Religious Scrupulosity: Neurobiological Investigation of Amygdala Activation and Biblical Salience of Cognitions

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Phenomena Under Investigation

Obsessive-compulsive disorder (OCD) is a debilitating psychiatric disorder that is characterized by obsessions and an unrelenting desire to engage in compulsive behaviors (Zhang & Takahashi, 2024). Over the past several decades, research has elucidated potential risk factors associated with the development of OCD (Salkovskis, 1999; Fraire, 2023; Frank & Davidson, 2014; Zhang & Takahashi, 2024). However, the heterogeneity of OCD (Han et al., 2022) renders it a distinctive psychiatric disorder characterized by numerous scientific gaps that require further scientific exploration. This research proposal seeks to address a significant gap in the scientific literature concerning a distinct manifestation of OCD, religious scrupulosity (RS).

Research has identified that highly devout Protestants experience a heightened apprehension regarding sinful cognitions and a superior reverence of God compared to other religiously devoted Christians (Abramowitz et al., 2004; Ayoub, 2024). Nevertheless, this phenomenon has not been scientifically examined among individuals who adhere to a Pentecostal orientation. Additional evidence supporting the deficiency in scientific inquiry is provided by Bucholz et al. (2019), who assert that religious scrupulosity represents a generally underexplored manifestation of OCD. Therefore, this research proposal aims to investigate amygdala activation in individuals from a Pentecostal-oriented background while reading biblical passages that underscore the significance of cognitions.

In the present proposal, the dependent variable is amygdala activation, quantified by regional cerebral blood flow (rCBF) using functional magnetic resonance imaging (fMRI; Phan et al., 2002; Phan et al., 2003; Phan et al., 2004; Heuvel et al., 2004; Rosen & Savoy, 2012;

Linden et al., 2021). The independent variable entails reading Bible verses that emphasize the importance of cognitions while conducting an fMRI. The Bible verses will be read from the *New Living Translation* (1996/2004) and include Matthew 5:28, Romans 8:5, Romans 12:2-3, Philippians 4:8, James 1:8, Colossians 3:2, Psalm 139:1-2, Hebrews 4:12, 1 Peter 1:13, and 2 Corinthians 10:3-5.

Conceptual Framework

Research has identified general teaching of the salience of cognitions as a vulnerability to developing clinical obsessions (Rachman, 1997; Briggs & Price, 2009; Barlow, 2000; Barlow et al., 2014; Sauer-Zavala & Barlow, 2021). In expanding upon the cognitive theory of obsessions, Rachman (1997) discusses a vulnerability associated with the emergence of clinical obsessions. Rachman (1997) asserts that individuals instructed on the significance of value-laden cognitions exhibit a higher propensity to develop clinical obsessions, particularly within religious communities. Rachman (1997) further highlights that those taught to over-value their cognitions strive to align their actions and cognitions to the highest possible virtue. The instructed learning of the salience of cognitions aligns with Barlow's (2000) triple vulnerability theory of emotional disorders. Indeed, Barlow et al. (2014) identify two key vulnerabilities in the proposed triple vulnerability theory of emotional disorders, which correspond with prior research on the overvaluation of cognitions and the misinterpretation of their meaning (Salkovskis, 1985; Salkovskis et al., 2000; Mitchell et al., 2020). Barlow et al. (2014) proposed that the general psychological vulnerability accounts for an initial risk factor. Indeed, the general psychological vulnerability emphasizes the significance of early childhood and adolescent learning experiences, particularly parenting style and perceptions of control (Barlow et al., 2014; Sauer-Zavala & Barlow, 2021). Sauer-Zavala and Barlow (2021) discuss that as a child observes, lives,

and is immersed in an environment that portrays specific parenting dimensions, these parental dimensions contribute to the development of the child's stored learning about their psychological perception, a generalized sense of controllability, and provide a cognitive and behavior framework for how the child should respond to negative affect. Related to parenting dimensions, Kertz et al. (2008) examined maternal anxiety and the transmission of anxiolytic effects to children. The study compared two groups: a maternal non-anxious control group and a maternal anxious group (Kertz et al., 2008). The group of mothers exhibiting anxiety was diagnosed with a primary diagnosis of an anxiety disorder, as defined by the diagnostic and statistical manual of emotional disorders (APA, 1994; Kertz et al., 2008). Kertz et al. (2008) found that the interaction of the maternal anxious group with their children was significantly different, particularly showing less sensitivity in child interactions compared to the maternal non-anxious group. This disparity emerged as a significant predictor in child outcomes and the dyadic relationship between mother and child (Kertz et al., 2008).

In addition, Barlow et al. (2014) emphasize the role of a specific psychological vulnerability contributing to the development of the presentation of emotional disorders. Sauer-Zavala and Barlow (2021) discuss observational learning, behavioral modeling, and instructional learning as contributors to developing an aversive reactivity to what would otherwise be considered a neutral stimulus. An illustration by Sauer-Zavala and Barlow (2021) relates to the teaching about the robustness of religious convictions in overestimating the significance and interpretation of cognitions. Cohen and Rozin (2001) further explored the vulnerability linked to the salience of cognitions, emphasizing that individuals from a Protestant-oriented religious background believe thoughts are morally equivalent to actions. It was observed that the presence of a perceived negative thought enhances the likelihood of its occurrence (Cohen & Rozin,

2001). Their study compared religious groups, Jews and Protestants, which revealed a significant difference between the two in the morality of mentality (Cohen & Rozin, 2001). Indeed, results indicated that Protestant-oriented individuals found consciously entertaining perceived immoral cognitions as bad as engaging in the cognitions when compared to Jewish participants (Cohen & Rozin, 2001). Additionally, Cohen and Rozin (2001) revealed that in a subsequent group of individuals divided between participants practicing Judaism and those identifying as Protestant-oriented, the Protestant-oriented participants believed that having a negative cognition increases the likelihood of occurrence. Cohen and Rozin's (2001) research revealed that religious dogma constitutes a significant factor in the perception of cognitions and likely serves as a contributing element for Protestant-oriented participants who perceive their negatively regarded cognitions to be equivalent in severity to acting upon those cognitions.

In a study conducted by Inbody (2015), the specific psychological vulnerability (Barlow et al., 2014; Sauer-Zavala & Barlow, 2021) can be additionally observed. The study indicated that participants who subscribed to Pentecostalism heavily relied on their cognitive interpretation of emotions and physiological sensations as manifestations of God’s presence, hearing the Holy Spirit, and feeling a greater connection with God (Inbody, 2015). Furthermore, Inbody (2015) discusses the potential mediating role of church leadership training and instruction in enhancing the understanding of interpreting internal stimuli as God’s divine intervention, presence, and guidance. Inbody’s (2015) findings align with earlier research that examines the vulnerability associated with the emergence of clinical obsessions in individuals who misinterpret the significance of internal stimuli (Rachman, 1997). Inclan (2024) further elaborates on the misinterpretation of internal stimuli and religious reinforcement learning of church leadership, discussing the possibility that church leadership may observe behaviors and experiences of

individuals suffering from OCD that appear religious in nature but are erroneously misinterpreted. This misinterpretation could potentially exacerbate, encourage, and reinforce behaviors that, while ostensibly religious, are manifestations of OCD (Huppert & Siev, 2010; Abramowitz & Buchholz, 2020; Inclan, 2024). Pirutinsky et al. (2015) additionally highlights the difficulties in identifying religious-oriented OCD symptoms, explaining that clinicians additionally experience complications when attempting to psychotherapeutically assess and treat religious scrupulosity as it is easily misinterpreted and masquerades as acceptable religious behaviors.

Misinterpreting internal cognitions and reinforcement of OCD religious compulsions is further convoluted by the experience of negative affect. Research has identified that highly devout religious participants experience a heightened level of negative affect regarding cognitions perceived as sinful and hold a superior reverence of God (Abramowitz et al., 2004; Ayoub, 2024). Indeed, research comparing psychometric assessments from three groups (highly religious, moderately religious, and agnostic/atheist groups) identified that highly devout religious participants exhibited more severe obsessional symptoms compared to those who identified as less devoted to their religion or claimed no religious affiliation (Abramowitz et al., 2004). Additionally, the analysis by Abramowitz et al. (2004) found that, compared to nonbelievers, highly devout Protestant participants had the propensity to overemphasize the importance of their cognitions, regard their interpretations of cognitions as significant, and place greater pressure on themselves to control cognitions perceived as leading to potentially catastrophic outcomes.

The experience of intense negative affect related to RS symptoms indicates increased neural activation, specifically regarding the amygdala, as the amygdala has been identified as a

sub-cortical neuroanatomical component of interest regarding OCD (Simon et al., 2010; Simon et al., 2014). Indeed, several studies utilizing functional magnetic resonance imaging (fMRI) have shown an increase in amygdala arousal associated with perceived threat and subjective experience of distress and anxiety (Phan et al., 2002; Heuvel et al., 2004; Gold et al., 2005; Loos et al., 2020). In a study investigating amygdala-frontal connectivity during emotion regulation, researchers identified the amygdala as a neuroanatomical structure involved in expressing emotion while viewing aversive and arousing images (Phan et al., 2002). Further, while investigating the top-down regulation of higher cortical regions on sub-cortical structures when presented with phobic stimuli, researchers identified the amygdala as a focus when assessing levels of amygdala activation during cognitive load strategies (Loos et al., 2020). In addition, while studying the amygdala's role in OCD symptoms, researchers interested in amygdala hyperactivity during symptom elicitation identified increased amygdala engagement when aversive stimuli were presented to the participants diagnosed with OCD (Simon et al., 2014).

Taken together, the extant body of literature indicates several factors that may aid in the development and maintenance of religiously oriented obsessions and possibly the development of religious scrupulosity obsessive-compulsive disorder (RS-OCD). These factors include the tendency to overvalue cognitions (Rachman, 1997; Abramowitz et al., 2004), misinterpretation of internal stimuli (Rachman, 1997; Barlow et al., 2014; Inbody, 2015; Sauer-Zavala & Barlow, 2021), erroneous behavioral and cognitive reinforcement from church leadership (Huppert & Siev, 2010; Abramowitz & Buchholz, 2020; Inclan, 2024), and the amygdala's role in recognizing and assessing the significance of both internal and external stimuli (Heuvel et al., 2004; Gold et al., 2005).

Research Design and Hypothesis

The present research proposal will utilize a correlational research design. This design was chosen for several reasons. First, the group of interest is pre-existing, as participants will originate from a Pentecostal-oriented background, will not be randomly selected, and will not be randomly assigned to different levels of the independent variable. Second, the independent variable, which involves reading Bible verses about the importance of cognitions, lacks multiple levels and will not be manipulated by the researcher. The present research proposal posits that individuals affiliated with Pentecostalism will demonstrate an increase in rCBF within the amygdala while reading Bible verses that emphasize the salience cognitions.

Method

Participants

The population of interest consists of individuals currently attending a Pentecostal-oriented Christian church, aged 18 years or older, and residing in Louisville, Kentucky. The inclusion criterion stipulates that participants must be from an identified Pentecostal-oriented church in Louisville, Kentucky, and at least 18 years old. The strategy for participant acquisition includes identifying Pentecostal-oriented churches via Google Maps. The researcher will use the search string “Pentecostal” in Google Maps, specifying the geographical search location as Louisville, Kentucky. The proposed sampling methodology will be a convenience sampling technique, wherein participants will be from the churches identified through the Google Maps query. The researcher aims to recruit 131 participants for the study, as this number has been determined necessary to achieve a correlation coefficient of 0.7 at a 95% confidence interval with an interval width of 0.2 (0.600, 0.800) and an anticipated non-response rate of 20% (Bujang, 2024). Furthermore, the correlation coefficient 0.7 is widely recognized as a significant

relationship between variables (Jackson, 2016). It remains unclear how many distinct churches will be included in the study, as all 131 participants may be acquired from a single church.

Materials

To assess rCBF in the amygdala, a functional magnetic resonance imaging (fMRI) model 3.0 Tesla Siemens Allegra head-only scanner will be utilized. For reading Bible verses, all Bible verses will be from the *New Living Translation* (1996/2004). The Bible verses will be presented using *Presentation* (Neurobehavioral Systems Inc.) and projected to a mirror fixated to the head coil (Paul et al., 2018). Data imaging will be analyzed using Statistical Parametric Mapping 12 (SPM12).

Procedure

The proposed research design is a correlational study that assesses the relationship between reading Bible verses that emphasize the salience of cognitions and amygdala activation. Regional cerebral blood flow (rCBF) in the amygdala will be evaluated through a two-task experience to evaluate amygdala activation while participants are assessed using fMRI. The first task experience will involve reading a Bible verse emphasizing the salience of cognitions; the second task is a five-second resting state as the participant will passively view a blank projection. Participants can access a keypad to move to the resting-state task when the Bible verse is read. This sequence will repeat (Bible verse, resting-state, Bible verse, resting-state) until all Bible verses have been read. The Bible verses will include Matthew 5:28, Romans 8:5, Romans 12:2-3, Philippians 4:8, James 1:8, Colossians 3:2, Psalm 139:1-2, Hebrews 4:12, 1 Peter 1:13, and 2 Corinthians 10:3-5 and be read from the *New Living Translation* (1996/2004).

Participant Acquisition Procedure

As outlined above, the churches will be identified using Google Maps with the search query “Pentecostal” in the Louisville, Kentucky, area. The researcher will elicit a list of churches that fit the aforementioned search criteria. The researcher will contact the church administration office and provide a synopsis of the proposed study. The churches that express interest in the proposed research will either accommodate the researcher in presenting the findings to their congregation or independently develop a strategy for disseminating the information provided by the researcher to their respective congregations regarding the proposed research. Churches interested in participating in the study will be given a URL to distribute to their church congregation. The URL will be a sign-up form, a description of participant rights, a disclaimer regarding the risk of participating, and a description of the research. The researcher will allow participants to sign up until the desired 131 participant count has been met. Upon reaching the desired 131 participants, the researcher will contact each participant via phone, SMS text, and email to confirm participation in the research and gather informed consent documentation from each participant. The informed consent documentation will summarize the proposed research, including the tasks the participants will complete and the risks associated with participating.

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