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In God We Trust: Effects of spirituality and religion on economic decision making☆

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ABSTRACT

Background: Spirituality and religion (S/R) are highly prevalent and relate to various aspects of mental health. However, S/R is multifaceted, and cognitive and behavioral mechanisms of S/R are unclear. Spiritual beliefs and attitudes, and regular practice of religious rituals, may facilitate general consistency of behavior and attenuate impulsive reactivity to loss and gains.

Methods: We utilized a sophisticated and complex economic decision-making paradigm – the Sequential Investment Task – to probe effects of S/R on behavioral adaptation to positive and negative outcomes (both real and fictive) within a diverse community-based sample ($n = 242$). S/R was assessed with a wide range of self-report measures.

Results: Collectively, facets of religion had significant effects on task variables, suggesting that religious involvement is associated with more consistency in decision making, and less behavioral change resulting from real gains and fictive losses, but not real losses. Conversely, spirituality was not significantly tied to behavior overall, though some facets (i.e., importance of spirituality and belief in God) predicted greater behavioral consistency.

Discussion: This study suggests that religion, but not spirituality, is associated with greater uniformity of behavioral responding, less reactivity to positive outcomes, and less reactivity to perceived losses, when making investment decisions.

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1. Introduction

Spirituality and religion (S/R) are virtually universal (Bloom, 2009), and their effects on mental health are well-established (Koenig, 2012; Newport, 2022). However, the underlying cognitive and behavioral markers mediating these effects are poorly understood.

Given that S/R is multifaceted and can be broadly bifurcated (Oman, 2013), there is a need to understand better how various facets of S/R may impact cognition differently, as they might have divergent effects on mental health. The first component, *spirituality*, represents the overarching construct of relating to the metaphysical/sacred domain in a subjective manner. The second, *religion*, represents objective culture-bound ways of defining and relating to metaphysical/sacred aspects of life (Pargament, 1999). Thus, belief in God/Higher Power and engagement in prayer are common to both *spirituality* and *religion*, whereas specific religious-cultural language (e.g., Jesus), and practices (e.g., Church attendance) are specific only to *religion* (Rosmarin, 2018). While spirituality and religion overlap both conceptually and empirically, recent polls show a general decline in religiosity worldwide – including in the United States (Inglehart, 2020; Pew Research Center, 2022) – and a simultaneous increase in spirituality (Fetzer Institute, 2022). Notably, recent national studies in the United States and Europe suggest that spirituality without religion is a risk factor for depression (Leurent et al., 2013; Vittengl, 2018). Identifying the cognitive and behavioral effects of specific aspects of spirituality and religion may help us contemplate how to adapt them to secular contexts such as the workplace, classroom or even psychotherapy.

There is also a need to understand mechanisms of how various facets of S/R may impact mental health, as very few studies have probed these connections with cognitive or behavioral markers. One commonly espoused theory is that religion (more than spirituality) is associated with positive life outcomes by enhancing self-control (McCullough & Willoughby, 2009). Regular and consistent practice of religious rituals may facilitate general consistency of behavior, attenuate loss aversion, and diminish reward-sensitivity, thereby decreasing impulsive decision making and behavior (Rosmarin, 2018). Clinically, religion mitigates negative emotional states by acting as a coping mechanism; substantial literature demonstrates buffering effects against depressive symptoms (Bonelli, Dew, Koenig, Rosmarin, & Vasegh, 2012). Religion also tempers impulsive behavioral responses, as evidenced by strong negative associations with alcohol/substance abuse (Connery & Devido, 2020) and suicidality (VanderWeele, Li, Tsai, & Kawachi, 2016), both of which are commonly mediated by impulsivity (Liu, Trout, Hernandez, Cheek, & Gerlus, 2017; Sanchez-Roige, Stephens, & Duka, 2016).

Prior experimental research, though not extensive, hint at mediating mechanisms driving these effects of S/R on mental health. Inzlicht et al. (2009, Inzlicht and Tullett, 2010) found that religious beliefs were associated with reduced post-error brain activity in the Stroop task, suggesting that religion can reduce affective response (i.e., distress) to errors, losses and/or perceived failures. Additionally, Good, Inzlicht, and Larson (2015) found that belief in a forgiving God dampened error-response in a Go/No-Go task. However, to our knowledge, no prior study has utilized experimental methods to examine how different dimensions of S/R relate to positive outcomes. Further, with regards to negative outcomes, it is unclear whether S/R reduces distress from errors, error monitoring, or both (Hoogeveen, Snoek, & van Elk, 2020; van Elk & Aleman, 2017). Prior research has also found religiosity to be negatively associated with attitudes towards risk (Miller & Hoffmann, 1995), and motivation to avoid uncertainty (Jost, Glaser, Kruglanski, & Sulloway, 2003). One study showed that church attendance, not personal spiritual beliefs, is associated with a greater aversion to risk (Noussair et al., 2013) – and that spirituality might be associated with *increased* risky behavior (Burris, Smith, & Carlson, 2009). In sum, religion and spirituality may differentially modulate (impulsive) responses to positive and negative outcomes in risk-based decision-making, and lessen awareness altogether to these outcomes.

In the present study, we used the Sequential Investment Task (SIT; Chiu, Lohrenz, & Montague, 2008; Lohrenz, McCabe, Camerer, & Montague, 2007), a behavioral economics decision-making task, to examine how different dimensions of S/R relate to changes in risky monetary decisions. The SIT has been utilized by the burgeoning field of computational psychiatry to understand cognitive mechanisms in addiction (Chiu et al., 2008; Gu et al., 2015), and similar tasks have been employed to examine behavioral and affective differences in depression (Chase et al., 2010) and psychopathy (Arielle et al., 2016) – motivating our current endeavor to examine differences in behavior (and cognition) in this task as modulated by different dimensions of S/R, which in turn can elucidate the complex associations between S/R and mental health.

In the SIT, subjects invest in a fluctuating stock market. In each trial, participants gain a profit (positive outcome) or incur a loss (negative outcome) based on their investment decision and market performance. The task assesses the overall consistency of reward expectancy (i.e., changes in investment decisions relative to previous trades), as well as dynamic, reward-based, responses to profits and losses (i.e., decisions in positive and negative markets)) in a risky context. Specifically, decisions in this task are driven by the prospect of better but riskier outcomes. Additionally, the task examines changes in investing behavior as modulated by losses of rewards that *could have been* gained. The latter are novel, since they represent aversive signaling from fictive errors (i.e., regret for not having wagered more) versus simply error monitoring (i.e., loss). Previous studies with the SIT have consistently shown that both real and fictive outcomes lead to a change in subsequent behavior (Chiu et al., 2008; Lohrenz et al., 2007), but behavior change resulting from fictive outcomes are more amenable to top-down cognitive appraisals or influences (Gu, Kirk, Lohrenz, & Montague, 2014).

We therefore utilized the SIT and self-report assessments of various facets of religion and spirituality, to examine whether S/R influences reward expectancies as measured by investing behavior in response to financial gains (positive outcomes), losses (negative outcomes), and fictive losses (regret). Based on findings of positive associations between religion, greater self-control, risk-aversion and a general attenuation of error monitoring, we hypothesized that dimensions of religiosity (as opposed to spirituality) would be preferentially associated with diminished impact of gains, losses, and regret on subsequent change in investing behavior.

2. Methods

2.1. Participants

A total of 290 participants were recruited, of which 48 (i.e., 16.5 %) were excluded (see methods for quantitative procedures) due to random responding or missing data from our behavioral task, which is consistent with typical exclusion rates for failing attention and compliance checks in mTurk studies (Aguinis et al., 2021), resulting in a total sample of $n = 242$ participants in the final dataset (age: $M = 41.56$ years, $SD = 12.25$; 54 % female). Most of the sample (65 %) was religiously affiliated (59 % Christian, 6 % other); 10 % identified as spiritual but were not religiously affiliated; and 25 % identified as neither spiritual nor religious. See Supplement for a complete description of study procedures.

2.2. Measures

2.2.1. Demographics

Participants provided information regarding biological sex, age, race, marital status, geolocation (state), income, and total years of education.

2.2.2. Spirituality/religion (S/R)

A series of single-item assessments as well as psychometrically valid and reliable scales were used to assess various facets of S/R, across its objective (*religion*), and subjective (*spirituality*) dimensions (see

Introduction for definitions of these terms). See supplement for description.

2.2.2.1. Importance of religion. Participants responded to "How important is religion to you?" on a 5-point Likert scale ranging from "Very" to "Not at All."

2.2.2.2. Religious community. Participants responded to "Are you active in a faith community or congregation?" on a 5-point Likert scale ranging from "Very" to "Not at All."

2.2.2.3. Duke Religion Index (DUREL). Participants completed the 5-item DUREL (Koenig & Büssing, 2010). The DUREL was used to measure three distinct facets of religiosity: (1) Frequency of Public Religious Activity; (2) Frequency of Private Religious Activity; and (3) Intrinsic Religiosity.

2.2.2.4. Importance of spirituality. Participants responded to "How important is spirituality to you?" on a 5-point Likert scale ranging from "Very" to "Not at All."

2.2.2.5. Belief in God (spirituality). Participants responded to "Do you believe in God/Higher Power?" on a 5-point Likert scale ranging from "Very" to "Not at All."

2.2.2.6. Belief in prayer (spirituality). Participants rated two items: "Do you believe that God answers prayers?" and "Do you feel your prayers are answered?" on a 5-point Likert scale from "Strongly Believe" to "Strongly Disbelieve." Items were averaged, and Cronbach's $\alpha = 0.96$ in our sample.

2.2.2.7. Perceived benefits of prayer (spirituality). Participants rated three items: "How strongly do you believe that prayer can help someone who is ill?"; "I believe that my prayers have an effect on my life"; and "I believe that my prayers have an effect on other people's lives" on a 5-point Likert-type scale from "Strongly Believe" to "Strongly Disbelieve." Items were averaged, and Cronbach's $\alpha = 0.95$ in the sample.

2.2.2.8. Personal importance of prayer (spirituality). Participants rated a single item: "How important is prayer in your life?" on a 4-point Likert-type scale from "Extremely Important" to "Not Important at All."

2.2.2.9. S/R identity. Participants answered the question "What is your religious affiliation (if any)?" by selecting from common options, as well as "Other" and "None." Participants' responses were dummy coded into three categories: (1) Religiously Affiliated (RA, 65 % of sample, $N = 157$); (2) Spiritual but Not Religiously Affiliated (SNRA, 9 % of sample, $N = 25$); and (3) Neither Spiritual nor Religiously Affiliated (NSRA, 24 % of sample, $N = 60$).

2.2.3. Sequential Investment Task

Participants completed six rounds of the Sequential Investment Task (SIT; also referred to in the literature as "Market Task"; Chiu et al., 2008; Gu et al., 2014; Lohrenz et al., 2007), an economic decision-making game involving a simulated stock market. At the beginning of each round, participants were given $100 in simulated assets to invest (in increments of ten, i.e., 0 %, 10 %, 20 %, etc.) in the stock market for 20 subsequent trials. In each trial, participants' total asset value increases or decreases proportionately to the sum invested, depending on whether the market goes up or down. The following investment decision and outcomes in the immediately previous trial are used to predict investment in the next trial (*Next Bet*): (1) *Previous Bet*, amount invested in the previous trial[2]; (2) *Positive Market*, financial gain when market goes up; (3) *Negative Market*, financial loss when market goes down; (4) *Gain*, relative loss in a positive market[3]; (5) *Loss*, relative gain in a negative market (see Supplement for a detailed description of the task variables and their cognitive associations, and Fig. S1).

2.3. Statistical analyses

Separate linear mixed-effects analyses were utilized for each S/R variable to examine their effect on investment decisions. Investment amounts were modeled as the dependent variable. The following predictors were included as fixed-effects: *Previous Bet*, *Positive Market*, *Negative Market*, *Gain*, *Loss*, the *S/R variable* (standardized) and its interactions with the five task variables. Participants were modeled as random effects (i.e., random intercepts and slopes). Specifically, a random intercept was included for each participant, as well as random slopes to allow the effect of task variables to vary for each participant.

As our predictor variables of interest coalesce into only two categories (i.e., Spirituality and Religion) and we aimed to examine multiple proxies of the same construct within each category (as opposed to testing a host of disparate predictors), we report uncorrected results in the main text. For completeness, we report False Discovery Rate (FDR; Benjamini & Hochberg, 1995) corrected results in Table S2.

Interactions of S/R Identity (i.e., RA, SNRA, NSRA) with the SIT variables were also calculated in a separate regression model, as supplementary analysis. To account for heterogeneity in variance of residuals due to unbalanced sample sizes, we used weighted mixed-effects regression (using R package nlme; Pinheiro & Bates, 2006) allowing for unequal variances between the different S/R Identity groups.

3. Results

3.1. Main effects of S/R on investment decisions

Significant main effects on investment decisions ($p < 0.05$) were observed for all Religion variables (i.e., Importance of Religion, Religious Community, Frequency of Public Religious Activity,[4] and Intrinsic Religiosity), except Frequency of Private Religious Activity. None of the Spirituality variables had significant main effects. See Table S1 for supplementary analysis on SIT behavior without S/R variables, and Table S2 for full results with each S/R variable.

3.2. Interactions between S/R and SIT variables

Regarding effects of *Previous Bet* (consistency of reward expectancy), significant interactions were observed for all Religion variables, and two of five Spirituality variables (Importance of Spirituality, Belief in God). Specifically, participants with high Religion (and certain aspects of Spirituality) were less sensitive to the *Previous Bet* in their subsequent investment decisions (see Fig. 2, left panel).

[2] Normalized scores of *next bet* (amounts invested during immediately subsequent trials) were used as the criterion for all regressions.

[3] Following each investment decision, there are two possible outcomes: An increase or decrease in aggregate value. Trials resulting in increased or decreased market values are considered "positive" and "negative" markets, respectively. In a "positive market" the best outcomes are achieved by investing 100 %, and in a "negative market" the best outcomes occur with 0 % investment. After each investment decision (each trial), *relative loss* is calculated as the difference between the best outcome (that which could have been achieved with 100 % investment in a "positive market," or 0 % in a "negative market") and the *actual* gain or loss. The relative loss of "positive market" trials is associated with fictive error, which is closely related to the concept of regret. As *gain* increases, fictive loss decreases.

[4] $p = 0.06$ for this variable

Similarly, regarding *Positive Market* effects (response to profit), all Religion variables except for Frequency of Private Prayer, showed significant interaction with the task, whereas none of the Spirituality variables had significant effects. Participants endorsing higher levels of religious involvement were less sensitive to *Positive Market* effects; they did not increase their next bet following a positive market to the same degree as those with lower scores on measures of Religion (see Fig. 2, center panel).

A similar pattern of results emerged for effects of *Gain* (response to fictive error, that is: loss of rewards that could have been gained). All Religion variables except for Frequency of Private Prayer, but no Spirituality variables, interacted with *Gain*, such that participants with greater Religion showed diminished effects of fictive error on subsequent investment decision making. These results indicate that Religion was associated with less adjustment of subsequent investment decisions in proportion to fictive error (Fig. 2, right panel).

We did not observe interactions with *Negative Market* for any Religion or Spirituality variable. Thus, in the context of responses to financial losses, neither Religion nor Spirituality predicted less (or more) adjustment of subsequent decision-making. See Table 1 for interactions between Importance of Spirituality/Religion and SIT variables.

3.3. Effects of S/R identity on investment decisions

Levene's test found no significant difference in variance of investment decisions (i.e., next bet) as a function of S/R identity (See supplementary Table S3 for descriptive statistics of the S/R variables by identity). S/R Identity had no main effects on investment decisions overall ($F = 1.37$, $p = 0.26$). However, we observed a significant interaction with both *Previous Bet* ($F = 12.88$, $p < 0.001$) and *Positive Market* effects ($F = 4.38$, $p = 0.01$). Tests of simple slopes showed that compared to those with no religious affiliation or spiritual identity (NRSA) and those who identified as spiritual without religious affiliation (SNRA), participants with religious affiliation (RA) had a weaker positive effect for *Previous Bet* (See Fig. 1). This slope did not significantly differ between the SNRA and NSRA groups ($p = 0.61$). Similarly, compared to the SNRA group and NSRA, the RA group showed a weaker positive effect of *Positive Market* ($p = 0.005$). There were no other significant interactions between S/R Identity and task variables.

Table 1
Importance of religion vs. spirituality and financial decision making.

Predictors	Importance of religion		Importance of spirituality	
	β (95 % CI)	*p*	β (95 % CI)	*p*
Main effect	0.02 (0.00–0.03)	**0.031**	0.01 (−0.00–0.03)	0.068
Interaction with previous bet	−0.08 (−0.11 to −0.04)	**<0.001**	−0.07 (−0.10 to −0.03)	**<0.001**
Interaction with positive market	−0.01 (−0.02 to −0.01)	**0.001**	0 (−0.01–0.00)	0.235
Interaction with negative market	0 (−0.01–0.00)	0.594	0 (−0.01–0.00)	0.483
Interaction with gain	0.02 (0.00–0.03)	**0.028**	0 (−0.01–0.02)	0.942
Interaction with loss	0 (−0.01–0.02)	0.498	0 (−0.01–0.02)	0.511

Notes: Table presents results of mixed linear multiple regressions with *Next Bet* (normalized) as the criterion. Subjects $n = 242$. $p < 0.05$ in bold. Only the main effects and interactions of "Importance of Religion" and "Importance of Spirituality" with task variables are reported here; see Table S1 for the main effects of task variables and demographics; See Supplemental Table S2 for main and interaction effects of all S/R variables. All continuous variables were normalized. Demographics (sex, age, race, marital status, geolocation, income, and education) were not related to outcome measures and therefore not included as control variables.

4. Discussion

As hypothesized, various dimensions of S/R predicted behavioral indicators of diminished reactivity to real gains and perceived losses (regret). Almost all facets of *religion* were associated with reduced *previous bet* (i.e., greater stability of responding overall), *positive market* (i.e., reaction to positive outcomes), and *gain* (i.e., reaction to the perception of fictive losses that could have been gained). By contrast, few aspects of *spirituality* had such effects; importance of spirituality, and belief in God, were associated with reduced *previous bet* effects only. Interestingly, the only facet of *religion* without effects on investment decisions was frequency of private religious activity, which included assessment of prayer/meditation that may not have been practiced within the context of religious culture; this variable could conceivably be considered an aspect of *spirituality* in the present study. Furthermore, religiously affiliated participants had weaker *previous bet* and *positive market* effects, than those who identified as spirituality but not religious, or neither spiritual nor religious, whereas the latter two groups were not different.

However, neither spirituality nor religion moderated investment behavior in the event of an actual financial loss. *Negative market* effects attenuate subsequent investing; this was no different among individuals with higher versus lower levels of S/R, regardless of how measured. Our results, therefore, did not show an overall general association between S/R and less error or loss monitoring – qualifying previous reports of reduced error-monitoring (Inzlicht & Tullett, 2010), behavioral change (Good et al., 2015), and analytical thinking (Risen, 2016; van Elk & Aleman, 2017), associated with religiosity. Then again, both the predictive processing model (van Elk & Aleman, 2017) and cognitive-resource depletion model (Schjoedt et al., 2013), suggest that religion—but not spirituality—may lead individuals to favor pre-committed beliefs over new information, thus suppressing influences of certain error signals that could lead to updated behavior. Actual losses may be particularly forceful agents of behavior change—and therefore less amenable to top-down influences (i.e., loss-aversion effects; Tversky & Kahneman, 1992). The affective influence of actual losses on behavior may be stronger (i.e., negativity-bias effects; Vaish, Grossmann, & Woodward, 2008) than fictive losses, which are more susceptible to higher-order cognitive influences (Coricelli, Dolan, & Sirigu, 2007; Gu et al., 2014). Religion may thus mitigate behavioral effects of regret through attenuation of attention to some errors and outcomes, but not others.

Our results suggest that risk aversion is generally amplified in those with high religiosity, which may reduce reactivity. These findings corroborate positive relationships between risk aversion and church attendance, but not personal spiritual beliefs (Noussair et al., 2013). Notably, people are generally more risk averse in a "gain frame" (when focused on the upside of an uncertain outcome), preferring certain gains to speculative gambles; and more risk-seeking in a "loss frame" (when focused on the downside) preferring to choose risky gambles rather than certain losses (Kahnemann, 1979; Tversky & Kahneman, 1985). It is possible that religious individuals refrained from investing more in their next bet in response to actual gains or counterfactual losses within our study, due to general risk aversion, that is: they were less driven by the prospect of better but riskier outcome.

Our findings also suggest that religion is associated with reduced consistency of reward expectancy, as evidenced by negative interactions between various dimensions of religion with the *previous bet* in predicting subsequent investment decision making. This suggests that investment decisions are less likely to follow discernable patterns or trends among religious individuals. Religious individuals may have less trust that financial markets are predictable; an effect that might be exacerbated by the ambiguity inherent in the SIT. This is consistent with previous research, suggesting that religious individuals tend to activate trust or faith in God during times of uncertainty (Rosmarin et al., 2011). We also found that religious participants were less likely to engage in

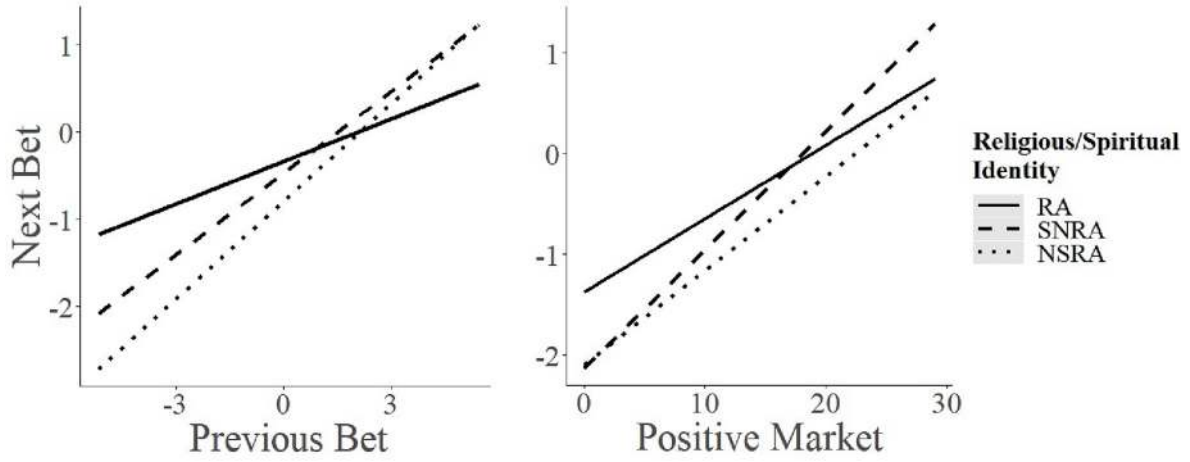

Fig. 1. Effects of religious vs. spiritual identity on financial decision making.
Notes: Religious affiliation reduced sensitivity to the *Previous Bet* and *Positive Market* in predicting the *Next Bet*. No other interactions between Religious/Spiritual identity and task variables were significant. RA = Religiously Affiliated, SNRA = Spiritual but Not Religiously Affiliated, and NSRA = Neither Spiritual nor Religiously Affiliated.

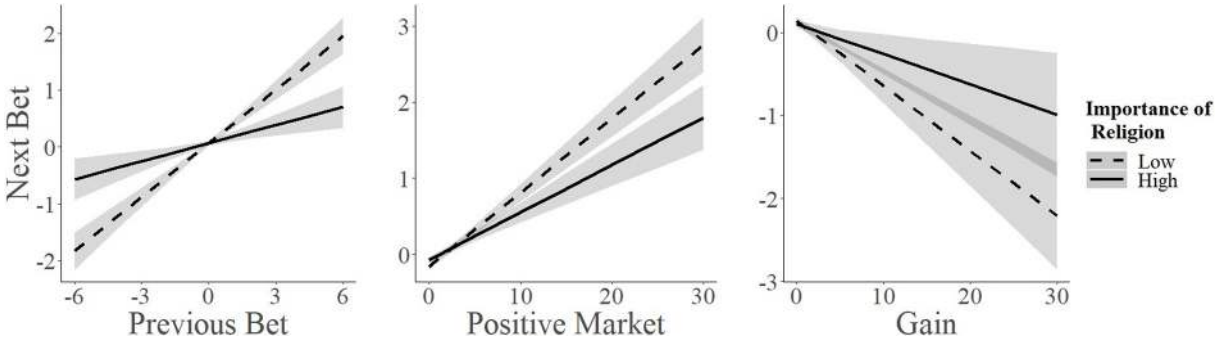

Fig. 2. Effects of importance of religion on financial decision making.
Similar results were observed for the following Religion measures: Religious Community, Frequency of Public Religious Activity, and Intrinsic Religiosity. In all cases, higher religion decreased sensitivity to the *Previous Bet, Positive Market*, and *Gain* in predicting the *Next Bet*. Only the interaction with *Previous Bet* was significant for the following Spirituality measures: Importance of Spirituality and Belief in God.

increasingly risky (e.g., high bets followed by other high bets), or risk-averse (e.g., low bets followed by other low bets) behavior patterns. This may represent diminished impulsivity, consistent with findings that religion is related to long-term self-control (Marcus and Mccullough, 2021).

Our findings may explain potential mechanisms by which S/R relates to mental health. Within the literature on this topic, which is well-established (Rosmarin & Koenig, 2020), S/R has particularly large protective effects on suicidality and alcohol/substance use (e.g., VanderWeele et al., 2016; Rosmarin et al., 2022; see Connery & Devido, 2020 for a review). It is possible that religion leads to greater behavioral stability, less risk-taking, and less reactivity to aversive states (e.g., regret), all of which may mitigate suicidality and alcohol/substance use. Involvement in organized religion may also engender greater stability particularly during volatile circumstances, through precommitment to certain rules of behavior. By contrast, subjective spiritual beliefs may not be as effective in protecting against impulse-related behaviors (Desmond, Ulmer, & Bader, 2013; Koenig, Koenig, King, & Carson, 2012). Notably, religious service attendance, but not spiritual identity, is a protective factor against suicide, even when controlling for social supports (Rasic et al., 2009).

Several methodological and conceptual limitations of the current study should be noted. First, although we studied an economically and socio-demographically diverse population, our religiously affiliated participants were predominantly Christian (Protestant and Catholic), and all were residents of the United States. Effects of S/R on behavior may vary across a broader range of religious, cultural, and geographic factors. Similarly, our analyses between different S/R identity may be undermined due to unbalanced sample sizes across the comparison groups – future research should replicate our findings with even larger and more balanced samples. Second, the correlational design of our study precludes causal attributions based on the observed findings. Self-control may lead to increased religiosity (Marcus & Mccullough, 2021) and precommitment (Sjåstad & Ekström, 2021). Furthermore, the relationship between S/R and our effects can be mediated by political attitudes, decision domain (e.g., economic vs. social), or personality. Future studies that include longitudinal designs and targeted experimental manipulations of S/R should provide insights into the causal mechanisms. Additionally, as previously noted, we report uncorrected results in our main text as we aimed to examine effects of essentially two main predictor categories (i.e., Spirituality and Religion). Nevertheless, almost all interactions of specific religious variables with *previous bet* effects, and several interactions with *positive market* and *gain* effects, remained significant after FDR correction (Table S2). Finally, the SIT does not directly assess affective responses—we only report objective behaviors—and the source(s) of these should be explored using self-report, physiological, and neurobiological markers of emotional response. Future research should continue to explore cognitive, behavioral, and affective mechanisms by which S/R relates to behavior, to inform translational models of S/R and mental health.

Data availability

Data will be made available on request.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.paid.2023.112350.

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