Relationship Between Religiosity and Thought Action Fusion: A Behavioral Paradigm

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Abstract

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Research investigating the origin of cognitive biases in OCD has demonstrated, through self-report measures, that higher levels of religiosity are positively correlated with thought action fusion (TAF). The current study examines the relationship between religiosity and TAF using a behavioral paradigm, in which participants are asked to imagine a loved one experiencing a positive or negative event. Seventy-three undergraduates (43 Highly Religious Christians, 30 Atheists/Agnostics) were included. Highly religious Christians were found to believe that thinking about and writing a negative event increased the degree of likelihood, responsibility, and moral wrongness of the event, in relation to Atheists/Agnostics. No religious group differences were found for the positive events. These results suggest that higher degrees of religiosity may act as a vulnerability factor in the misinterpretation of one's thoughts as overly important, significant, or threatening, contributing to the possible development of an obsession. Limitations, future directions, and implications for understanding OCD are discussed.

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ABBREVIATIONS

OC	Obsessive Compulsive
OCD	Obsessive Compulsive Disorder
TAF	Thought Action Fusion
HRC	Highly Religious Christians
AA	Atheist/Agnostics
CES-D	Center for Epidemiological Studies of Depression-Scale
TAFS	Thought Action Fusion Scale
SCRFS	Santa Clara Religious Faith Scale

RELATIONSHIP BETWEEN RELIGIOSITY AND THOUGHT ACTION FUSION: A BEHAVIORAL PARADIGM

Obsessive-compulsive disorder (OCD) involves thoughts, images, impulses, or doubts that are unwanted and anxiety provoking (i.e., obsessions). In order to reduce the anxiety brought about by obsessions, individuals engage in behavioral and mental rituals (i.e., compulsions), which serve to neutralize the intrusive obsessional thought (American Psychiatric Association, 2000). For example, consider someone who experiences unwanted obsessional thoughts of stabbing his or her dog. He or she might neutralize this intrusion by mentally transforming the image of the dog into a pillow, thus reducing the anxiety produced by the thought.

Although OCD is only found to affect approximately 2-3% of adults (Karno, Golding, Sorenson, & Burnam, 1988) research suggests that 80-90% of the population experiences unwanted, negative intrusive thoughts, similar in content to clinical obsessions, on a regular basis (Rachman & DeSilva, 1978). Such everyday "normal obsessions," however, are experienced as less intense, frequent, and distressing, relative to their clinical counterparts (Salkovskis & Harrison, 1984). Identifying the factors that transform everyday intrusions into clinical obsessions is key to understanding the development and maintenance of OCD.

Theoretical models have been proposed to explain the escalation of normal intrusions into clinical obsessions. The most well articulated of these models parallels Beck's (1976) cognitive specificity theory, which asserts that emotions arise from one's

interpretations of stimuli and events. Rachman (1998), for example, proposed that when one perceives an otherwise normally occurring intrusive thought as highly important. (e.g., "If I have a thought it must be important") or dangerous and threatening (e.g., "Thinking this thought means I'm a bad person"), it leads to anxiety and a preoccupation with the unwanted thought—hence the development of an obsession. Due to the increase in anxiety brought about by the obsession, individuals begin to engage in certain behaviors or covert rituals (e.g., neutralizing) aimed at decreasing the likelihood of a feared consequence occurring. Engaging in these behaviors maintains the anxiety associated with the obsessive thought because it prevents the disconfirmation of fear. Thus, rituals and other neutralizing strategies complete a self-perpetuating vicious cycle of obsessions and rituals. This theoretical model proposes a cognitive vulnerability factor for the development of OCD, but it should be noted that it does not fully explain the development of OCD, and thus there are likely additional factors that contribute to the etiology of this condition, such as genetic and biological factors (Alsobrook, Leckman, Goodman, Rasmussen, & Pauls, 1999; Greenberg et al., 2000; Gross, Sasson, Chopra, & Zohar, 1998; Saiz et al., 2008), stress (Abramowitz, Moore, Carmin, Wiegartz, & Purdon, 2001; Horowitz, 1975), and childhood experiences (Cromer, Schmidt, & Murphy, 2007; Khanna, Rajendra, & Channabasavanna, 1988).

The current study will examine a specific cognitive factor—thought-action fusion (TAF)—that has been found to predict OC symptoms both in cross-sectional and longitudinal research (Abramowitz, Storch, Keeley, & Cordell, 2007; Shafran, Thordarson, & Rachman, 1996). TAF involves two biases that are thought to underlie the misperception of unwanted thoughts as highly significant and threatening (Shafran et al.,

1996). The moral TAF bias refers to morally equating thoughts and actions (e.g., a sexual thought involving one's sister is as morally repugnant as actually having sex with one's sister). The likelihood TAF bias refers to the belief that thinking about a particular event increases the likelihood of the corresponding event (e.g., thinking about someone's house burning down increases the likelihood that this will occur; Shafran et al., 1996).

If cognitive biases such as TAF lead to the development of obsessional problems, from where does TAF originate? One hypothesis is that certain religious beliefs, which appear to overlap with TAF, foster the development of this cognitive bias (Abramowitz, Deacon, Woods, & Tolin, 2004). Empirical research that has investigated the relationship between religiosity and TAF provides consistent support for this notion. For example, several studies of individuals from different religious groups (e.g., Protestants, Catholics, Jews) have reported positive correlations between religiosity and TAF (Abramowitz, Huppert, Cohen, Tolin, & Cahill, 2002; Abramowitz et al., 2004; Rassin & Koster, 2003; Sica, Novara, & Sanavio, 2002; Siev & Cohen, 2007). Rassin and Koster (2003) further explored the relationship between Christianity, religiosity, and TAF (morality and likelihood TAF), finding that this relationship was most pronounced among Protestants, when compared to Catholics and Atheists. However, it should be noted that this previous research used measures of religiosity that were not psychometrically validated (e.g., Likert scale ratings of strength of religious affiliation). Additionally, in these studies, TAF was solely assessed using self-report questionnaires.

Collectively, these findings suggest that highly religious individuals, compared to those who are moderately religious and non-religious, are more likely to perceive negative unwanted thoughts as important or threatening. This tendency may be

influenced by certain biblical or religious teachings. For example, in the Sermon on the Mount (Matthew 5:27–28; New American Standard Version), Jesus Christ states: "You have heard that it was said 'you shall not commit adultery'; but I say to you, that everyone who looks on a woman to lust for her has committed adultery already in his heart." In this religious teaching, Christ instructs his followers that an immoral thought is comparable to engaging in the immoral behavior. Children are taught that this is the word of God by parents, teachers and authority figures, in certain religious upbringings, which emphasize the messages' significance. Children may internalize these teachings, thus influencing the way they perceive their thoughts and external stimuli. This has been a hypothesized origin for the morality bias (Abramowitz et al., 2004; Rassin & Koster, 2003).

Religious teachings may similarly influence the likelihood and morality biases regarding positive thoughts (e.g., "Thinking of winning the lottery increases the probability that this will happen"). Although no research has evaluated this particular hypothesis, there is indirect evidence that such a phenomenon is possible. Amir, Freshman, Ramsey, Neary, and Brigidi (2001), for example, found that individuals with OCD exhibit the likelihood bias for positive events (e.g., "Thinking about my husband getting this job makes it more likely to happen"), and previous research indicates that highly religious individuals, compared to those who are moderately religious and non-religious, are more likely to overvalue their ideations and perceive their thoughts as important or powerful (Abramowitz et al., 2002; Kozak & Foa, 1994; Rassin & Koster, 2003). Thus, due to the research suggesting that highly religious Christians have been shown to overvalue ideations and misperceive their thoughts as overly important, it may

be that the moral and likelihood biases of TAF are similarly related to religiosity for the positive thoughts, as they are the negative thoughts. This possible overvaluation of positive thoughts may be influenced by certain biblical teachings as well. For instance, in John 5:14-5:15 (New American Standard Version), it is stated, "We can have confidence that, if we pray according to God's word, He will hear us and grant what we ask." This excerpt reflects the TAF likelihood bias regarding positive thoughts, and even posits a mechanism by which a thought influences an event: by thinking and praying for positive events, God operates to increase the likelihood of the event occurring.

Research has established a relationship between religiosity and TAF for negative thoughts, and suggests that TAF can extend to positive thoughts. Still, important limitations of the previously described studies exist, including their correlational design and exclusive reliance upon self-report measures. No studies have evaluated the relationship between religiosity and TAF using a behavioral analogue paradigm.

Thus, the present study was designed to address this gap in the literature. Specifically, we asked university students to purposely contemplate personal negative and positive thoughts. First, each participant was instructed to think of a close beloved relative. Next, the experimenter asked him or her to complete positive and negative thoughts (e.g., "I hope _____ is in a car accident today") by inserting the name of this person into the sentence. The participant was then instructed to dwell on this thought and report his or her level of anxiety, guilt, likelihood of the corresponding event, control over the actual event, responsibility for the event, morality of thinking this thought, and the urge to neutralize the thought. As described further below, we included four sentences in the current study. The likelihood TAF bias was assessed with one positive ("I hope

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____ receives good news today") and one negative sentence (see car accident sentence above). The moral TAF bias was assessed with one positive ("I hope I can help ___ if they need me") and one negative sentence ("I hope I have sex with ___").

To examine the relationship between religiosity and TAF, two groups of participants were recruited: Highly Religious Christians (HRC) and Atheists/Agnostics (AA). Only Protestants were included in the current study for two reasons. First, the relationship between religiosity and TAF has been found to be most pronounced among this religious group (Rassin & Koster, 2003). Second, Protestantism is the majority religion in the U.S. (United States Census Bureau, 2001) and on our campus.

On the basis of theory and previous research we had the following hypotheses: relative to the AA group, the HRC group would report higher scores on measures of anxiety and perceived likelihood for the car sentence, and higher scores on measures of anxiety and moral wrongness for the incest sentence. We also hypothesized that relative to the AA group, the HRC group would report higher scores on measures of likelihood associated with the positive sentences. We adopted an exploratory approach regarding the relationship between both the negative and positive sentences and the remaining dependent measures, as previous research has not explicitly explored these relationships.

Methods

Participants

Seventy-three participants were included in the current study (43 HRC and 30 AA). Table 1 presents the demographic characteristics for both groups. All participants were drawn from a sub-group of the UNC undergraduate psychology subject pool. The students who were asked to participate in this study had already completed a previous

online web survey, assessing religious affiliation, level of religiosity, general level of distress, and self-reported TAF. Participants were included in the HRC group if they identified as Protestant on a demographic questionnaire and scored ≥ 33 on the Santa Clara Religious Faith Scale (SCRFS), indicating high religiosity (Plante & Boccaccini, 1997). Participants in the AA group were those who identified themselves as Agnostic or Atheist on the demographic survey. Because the SCRFS assesses religious behavior (e.g., praying daily), it is not an appropriate instrument to measure one's level of Atheism or Agnosticism. In exchange for participation, subjects received 1 hour of research credit toward the mandated 5 hours of research participation credit as part of the Introduction to Psychology course.

Measures

      Center for Epidemiological Studies- Depression Scale (CES-D; Radloff, 1977). The CES-D consists of 20 items developed as a global measure to assess psychological distress or well being in general community samples. Participants are asked to rate how often they have felt (or behaved) in certain ways (e.g., "I felt sad"; "My sleep was restless") over the past week from 0 (rarely) to 3 (most of the time). Items are summed (4 are reverse scored) to obtain a total score ranging from 0 to 60. Scores of 16 or greater indicate the possibility of clinical depression. This measure has been shown to possess strong internal consistency in a general (α = .85) and clinical sample (α = .90; Radloff, 1977) and has shown convergent validity through its strong correlation (r = .87) with the Beck Depression Inventory (Beck, Steer, & Garbin, 1988; Santor, Zuroff, Ramsay, Cervantes, & Palacios, 1995), a reliable and valid instrument for assessing depressive symptoms.

Santa Clara Religious Faith Scale (SCRFS; Plante & Boccaccini, 1997). The SCRFS is a 10-item self-report scale, which measures strength of religiosity (e.g., I pray daily). Each item is rated on a 4-point Likert scale (1=strongly disagree, 4=strongly agree). Total scores range from 10-40, with higher scores indicating higher religiosity. Psychometric research demonstrates that scoring at or above 33 indicates high religiosity and scoring at or below 19 indicates low religiosity (Plante & Boccaccini, 1997). This instrument has demonstrated high internal and split-half reliability ($\alpha = .95$ and .92, respectively), as well as adequate convergent validity, as seen through its high positive correlation (*r's* ranged from .64 to .90 across subscales; Plante & Boccaccini, 1997) with another validated measure of religiosity, the Age Universal Religious Orientation Survey (AUROS; Gorsuch & Venable, 1983).

Thought-Action Fusion Scale (TAFS; Shafran et al., 1996). This is a 19-item self-report measure of beliefs about the importance of thoughts. It contains three subscales: *moral* (12 items, e.g., "Having a blasphemous thought is almost as sinful to me as a blasphemous action," $\alpha = 0.90$), *likelihood-other* (four items, e.g. "If I think of a relative/friend losing their job, this increases the risk that they will lose their job," $\alpha = .92$), and *likelihood-self* (three items, e.g. "If I think of myself having an accident, it increases the risk that I will have an accident," $\alpha = .48$). Each item is rated on a scale from 0 (disagree strongly) to 4 (agree strongly). This measure has demonstrated strong internal consistency for all subscales in the normative data (α between .75 and .96; Shafran et al., 1996).

Procedure

Subject pool participants from undergraduate psychology courses at UNC who completed the above measures online and agreed to be contacted for participation in additional studies were first contacted by a research assistant and invited to participate in the present study, which was called "Study on thoughts and feelings" as to protect the purpose and hypotheses. Participants were tested individually in the Anxiety and Stress Disorders Laboratory in Davie Hall by a research assistant who had been trained in the research protocol and observed several times running participants through the study. Once participants arrived for the experiment, the experimenter obtained informed consent. If participants consented, the experimenter initiated the experiment by bringing up a prepared survey on the computer using the Qualtrics software.

As part of this survey, participants were first asked to indicate their current (baseline) level of distress/anxiety from 0 (not at all) to 100 (extremely anxious), by dragging the cursor across a visual analogue scale (VAS) on the screen. If their reported level of anxiety was above 30, the experimenter conducted a brief progressive muscle relaxation procedure shown to reduce state anxiety (Rachman, 1998). Subsequently, participants reported their level of anxiety again. If a participant could not be relaxed to below 30, he/she was dismissed, but still given credit for participating.

Next, participants were asked to think of a close (and beloved) relative, such as a parent or sibling, and write the person's full name on a provided note card. The experimenter then placed the note card next to the computer monitor. Participants were then presented with one of the following sentences that assessed the likelihood and morality biases of TAF:

a) "I hope _____ receives good news today" [positive likelihood]

b) "I hope _____ is in a car accident today" [negative likelihood]

c) "I hope I can help _____ if they need me" [positive morality]

d) "I hope I have sex with _____" [negative morality]

Participants were then instructed to copy the sentence onto another card, inserting their close relative's name into the blank. They were then asked to close their eyes and think about the event occurring. Then, they was asked to rate seven items using the computerized 0-100 VAS scale. The items included:

1. How much anxiety do you feel right now?

2. How much guilt do you feel right now?

3. What is the likelihood of the event occurring in the next 24 hours?

4. How much control do you have over the event occurring?

5. How responsible would you feel if the event did occur in the next 24 hours?

6. a. How morally right was it to write out the sentence? (positive events)

   b. How morally wrong was it to write out the sentence? (negative events)

7. How strong is your urge to reduce or cancel the effects of writing the sentence?

Once this process was complete for the first sentence, it was repeated for each of the remaining three sentences. The order of the negative sentences "b" and "d" were counterbalanced. After completing the procedure for the last sentence, participants were debriefed, thanked, given credit for participation, and dismissed.

<div align="center">Results</div>

Sample Characteristics

Table 1 presents the demographic characteristics (gender, race, and age) for each group (HRC and AA), as well as for the entire sample. No significant differences were found between groups for age, $t(70) = .26$, $p > .05$, gender, $\chi^2 (1) = 3.51$, $p > .05$, or race, $\chi^2 (4) = 6.43$, $p > .05$.

Between Group Differences at Baseline

To examine religious group differences on baseline questionnaire measures, independent sample t-tests were conducted between groups on the CES-D and the TAFS (total score, and the moral, likelihood-other, and likelihood-self subscales). Table 2 presents the range, mean, standard deviation, and significance test for each self-report measure. Results indicated that the CES-D mean score for the HRC group did not differ from that of the AA group. As expected, for the TAFS total score and moral subscale, the HRC group had significantly higher scores than did the AA group. No differences, however, were found on either the likelihood-self or likelihood-other subscale.

To ensure that baseline levels of anxiety did not differ across groups, a t-test was conducted to compare the group's self-reported initial level of anxiety (0-100). No significant differences were found between the HRC ($M = 17.72$, $SD = 18.35$) and the AA group ($M = 13.47$, $SD = 15.79$; $t(71) = -1.05$, $p > .05$).

Manipulation Check: TAFS Scores and Behavioral Measure of TAF

As a manipulation check on the validity of our TAF induction, we conducted bivariate correlation analyses between the TAFS (and its subscales) and the seven dependent outcome measures for each negative sentence (Table 3). We only examined these correlations for the negative sentences because the TAFS only assesses for TAF as it relates to negative thoughts, not positive thoughts. As expected, for the negative

sentence that assessed likelihood TAF (car), a significant positive relationship was found between the TAFS likelihood-other subscale and participant ratings of the perceived likelihood of the car accident. For the negative sentence that assessed moral TAF (incest), a significant positive relationship was found between the TAF-moral subscale and ratings of moral wrongness. Although somewhat weaker than expected, these significant relationships indicate that engaging in the sentence-writing task induced TAF. Therefore, this task may be conceptualized as a laboratory behavioral paradigm to assess TAF.

Group Differences on Negative Sentence Ratings

Table 4 presents descriptive statistics for the HRC and AA groups on each of the seven dependent variables for the negative sentences (car, incest). To examine our first hypothesis, that relative to the AA group, the HRC group would report higher levels of anxiety and likelihood when exposed to the negative likelihood sentence (car) and higher levels of anxiety and moral wrongness when exposed to the negative morality sentence (incest), we conducted univariate ANCOVAs comparing the group means on each dependent variable within each sentence, controlling for scores on the CES-D. We controlled for general distress (CES-D) because of previous research indicating that a unique relationship between depression and the negative interpretation of one's thoughts may exist (Abramowitz et al., 2007).

Car accident. For the car accident sentence, the HRC group rated the likelihood of the event occurring within the next 24 hours higher than did the AA group, $F(2, 70) = 3.14$, $p < .05$. Additionally, the HRC group rated their level of responsibility if an accident does occur as higher than the AA group, $F(2, 70) = 5.52$, $p < .01$. No other

significant differences emerged.

Incest. For the incest sentence, the HRC group rated thinking about having sex with a relative as more morally wrong than did the AA group, $F(2, 70) = 5.79$, $p < .01$. No other significant differences emerged.

Group Differences on Positive Sentence Ratings

Table 5 presents descriptive statistics for the HRC and AA groups on each of the seven dependent variables for the positive sentences (help, news). To examine our second hypothesis, that relative to the AA group, the HRC group would more highly rate the likelihood of the positive events occurring, we conducted independent sample t-tests. No significant differences on measures of likelihood were found between religious groups for either positive sentence. Further, no significant differences were found between religious groups on the remaining dependent variables for either positive sentence.

Discussion

TAF is a well-established cognitive phenomenon, in which biases involving morality and likelihood underlie the misperception of negative thoughts as significant and threatening (Shafran et al., 1996), leading to the development and maintenance of obsessions. Through self-report questionnaires, previous research has also suggested that TAF applies to positive thoughts (Amir et al., 2001). Moreover, research has shown a positive relationship between religiosity and TAF for negative thoughts (Abramowitz et al., 2002; Abramowitz et al., 2004; Rassin & Koster, 2003; Sica et al., 2002; Siev & Cohen, 2007). A limitation of previous work is that it has all been based on self-report measures. Thus, the primary aim of this study was to examine the relationship between

religiosity and TAF, for both positive and negative thoughts, using a behavioral paradigm.

Our first hypothesis, that highly religious Christians would report higher levels of anxiety and perceived likelihood relative to Atheists and Agnostics when exposed to negative thoughts, was partially supported. After controlling for levels of general distress, the highly religious Christians believed that writing a sentence about a loved one having a car accident made such an accident more likely than did the Atheist and Agnostic individuals. The highly religious participants also indicated feeling greater responsibility for such an event, should it happen. Moreover, they believed it was more morally wrong to write, "I hope I have sex with [close relative]" than did the Atheists and Agnostics. These findings reflect religious group differences on the two main components of TAF: likelihood and morality. In addition, they suggest that religiosity is related to inflated estimates of responsibility; wherein one feels a greater sense of power over causing negative events simply by thinking or writing about them. These findings are consistent with previous questionnaire research demonstrating relationships between religiosity and TAF (Abramowitz et al., 2002; Abramowitz et al., 2004; Rassin & Koster, 2003).

On the other hand, we did not find religious group differences on levels of anxiety for either the car accident or incest sentence, contrary to our hypothesis. One possible explanation is that the nature of the anxiety prompt (i.e., "How much anxiety do you feel right now?") was too general and participants did not evaluate the possible effects of thinking about or writing the negative event. However, when pointed follow-up questions (e.g., "What is the likelihood of this event occurring in the next 24 hours?")

pushed participants to consider the consequences of thinking about and writing the negative event (e.g., "What if by thinking this thought I make it more likely to happen?"), the religious group differences were evidenced. Thus, in using a behavioral measure of TAF, dependent measures that assess participants' perception of the importance and consequences of their thoughts should be used.

Our second hypothesis, that highly religious individuals would believe that thinking about and writing a positive event would be associated with higher ratings of likelihood, relative to Atheists and Agnostics, was not supported. Highly religious Christians rated the likelihood of their relative receiving good news or getting help if needed, similar to Atheists or Agnostics. Thus, religiosity may not be related to inflated perceptions of likelihood for positive events. Although in Christianity prayer is thought to help increase the likelihood of events occurring (e.g., John 5:14-5:15, "We can have confidence that, if we pray according to God's word, He will hear us and grant what we ask"), this religious teaching may not be internalized to the same degree as the teachings regarding divine punishment for thinking immoral (i.e., negative) thoughts (e.g., Chronicles 28:9, "The Lord understands every intent of [your] thoughts...and if you forsake Him, He will reject you forever").

The absence of religious group differences for the positive thoughts may also be due to their low valence and lack of religious undertones. The positive thoughts that were used may have been perceived as more neutral than positive, and as a result, using these sentences to measure the relationship between TAF for positive thoughts and religiosity may have been inappropriate. Moreover, the positive thoughts do not map

onto religious teachings, as do the negative thoughts (i.e., incest is a sin in Christianity), and thus religious differences for the positive thoughts may not be merited.

Results indicate that religiosity may increase one's vulnerability to misinterpret negative thoughts as important, threatening, or powerful, leading to inflated perceptions of likelihood, responsibility, and moral wrongness. This vulnerability can be understood in the context of Rachman's (1998) theory of OCD. In this model, misperceiving otherwise normally occurring intrusive thoughts as highly important (e.g., "God knows all of my thoughts and therefore all are important") or dangerous and threatening (e.g., "Thinking this thought means I'm a bad person in the eyes of God") may lead to an increase in obsessional anxiety, and therefore contribute to the development of an obsession. These findings similarly support Salkovskis, Shafran, Rachman, and Freeston's (1999) assertion that, as a child, rigid codes of conduct and strict behavioral rules can act as a pathway to inflated responsibility of beliefs and the misinterpretation of normally occurring intrusive thoughts. Moreover, Salkovskis et al. (1999) emphasize the possible role of religiosity in this pathway, wherein members of authority set strict behavioral rules, in which guilt and punishment are explicitly defined as appropriate consequences for deviants.

The current findings also have implications for the assessment of OCD, suggesting that clinicians could evaluate patient's religious education, strength of religious beliefs, and perception of negative intrusive thoughts. In doing so, the clinician should recognize that religious affiliation and strength of religious beliefs *may* be a contributing factor to cognitive biases associated with OCD; although they are probably not solely responsible for obsessional problems. Additionally, findings highlight

important treatment considerations for OCD. If patient's religious beliefs are tied to the misinterpretation of intrusive thoughts, clinicians should carefully conduct cognitive restructuring and exposure practices in a manner that does not refute patient's religious beliefs, but instead emphasizes how their response to the negative intrusive thoughts (e.g., feeling guilty) is maladaptive and thus leads to their impairing level of anxiety.

In the interpretation of these findings, one should consider the ambiguous causal direction between religiosity and TAF. Because the current study did not evaluate how and when participants' religious affiliation strengthened, and similarly whether their cognitive biases of TAF changed over time, a causal relationship cannot be determined. It may be that individuals developed a vulnerability to TAF through a highly religious upbringing, but on the other hand, individuals with high levels of TAF may have been drawn to a religion that is consistent with their beliefs about thoughts. Future research should better assess for changes in participants' identification with and strength of religious affiliation, as well as the development of TAF, in order to better generate causal precedence.

It is also important to note that results reflect group differences between highly religious Protestants and Atheist/Agnostics. The findings may not generalize to less religious Protestants, or to individuals of other religious faiths. Future research, however, should examine these questions using religious groups in which positive relationships between religiosity and TAF have been found, such as among Jews (Siev & Cohen, 2007) and Catholics (Sica et al., 2002).

Several other limitations should be considered in the interpretation of the results. First, the negative morality sentence (incest) did not seem to effectively target the

intended type of cognitive bias, as many participants verbally noted that this event would never happen, and as a result, their ratings of control, responsibility, and likelihood were not reflective of their TAF. Second, the same negative sentences were used for all participants, and despite our attempt to make them personally relevant by having the participant include the name of a close relative, the induced thoughts may not have been equally personally relevant across participants. This limitation could be avoided in future research by using personally relevant situations in addition to personally relevant people as subjects of the thoughts. In doing so, each participant, with direction from the research assistant, could generate a personally relevant intrusive thought that assesses the likelihood and moral biases of TAF. Third, the use of an undergraduate sample may limit the generalizability of the results. It would be meaningful to examine whether these religious group differences exist in clinical populations. We also encourage future research to examine how certain factors of religiosity are related to TAF. For instance, how intrinsic and extrinsic motivation are related to the morality and likelihood biases.

The current study revealed religious group differences for the TAF phenomenon in response to negative thoughts, but not positive thoughts. Highly religious Christians reported that writing a negative sentence increased the degree of likelihood, personal responsibility, and level of moral wrongness, in relation to Atheists/Agnostics. Moreover, these results use a behavioral paradigm to demonstrate the positive relationship between TAF and religiosity, which has only been previously evidenced using self-report questionnaires (Abramowitz et al., 2004; Rassin & Koster, 2003). These results suggest that higher degrees of religiosity, in Protestants, may act as a vulnerability factor in the misinterpretation of one's negative thoughts as overly important, significant,

or threatening. This misinterpretation, according to Rachman (1998), may lead to an increase in obsessional anxiety, and potentially contribute to the development of an obsession.

Table 1

Sample Demographics

Demographic Characteristic	Highly Religious Christian (*n* = 43)	Atheist or Agnostic (*n* = 30)	Total (*N* = 73)
Gender[a]			
Male	9 (20.9%)	12 (40%)	21 (28.8%)
Female	34 (79.1%)	17 (56.7%)	51 (69.9%)
Race			
Caucasian	25 (58.1%)	20 (66.7%)	45 (61.6%)
African-American	14 (32.6%)	3 (10%)	17 (23.3%)
Hispanic	1 (2.3%)	2 (6.7%)	3 (4.1%)
Asian	2 (4.7%)	3 (10%)	5 (6.8%)
Other	1 (2.3%)	2 (6.7%)	3 (4.1%)
Age			
Range	18 - 47	18 - 25	18-47
Mean (*SD*)	20.19 (*4.47*)	19.97 (*1.81*)	20.1 (*3.59*)

Note. [a] One participant did not identify a gender

Table 2

Descriptive statistics for self-report questionnaires

Self report measures	Highly Religious Christians (*n* = 43)		Atheist or Agnostic (*n* = 30)		
	Range	Mean (*SD*)	Range	Mean (*SD*)	*t* value
CES-D	1 – 42	12.70 (*10.11*)	0 – 56	15.2 (*11.21*)	.995
SCRFS	33 – 40	37.02 (*2.33*)	10 – 29	18.38 (*6.68*)	N/A
TAFS					
Total Score	0 – 64	24.56 (*14.70*)	0 – 42	13.13 (*11.12*)	-3.60***
Moral subscale	0 – 44	19.63 (*12.23*)	0 – 25	9.10 (*7.58*)	-4.11***
Likelihood – Other	0 – 12	2.07 (*3.15*)	0 – 8	1.34 (*2.06*)	-.34
Likelihood – Self	0 – 9	2.47 (*2.79*)	0 – 9	2.23 (*2.97*)	-1.09

Note. CES-D = Center for Epidemiological Studies – Depression Scale; SCRFS = Santa Clara Religious Faith Scale. ***$p < .001$.

Table 3

Dependent Measures	TAF – M	TAF – LO	TAF – LS	TAF - Total

I hope _____ is in a car accident today.				
Level of Anxiety	.19	.37**	.21*	.25*
Level of Guilt	.01	.24*	.08	.06
Degree of Likelihood	.17	.26*	.11	.22*
Level of Control	-.07	.22*	.09	.005
Degree of Responsibility	.12	.30*	.17	.17
Moral Wrongness	.15	.19	.08	.15
Urge to neutralize	.09	.24*	.12	.12
I hope I have sex with _____				
Level of Anxiety	.23*	.33**	.23*	.29**
Level of Guilt	.08	.25*	.26*	.17
Degree of Likelihood	-.10	-.09	-.04	-.11
Level of Control	.13	.05	.04	.12
Degree of Responsibility	-.16	-.06	-.12	-.15
Moral Wrongness	.26*	.14	-.04	.21*
Urge to neutralize	.17	.21*	.06	.17

Correlation between TAFS subscales and dependent measure of TAF

Note. TAF-M = Thought Action Fusion - Moral subscale; TAF-LO = Thought Action Fusion – Likelihood Other subscale; TAF-LS = Thought Action Fusion – Likelihood Self subscale; TAF-total = Thought Action Fusion total score. *$p < .05$; **$p < .01$.

Table 4

Descriptive statistics for the negative sentences

Dependent Measure	Highly Religious Christians ($n = 43$)		Atheist or Agnostic ($n = 30$)	
	Range	Mean (SD)	Range	Mean (SD)
I hope _____ is in a car accident today.				
Level of Anxiety	3 – 98	42.74 (29.95)	5 – 83	36.80 (21.28)
Level of Guilt	0 – 100	44.52 (35.37)	0 – 100	35.90 (32.82)
Degree of Likelihood	0 – 62	27.60 (19.31)*	1 – 71	18.80 (18.31)*
Level of Control	0 – 45	3.26 (9.76)	0 – 10	.40 (1.83)
Degree of Responsibility	0 – 95	21.63 (26.27)*	0 – 87	13.43 (20.31)*
Moral Wrongness	0 – 100	75.09 (33.70)	0 – 100	79.70 (27.04)
Urge to neutralize	0 – 100	65.88 (38.47)	0 – 100	60.80 (39.74)
I hope I have sex with _____				
Level of Anxiety	0 – 100	39.14 (29.82)	0 – 98	43.57 (26.49)
Level of Guilt	0 – 100	40.52 (37.49)	0 – 100	41.57 (35.64)
Degree of Likelihood	0 – 2	.09 (.37)	0 – 30	1.07 (5.48)
Level of Control	0 – 100	91.02 (26.49)	0 – 100	87.30 (27.23)
Degree of Responsibility	0 – 100	80.93 (31.74)	0 – 100	86.50 (23.93)
Moral Wrongness	61 – 100	98.47 (6.08)*	0 – 100	81.23 (33.63)*
Urge to neutralize	0 – 100	81.53 (32.52)	0 – 100	72.63 (37.36)

Note. *$p < .05$

Table 5

Descriptive statistics for the positive sentences

Dependent Measure	Highly Religious Christian (*n* = 43)		Atheist or Agnostic (*n* = 30)	
	Range	Mean (*SD*)	Range	Mean (*SD*)
I hope _____ receives very good news today				
Level of Anxiety	0 – 35	8.88 (*9.05*)	0 – 40	9.67 (*11.81*)
Level of Guilt	0 – 11	.77 (*1.98*)	0 – 20	1.87 (*5.20*)
Degree of Likelihood	0 – 100	55.95 (*26.35*)	5 – 95	52.17 (*23.28*)
Level of Control	0 – 93	18.42 (*22.86*)	0 – 99	18.90 (*23.80*)
Degree of Responsibility	0 – 94	15.42 (*20.66*)	0 – 99	18.60 (*23.13*)
Moral Rightness	0 – 100	83.49 (*26.37*)	50 – 100	91.73 (*13.32*)
Urge to neutralize	0 – 9	.33 (*1.41*)	0 – 5	.20 (*.92*)
I hope _____ I can help ____ if they need me				
Level of Anxiety	0 – 40	13.14 (*11.62*)	0 – 40	12.80 (*10.56*)
Level of Guilt	0 – 45	5.91 (*11.43*)	0 – 35	5.40 (*9.85*)
Degree of Likelihood	0 – 100	60.74 (*29.29*)	9 – 100	53.63 (*27.81*)
Level of Control	0 – 100	50.91 (*36.90*)	0 – 100	53.17 (*32.21*)
Degree of Responsibility	0 – 100	56.33 (*35.15*)	0 – 100	58.53 (*34.92*)
Moral Rightness	0 – 100	85.74 (*24.96*)	50- 100	94.63 (*10.37*)
Urge to neutralize	0 – 72	5.39 (*14.55*)	0 – 40	2.97 (*8.13*)

Note. *$p < .05$

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