



## Neural responses to one's own name under mortality threat

Xiaoyue Fan, Shihui Han\*

School of Psychological and Cognitive Sciences, PKU-IDG/McGovern Institute for Brain Research, Beijing Key Laboratory of Behavior and Mental Health, Peking University, Beijing 100080, China



### ARTICLE INFO

#### Keywords:

Christian  
ERP  
Mortality threat  
Self  
Arousal

### ABSTRACT

Recent behavioral research has shown evidence for greater inclination to avoid symbolic cues of mortality threats in nonbelievers than Christians. However, the neurocognitive mechanisms underlying religious influences on behavioral tendency to avoid mortality threats remain unknown. We tested the hypothesis of distinct arousal/attention-related brain responses to self-related information under mortality in nonbelievers and Christians. We recorded event-related brain potentials (ERPs) from Christians and nonbelievers while they viewed their own names and a stranger's name (i.e., Zuma) that flashed around a cue word (i.e., *death*, *pain* or *life*) located at the center of a screen. While own name vs. a stranger's name induced faster responses and larger P3 amplitudes, the P3 amplitudes to own name showed distinct patterns of modulations by the cue words in nonbelievers and Christians. Specifically, own name elicited larger P3 amplitudes in the *death* than *pain/life* cue conditions in nonbelievers but not in Christians. Moreover, the differential P3 amplitude to own names in the *death* vs. *life* cue conditions predicted greater inclination to avoid mortality threats in nonbelievers but not in Christians. Our findings provide a neurocognitive account of increased behavioral tendency to avoid mortality threats in nonbelievers than in Christians.

### 1. Introduction

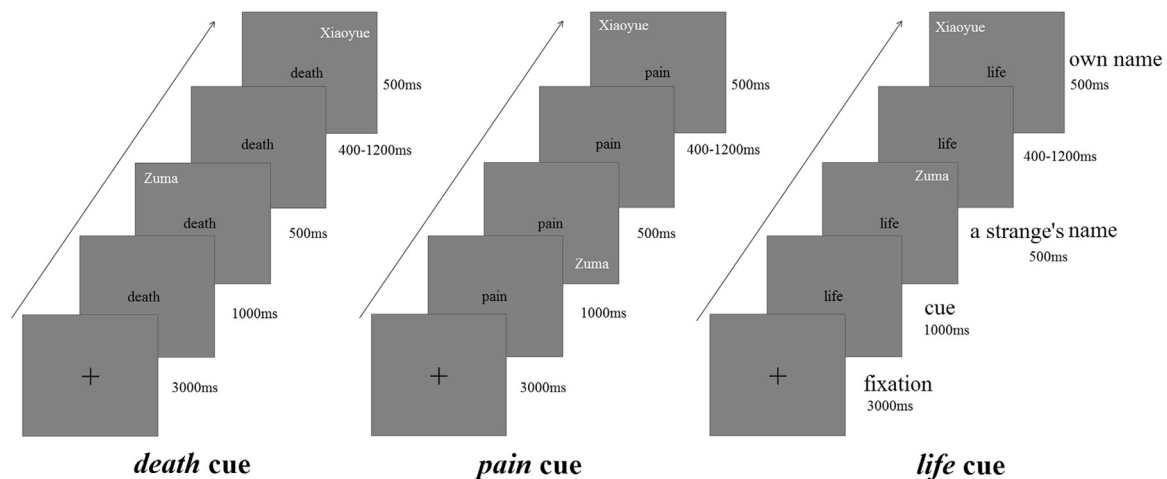
It has been long acknowledged that a major function of religious beliefs is to reduce individuals' fear of death (Grogh-Marnat, 1992). This proposition has been examined empirically by extensive studies of terror management theory (TMT) (Greenberg et al., 1986, 1990; Pyszczynski et al., 1999; Rosenblatt et al., 1989). TMT proposes that our awareness of inevitable death and desire for continued existence produce fear and anxiety, which, however, can be dampened by cultural worldviews and self-esteem. Cultural worldview refers to a large-scale system of beliefs regarding the nature of reality and future, including religious beliefs. A prediction of TMT is that religious believers relative to nonbelievers have a lower level of death fear/anxiety due to their religious beliefs such as a good afterlife.

One line of TMT research revealed evidence for this prediction (see Vail et al., 2010 for review) by showing that affirmation of religious beliefs decreased death-thought accessibility following mortality salience (Jonas and Fischer, 2006) and that challenging individuals' religious beliefs increased their anxiety and death-related thoughts (Greenberg et al., 1995; Schimel et al., 2007). Another line of TMT research based on questionnaire measures, however, has shown inconsistent results (see Ellis and Wahab, 2013 for review). Regarding the relationship between religiosity and death fear/anxiety, there have

been studies that reported negative (e.g., Clements, 1998; Daaleman and Dobbs, 2010; Henrie and Patrick, 2014), positive (e.g., Dezutter et al., 2009; Ellis et al., 2013; Swanson and Byrd, 1998), curvilinear (e.g., Cohen et al., 2005; Wink and Scott, 2005), or no (e.g., Azaiza et al., 2010) associations between religiosity and death fear/anxiety.

While the previous research focused on the relationship between religiosity and death fear/anxiety, we recently investigated the relationship between religious beliefs and inclination to avoid symbolic mortality threats (IASMT) (Fan et al., In preparation). We first developed and validated a word-position (WP) task to estimate IASMT. The WP task required participants to write target words (e.g., self, family, a stranger's name) in a circle with a cue word (e.g., *death*, *life*, or *pain*) located at the center of the circle. The distance between target and cue words was measured as an index of target-related behavioral tendencies to avoid death. We then showed evidence that, relative to nonbelievers, religious believers exhibited decreased IASMT, and the difference in IASMT between nonbelievers and believers including Christians, Muslims, Hindus and Buddhists was evident across samples with ethnic and age diversities from different sociocultural environments. In addition, we found that exposing nonbelievers to religious afterlife beliefs reduced their IASMT, further suggesting a causal relationship between religious afterlife beliefs and decreased IASMT. While the behavioral findings shed new light on the influences of religious afterlife beliefs on

\* Correspondence to: School of Psychological and Cognitive Sciences, Peking University, 52 Haidian Road, Beijing 100080, China.  
E-mail address: [shan@pku.edu.cn](mailto:shan@pku.edu.cn) (S. Han).



**Fig. 1.** Illustration of the stimuli and procedure of EEG recording. The *death/life/pain* cues were used in separate blocks of trials. Own name and Zuma were flashed randomly at one of the four positions and in a random order.

IASMT in adults, the neurocognitive underpinnings of distinct IASMT in religious believers and nonbelievers remain unresolved.

A possible cognitive mechanism underlying the increased IASMT in nonbeliever vs. religious believers is enhanced attention/arousal in responses to self-related information under mortality threat, as self-focused attention and psychological arousal have been proposed to play an important role in avoidance behavior (Clark and Wells, 1995). Individuals under conditions of social threat reported increased self-focused attention and heightened arousal which in turn drive avoidance of external threatening cues (Mansell et al., 2003). It is likely that, relative to religious believers, nonbelievers showed enhanced self-focused attention and arousal when viewing stimuli that remind the self (i.e., self-related information) under mortality threat.

The present study tested this hypothesis by recording electroencephalogram (EEG) in a task to identify one's own name and a stranger's name (i.e., Zuma) that flashed around the *death*, *pain*, or *life* cue at the center of a monitor (Fig. 1). Previous event-related potential (ERP) studies have shown that the amplitude of a parietal positive ERP component with a long peak latency (i.e., P3) is enlarged by highly arousing stimuli (Cuthbert et al., 2000; Olofsson et al., 2008) due to enhanced attention to emotionally salient information (Polich, 2007). In the current work, the P3 amplitude elicited by one's own name in the death cue condition was a key measure for assessing attention/arousal in association with self-related information. Brain activity in the pain cue condition was recorded as a baseline that allowed us to clarify whether and how nonbelievers or Christians were different in brain responses to own name in the death (vs. pain) cue conditions. Such a comparison also allowed us to exclude possible effects of negative but death-unrelated emotion on brain activity in response to own name. In addition, brain activity to Zuma was recorded as a second control condition which allowed us to examine whether any effect of the death (vs. pain) cue on brain activity was specific to own name and to clarify the self-specific death-cue effect on brain activity. Finally, we included a life-cue condition to examine whether the fundamental, genetically based human need and propensity to affiliate with other living organisms, or biophilia (Wilson, 1984) – the other aspect of human desires for survival – also modulates self-specific brain activity.

If our hypothesis is correct, one would expect that one's own name would elicit a larger P3 when flashing around the *death* cue than *pain/life* cues and this effect should be stronger in nonbelievers than in religious believers. We recorded ERPs to own name and the stranger's name flashing around the *death*, *life*, or *pain* cues from two independent subject groups who self identified as nonbelievers and Christians, respectively. After EEG recording all participants were asked to complete the WP task with the *death* cue. We were interested in whether

nonbelievers but not Christians showed enlarged P3 amplitudes in responses to own name in the *death* (vs. *life/pain*) cue conditions and whether the P3 amplitude can predict how far participants positioned the self in relation to the *death* cue in the WP task.

## 2. Methods

### 2.1. Participants

Sixty Chinese undergraduate and graduate students participated in this study as paid volunteers, including 30 self-identified Christians (15 males, 15 females,  $23.30 \pm 2.76$  years) and 30 self-identified nonbelievers (15 males, 15 females,  $22.80 \pm 2.34$  years) who were not affiliated with any religion. Christians and non-religious participants were matched in age and education.

Christian participants were members of local Protestant communities. Their religious attitudes were evaluated using a questionnaire containing 10 religious items derived from Minnesota Multiphasic Personality Inventory (Butcher et al., 1989). All Christian participants reported believing in God and the second coming of Christ. 96.7% reported believing in a life hereafter and 90.0% believing there was only one true religion. 96.7% reported praying several times a week. 80.0% reported going to church every week. 96.7% reported reading the Bible several times a week. 96.7% reported believing Christ performed miracles.

All participants had normal or corrected-to-normal vision and reported no neurological or psychiatric history. Informed consent was obtained prior to the experiment. All participants were debriefed by explaining the purpose of this study after data collection. This study was approved by the local ethics committee at the School of Psychological and Cognitive Sciences, Peking University.

### 2.2. Stimuli and procedure during EEG recording

Stimuli used during EEG recording consisted of 3 cue words (i.e., *death*, *pain* and *life*) and 2 target words (i.e., a participant's own name and Zuma (the president of South Africa)). All words were presented against a gray background on a computer monitor. Each cue word was displayed in black at the center of the screen. Each target word was presented in white on the gray background and randomly displayed at one of the four positions along the diagonal of the monitor with a distance of 6 cm from the center of the monitor (Fig. 1). Each word subtended a visual angle of  $1.90^\circ \times 0.95^\circ$  (width  $\times$  height) at a viewing distance of 120 cm.

EEG was recorded in 12 blocks of 64 trials. Each block started with a

متن کامل مقاله

دریافت فوری ←

**ISI**Articles

مرجع مقالات تخصصی ایران

- ✓ امکان دانلود نسخه تمام متن مقالات انگلیسی
- ✓ امکان دانلود نسخه ترجمه شده مقالات
- ✓ پذیرش سفارش ترجمه تخصصی
- ✓ امکان جستجو در آرشیو جامعی از صدها موضوع و هزاران مقاله
- ✓ امکان دانلود رایگان ۲ صفحه اول هر مقاله
- ✓ امکان پرداخت اینترنتی با کلیه کارت های عضو شتاب
- ✓ دانلود فوری مقاله پس از پرداخت آنلاین
- ✓ پشتیبانی کامل خرید با بهره مندی از سیستم هوشمند رهگیری سفارشات