PROPOSAL TO LOYOLA UNIVERSITY NEW ORLEANS
UNIVERSITY COMMITTEE ON INTERNAL GRANTS
Marquette Faculty Fellowship Proposal

Name: Kate Yurgil, Ph.D.

College/Department: A&S, Psychological Sciences

Rank: Assist. Professor

Title of Project: Growth after trauma: Understanding the neural basis of positive change after life's worst moments

Year of Project: Year 2

Amount Requested: _$5,306_____

Plan for Fellowship Funds

- ❑ Salary Reimbursement/Stipend
- ❑ Project Reimbursement (provide budget justification in narrative)
- ✓ Both (provide budget justification in narrative)

Project Summary (100 words):

Trauma is ubiquitous, yet affects individuals in profoundly personal ways. While some may suffer chronic symptoms, others may experience positive life changes after the event, termed post-traumatic growth (PTG). Identifying neuropsychological markers of PTG is important in our understanding and promotion of resilience, however research in this area is extremely limited. This novel project integrates behavioral and neuroimaging techniques to investigate whether PTG is associated with neural differences in emotional processing that may underlie altruistic behavior. This project would provide a basis for understanding positive outcomes following trauma, thus shifting scientific and public focus from pathology to health and wellness.

Where will the results be published, exhibited or performed?
The results of the proposed study will be shared with the broader research community through publications in peer-reviewed journals (e.g., *Journal of Consulting and Clinical Psychology*; *Journal of Traumatic Stress; Neurobiology of Stress*) and conference presentations (*International Society of Traumatic Stress Studies*, November 2020).

What other sources of funding (internal and external) have you identified for this project?
None as of yet.

List years and amounts of prior Loyola University faculty grants (for the last three years):
None.

Does your research involve human subjects? _X__ Yes _____ No.
If yes, funding for this project is contingent on receiving IRB approval. If you have IRB approval prior to submitting your proposal, please attach the approval memo to your application. If you do not have IRB approval at the time of your submission, please complete the IRB protocol as soon as possible after your proposal submission.
Please see attached approval memo. Note that an amendment will be submitted for continued data collection beyond the end date specified on the memo.

I have submitted the Employee Conflict of Interest Disclosure Form.
Please see attached form.

I have read and understand the University's reimbursement policy.
Yes.

Project Narrative

Background and Significance

Traumatic events are common. Regardless of race, culture, geography, income, or education, most people are likely to experience at least one traumatic event or natural disaster within their lifetime. According to a recent large-scale study in the U.S., 89.7% respondents reported lifetime exposure to at least one trauma event, and of those, 8.3% experience chronic or persistent psychological symptoms that interfere with daily functioning (Kilpatrick et al., 2013). With such high rates of exposure, most clinicians and scientists have focused on understanding and treating pathological responses following traumatic events, such as post-traumatic stress disorder (PTSD).

Yet despite the ubiquity of trauma, PTSD is rare and only one of several possible health trajectories following exposure to trauma or disaster events (Bonnano, Galea, Bucciarelli, & Vlahov, 2007). In fact, of those who experience a traumatic event, the vast majority will recover and experience minimal if any lingering effects of the experience. Recently, there has been a growing interest in understanding and promoting more adaptable health trajectories following trauma, including resilience and post-traumatic growth. Post-traumatic growth (PTG) is characterized by positive life changes that occur as a result of a major life stressor (Tedeschi & Calhoun, 1996). PTG may occur in the absence of any symptoms, or may follow or co-occur with PTSD. In a 2015 study of military veterans, roughly 72% of veterans who screened positive for PTSD exhibited some characteristics of PTG (Tsai, El-Gabalawy, Sledge, Southwick, & Pietrzak, 2015). Furthermore, resilience and PTG have been associated with *improved* overall functioning and healthier lifestyles (Bonnano et al., 2007; Tsai et al., 2015).

Growth after trauma appears to have a lasting impact on health and well-being as well as interpersonal relationships. Studies have shown that experiencing trauma may promote pro-social behaviors like altruism (Staub & Vollhardt, 2008; Yehuda, Kahana, Southwick, & Giller, 1994). However it is unclear whether *all* trauma survivors exhibit this tendency towards altruism, or if PTG increases the likelihood of pro-social behavior. Associations between PTG and altruism may be mediated by brain changes underlying important socio-cognitive functions like emotional processing. The proposed study will examine the neural basis of the relationship between PTG and altruism. We will determine if PTG is associated with neural changes in emotional processing, which in turn, may predict individual differences in altruistic behavior.

Attempts to identify biological or neuropsychological markers of PTG have been extremely limited. There is some evidence that PTG may be associated with neural, endocrine, and/or immune markers that differ from those with chronic stress symptoms (Berg et al., 2017; Hellewell & Cernak, 2018; Highland et al., 2015; Milam, 2006; Rabe, Zöllner, Maercker, & Karl, 2006). However, biomarker selection, methodology, and participant sampling are inconsistent across these few studies. In addition, these studies often conflate PTG with general recovery or asymptomatology, further impeding the ability to identify markers specific to PTG. Thus, there is an ***urgent need*** to identify the neurobiological, social, and environmental correlates PTG, and how PTG may impact other important socio-cognitive behaviors.

Electroencephalography (EEG) is a non-invasive neuroimaging technique which may be used to examine changes in electrical brain activity as a function of PTG. Electrical brain activity may be analyzed as event-related potentials (ERPs) which are sinusoidal waveforms of changes

in electrical activity (or voltage) over time. Because ERP components are time-locked to a specific stimulus or response event, peak amplitudes and latencies may be associated with corresponding sensory and cognitive processes. The proposed study will examine changes in the N170, a negative ERP occurring roughly 170 milliseconds after the detection of a face stimulus (see Figure 1). ERPs like the N170 may be modulated by individual differences and/or task demands, and are thus useful in quantifying group differences in emotional processing related to PTG and altruism.

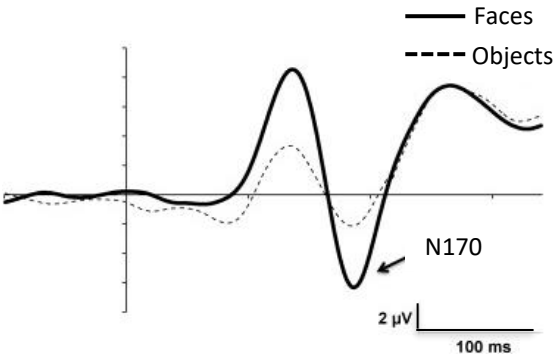

Figure 1. Face stimuli elicit the N170 compared to other visual objects. The recording was taken from an electrode positioned over the occipito-parietal juncture in the right hemisphere (figure adapted from Hinojosa, Mercado, & Carretié, 2015).

Specific Aim

The *goal* of this project is understanding the neuropsychological mechanisms associated with PTG, and how these processes influence positive socio-cognitive behaviors. Recently in our lab, we found that PTG positively correlated with self-reported altruistic behavior, even after controlling for trait empathy and positive coping styles (Yapp, Schexnaildre, & Yurgil, 2017). In a follow-up study currently underway, we use *the novel approach* of integrating self-reported behavior with EEG measures of brain activity to investigate adaptive health trajectories following stress. The *overall objective* is to determine whether PTG is associated with neural differences in emotional processing, and if these differences predict altruistic behavior. Our *central hypothesis* is that PTG is associated with enhanced emotional processing (i.e. greater sensitivity), which in turn, may mediate helping behavior. Thus, the *rationale* for this project is that identifying neuropsychological correlates and outcomes of PTG provides a basis for understanding positive outcomes following trauma, thereby shifting the conversation from pathology to health, resilience, and neuroplasticity.

Method

Experimental Design.

All study activities take place in the Cognitive Neuroscience laboratory within the Department of Psychological Sciences at Loyola University New Orleans. All adults ages 18 and older qualify for participation. After giving informed consent, participants will complete self-report questionnaires regarding demographic, personality, altruism, and trauma exposure factors, as well as a computerized emotional processing task during which EEG brain activity is recorded. Participants will be assigned to one of three groups based on their post-traumatic growth (PTG) score: non trauma-exposed, trauma-exposed, or trauma-exposed with PTG.

A mixed (between and within) subjects experimental design will be used to examine altruistic behavior and event-related potentials associated with emotional face processing in individuals with and without PTG. *Hypothesis 1* will attempt to replicate our previous finding of a positive association between PTG and altruism. *Hypothesis 2* will test whether PTG will be associated with enhanced responses to emotional vs. neutral stimuli compared to (a) trauma exposed controls with no PTG, and (b) trauma unexposed controls. Finally,

Hypothesis 3 will test whether enhanced sensitivity to emotional faces mediates the relationship between PTG and altruism.

Behavioral Measurements

Prior to completing the emotional processing task, participants complete the following self-report questionnaires: a brief demographic survey; the Life Events Checklist for stressful life events (Blake et al., 1995); the Post-Traumatic Growth Inventory (Tedeschi & Calhoun, 1996); the Toronto Empathy Scale (Spreng, McKinnon, Mar, & Levine, 2009); the Response to Stressful Experiences Scale to measure resilient coping styles (Johnson et al., 2008); the Self Report Altruism Scale (Rushton & Chrisjohn, 1981); and the Perceived Stress Scale (Cohen, 1983) to capture daily stress for the last month.

During the emotional processing task (adapted from Choi et al. 2015) participants identify emotional faces presented amid frequent neutral faces. Stimuli were obtained from the NimStim database (Tottenham et al., 2009) and consist of 12 adult faces (6 male, 6 female), ages 20-30 years, and reflect four different ethnicities (Caucasian, African American, Asian, Hispanic/Latinx). Face stimuli elicit a reliable N170 brain response (negative ERP occurring ~170 milliseconds after a face stimulus) and will be compared across participant groups.

EEG Recording and Analysis

EEG is recorded throughout the duration of the face processing task. Participants are fitted for a 32-channel active electrode cap. Electrodes are filled with a non-toxic conductive gel then connected to an EEG amplifier and recording software. EEG recordings will be processed offline and used to generate ERPs for each stimulus type (i.e., facial expression): neutral, happy, sad, angry, fearful. Emotional faces will be averaged together to create a grand average for target emotional faces. Activity from midline and lateral electrodes will be selected for statistical analysis. All EEG hardware and software was purchased from Brain Vision, LLC.

Project Budget Justification

The success of this project is contingent upon the completion of time-intensive data analysis. This fellowship would be used to fund two part-time student research assistants who will be trained in analyzing EEG and behavioral data. The students benefit by learning extremely valuable neuroimaging skills typically not learned until graduate school, and by being named authors on forthcoming presentations and publications. Additional funds are requested for consumable EEG electrode gel needed in ongoing data collection. An itemized description of requested funds is included on page 9.

Dissemination of Findings

The results of the proposed study will be shared with the broader research community through publications in peer-reviewed journals (e.g., *Journal of Consulting and Clinical Psychology*; *Journal of Traumatic Stress; Neurobiology of Stress*) and conference presentations (*International Society of Traumatic Stress Studies*, November 2020).

References

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Timeline

With approval from the Loyola IRB, data collection is ongoing and will be sufficient to begin analyzing by Summer 2020. The summer months offer an ideal block of time to accomplish this task, which is time-intensive and requires research assistants with specialized training in behavioral and EEG data analysis. The completion of data analysis by the end of Summer 2020 is necessary for conference submission deadlines which occur every fall. Our goal is to present these findings at the 36th annual meeting of the *International Society for Traumatic Stress Studies* to be held in November 2020, followed by manuscript submission to a peer-reviewed scientific journal.

A table description and timeline of research activities are shown below.

Time	**Activities**	
ongoing	Data collection	
Week 1	Student training	
Weeks 2-3	Behavioral analysis	Self-report data entry Summary variable computation Response time & accuracy calculations
Weeks 3-6	EEG post-processing	Raw artifact rejection Eyeblink correction EEG segmentation ERP averaging
Week 7	Statistical analysis	Data file preparation Analysis using SPSS
Week 8	Results summary	Writing abstract Preparing conference poster

Itemized Budget

The success of this project is contingent upon the completion of time-intensive data analysis. This fellowship would be used to fund two part-time student research assistants who will be trained in analyzing EEG and behavioral data. The students benefit by learning extremely valuable neuroimaging skills typically not learned until graduate school, and by being named authors on forthcoming presentations and publications. Additional funds are requested for consumable EEG electrode gel needed in ongoing data collection.

An itemized description of requested funds is listed below.

A. Salaries and Wages – Research assistant(s): A total of $3,200 is requested to fund two undergraduate students ($10/hour x 2 students x 20 hours/week x 8 weeks = $3,200). The students will be involved in collection of behavioral and EEG data and its analysis.
B. Salaries and Wages – Other Personnel: N/A
C. Fringe Benefits: N/A
D. Permanent Equipment: N/A
E. Travel: N/A
F. Participant Support Costs: N/A
  1. Stipends: N/A
  2. Travel: N/A
  3. Subsistence: N/A
  4. Other: N/A
G. Other Direct Costs
  1. Materials and Supplies: $250 is requested for consumable EEG electrode gel.
  2. Publication Costs/Documentation/Dissemination: N/A
  3. Consultant Services: N/A
  4. Computer Services: N/A
  5. Subawards: N/A
  6. Other: N/A
H. Total Direct Costs: $__3,450_____
I. Indirect Costs: Indirect costs are calculated at 58% of salaries and wages, as per Loyola's indirect cost rate agreement, dated May 31, 2017.
J. Total Direct and Indirect Costs: $__1,856__
K. Residual funds: None
L. Amount of this Request: $__5,306___