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BE YE FRUITFUL AND MULTIPLY: DOES RELIGIOUS ACTIVATION INCREASE REPRODUCTIVE DESIRE?

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THESIS

A thesis submitted in partial fulfillment of the
requirements for the degree of Master of Science in the
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By

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ABSTRACT OF THESIS

BE YE FRUITFUL AND MULTIPLY: DOES RELIGIOUS ACTIVATION INCREASE REPRODUCTIVE DESIRE?

While many norms sustain or destabilize certain religions, one domain is particularly relevant to the survival of some religions over others: norms about fertility and reproduction. Thus far, several ethnographic and correlational studies have found a positive association between religiosity and fertility rate, but there is a dearth of laboratory investigation utilizing experimental methods to isolate causation. In Study 1, I found that experimentally activating religious concepts led to an increased desire to have children (N = 462). In Study 2, the focal study, I attempted to replicate and extend the previous study by examining implicit behavior (N = 120). I predicted that individuals primed with religion would be more likely to show an implicit approach motivation towards images of children. Failing to support my hypothesis, participants with religion activated were no more likely to approach images of babies than controls. This null finding was not affected by taking into account several relevant covariates. Additionally, an exploratory investigation of the effect that religious community norms may have on reproductive behavior was conducted. I found that participants that come from religious communities in which sexual deviance is emphasized were more likely to approach baby images. Future directions are discussed.

KEYWORDS: Religion, Reproductive Behavior, Approach, Children, Norms

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

Chapter One: Introduction

And you, be ye fruitful, and multiply; bring forth abundantly in the earth, and multiply therein
Genesis 9:7

Religions are born all of the time, but live and die by the norms they enact and enforce. At one time the ancient Greeks believed that Zeus was the master of the gods and controlled the sky, thunder, and lightning; the ancient Egyptians believed that Anubis watched over the dead; and the ancient Romans believed that Mercury watched over travellers and salesmen. Today, these beliefs are charming, fictional, cultural antiquities. While many norms sustain or destabilize certain religions (e.g. food practices, degree of ingroup prosociality, strategies for combating disease; see Boyer, 2003; Norenzayan & Gervais, 2012) one domain is particularly relevant to the survival of some religions over others: norms about fertility and reproduction.

Ethnographic, correlational survey data, and fertility patterns have uncovered a positive association between degree of religiosity and reproductive output (see Blume, 2009). As a whole, religious people have more children than their secular counterparts. However, there has been little laboratory investigation of this phenomenon. I attempt to unpack what processes may be driving this effect, and describe two completed studies to test this novel prediction.

A Tale of Two Religions

Consider these recent historical examples for a few minutes. Two separate religions were founded around the same time, in the late 18th century and early 19th century, both by charismatic leaders. Mormonism began in upstate New York, based upon the visions of Joseph Smith. After his death, its followers migrated to the Utah Territory, where its members led a steadfastly healthy lifestyle, abstaining from alcohol, tobacco, caffeine, and other addictive substances. As one aspect of Mormonism's religious doctrine, some of its male adherents practiced polygyny, marrying multiple women and generating numerous offspring. Brigham Young, a successor to Joseph

Smith, had approximately 55 wives and 46 surviving children. In 1902, less than 30 years after his death, Young was determined to have over 1000 direct descendants (Turner, 2012). Whether men had multiple wives or not, a commitment to family was central, fidelity within marriages was required, and having many children strongly encouraged. Today, Mormonism is thriving, and can claim over 15 million members (Bushman, 2008).

The Shakers began in England, one of many religions branching off from mainstream Protestantism. Ann Lee took the reins of the newly formed religion, and was later known to her followers as "Mother Ann". After some initial difficulty, numerous Shaker communities took root, including several in the early American colonies. At its beginnings, Shakerism claimed as many as 20,000 adherents. However, one central tenet of its belief system hindered its growth: it required its members to be celibate. Initially it recruited its new members through conversions, indentured children, and orphan adoptions. As the years passed, laws governing orphan adoptions and other regulations emerged, and recruitment became increasingly difficult. As of December of 2009, Shakerism can claim three remaining members, all residing in Sabbathday Lake, Maine (Andrews, 1953; Ouimet, 2009). How did these two religions come to hold such differing norms about reproduction, which ultimately decided their fate?

The Cultural Transmission of Religious Norms

Evidence is mounting that traits once thought unique to humans have been found in other species. Chimpanzees and bonobos have notions of morality and fairness (see de Waal 2013), and some evidence of theory of mind (e.g. Call & Tomasello, 2008), magpies grieve for lost conspecifics (Makoff, 2009), New Caledonia crows have complex tool use (Hunt, 1996), a diverse range of species exhibit individual differences in personality (Gosling & John, 1999), and rudimentary social learning can be found in many species (e.g. Whiten, 2005). What then, is unique to humans?

Complex cumulative cultural learning appears to be unique to *homo sapiens* and in a very short time has propelled our species to manipulate, cultivate, and occupy all seven continents (Henrich & McElreath, 2007; Boyd & Richerson, 1985). Humans rely

on one another to a staggering degree, and intergenerational transmission of cultural concepts such as tool use, hunting and gathering techniques, and complex belief systems have made us the dominant species on the planet. Two main processes are at work in cultural transmission, content biases and context biases.

Content biases are fitness-relevant intuitive tendencies to acquire information in a certain way (Boyd and Richerson 1985; Sperber 1996). Many religions are characterized by minimally counterintuitive elements (e.g. character that can fly, be in two places at once, or possess omniscience), which are easier to remember and in turn easier to culturally transmit (for review, see Norenzayan et al., 2006). Content biases make supernatural elements interesting, memorable, and easily transmissible. However, on their own they do not explain why people come to believe in the particular supernatural elements to which they're culturally exposed (e.g. the Ancient Greeks and Anubis, or Mormons and the holy trinity, see Atran & Henrich, 2010; Gervais & Henrich, 2010; Gervais et al., 2011).

Context biases refer to how we learn from one another. Instead of being passive receptacles of information, people are discerning in whom they learn from. A combination of behavioral cues signal which individuals are likely to provide us with valuable information. We learn best from people who are similar in age, gender, ethnicity, and those who are successful, credible, and prestigious (for review, see Chudek et al., in press). These context biases lead people to adopt the beliefs of religious leaders who exhibit credibility enhancing displays such as public prayer, ritualistic suffering, and martyrdom (see Henrich, 2009).

Central to the culture-gene coevolutionary framework (see Boyd & Richerson, 1985), through happenstance, the ingenuity of particular members, or environmental variation (for example), some particularly advantageous innovations or ideas may have been generated by one group but not a neighboring group. This could have led to the survival of the first group, and the demise of the second. While little theorizing has been done with respect to religious norms concerning reproduction, it seems highly probable that they would be under heavy cultural group selection.

Returning to the earlier historical example, the charismatic leaders of Mormonism combined ritualistic forsaking of pleasurable but costly behaviors (e.g. consumption of

alcohol) with a strong emphasis on high fertility reproductive norms to expand membership at a staggering rate. The Shakers on the other hand, espoused celibacy, which quickly withered their ranks. This is a salient example of how cumulative cultural evolution can occasionally result in runaway-selection for fitness reducing traits (see Richerson & Boyd, 2005 for a comprehensive treatment).

Evidence for the Link between Religion and Reproduction

There are a few other examples of religions differing in their reproductive output. In one 1950s-1960s Wisconsin cohort of farming communities, Catholics had more children than non-Catholic religious individuals (Janssen & Hauser, 1981). In another study, Muslim women produced a higher average number of children than their Buddhist counterparts in similar geographic areas in Thailand (Knodel et al., 1999).

But at a more macro level there is a growing literature finding that religious people as a whole have more children than their secular counterparts, often at staggering rates. There is a positive association between religiosity in general and fertility rates (for review see Blume, 2009; Frejka & Westoff, 2008). Norris and Ingelhart (2004) conducted an influential analysis of the interrelation between the increase in economic development, existential security, strong justice systems (and other components) and declining religiosity in developing countries. They found that with declining religiosity comes a substantial decline in fertility rates, often plummeting below replacement rates.

Enste (2007) examined waves of the World Value Survey from 1981-2004 and found that adults who attended religious services more than once per week had 2.5 children on average, while those that never attended religious services had an average of 1.67 children. The highly religious United States has significantly higher fertility rates than the more secular countries in Western Europe (Frejka & Westoff, 2006). Within the United States, women in one highly religious Old Order Amish community had an average fertility rate of 7.7 births (Greeksa ,2002), almost four times the current average U.S. fertility rate (Martin et al., 2013). Orthodox Jewish communities have more children than their more secular counterparts in Israel (Blume et al., 2006). In examining the 2000

Swiss Census data, Blume (2009) found that the religiously affiliated had nearly 2.5 times more children than the nonreligious.

A Case Study: The Religion-Reproduction Link within the Contemporary United States

Another team of researchers has recently examined the religion-reproduction link in the contemporary United States using a life history approach. Life History Theory has been tremendously successful at explaining a diverse array of animal behavior (for review, see Stearns, 1992), and there is building evidence that its processes explain some human behavior (e.g. Griskevicius et al., 2010). In short, throughout an organism's life, fertility decisions or outcomes will be affected by tradeoffs between life history events (e.g. individual somatic development, resource availability, quality vs. quantity of offspring). For example, time spent evading predators or finding food cannot be spent attracting a mate.

Weeden and colleagues (2008) argue that religious attendance within the contemporary United States can be conceptualized as one type of life history strategy. They argue that a primary function of religious groups within the United States is to emphasize and support high fertility, low-promiscuity, heterosexual, pair-centered partnerships. There are trade-offs to this type of lifestyle. Men are forgoing the possibility of promiscuous relationships and signing up for substantial amounts of parental investment. Women are avoiding extra-pair relationships and the potential reproductive advantages of cuckoldry. However, the reproductive advantages for both sexes can be substantial. Men are afforded increased paternity certainty and women significant parental investment. Both sexes are afforded the near certainty of producing numerous offspring (see Weeden, Cohen, & Kenrick, 2008).

Weeden, Cohen and Kenrick (2008, Study 1) analyzed data from approximately 21,000 people that participated in the US General Social Survey and found that religious attendance was the strongest predictor of several reproductive behaviors. They found that attending religious services frequently positively correlated with being married and not divorced, number of children, and negatively correlated with number of sex partners

(controlling for age, gender, and cohorts effects). In a large sample of undergraduates, Weeden, Cohen, and Kenrick (2008, Study 2) present and future religious attendance positively correlated with family desire, and negatively correlated with sociosexual attitudes, past sex partners, family age, divorce initiation, and homosexual sexual activity (controlling for a host of personality and demographic variables).

As the authors make clear, they're only proposing that this model helps to explain religious behavior within the contemporary United States. As the previous historical examples illustrate, reproductive norms and behavior can differ wildly between religions and between time periods.[1] Indeed, polygyny is still legally sanctioned in many predominantly Islamic countries (Barber, 2008). Therefore, I highlight this case study to illustrate how one set of religious norms (within the predominantly Christian United States) can shape reproductive attitudes. Importantly, it is within this cultural context that I test my central hypothesis.

Overview of the Current Studies

As previously identified, a package of norms surrounding reproduction (e.g. low promiscuity, high-fertility/reproductive desire, pair-centered partnerships) may drive the behavior of individuals in the predominately Christian United States. My thesis has the broad goal of examining whether activating religious concepts in general leads to activation of one of those norms: reproductive desire. While fertility patterns, demographies, and correlational surveys have established a clear link between religiosity (as a whole) and reproduction, there is a dearth of laboratory investigation of the phenomenon. In Study 1, I tested this prediction by activating participants' religious identities and assessing their nonspecific desire to have children.

In Study 2, I assessed participants' implicit behavioral motivations towards children by using an approach-avoid measure. Approach and avoidance are basic responses typically associated with appetitive and aversive motivations respectively (Cacioppo & Berntson, 1994; Lang, Bradley, & Cuthbert, 1997). The speed at which a subject approaches a target effectively indexes their implicit desire for the target (Chen &

Bargh, 1999). Therefore, I activated religious concepts and tested how quickly participants approached images of babies.

Chapter 2: Study 1, Religion and Desire for Children

As previous studies have only investigated the religion-reproduction link using correlational methods (e.g. Blume, 2009; Frejka & Westoff, 2008), it is important to attempt to establish the direction of causality. It's plausible that individuals who already hold high-fertility values are more likely to become religious. Indeed, Weeden and colleagues (2008) suggest this as an explanation for their findings within the United States. Therefore, in Study 1, I experimentally manipulated religion salience, and then assessed participants' desire for children. I hypothesized that after participants had their religious beliefs activated they would indicate an increased desire to have children.

Method

Participants. Four-hundred and sixty-two volunteers were recruited around the University of Kentucky's campus and completed all dependent measures (see Table 1 for demographics and religious identification).

Recruitment and Procedure. A research assistant approached people walking around or sitting on benches outside or inside buildings on campus. The research assistant asked whether they would be interested in taking a brief psychology study survey on a tablet (Android *Nexus 7*), and were told they would be reimbursed with a piece of candy. Participants then read and signed an informed consent and began the study.

The independent measure and sole manipulation in the study was the randomly generated presentation order of the religious identification items. The study had two between-subjects conditions: *Religion* and *Control*. Participants in the *Religion* condition (N = 211) completed the ten-item well-validated Hoge (1972; see Appendix A) intrinsic religiosity scale as the first measure. Sample items include: "One should seek God's guidance when making very important decisions", "My faith involves all of my life", "In my life, I feel the presence of the Divine" (on a 7-point Likert scale, Strongly Disagree – Strongly Agree). Participants were then assessed on other religious identification items ("I Pray Frequently", "I attend church (or other religious services) frequently"; "I was

raised to be religious"; "I was raised to believe in God"; "I believe in heaven"; "I believe in hell"; "How strongly do you believe in God", 0-100; "What is your current religion?").

In order to reduce suspicion, participants were then informed that the survey consisted of a "number of mini-studies", and were instructed to choose a letter (A, B, C, or D) which ostensibly would carry them to the next random mini-study of their choice. Participants in the *Religion* condition were then immediately assessed on three *Reproductive Timing* items ("Would you like to have children within the next few years?", 1-Definitely No – 9-Definitely Yes; "If you were to have a child within the next few years, how would you feel?", 1-Feel Negative – 9- Feel Positive; "How disappointed would you be if you did not have a child within the next few years?", 1-Not at all disappointed – 9-Very disappointed; see Griskevicius et al., 2011).

Participants in the *Control* condition (N = 251) had the presentation order reversed, with the *Reproductive Timing* items assessed first, followed by religious identification items described above. Therefore, participants in the *Religion* condition had their religious beliefs activated before being assessed on their *Reproductive Timing* items, while participants in the control did not. Participants then completed standard demographics, were given a debriefing form that revealed the intent of the study, and were given a piece of candy as payment.

Results

The three reproductive timing items displayed good reliability (α = .813) therefore I collapsed them into a scale called *Reproductive Timing* as the dependent measure. High scores indicated a greater desire to have children sooner. An independent samples t-test revealed that participants in the *Religion* condition (M = 4.08, SD = 2.30), 95% CI [3.77, 4.39] had a greater desire for children than did participants in the *Control* condition (M = 3.56, SD = 2.10), 95% CI [3.30, 3.82], $t(460) = -2.52$, p = .012, *Cohen's d* =.14. Additionally, in order to control for potentially confounding influence of age, gender, and political orientation, I included all three as covariates in a univariate ANOVA. Only political orientation emerged as a predictor, $F(1,441) = 10.64$, p = .001, $\eta\rho^2$ = .024,

however over and above its influence, condition still predicted reproductive timing $F(1,441) = 4.91$, $p = .027$, $\eta\rho^2 = .011$.

Discussion

Therefore, I found support for my prediction. Those who had religiosity activated were more likely to report a desire to have children sooner. This was achieved with a relatively subtle manipulation, assessing religiosity via a well-validated scale, as well as assessing other common religious identification questions. Especially interesting was that this effect was found across the board, for both individuals that identified as religious ($N = 343$), and those that did not (reported as "None", "Atheist", "Agnostic"; $N = 113$).

Chapter 3: Study 2, Religion, and Implicit Approach Behavior towards Children

While I have found that religious activation leads to a self-reported increase in reproductive desire, it would be instructive to determine whether it also leads to implicit approach behavior. People have an automatic tendency towards developing attitudes about stimuli (e.g., Duckworth, Bargh, Garcia, & Chaiken, 2002), which can facilitate the production of immediate behavioral reactions such as approach and avoidance (Chen & Bargh, 1999; Solarz, 1960). Furthermore, automatic evaluations can be influenced by primed goals (Ferguson & Bargh, 2004), and primed goals can affect subsequent approach and avoidance tendencies (e.g. Ackerman et al., 2010).

Therefore, in Study 2, I tested the hypothesis that priming religion will increase approach behavior towards images of babies. As a control against the possibility of religious activation leading to approach behavior towards people in general, presentation of baby images was counterbalanced with images of adults. Additionally, all participants were subjected to both conditions in a within-subjects design, which significantly boosted power. This study extended the previous study in several ways: A) by varying the religious prime, B) by varying the reproductive dependent variable, C) by using a well-validated implicit behavioral measure.

Method

Participants. One-hundred and twenty University of Kentucky students were recruited (see Table 1 for demographics and religious identification).

Procedure. Participants were brought into the lab and read through and signed an informed consent. Participants were then sat down in front of a computer, in a cubicle alone. There were two within-subjects conditions, *Religion Prime* and *Control Prime*. "Mini-study" prompts were again used before and between the main independent and dependent variables to reduce suspicion. Participants saw both conditions, and the presentation order was randomized. The order of the tasks was as follows: 1.) *religion* (or *control*) prime, 2.) Approach Avoidance Task, 3.) filler task 4.) *control* (or *religion*) prime, 5.) Approach Avoidance Task, 6.) demographics.

In the *Religion Prime* condition, participants were shown the following passage (used in Inzlicht & Tullet, 2010): "In this mini-study, you will be completing a written exercise. Therefore for the following task, you will be required to write a paragraph in response to a group of questions. Think carefully about the question and be as sincere as you can in your response. After 5 minutes the computer will close the response window and proceed to the next task. The question for your essay is the following: Briefly describe what your religion means for you. How has your religion influenced your life and how has it affected the way you view the world? Also, write about at least three things that your religion explains in your life". Participants were then given five minutes to respond to the prompt and then were moved on to the next task.

In the *Control Prime* condition, participants were given a similarly worded essay however the topic was about the weather. The passage was as follows: "Briefly describe your favorite season of the year. How does this season differ from the other seasons of the year? Also, write about at least three reasons why you like this season. Think carefully about the question and be as sincere as you can in your response". This control condition was included to dissociate any priming effects that may occur from simply typing a text passage of any kind.

A *filler task* was included between the two conditions to allow the effects of the prime to wear off. The task consisted of participants being routed to a non-strenuous word search puzzle. Participants were instructed to find as many "furniture-related" words in five minutes. When the five minutes expired, the computer automatically initiated the next prime condition.

Dependent variable- approach avoidance task with images of babies. Following each condition, the "mini-study" participants completed was the Approach Avoidance Task (AAT; see Chen & Bargh, 1999; Marsh, Ambady, & Kleck, 2005). A computer joystick (*Microsoft Sidewinder*) was positioned in front of the participants. On the screen, participants read: "This task measures how quickly and accurately people can move their bodies in response to visual stimuli. In this task, your job will be to move the joystick in a certain direction as quickly as possible after seeing something appear on the computer screen". A research assistant had previously modeled the action and certified that the participant understood the process.

Participants began two practice trials. In the first trial, participants were instructed to keep their eyes on a fixation point in the center of the screen, and watch for words indicating in which way they should move the joystick. The words "Push" or "Pull" randomly appeared for several iterations. In the second trial, instructions were identical, except adding that participants will want to move the joystick as "quickly and accurately" as possible.

Following the two practice trials, the experimental trials began. Participants were told that they will see a series of photographs, and were instructed to pull or push the joystick in response to specific descriptions linked with the photographs. Sixteen images were included in the task, 8 images of babies, and 8 images of adults (see Appendix B). The first prompt included these instructions:

> For these next trials, you will be responding to pictures of people. Some of these pictures will be of babies; other pictures will be of adults. Again, prior to the appearance of each picture, a string of asterisks (***) will appear in the center of the screen. You should focus your attention here, as this is where the picture will appear. If the image that appears is a BABY, you should PUSH the joystick forward (away from you). If the image that appears is an ADULT you should PULL the joystick back (toward you).

The participant was guided through 5 more experimental trials (for a total of six). In the next trial, the instructions were reversed (see BABY then PULL; see ADULT then PUSH), and the trials continued to counterbalance instructions. When the AAT concluded, participants completed the modified 8-item Hoge (1972) intrinsic religiosity scale, and the same religious identification items as Study 1.

Normative content of participants' religious community. As an exploratory investigation, the majority[2] of the participants also completed 20 items intending to measure the normative content of participants' religious community. Specifically, I wanted to discover what norms and/or moral themes were a frequent topic in the community context of an individual's religion. To my knowledge, no prior instrument exists to measure religious community norms.

The prompt for the 20 items was as follows: "We would like to ask you a few questions about your experiences within your religious community (if you are a part of a

religious community). To what degree does your religious community emphasize the following topics? If you are NOT part of a religious community, check the N/A box next to each question". The topics were: marriage, promiscuity/cheating, cursing, birth control, homosexuality, theft/shoplifting, starting a family, academic misconduct, abortion, divorce, obeying your parents, lying/dishonesty, sharing with people/helping, drug use, abstinence, forgiving others, obeying traffic laws, having children, sex, and alcohol use (1-Never – 9-Very often, N/A).

I hypothesized that individuals that participated in religious communities in which sexual behavior was frequently emphasized would be more likely to exhibit implicit approach motivation towards images of children. However, because this was an attempt to measure a previously unmeasured construct, analyses using these items are purely exploratory. Finally, participants completed standard demographics, and were given the debriefing form.

Results

Response latencies were computed to form eight variables: control-approach-babies, control-avoid-babies, control-approach-adults, control-avoid-adults, religion-approach-babies, religion-avoid-babies, religion-approach-adults, and religion-avoid-adults. These variables were formed by averaging each participant's latency values in each of the above categories, then taking the overall mean (among all participants) of those means. For each of the above categories, a maximum of 10 trials could occur for each participant. Latency values for incorrect responses (i.e. wrong direction on the joystick) were discarded, as were trials greater than 1500 milliseconds (4.1% of trials were errors, 6.2% of trials were > 1500 milliseconds, see Krieglmeyer & Deutsch, 2010).

Difference scores were then computed for each condition by subtracting the avoid scores from the approach scores, yielding four variables: control-approach-babies, control-approach-adults, religion-approach-babies, religion-approach-adults (positive scores indicate an approach motivation).

Using these four variables, I ran a Repeated Measures General Linear Model with two within-subjects factors (Condition and Target) with two levels within each factor

(Baby and Adult). I found no main effect of condition $F(1,115) = 0.03$, $p = .87$, $\eta_p^2 = .00$. I found no main effect of target $F(1,115) = 1.26$, $p = .27$, $\eta_p^2 = .01$. The anticipated interaction (Condition X Target) was marginally significant $F(1,115) = 2.88$, $p = .09$, $\eta_p^2 = .02$, however the effect was in the reverse direction of my prediction (see Figure 1).[3-4] To test whether the mean approach motivation significantly differed between the baby-control and the baby-religion variable I ran a custom hypothesis test. The two variables did not significantly differ $F(1,115) = 2.34$, $p = .13$.

Religiosity. Some studies have found that religious priming works on nonreligious people, and other studies have found that it doesn't. Therefore I tested the three-way interaction between Condition, Target, and God Belief (a one item measure: "Do you believe in God?": Yes or No). With God Belief entered as a between-subjects factor, the three-way interaction was not significant $F(1,114) = 1.26$, $p = .26$.

Additional covariates. In an exploratory manner, I tested whether four additional covariates affected the relationship between the different prime conditions and approach-avoidance motivation towards the target images.

Gender. With the gender differences that exist in somatic childbearing expenditure and parental investment (e.g. Trivers, 1972), I investigated whether gender affected the primary analyses. Entering gender as a between-subjects factor, none of the main effects or two-way interactions were significant (all ps > .18). The three-way interaction was also not significant $F(1,114) = 0.31$, $p = .58$.

Race. Because the images were of white targets, I tested whether participants' race affected the primary analyses. It's possible that white participants would be more likely to approach the white targets overall. Due to the small sample sizes of individual non-white racial identifications, I compared white participants ($N = 82$) to nonwhite participants ($N = 38$). Entering race as a between-subjects factor, none of the main effects or two-way interactions were significant (all ps > .1). The three-way interaction was also not significant $F(1,114) = 0.04$, $p = .84$.

Political orientation. Religion and political orientation are inextricably linked in the United States (e.g. Newport, 2011). Therefore, I tested whether political orientation affected the primary analyses using the item: "We are interested in your political beliefs.

Would you consider yourself more liberal or more conservative? Please select an option below" (1- Very Conservative – 7- Very Liberal). With political orientation entered as a covariate, the main effect of condition was marginally significant $F(1,114) = 3.49$, $p = .06$, $\eta\rho^2 = 0.03$. Participants in the religion condition ($M = 16.68$, $SD = 6.09$), 95% CI [4.62, 28.75] were *less* likely to approach the targets overall than those in the control condition ($M = 18.15$, $SD = 6.92$), 95% CI [4.43, 31.86]. There was also a marginally significant main effect of target $F(1,114) = 3.49$, $p = .06$, $\eta\rho^2 = 0.03$. Participants overall were *less* likely to approach images of babies ($M = 10.29$, $SD = 7.51$), 95% CI [-4.59, 25.16] than of adults ($M = 24.54$, $SD = 8.26$) 95% CI [8.18, 40.91]. However, the condition by target interaction was not significant $F(1,114) = 0.01$, $p = .92$.

Religious community's emphasis on "deviant sexual behavior". I ran an exploratory factor analysis with the 20 items related to the content of religious community norms. Because the first 19 participants did not fill out this measure, I omitted them from the analyses. I also omitted any participants who selected "N/A" ($N = 22$). With the data from the remaining participants ($N = 79$) I first ran a Principal Axis Factoring, which revealed an acceptable factor structure (*KMO* = .676, *Bartlett's* < .001). The scree plot suggested four factors. I then re-ran the Principal Axis Factoring, requesting the number of factors to be restricted to four with Direct Oblimin rotation.

Examining the rotated factor matrix, I pulled out the factor that seemed to most directly and exclusively tap into sexual behavior norms. This happened to be four items (abortion, homosexuality, divorce, and birth control) which post-hoc could be labelled: deviant sexual behavior.[5] The reliability of these four items was good ($\alpha = .797$). I collapsed these four items into a composite scale.

I then assessed how this scale affected the implicit approach motivation of the remaining participants ($N = 79$). For ease of interpretation, I performed a mean split on the composite scale ($M = 4.17$, variable labelled "deviant sexual behavior"), with participants' scores above the mean labelled "high emphasis" and below labelled "low emphasis". I then re-ran the above primary repeated measures analysis, with deviant sexual behavior as a between-subject factor. The three-way interaction between condition, target, and deviant sexual behavior was not significant $F(1,74) = 0.04$, $p = .85$.

However, an interesting two-way interaction emerged between target and deviant sexual behavior $F(1,74) = 3.94$, $p = .05$, $\eta\rho^2 = .05$. It appears that regardless of condition, participants that are involved in a community that places a high emphasis on sexual deviance were more likely to approach images of babies ($M = 31.49$, $SE = 13.92$), 95% CI [3.76, 59.22] than participants from a community that placed low emphasis on sexual deviance ($M = -4.52$, $SE = 12.86$), 95% CI [-30.14, 21.10]. Follow up contrasts revealed that the mean difference between approach towards baby images was significant $F(1,74) = 5.08$, $p = .03$, $\eta\rho^2 = .06$. The mean difference between approach towards adults was not significant $F(1,74) = 1.45$, $p = .23$ (see Figure 2).

Discussion

I had proposed that individuals who had religion activated would be more likely to approach images of babies. I hypothesized that this would be specific to babies (including adult images as a contrast), and that this effect would be specific to religious activation (not simply to the effect of responding to a passage of any kind). My predictions were not supported. Participants exposed to a religious prime were no more likely to approach baby images than participants exposed to a control prime about the weather. While it appeared the effect was trending in the opposite direction (i.e. the religious prime actually lead to *avoidance* of baby images) the approach latency values towards baby images did not significantly differ between conditions.

In addition, I tested whether several covariates affected the primary analysis. The gender of the participants had no effect on approach motivation. The target images were all of white babies and adults, therefore I tested whether the race of the participants affected approach motivations. Participant race had no effect on the analyses. Religion and politics are inextricably linked in the United States (e.g. Newport, 2011), therefore I tested the effect of political orientation. With the variability of political orientation controlled, the trend was again in the opposite of my predicted direction. There was a trend for participants that had religion activated to have less of an overall approach motivation. Additionally, there was a trend for participants overall to be less likely to approach the baby images (in comparison to the adult images).

Finally, I investigated the degree to which the norms of an individual's religious community affected his or her approach motivation towards children. I had predicted that individuals that had religion activated and were involved in a religious community in which norms surrounding sexual behaviors were emphasized would be more likely to approach baby images. This was not supported. There is some indication that regardless of condition, participants from communities with a high degree of emphasis on sexually deviant behaviors were more likely to approach baby images. However, due to the fact that this was an exploratory attempt to measure a previously unmeasured construct, extreme caution is warranted in the interpretation of this finding.

Table 1.
Summary of Descriptive Statistics Across Experiments

	Study 1			Study 2		
Variable	Male	Female	Total	Male	Female	Total
Gender (*N*)	192	254	479	35	85	120
Age (years)						
M	23	22.1	22.5	19.56	19.45	19.48
SD	6.6	6.8	6.7	1.16	1.22	1.20
Range	18-57	18-62	18-62	18-23	18-24	18-24
Ethnicity (%)						
White	33.4	39.4	73.5	18.3	50	68.3
Black	2.4	5.1	7.6	4.2	13.3	17.5
Hispanic	1.3	1.8	3.1	0.8	1.7	2.5
Asian	3.1	5.1	8.2	1.7	3.3	5
Native American	0	0.2	0.2	0	0	0
Mixed or other	2.5	4.9	7.4	2.5	3.2	6.7
Religion (%)						
Christian (Catholic)	7.4	12.3	19.7	5	17.5	22.5
Christian (Baptist)	8.1	10.8	18.8	10	22.5	32.5
Christian (other)	11.2	17.7	28.9	3.3	20.8	24.2
Buddhist	0	1.1	1.1	0.8	0	0.8
Muslim	1.8	0.7	2.5	0.8	0	0.8
Other	2.4	1.8	4.2	0.8	1.7	2.5
Atheist	2.2	2.9	5.4	3.3	1.7	5
Agnostic	6.1	5.4	11.7	2.5	2.5	5

Fig. 1. Study 2: Means of approach motivation by condition (religion vs. control) and target (baby vs. adult). Error bars represent 95% confidence intervals.

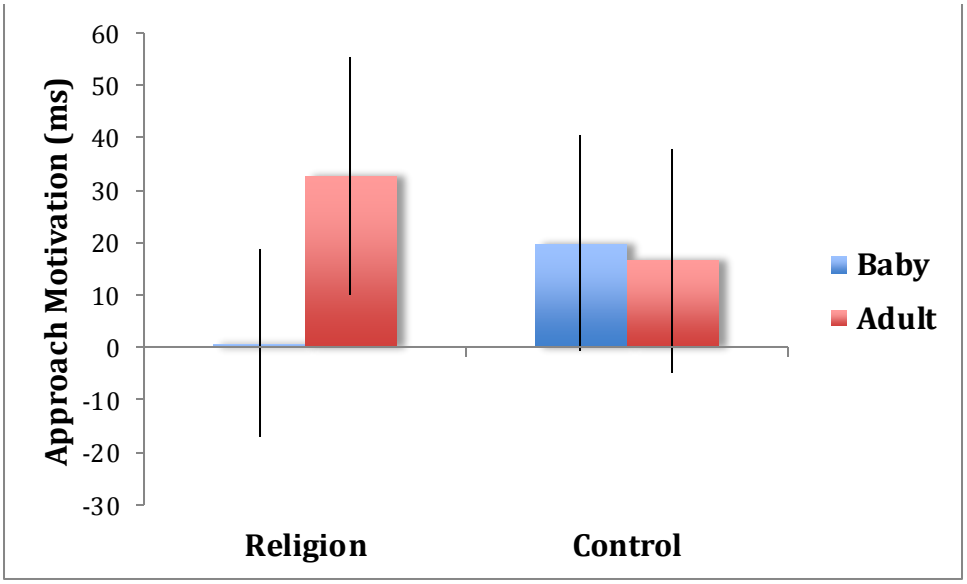
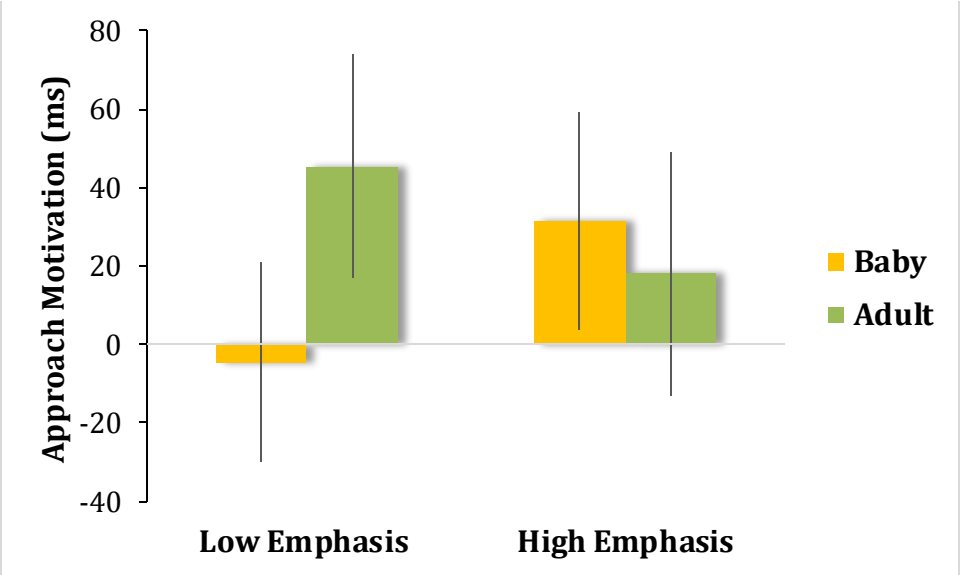


Fig. 2. Study 2: Means of approach motivation by degree of religious community emphasis on sexual deviance (low vs. high) and target (baby vs. adult). Individuals in religious communities with a high emphasis on sexual deviance are more likely to approach baby images than low emphasis individuals. Error bars represent 95% confidence intervals.



Chapter 4: General Discussion

Religions come and go. The most successful religions have evolved to have a powerful set of norms that dictate the behavior of its adherents, often for the benefit of the group. Norms surrounding the avoidance of disease, agricultural patterns, and ingroup prosociality have all likely contributed to the success or failure of individual religions. However, norms that dictate reproductive behavior may have been the biggest contributor to the expansion, or the stagnation, of religious groups throughout human history.

There is an accumulating literature centered around one theme: religious people have more children (for a review, see Blume, 2009). For example, looking at multiple waves of the World Values survey, Entse (2007) found that those who attended religious services more than once per week had substantially more children than their counterparts that never attended religious services. Norris and Inglehart (2004) found that as religiosity declined in some parts of the Western world, so did fertility rates. However, as of yet this literature has utilized only correlational methods.

In two studies, I investigated causation. Using tightly controlled laboratory methods, I proposed that religious activation at the individual level would lead to increased reproductive desire. In my first study, I found that activating religious concepts led to a self-reported increase in the desire to have children. In the second (and focal) study, I attempted to replicate and extend the previous findings. I hypothesized that priming religion would lead to an implicit behavioral motivation to approach children.

It was important to move the investigation from self-report to implicit behavior, which is less subject to self-presentational concerns and experimental demand. If a religious context, or the activation of religious concepts, are linked with reproductive behavior it's likely that a powerful implicit association between the two should be present. In this study, I failed to find that link. There are several methodological and theoretical concerns that are important for interpreting these null findings.

Limitations and Future Directions

First, the nature of my behavioral approach task makes definitive interpretation difficult. Even if I had found the implicit link, it would not necessarily imply that participants desire having children of their *own*. Follow-up studies would have had to tease apart the desire for children from a related but different caregiving motivation.

Second, there are several methodological explanations for the null finding. Analyzing approach-avoidance data, especially the joystick task, is a relatively subjective task. Several different latency outlier and trial error detection methods have been employed by various research teams, and there is little consensus on the efficacy of various techniques (see Krieglmeyer & Deutsch, 2010). I used the method recommended by Krieglmeyer and Deutsch (2010), however, other methods could have been used and I'd expect moderately to substantially different analysis results to occur with each.

The demographic composition of my sample may have also had a large effect on the results. While my subjects were all young and in a prime fertility window, as an undergraduate sample they were above average in socioeconomic status with a narrow range (M = 6.29, SD = 1.47, on the 1-10 range SES ladder item). Individuals of higher socioeconomic status may have a predominately slow life history strategy, which emphasizes delayed reproduction and the pursuit of other superordinate goals such as an education and a career (e.g. Griskevicius, Delton, Robertson, & Tybur, 2011). Therefore, reproductive interests may not have been as important to the subjects in my focal study, implicitly or explicitly, as they would have been to a more representative community sample. Indeed, in my first study (which found the predicted effect) the subjects were selected at random from among anyone that happened to be walking through campus – and the age and SES ranges were more variable.

Third, it is possible that the hypothesis in the focal study was just not theoretically sound. While mating evaluations and motivations have been repeatedly found to be relatively easy to activate implicitly (e.g. Miller & Maner, 2011), something as complex and fraught with cost/benefit considerations as childrearing is likely a more deliberative process. While religiosity and mating behavior have been experimentally linked (e.g. Li, Cohen, Weeden & Kenrick, 2010) what is often the end result of mating behavior (i.e. having children) may be further apart in the causative chain. Future studies may need to be more direct when assessing a religiosity-reproduction link.

Finally, further investigation of how the norms of an individual's religious community affect his or her reproductive behavior is needed. In the focal study, the results hinted at the possibility that the emphasis of the religious community's norms may be a significant moderator. However, the items I used to attempt to measure the degree of emphasis on reproductive behavior were new and untested. Future researchers may be able to design a more refined measure of this construct.

Conclusion

In two studies, I investigated whether activation of religiosity led to an attitudinal and behavioral desire to increase reproductive output. In my first study I found that activating religious concepts led to a self-reported increase in the desire to have children. However, my focal study failed to extend this to an implicit behavioral motivation. This initial look can perhaps lay the groundwork for much more causal experimental investigation of the well-established correlational finding that religious people have more children.

1. In a more recent study, Weeden & Kurzban (2013) examined World Value Survey data from over 90 countries and found that "restrictive" reproductive norms positively predicted religiosity. However, the authors point out that the associations were strongest in wealthy countries, and weaker in poorer countries. I believe this hints at the variability between religions that exists in reproductive norms.
2. The first 19 participants did not get this measure due to a delay in its IRB approval.
3. The first 11 participants got different primes than the ones described above in the Methods section (due to a delay in the IRB approval for the final manipulations). They were a similar but simplified version of the described primes, asking participants to: "Please describe what religion means to you, and what religion explains in your life. Please write a paragraph or two below" (in the control prime, this prompt referred to the weather). These manipulations did not have the five minute timeline. Analyses without these 11 participants included did not change the results.
4. Even though the order of the conditions participants were subjected to was randomized (i.e. whether they received the religion prime first or second), I investigated the effect the order may have had. Controlling for prime order by entering it as a covariate, the pattern of mean latency values was virtually

unchanged. However the interaction between condition and target dropped to non-significant $F(1,114) = 1.46$, $p = .23$.

5. "Deviant" in this context of course refers to sexual or normative practices that would be considered undesirable or immoral by the majority of the followers of Christianity.

Appendix A: Hoge Intrinsic Religiosity Scale

(Hoge, 1972)

Please rate how much you agree or disagree with each statement according to the following scale.
1 = Strongly Disagree
7 = Strongly Agree

My faith involves all of my life.
One should seek God's guidance when making every important decision.
Although I believe in my religion, I feel there are many more important things in life.
My religious beliefs are what really lie behind my whole approach to life.
Nothing is as important to me as serving God as best I know how.
It doesn't matter so much what I believe as long as I lead a moral life.
I try hard to carry my religion over into all my other dealings in life.
Although I am a religious person, I refuse to let religious considerations influence my everyday affairs.
In my life I feel the presence of the Divine.
My faith sometimes restricts my actions.

Appendix B: Baby and Adult Images

Baby Images:








Adult Images:









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