.01	.23***	.17***	-.28***	.00	-.23**	-.14**	-.19**	.26***	.31***			
15 PTG Spiritual growth	-.10*	-.09	-.02	.04	.01	.25***	.02	-.04	-.10*	-.11*	-.12*	.33***	.36***	.11*		
16 PTG Relationship with others	-.17**	.01	.07	.05	-.02	.43***	.03	-.15**	-.19**	-.12*	-.19**	.17**	.12*	.26***	.16**	
17 Global PTG	-.19***	.00	.04	.07	.16**	.48***	-.10*	-.09	-.26***	-.16**	-.24***	.64***	.70***	.65***	.51***	.63***

Note: * $p < .05$.

** $p < .01$.

*** $p < .001$.

ER = emotion regulation; PTSD = posttraumatic stress disorder symptoms; PTG = posttraumatic growth; Gender: male = 1, female = 2; Education: no formal and primary education = 1, secondary and higher education = 2.

for avoidance, 25% for hyper-arousal, 18% for intrusion, and 35% for total PTSD.

Table 3 also shows that event centrality moderated the associations of both cognitive reappraisal and expressive suppression with PTSD avoidance and hyper-arousal symptoms as well as total PTSD symptoms, but not PTSD intrusion symptoms. Further analysis showed that cognitive reappraisal was consistently more negatively associated with avoidance and hyper-arousal symptoms as well as total PTSD symptoms for those with high event centrality than for those with low event centrality. Obtained simple slopes for event centrality's moderation of the associations of cognitive reappraisal with avoidance and hyper-arousal symptoms follow exactly the pattern for total PTSD (see Fig. 1).

Expressive suppression was consistently more positively associated with avoidance and hyper-arousal symptoms as well as total PTSD symptoms for those with high event centrality than for those with low event centrality. Obtained simple slopes for event centrality's moderation of the associations of expressive suppression with avoidance and hyper-arousal symptoms follow exactly the pattern for total PTSD (see Fig. 2).

3.3. Event centrality and associations of emotion regulation strategies with PTG

Table 4 shows that greater use of cognitive reappraisal was associated with higher growth in all the domains and global PTG. Higher expressive suppression was positively associated with greater appreciation of life, but negatively associated with personal strength. A significant association was not found for expressive suppression and new possibilities, spiritual growth, and relationship with others domains, nor with global PTG. With variance due to cognitive reappraisal or expressive suppression controlled for, higher event centrality was only associated (positively) with greater appreciation of life, increased personal strength, and global PTG, but not new possibilities, spiritual growth, and relationship with others domains. The contributions of cognitive reappraisal and event centrality to the variance in the PTG domains were 27% for appreciation of life ($R^2 = .27$), 19% for relationship with others, 12% for personal strength, 9% for new possibilities, 7% for spiritual growth, and 28% for global PTG scores. The contributions of expressive suppression and event centrality to the variance in the PTG domains were 17% for personal strength, 10% for appreciation of life, 4% for new possibilities, 1% for spiritual growth, 1% for relationship with others, and 5% for global PTG scores.

Event centrality moderated the association between cognitive reappraisal and personal strength domain of PTG, and the association between expressive suppression and greater appreciation of life. There was no moderation effect for the other domains and global PTG. Simple slopes obtained for the interaction of event centrality with cognitive reappraisal on increased personal strength domain of PTG is shown in Fig. 3. Cognitive reappraisal was associated with increased personal strength for those with high event centrality, but not for those with low event centrality. The interaction effect of event centrality with cognitive reappraisal on increased personal strength explained additional 2% of the variance in increased personal strength ($\Delta R^2 = .02$). Simple slopes obtained for interaction of event centrality with expressive suppression on greater appreciation of life domain of PTG is shown in Fig. 4. Expressive suppression was associated with greater appreciation of life for those with low event centrality, but not for those with high event centrality. The interaction effect of event centrality with expressive suppression on greater appreciation of life explained additional 2% of the variance in greater appreciation of life ($\Delta R^2 = .02$).

4. Discussion

The findings confirmed our hypothesis that greater use of cognitive reappraisal would be associated with lower PTSD symptoms in all clusters, but greater PTG in all domains. The findings support previous

Table 3
PROCESS Macro results predicting PTSD symptoms from Event Centrality and Emotion Regulation (cognitive reappraisal and expressive suppression).

Predictor	Intrusion				Avoidance				Hyper-arousal				PTSD total			
	B	t	p	95% CI	B	T	P	95% CI	B	t	p	95% CI	B	t	p	95% CI
<i>Cognitive reappraisal (CR) and Event centrality (EC)</i>																
CR	-.14	-4.58	.000	[-.20, -.08]	-.34	-6.50	.000	[-.44, -.23]	-.25	-6.33	.000	[-.33, -.17]	-.74	-7.87	.000	[-.92, -.55]
EC	.17	7.25	.000	[.13, .22]	.19	5.31	.000	[.12, .26]	.17	5.56	.000	[.11, .23]	.53	8.01	.000	[.40, .66]
CR * EC	-.00	-0.63	.529	[-.02, .01]	-.03	-2.57	.011	[-.05, -.01]	-.02	-2.57	.011	[-.04, -.01]	-.05	-2.80	.005	[-.09, -.02]
<i>Event centrality (EC) and Expressive suppression (ES)</i>																
ES	.13	3.31	.001	[.05, .21]	.50	7.86	.000	[.38, .63]	.38	6.87	.000	[.27, .49]	1.03	8.81	.000	[.80, 1.26]
EC	.17	6.88	.000	[.12, .22]	.14	3.99	.000	[.07, .21]	.13	4.17	.000	[.07, .19]	.44	6.53	.000	[.31, .57]
ES * EC	.00	-0.02	.982	[-.02, .02]	.04	3.13	.002	[.02, .07]	.04	8.47	.002	[.01, .06]	1.46	3.03	.003	[.03, .13]

reports linking cognitive reappraisal with less deleterious trauma outcomes and fostering of PTG (Seligowski et al., 2015). Cognitive reappraisal, as an antecedent process that intervenes to control the full generation of an emotion-laden cognition (Gross and John, 2003), could be a critical part of the strategy through which the individual achieves effective inhibitory control (Brewin, 2001) over intrusion, avoidance, and hyper-arousal PTSD symptoms. It could equally enable the person to observe hitherto unnoticed scenarios as well as inner capacity or resources that sustain the individual to overcome traumatic experience and thus could activate PTG. The probable dual role of cognitive reappraisal in mitigating negative trauma outcomes and as well facilitating positive trauma outcomes may partly explain the negative correlation between PTSD and PTG as shown in Table 2. Previous findings have also shown that PTSD and PTG may be only indirectly related through some cognitive processes, including fear and guilt (Wang et al., 2020), self-blame, and problem solving (Ye et al., 2018).

Our finding that greater expressive suppression was associated with worse PTSD symptoms clusters and total PTSD symptoms, and with lower PTG in personal strength, but positive association with greater appreciation of life, partially supported our hypothesis. Previous findings (Seligowski et al., 2015) had linked greater expressive suppression with PTSD symptoms. Being a response-focused strategy intended to mitigate an already activated emotion process (Gross and John, 2003), expressive suppression is unlikely to enable the person to achieve inhibitory control (Brewin, 2001) over trauma memory. Rather, it can generate negative emotions in the individual over its failure to control trauma memory and incongruence between inner experience and outer presentation (Gross and John, 2003). Our finding that expressive suppression was positively associated with greater appreciation of life was not anticipated.

Our expectation that event centrality would be associated with PTSD symptoms clusters and PTG domains was partially supported. It was associated with worse PTSD symptoms in all clusters and total PTSD symptoms, supporting previous findings linking event centrality with PTSD (Berntsen and Rubin, 2006; George et al., 2016). The magnitude and unpredictability of the violent attacks and uprooting of the Tiv from their farmlands without foreseeable resolution of their IDP status may have intensified the trauma memory in the IDPs.

Event centrality was associated with global PTG, supporting previous findings (Boals and Schuettler, 2011; Lancaster et al., 2013; Roland et al., 2014) linking event centrality with PTG. In spite of the deleterious effect of the trauma memory in some IDPs, it could promote efforts in emerging adults to overcome the challenge and thereby enable them to experience PTG. However, in our study the association of event centrality with PTG was limited to greater appreciation of life and personal strength domains.

Event centrality moderated the associations of cognitive reappraisal and expressive suppression with PTSD avoidance and hyper-arousal symptoms as well as total PTSD symptoms, but not PTSD intrusion symptoms, thus only partially confirming our moderation hypothesis. Intrusion involves automatic and unwanted recall of emotion-laden traumatic situations and thus seems to form a different facet and base upon which avoidance and hyper-arousal symptoms may build (Brewin,

2001). Yet our results in Table 2 show that intrusion is positively related to both avoidance and hyper-arousal. The individual's avoidance or negative reactions in approaching salient trauma-related (environmental and cognitive) cues seem to represent efforts to limit the probability of the occurrence of intrusions. Thus, while avoidance and hyper-arousal would be prone to the individual evaluating the event centrality while applying an emotion regulation strategy, intrusions, due to their automatic occurrence, would not accommodate the evaluation of the memory content before they are fully generated. Cognitive reappraisal may inhibit attention to intrusions, independent of event centrality, and expressive suppression may worsen intrusions due to its ineffectiveness in controlling them irrespective of the event centrality.

Event centrality only moderated the relationship between cognitive reappraisal and increased personal strength domain of PTG, and worsened the relationship between expressive suppression and greater appreciation of life. On why the positive relationship between expressive suppression and greater appreciation of life became negative in the context of event centrality, expressive suppression support appreciation of life under low event centrality but not under high event centrality such as the highly devastating Fulani herdsmen attacks. It has also been shown that violent death of a close relative presents a special challenge to the Tiv based on cultural prescriptions regarding grieving (Chukwuorji et al., 2018). In this study, number of dead relatives was negatively related to avoidance symptoms (Table 2), probably suggesting distress from inability to fulfill familial responsibility of burying their dead relations and achieve foreclosure with their dead relatives (Chukwuorji et al., 2018). Thus, effort at suppressing the trauma memory would generate excessive anxiety rather than supporting greater appreciation of life.

Our findings support the general precepts of models on the critical role of event centrality in the emergence of PTG (Janoff-Bulman, 1992, 2004; Berntsen and Rubin, 2006; Tedeschi and Calhoun, 2004). There are however some detailed propositions of the Janoff-Bulman model which our findings seem not to fit into properly. Janoff-Bulman's (2004) strength through suffering model comprises the PTGI domains of increased personal strength and new possibilities, while the existential reevaluation model comprises greater appreciation of life, relationship with others, and spiritual growth. From the model, a direct link is expected from core beliefs challenge to strength through suffering, implying that increased personal strength and new possibilities are comparably simpler processes that may be explained by event centrality whereas the other domains should involve more complex processes. Our findings could not clearly identify such pattern (Janoff-Bulman, 2004). A study (Lancaster et al., 2013) that seems to have replicated Janoff-Bulman's model show more complex associations of event centrality and posttraumatic cognitions for both increased personal strength and new possibilities rather than for the PTG domains in the existential re-evaluation model. More research is required in order to confirm the proposed relationship in Janoff-Bulman's model.

Generally, the links of emotion regulation and event centrality with PTSD seems to be clearer than the links with PTG. Some of the psychological processes that underlie the manifestation of PTSD and PTG seem to be related but involve varied cognitive systems even within

Table 4
Results of PROCESS Macro predicting PTG domains and total scores from Event Centrality and Emotion Regulation (cognitive reappraisal and expressive suppression).

Predictor	Greater Appreciation of Life			New Possibilities			Increased Personal Strength			Spiritual Growth			Relationship with others			Global PTG		
	B	t	p	B	t	p	B	t	p	B	t	p	B	t	p	B	t	p
Cognitive reappraisal (CR) and Event centrality (EC)																		
CR	.29	8.11	.000	.25	4.22	.000	.18	3.08	.002	.15	5.24	.000	.55	8.29	.000	1.42	10.13	.000
			[.22, .36]			[.14, .37]			[.06, .29]			[.09, .21]			[.42, .68]			[1.14, 1.69]
EC	.18	6.95	.000	.07	1.66	.097	.18	4.42	.000	.02	1.01	.314	.05	1.14	.255	.50	5.05	.000
			[.13, .23]			[.01, .15]			[.10, .26]			[.06]			[.04, .14]			[.31, .70]
CR * EC	.01	1.37	.173	.02	1.46	.145	.03	3.11	.002	-.00	-0.86	.393	-.01	-0.78	.439	.04	1.70	.091
			[.00, .02]			[.01, .04]			[.01, .05]			[.01]			[.03, .01]			[.01, .08]
Expressive suppression (ES) and Event centrality (EC)																		
ES	.78	2.09	.001	-.22	-2.61	.009	-.46	-6.42	.000	.02	0.45	.650	.05	0.47	.641	-.50	-2.20	.028
			[.28, 1.20]			[.09, .05]			[.00, .32]			[.06, .11]			[.15, .24]			[.94, .05]
EC	.14	4.62	.000	.08	1.78	.075	.24	5.70	.000	.00	0.07	.947	-.02	-0.44	.964	.44	3.65	.000
			[.24, .76]			[.01, .18]			[.16, .32]			[.04, .04]			[.31, .29]			[.20, .68]
ES * EC	-.03	-2.31	.005	-.02	-1.34	.180	-.02	-1.33	.185	-.01	-1.11	.266	.01	0.76	.448	-.07	-1.58	.115
			[-.04, -.01]			[.06, .01]			[.05, .01]			[.02, .01]			[.16, .36]			[.15, .02]

PTSD and PTG. They definitely involve more than the variables undertaken in this study. For instance, fear and guilt (Wang et al., 2020), self-blame, problem solving, wishful thinking (Ye et al., 2018), and rumination (Allbaugh et al., 2016; Wang et al., 2020) have been identified as potent variables in manifestation of PTSD and PTG. Berntsen and Rubin's mnemonic model (Berntsen and Rubin, 2006) seems to identify the turning point to the divergent psychological processes that result in opposite outcomes of PTSD and PTG bordering on event centrality: PTSD could be an outcome of scenarios where the traumatic event is interpreted as disruptive (Cann et al., 2010; Janoff-Bulman, 1992), whereas PTG would emerge in scenario where the traumatic event is interpreted as a challenge requiring coping resources (Boals et al., 2019; Owenz and Fowers, 2018) or adjustment of life trajectories. Therefore, it is possible for a person to emerge from PTSD and encounter PTG.

The implications of trauma type and demographic characteristics in trauma outcomes need to be noted. The mean score of the participants on PTSD (31.92) as shown in Table 1 is almost double the minimal endorsement of symptoms on the 17-item HTQ used to measure PTSD symptoms in this study. Interpersonal traumas (such as armed attack) have been linked to stronger emotions that may overwhelm the person and result to PTSD symptoms, compared to non-interpersonal traumas (e.g., illness, natural disaster) which are more likely to generate lower levels of emotions and thereby more likely to facilitate PTG than PTSD symptoms (Wamser-Nanney et al., 2018). The intensity of the armed attacks and the short period for assessment after the armed attack could explain the less clear pattern of results we obtained on PTG compared to PTSD.

Our findings also show that PTSD symptoms seemed worse among older emerging adults, and PTG seemed higher among younger emerging adults (Table 2). Higher education was positively related with higher cognitive reappraisal and negatively related with expressive suppression, implying that those who had higher education are more likely to use cognitive reappraisal and less likely to use expressive suppression. Higher education was negatively related with all PTSD symptoms clusters and total PTSD, but was not related to PTG.

One of the practical implications of our findings is that psychological intervention programs that seek to control PTSD among armed attack survivors similar to the participants in this study may consider training them in cognitive reappraisal skills. Accentuating event centrality in such persons being trained in cognitive reappraisal skills may be beneficial. Those who apply expressive suppression would need to be trained to inhibit it and learn cognitive reappraisal strategy. One way to limit the use of expressive suppression and increase the adoption of cognitive reappraisal could be by providing social support to traumatized populations (Tedeschi and Calhoun, 2004; Ye et al., 2018). With social support, people are more likely to expose their emotions to others and to vent negative feelings, thereby decreasing the probability of expressive suppression (Zhou et al., 2016). Intervention programs also need to note our finding that older persons and the less educated seem to be more vulnerable to PTSD symptomatology. Or does the negative relationship between education and PTSD symptoms indicate that persons with higher education are more likely to dismiss symptoms reported by the less educated? This requires further research.

4.1. Limitations of the study

The cross-sectional design of this study requires caution in interpreting predictive directions among the variables in this study. Future study may consider comparative and longitudinal designs and the use of experience sampling methods not only to overcome this challenge but also to enable the investigation of the suggestion that the process of cognitive processing involved in posttraumatic growth is convoluted and changes in its quality over time (Tedeschi and Calhoun, 2004). The participants were assessed for PTG only six (6) months after the armed attack. Perhaps a clearer result with PTG would have been obtained with

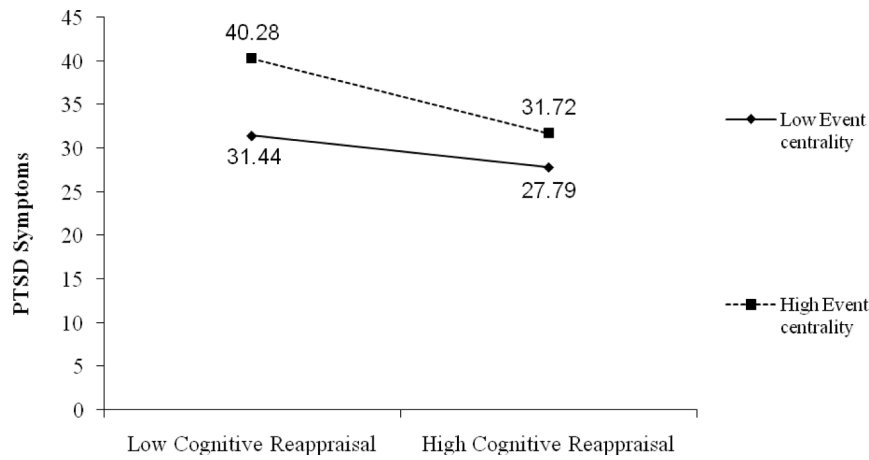


Fig. 1. Slope of moderation effect of event centrality on cognitive reappraisal and total PTSD symptoms.

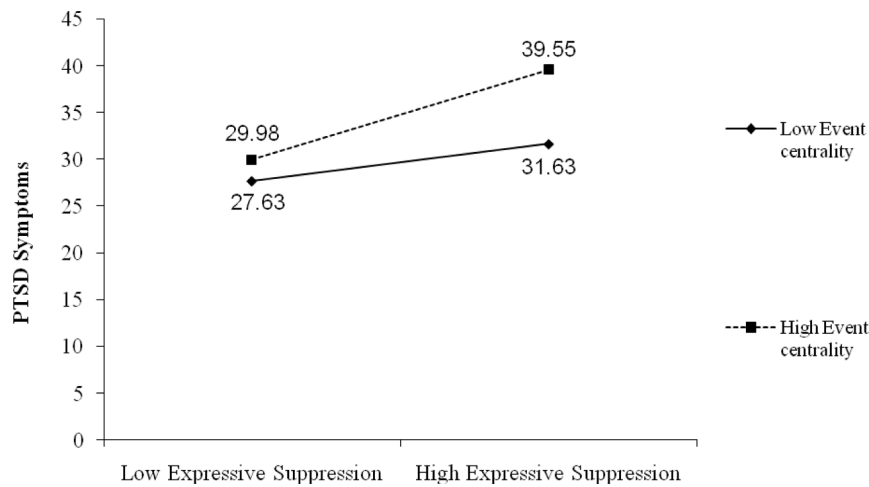


Fig. 2. Slope of moderation effect of event centrality on expressive suppression and total PTSD symptoms.

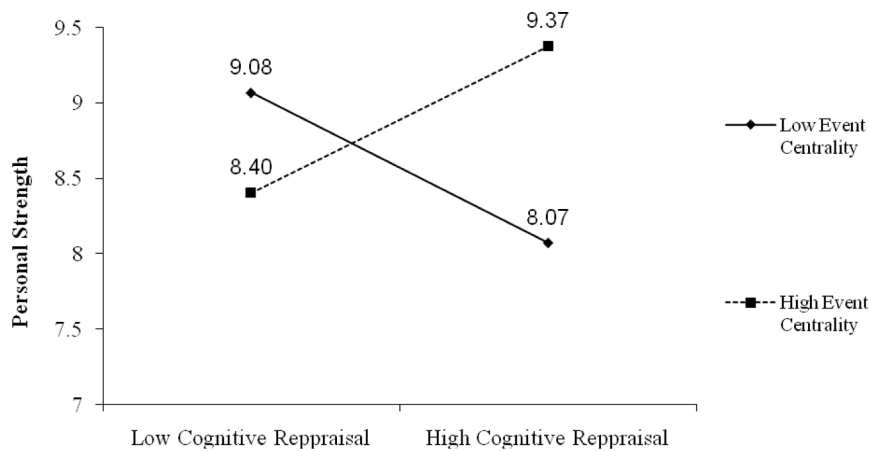


Fig. 3. Slope of moderation effect of event centrality on cognitive reappraisal and personal strength domain of PTG.

longer duration after the attack. Another limitation of the study is that we did not control for cumulative trauma. In addition to the substandard environment in which the measures were administered on the participants and expected response bias observed in self-reports, research assistants helped illiterate participants in completion of the measures, and some literate participants completed the measures in the absence of the research assistants. We note the possible response bias that can arise

from this procedure. Again, our inclusion criterion of understanding of Tiv language for participants may have extremely limited our sample complexity and therefore warrants caution in the generalization of the findings. We also note that Tiv culture relating to attachment to the land from which they were displaced, and inability to perform rituals related to grieving due to their displacement (Chukwuorji et al., 2018), may also have influenced the participants' reaction to trauma. It remains to be

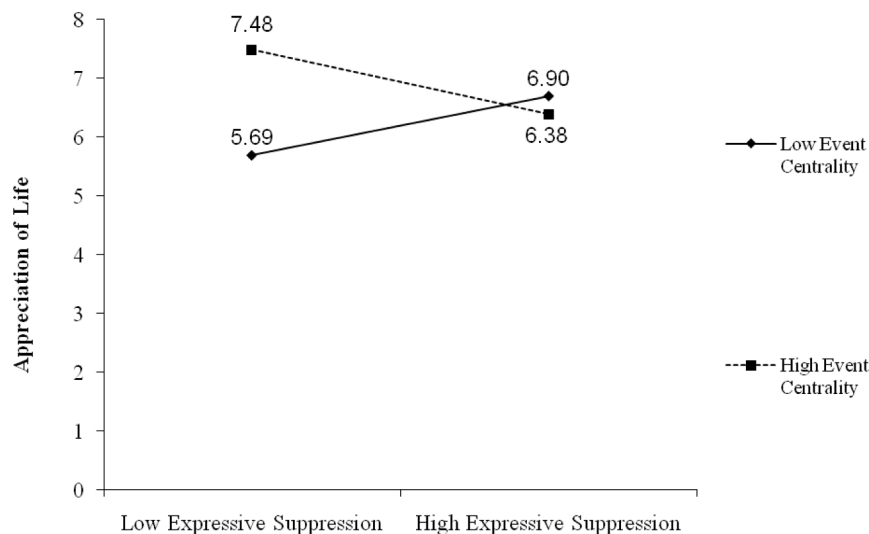


Fig. 4. Slope of moderation effect of event centrality on expressive suppression and appreciation of life domain of PTG.

seen whether the findings of this study will be replicated in other cultures.

4.2. Conclusion

Our study was based on an area where the literature is scanty. It has however demonstrated that PTSD and PTG have different interactively predictive processes. We note that event centrality is critical in the associations of cognitive reappraisal and expressive suppression strategies of emotion regulation with PTSD symptoms in an emerging adult. How event centrality becomes critical in the facilitative or obstructive relationship of cognitive reappraisal and expressive suppression, respectively, with aspects of PTG is however less clear. We therefore suggest that more studies are required in this area. Psychological interventions that train survivors in application of cognitive reappraisal strategy centered on the traumatic event would reduce PTSD symptoms, especially among those with high event centrality. Event centrality may be less critical in engendering PTG through emotion regulation.

Informed consent

All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2000 (5). Informed consent was obtained from all patients for being included in the study.

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Ethical approval

Ethical clearance for the study was granted by the psychology research ethics review committee of the University of Nigeria, Nsukka.

Declaration of Competing Interest

John E. Eze, Chuka Mike Ifeagwazi and JohnBosco Chika Chukwuorji declare that they have no conflict of interest.

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