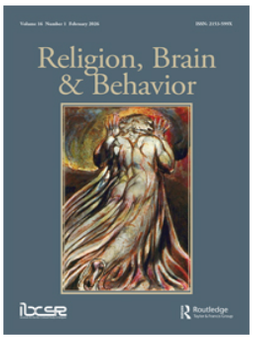

Religion, Brain & Behavior

ISSN: 2153-599X (Print) 2153-5981 (Online) Journal homepage: www.tandfonline.com/journals/rrbb20

Maternal religiosity and social support to mothers: helpers' religious identity matters

Radim Chvaja, Laure Spake, Anushé Hassan, Mary K. Shenk, Richard Sosis, Rebecca Sear & John H. Shaver

To cite this article: Radim Chvaja, Laure Spake, Anushé Hassan, Mary K. Shenk, Richard Sosis, Rebecca Sear & John H. Shaver (2026) Maternal religiosity and social support to mothers: helpers' religious identity matters, Religion, Brain & Behavior, 16:1, 24-45, DOI: 10.1080/2153599X.2025.2454705

To link to this article: https://doi.org/10.1080/2153599X.2025.2454705

RELIGION, BRAIN & BEHAVIOR
2026, VOL. 16, NO. 1, 24–45
https://doi.org/10.1080/2153599X.2025.2454705

Routledge
Taylor & Francis Group

RESEARCH ARTICLE

Maternal religiosity and social support to mothers: helpers' religious identity matters

Radim Chvaja [a,b], Laure Spake[c], Anushé Hassan[d], Mary K. Shenk [e], Richard Sosis[f], Rebecca Sear[g], and John H. Shaver[h]

[a]Religion Programme, University of Otago, Dunedin, New Zealand; [b]European Research University, Ostrava, Czech Republic; [c]Anthropology Department, Binghamton University, New York, USA; [d]Department of Population Health, London School of Hygiene and Tropical Medicine, London, UK; [e]Department of Anthropology, Pennsylvania State University, State College, USA; [f]Department of Anthropology, University of Connecticut, Storrs, USA; [g]Centre for Culture and Evolution, Brunel University, London, UK; [h]Department of Anthropology, Baylor University, Waco, USA

ABSTRACT

Research demonstrates that religious people are trusted more, receive and provide more cooperation, and have larger cooperative networks. This line of research also suggests, that religious prosociality is not always parochial, and often extends to people outside of a religious ingroup. Here, we test whether the intensity of religious practice associates with received support from coreligionists and/or non-coreligionists among a sample of American mothers. Specifically, we test the association between self-reported behavioral religiosity of religious (here Christian) and non-religious mothers from the Greater Pittsburgh area, USA, and the frequency of emotional support ($N_{mothers}$ = 517, $N_{supporters}$ = 1999) and housework help ($N_{mothers}$ = 447, $N_{supporters}$ = 997) they received from Christian and non-religious supporters. We found that maternal religiosity was positively associated with the frequency of housework help received from Christian supporters, but not from non-religious supporters. We did not find evidence for an association between maternal religiosity and emotional support received from religious nor non-religious supporters. We interpret our results through the lens of religious signaling theory.

ARTICLE HISTORY
Received 23 April 2024
Accepted 17 December 2024

KEYWORDS
Emotional support, prosociality, USA, religious practice, parochialism

Introduction

Cooperation, and its role in maintaining harmonious social interactions, has long intrigued researchers across many disciplines (Axelrod, 1984; Greene, 2013; Haidt, 2013; Nowak & Highfield, 2012; Tomasello, 2009). One area of significant scholarly attention has been the role of religion in promoting cooperation. Religion, with its capacity to shape ingroup values, norms, and social bonds, has been proposed as a powerful force fostering cooperative behaviors among people of the same religion (Norenzayan et al., 2016; Rossano, 2010).

Some scholars have argued that religious identities and practices have proliferated throughout populations because of their ability to bond members of the same religions (Graham & Haidt, 2010; Lang & Kundt, 2023; Rossano, 2010). Indeed, the literature on religious prosociality supports such a proposition. People think about their coreligionists as being more moral and trustworthy than non-coreligionists (Widman et al., 2009), and believers cooperate more with other believers as compared to atheists in economic games (Isler et al., 2021). Cross-cultural work suggests a

CONTACT Radim Chvaja radim.chvaja@otago.ac.nz, radimchvaja@gmail.com
Supplemental data for this article can be accessed online at https://doi.org/10.1080/2153599X.2025.2454705.

positive association between belief in morally concerned gods and cooperation between coreligionists (Lang et al., 2019; Purzycki et al., 2016). Religious practice, such as collective ritual, is even more directly linked to parochial cooperation through mechanisms that bond ritual participants (Fischer & Xygalatas, 2014; Whitehouse & Lanman, 2014). Mechanisms such as behavioral synchrony (Chvaja et al., 2020; Lang et al., 2017), similarity (Rabinowitch & Knafo-Noam, 2015; Riolo et al., 2002), sharing pain and other negative experiences (Bastian et al., 2014; Jong et al., 2015), and signaling (Lang et al., 2022; Purzycki & Arakchaa, 2013) may increase trust, bonding, and subsequently cooperation within groups of people attending rituals (Fischer et al., 2013; Sosis & Ruffle, 2003; Xygalatas et al., 2013).

While not arguing against the parochial nature of religious cooperation, some have highlighted that religion can also enhance prosociality toward outgroups. Research drawing upon extensive national and cross-national datasets and field studies, for example, suggests that more religious people tend to justify transgressions such as cheating to a lower extent than those who are less religious (Atkinson & Bourrat, 2011; Stark, 2001) and that ritual cues decrease cheating among religious participants in a laboratory setting (Lang et al., 2016). Other research suggests that religious belief (Goodwin & Darley, 2008; Yilmaz & Bahçekapili, 2015) and attending religious rituals (Chvaja, 2024; Chvaja et al., 2022) are associated with increased perception of the universality of moral norms across time, space, situations, and actors. Manipulating participants to think from the perspective of their god is associated with discouraging the dehumanization of religious outgroups, even in conflict zones (Ginges et al., 2016; Shackleford et al., 2024; Smith et al., 2022), while thinking about one's god increases cooperation with religious outgroups (Pasek et al., 2023). Research on collective synchrony, a key component of many religious collective rituals, suggests that synchronized participants are more prosocial toward people with whom they were not previously synchronized; in other words, after engaging in synchrony, participants act generously to outgroups (Reddish et al., 2013, 2016). Finally, markers indicating participation in religious rituals increase perceived trustworthiness among both believers and non-believers (McCullough et al., 2016).

The two propositions—that religion either encourages parochial or generalized prosociality—are not mutually exclusive. The evidence clearly suggests that parochial religious prosociality is more stable and likely widely encourages ingroup cooperation (Tsang et al., 2021), while under fewer circumstances can extend to outgroups. For example, belief in God seems to encourage cooperation with outgroups, while institutional religious aspects emphasizing affiliation and group ritual promote parochialism (Preston et al., 2010). Most previous work examining the parochial or generalized effects of religion has mostly employed experimental designs. These experiments allow an easier manipulation of the identity of those receiving or providing cooperative benefits so that the effects of religious identity on cooperation with coreligionists can be compared with its effects on prosociality toward non-coreligionists (Isler et al., 2021). For example, research suggests that highlighting religious affiliation increases cooperation with outgroups and highlighting god concepts increases cooperation with ingroups (Preston & Ritter, 2013). This finding is congruent with other studies showing that while collective rituals promote aggressive behavior toward outgroups (Ginges et al., 2009), god concepts encourage bonding with outgroups (Pasek et al., 2023).

Experiments, however, often lack ecological validity and experimental results cannot be automatically assumed in natural settings of cross-sectional and longitudinal designs (Diener et al., 2022). Such studies are rare and have not tested whether religious prosociality is general and extends to outgroups. Recent studies conducted in India, Brazil, and Tibet show that people who take part in costly religious events or repeatedly attend religious rituals have denser social networks, receive and provide more cooperation to others, and are more likely to be listed as generous by other people in their community (Cairang et al., 2023; Ge et al., 2024; Power, 2017a, 2017b, 2018; Soler, 2012). Yet, these studies utilize data involving religious participants reporting the

intensity of cooperation they provide and receive from religious people, often because these studies are conducted in religiously homogenous communities. Thus these studies cannot simultaneously examine the degree to which religious involvement influences parochial and non-parochial cooperation.

In this study, we aim to test whether cooperation is only observed among people of the same religious group or whether religiosity is associated with cooperation regardless of a cooperator's religious identity. To test between these alternatives, we use a sample of people who are exceptionally dependent on support received from others, and who may have both religious and non-religious supporters—mothers—in this case, from the United States.

A wide range of cross-cultural literature suggests that mothers receive social support and help with raising their children and that this support may be associated with child survival, health, well-being (Coall & Hertwig, 2010; Henderson et al., 2009; Hrdy, 2009; Kramer, 2024; Sear, 2016; Sear & Coall, 2011), and decisions to have another child (Schaffnit & Sear, 2017). In pre-transition, less market-integrated societies, kin networks are typically the most important source of maternal support (Sear et al., 2002; Sear & Mace, 2008; c.f. Kemkes-Grottenthaler, 2005; Sheppard & Sear, 2016), yet in market-integrated societies and post-industrialized societies (Kirk, 1996), individuals' social networks may be more dispersed and closely related individuals may live in more distant places because of the high mobility that is characteristic of these environments (Reher, 2011; Sear & Coall, 2011).

Religious involvement may be a strategy that mothers can employ to motivate others to support them and their offspring in highly market-integrated settings (Shaver et al., 2019). Evidence suggests that religious identity and religiosity are associated with larger social networks and potentially more intensive social support provided to mothers. Lim and Putnam (2010) found that religious people build extra friendships (as compared to non-religious people) within religious groups, which increases their overall life satisfaction. We[1] have previously shown, in a community in Bangladesh, that more religious women have larger and more kin-dense social networks than less religious women and that, although they receive more emotional support from their networks compared to non-religious women, this is not true for financial or childcare support (Lynch et al., 2022). Using data from rural Gambia, we found that while mothers' higher religiosity is associated with lower maternal investment, more religious mothers receive more childcare support from others, which results in more total investment for children of more religious mothers compared to less religious mothers (Shaver et al., 2024). Previously, we proposed the "Religious Alloparenting Hypothesis" arguing that religious mothers are able to secure extra childcare and other investment in children from coreligionists, and thus offset the costs of having larger family sizes (Shaver et al., 2019). Testing this hypothesis, a study from New Zealand revealed that religious identification and ritual attendance were positively associated with investment in others' children (Shaver et al., 2019). In another study, we found, using data from the Avon Longitudinal Study in England, that church attendance is positively related to overall social support provided to mothers by coreligionists (Shaver et al., 2020). Finally, our study of US and British mothers indicates that maternal religiosity is positively associated with household help and childcare provided by kin and, in the UK, with household help provided by a woman's spouse (Spake, Schaffnit, et al., 2024). These results indicate that religious investments pay benefits on multiple levels from supportive social networks to potentially improve child outcomes.

While the literature provides suggestive evidence for the argument that religiosity is overall associated with increased social support or allomaternal childcare toward religious participants, the data used in these studies do not take into account the religious/non-religious nor denominational identities of supporters. In this paper, we address this gap by examining religion (no religion vs Christianity) and denominations (Christian denominations) of our participants and their helpers. The strict parochial cooperation hypothesis predicts that maternal religious behavior is positively associated with social support (emotional support and housework assistance) received

from helpers who match participants' religion or religious denomination. A broader hypothesis that extends religious cooperation beyond parochial religious groups predicts that the positive association between religiosity and social support received is independent of whether participant's and helper's religion or denomination are matched.

Materials and methods

Data

Data used in this paper were collected as part of The Evolutionary Demography of Religion project (https://osf.io/b865v/). Data were collected in the greater Pittsburgh area, USA, in 2022 and 2023. The greater Pittsburgh area, with a population of around 2.5 million, is the metropolitan area ranging over almost 14 thousand square kilometers surrounding the city of Pittsburgh, Pennsylvania, USA. The economy of Pittsburgh includes all spheres of a highly integrated economy such as technology, health, finance, and higher education, among others. The average annual income per capita in 2017–2021 was ~38 thousand USD, and 46% of the population older than 25 years had bachelor's degree or higher (United States Census Bureau, 2024). According to a Pew survey (2014), 78% of the Greater Pittsburgh population identified as Christian, while 4% affiliated with non-Christian faiths and 18% were unaffiliated.

Data collection was performed in collaboration with Pennsylvania State University's Survey Research Center (SRC). Interviews were led by trained interviewers over online video calls with participants and used Open Data Kit (ODK, https://getodk.org/), an open-source software for conducting surveys (Unwin et al., 2010). The online modality of the interviews was made necessary by governmental social distancing mandates due to COVID-19, which were rapidly changing during interviewer training and at the start of data collection in 2022. Before the onset of data collection, we conducted focus groups to adapt our questionnaire to capture locally relevant variation in socioeconomic status, social support, and religiosity. The resulting questionnaires were piloted until we were satisfied that the questionnaire was effective and easily understood by our participants (Spake, Hassan, et al., 2024).

We recruited mothers aged between 25 and 60 years, who had at least one biological child younger than 30 years, to participate in our survey. The lower limit of 25 years (rather than 18 or 21 years) was chosen to increase the probability that the invited woman had a child. A further eligibility criterion was that if the child was aged under 17 years, they should be co-resident with the mother at the time of the interview to ensure that the mother was the primary caregiver of the child. Recruitment was done by the SRC, who purchased a list of addresses for women of the target age ranges residing in the Pittsburgh area from a third-party company. Participants were randomly selected from this list, and were sent a post-card in the mail to advertise the study ($n \sim 28{,}000$). Participants who expressed willingness to take part in the study were directed to a short pre-screening survey to confirm their eligibility. As the aim was to recruit a roughly even number of mothers who were either affiliated with Christianity (the dominant religion in the region) or were religiously unaffiliated, the SRC also asked mothers to refer other potential participants to the study. Mothers recruited through this snowball technique also completed the pre-screening survey and if eligible were then entered into the study (total n of mothers who completed the pre-screen = 1897). Mothers were compensated for their time with a US $100 gift card. The study was approved by Institutional Review Board at Pennsylvania State University (STUDY00016919).

Interviews were completed by a total number of 567 mothers. Questionnaires were extensive and took between one and a half to two hours to complete. Information collected included demographic and socioeconomic information, household composition, birth and family histories, religion and religious behaviors, and a social support ego-network. The social support ego-network was collected via the name generator approach, in which mothers were asked to list all individuals who helped them with specific tasks in the previous year. We then asked the mother demographic details

Table 1. Basic characteristics of mothers' supporters.

	Emotional support	Housework assistance
Number of supporters	2197	1088
Religion		
Non-religious	494 (22.5%)	31 (29.3%)
Christians	1510 (68.7%)	691 (63.5%)
Religion missing	147 (6.7%)	65 (6%)
Other religion	46 (2.1%)	13 (1.2%)
Relationship to mother		
Relationship missing	1 (0%)	0 (0%)
Hired help	21 (1%)	36 (3.3%)
Close kin	744 (33.9%)	559 (51.4%)
Spouse	369 (16.8%)	366 (33.6%)
Other kin	179 (8.1%)	85 (7.8%)
Non-kin	883 (40.2%)	42 (3.9%)

about each supporter, including each supporter's religious affiliation, as well as the frequency of support with each task. Of 567 participating mothers, 517 reported having someone who supported them emotionally in the previous year, and 447 reported someone who helped them with housework during the previous year.

The unit of observation for this study is the people in maternal ego-networks who were reported by mothers as providing them either emotional support or help with housework. Mothers listed 2197 emotional supporters and 1088 housework helpers. We had to drop supporters whose religion or relationship to the mother was missing, and we also dropped hired help because support provided by these people should be independent of religion (around three quarters of hired help supporters had missing data on religion as mothers were ignorant of such information). Finally, we dropped supporters affiliated with non-Christian religions as we did not have enough to permit a separate category for analysis. We conducted several robustness analyses including an analysis (Tables S3–S6 in SM) with hired help and non-Christian supporters to ensure the stability of our results due to these dropped datapoints. The final sample consisted of 1999 emotional supporters and 997 housework helpers (see Table 1 for basic information on supporters).

Variables

Social support

As suggested above, we modeled social support using two different types of support mothers often rely upon, namely emotional support and housework help. Both support types were measured via a series of questions. In the case of emotional support, we first asked: "Think of the people who you turn to when you are having a difficult time. Did someone provide you with emotional support in the last year?" Then, the mother selected from the list of previously mentioned supporters or added a new one. For each of the selected supporters, we asked: "Over the last year, how intensely did you rely on [supporter] for emotional support?" with options 1 = "very little/ not intensively at all", 2 = "a little but not intensively, 3 = "intensively, or 4 = "very intensively." To obtain a measure of housework assistance, we first asked: "In the past year, has someone helped you with work (e.g., housework, yard work, or other) when you needed it?" Again, mothers selected from the list of supporters or added a new supporter and we asked a question: "Over the past year, how frequently has [supporter] helped you with this work?" for each of them. The ordered options for housework help variable were 1 = "less than monthly", 2 = "monthly", 3 = "weekly", and 4 = "daily".

Religiosity

Our main predictor was maternal self-reported religious behavior. First, mothers were asked what to which religion they are affiliated. Second, mothers were categorized into four levels of religiosity based upon a combination of their self-declared religious affiliation and a religiosity score calculated

with a factor analysis. This was done because mothers who were unaffiliated ($N = 221$) were not asked any further questions on religious behaviors; during pilot surveys, these mothers expressed confusion and/or irritation when asked about religious behaviors after having stated they were non-affiliated.

To construct an index of mother's religiosity, we used factor analysis based upon the total sample of 346 religiously affiliated women. Note that not all data that were used to create the religiosity score were used in analyses presented here because some mothers had no-one who provided them with emotional support or housework help. From focus groups, we learned that mothers often use cues of religiosity such as prayer and religious attendance to judge the religiosity of others. This is congruent with previous literature suggesting that subtle, but frequent religious behaviors, seem to be especially important in building trusted connections between people (Bird et al., 2018; Power, 2018; Uhrin & Bužeková, 2022). Table 2 provides descriptions of six religiosity variables that we used and Figure S1 presents their distributions.

One of these six variables (prayer frequency) included three missing values, which we imputed with the median. The Kaiser-Meyer-Olkin (KMO) value for the six variables was 0.74, indicating suitable sampling adequacy and that the data likely have an underlying common structure. Forcing items to load on a single factor yielded factor loadings all higher than 0.4 and the scale had sufficient internal reliability (Cronbach's alpha = 0.759). The resulting scale was obtained from the factor analysis.

To collapse scores for affiliated mothers with unaffiliated mothers, we further split religiosity scores of affiliated mothers into three categories. Mothers scoring higher than one standard deviation above the mean were coded as 3 (high religious), those scoring higher than the mean but lower than one standard deviation were coded as 2 (middle religious), and the rest were coded as 1 (low religious). Moreover, unaffiliated mothers were coded 0. Thus, the resulting variable of religiosity has four ordered categories. Our aim in creating these categories was to keep the relatively long tail of the latent religiosity scale, but still have enough observations in all categories (see Figure 1 for mapping categories of affiliated mothers onto the latent scale of religiosity).

Table 2. Factor loadings of maternal religiosity.

Variable description	*M* (SD)	Factor loading
Frequency of church attendance: Mothers were asked "In the past 4 weeks, how many times did you go to church?"	1.86 (2.83)	0.604
Number of public religious activities other than service: Mothers were asked whether they "participate in any religious/faith-based activities with other people, outside of regular services at your church?" and if yes, then "What activities? Tick all activities that you participated in outside of regular services at your church (or other house of worship)?" Mothers had five options (faith-based volunteering, reading groups, prayer groups, women's groups, other) and they could decide for multiple answers. We calculated their total number.	0.69 (1.12)	0.764
Frequency of public religious activities other than service: Mothers were asked "In the past month (last 4 weeks) how many times did you participate in these activities?"	1.80 (4.54)	0.619
Frequency of prayers: Mothers were asked "In the last week (7 days), how many times have you prayed outside of services at your church?"	14.67 (37.14)	0.432
Number of private religious activities: Mothers were asked "Do you participate in any religious/ faith-based activities at home privately?" and those who answered positively "What activities? Tick all activities that you participated in at home privately." Mothers had six options (reading/ reciting religious texts, praying, visiting religious websites, reading books about religion, watching religious programs/ listening to religious radio, other) and they could decide for multiple answers. We calculated their total number.	2.13 (1.92)	0.692
Frequency of private religious activities: Mothers were asked "In the past month (last 4 weeks) how many times did you participate in these activities?"	26.88 (55.96)	0.421
SS loadings	2.175	
Proportion of variation explained	0.362	

Note: Figure S1 in SM visualizes the distributions of all individual religiosity variables.

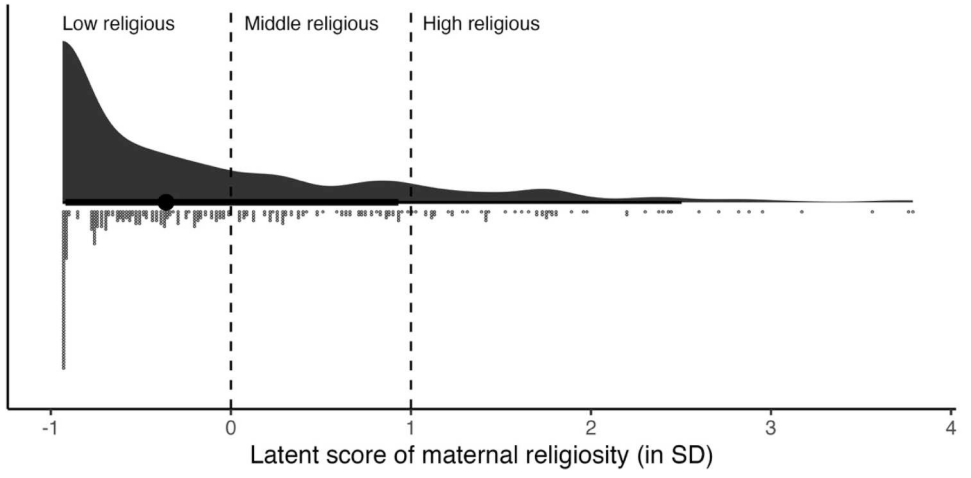

Figure 1. Distribution of latent religiosity scores across the sample of affiliated mothers. Two dashed lines separate low-religious mothers from middle religious mothers and middle religious mothers from high-religious mothers. Note that the final variable of religiosity includes a fourth category of unaffiliated mothers that is not included in this figure.

Table 3. Mothers' and supporters' denominations.

Denomination	Emotional supporters	Housework supporters
Mothers	517	447
Roman Catholic Church	133 (25.7%)	110 (24.6%)
Christian; not further defined	73 (14.1%)	69 (15.4%)
Presbyterian Church	46 (8.9%)	38 (8.5%)
Protestant (not further defined)	21 (4.1%)	20 (4.5%)
Baptist Church	12 (2.3%)	13 (2.9%)
Methodist Church	12 (2.3%)	11 (2.5%)
Lutheran Church	7 (1.4%)	7 (1.6%)
Episcopalian Church	5 (1%)	4 (0.9%)
The Church of Jesus Christ of Latter-day Saints	4 (0.8%)	4 (0.9%)
Anglican Church	2 (0.4%)	2 (0.4%)
Jehovah's Witnesses	2 (0.4%)	1 (0.2%)
Amplify Church	1 (0.2%)	1 (0.2%)
Evangelical Church	1 (0.2%)	1 (0.2%)
Christian Israelite Church	1 (0.2%)	1 (0.2%)
Missing	0	0
Supporters	1999	997
Roman Catholic Church	650 (32.5%)	270 (27.1%)
Christian; not further defined	314 (15.7%)	150 (15%)
Presbyterian Church	161 (8.1%)	95 (9.5%)
Protestant (not further defined)	65 (3.3%)	39 (3.9%)
Methodist Church	63 (3.2%)	28 (2.8%)
Baptist Church	60 (3%)	29 (2.9%)
Lutheran Church	46 (2.3%)	22 (2.2%)
The Church of Jesus Christ of Latter-day Saints	33 (1.7%)	12 (1.2%)
Episcopalian Church	28 (1.4%)	10 (1%)
Evangelical Church	13 (0.7%)	2 (0.2%)
Anglican Church	6 (0.3%)	5 (0.5%)
Eastern Orthodox Church	5 (0.3%)	1 (0.1%)
Pentecostal Church	3 (0.2%)	2 (0.2%)
Jehovah's Witnesses	3 (0.2%)	1 (0.1%)
Unitarian Universalist Association	2 (0.1%)	2 (0.2%)
Amplify Church	1 (0.1%)	2 (0.2%)
Missing	43 (2.1%)	8 (0.8%)

Religious identity of mothers' supporters

Mothers were asked to report the religious affiliation of every supporter (see Table 1 for basic information on supporters' religion). Subsequently, they were asked to report on the denomination for each supporter. In total, mothers reported 18 denominations for their supporters (Table 3). We display the relation between mothers' and supporters' denomination for the six most frequently observed denominations (and non-religious) in Figure 2.

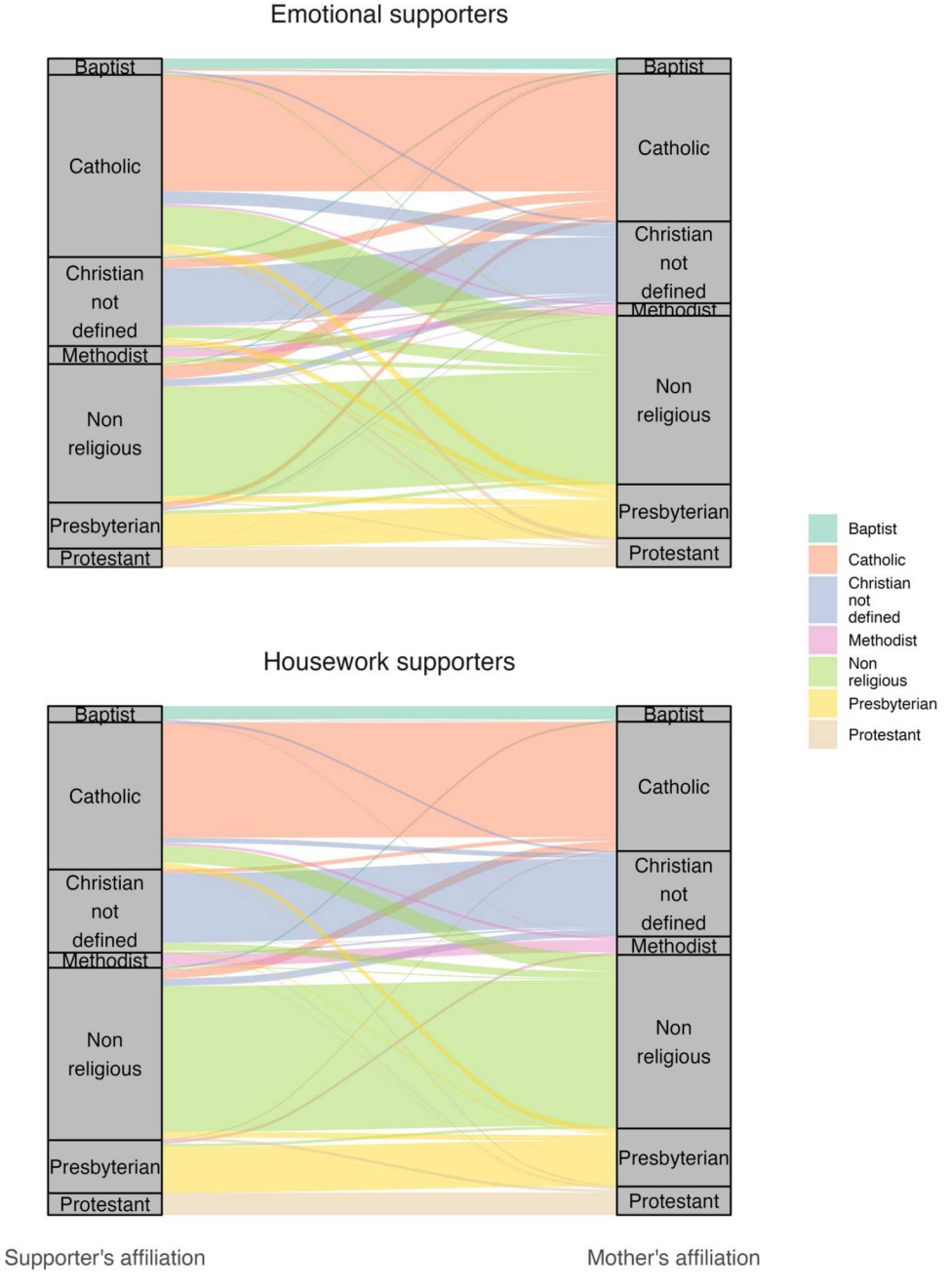

Figure 2. Sankey diagram displaying the relationship between mothers' and supporters' denomination. We note that the diagram lacks rare denominations for the sake of visualization.

On the level of supporter, our statistical models included gender (female vs non-female) and relatedness. On the level of mother, the models included covariates of mother's age, number of children residing with mother, education, household wealth, and urbanization. All variables included in the models were selected based upon Directed Acyclic Graphs (DAGs). DAGs help to model the complex causal relationships between variables and assess which covariates are necessary to include in a model in order to obtain causally relevant estimates (Bulbulia, 2024; Bulbulia et al., 2021). See Figure S2 in SM for more information on our DAG (Textor et al., 2016) and its interpretation.

Supporter's relationship to the mother

Close relatives will likely provide more support to mothers (Hamilton, 1964; Page et al., 2019). If close relatives, such as parents, are religious, their children will be likely religious, too (Petts, 2015; Willard & Cingl, 2017). This may bias interpretation of results because an association between maternal religiosity and support received from religious supporters may be simply explained by supporters' relatedness. Therefore, it is crucial to control for each supporter's relationship to the mother. We therefore categorized all supporters into four categories: mothers partners, close kin, other kin, and non-kin. Close kin were defined as those who have on average a 0.5 coefficient of relatedness (mother, father, sibling, child). Other kin were included in the category of "other kin" including affinal kin. Non-kin were all others except for people hired to perform childcare, who were dropped from the main analyses.

Table 4. Descriptive statistics.

	Sample for analysis of emotional support	Sample for analysis of housework help
Mothers	517	447
Religiosity		
0 = Unaffiliated	196 (38%)	164 (37%)
1 = Low	200 (39%)	176 (39%)
2 = Middle	67 (13%)	61 (14%)
3 = High	54 (10%)	46 (10%)
Education		
1 = High school	28 (5%)	26 (6%)
2 = Associate degree	70 (14%)	63 (14%)
3 = Bachelor's degree	215 (42%)	181 (40%)
4 = Graduate school	204 (39%)	177 (40%)
Age in years	44.96 (9.19)	44.62 (9.02)
Children at home	0.56 (1.00)	0.55 (1.00)
Household wealth in USD	209,687 (70,842)	213,433 (69,869)
Household urbanization in minutes	12.62 (5.12)	12.49 (4.86)
Supporters	1999	997
Emotional support frequency		
1 = Less than monthly	213 (11%)	
2 = Monthly	779 (39%)	
3 = Weekly	630 (32%)	
4 = Daily	377 (19%)	
Housework help frequency		
1 = Less than monthly		126 (13%)
2 = Monthly		112 (11%)
3 = Weekly		324 (32%)
4 = Daily		435 (44%)
Religious affiliation		
1 = Christian	1505 (75%)	682 (68%)
0 = Non-religious	494 (25%)	315 (32%)
Gender		
1 = Female	1351 (68%)	315 (32%)
0 = Male	645 (32%)	681 (68%)
0 = Non-binary	1 (0%)	1 (0%)
0 = refused	2 (0%)	0 (0%)

Total wealth of the household

Since religiosity, fertility intentions, and support might be affected by material insecurity (Norris & Inglehart, 2004), we estimated the total wealth in USD of the household based on all listed assets. We asked mothers to list all belongings of their household including real estate, cars, computers, and/or phones. To each item, we assigned an average estimated value based on internet-listed prices for Pittsburgh stores. Some asset variables were weighted (e.g., a 0.15 was assigned when a house is not owned but rented). Finally, we summed all values and log-transformed the final value. See Table S1 in SM for more details.

Education

Education has been previously shown to affect religiosity (Hungerman, 2011; Mocan & Pogorelova, 2017) and social support (Brandt & Hagge, 2020). We therefore asked mothers about their highest completed education (1 = "high school", 2 = "associate degree", 3 = "bachelor's degree", 4 = "graduate school"). For simplicity of modeling, we treated education as continuous variable in our models.

Urbanization

Research suggests that degree of economic integration can be associated with the structure of social networks (Colleran, 2020). Instead of economic integration, which might be irrelevant in many areas of the USA, we obtained the distances from four basic public institutions (hospital, secondary school, small shop, and the downtown area of Pittsburgh) reported by mothers in minutes, and then we calculated a mean distance. All four variables included three missing values in total, which we imputed using the median. Finally, we log-transformed the scale.

All questions used in this study are accessible from the document stored at OSF page associated with this study (https://osf.io/6mpbe/). For descriptive statistics of the sample see Table 4.

Results

All analyses were conducted using *R* (R Core Team, 2024). To analyze ordinal variables, we utilized cumulative link models (Bürkner & Vuorre, 2019; Christensen, 2018). These models estimate the cumulative odds of moving from a lower to higher category. We built multilevel models to estimate the probability that a given supporter will provide emotional support or housework help at a higher frequency. The main predictors in these models were interaction terms between mother's religiosity and the religious identity of the supporter. Other variables were entered as linear standardized covariates or fixed effects. We do not report the effects of covariates in the main text because we use them only to provide causally relevant estimates, and they do not have any further inferential value (full model specification of all analyses are available from Tables S2–S7 in SM). Because multiple supporters were linked to one mother, we included varying intercepts using mother's id. Next, we built further models to analyze the effects of an interaction between a supporter-mother denomination match, and maternal religiosity, on emotional support and housework assistance among affiliated mothers.

Emotional support

The odds ratios displayed in Table 5 (Model 1) indicate that Christian supporters provided more emotional support to the mothers in three religious categories as compared to unaffiliated mothers. However, these differences are all poorly estimated with confidence intervals largely crossing one. Moreover, there is no difference between support provided to unaffiliated mothers by Christian and non-religious supporters. Interaction terms suggest no interaction between supporter's affiliation and mother's religiosity.

Table 5. Cumulative link models of the association between mothers' religiosity and social support moderated by supporters' affiliation.

	Model 1: Emotional support			Model 2: Housework help		
Predictors	OR	95% CI	*p*	OR	95% CI	*p*
Mother's religiosity (reference: unaffiliated)						
Low religiosity	1.17	0.76–1.81	0.478	2.57	1.32–4.99	0.005
Middle religiosity	1.53	0.86–2.72	0.151	3.52	1.67–7.42	0.001
High religiosity	1.48	0.81–2.69	0.205	9.98	4.27–23.34	<0.001
Supporter's affiliation (reference: Christian)						
Non-religious	0.85	0.59–1.23	0.384	3.30	1.72–6.34	<0.001
Low religiosity × non-religious supporter	0.68	0.36–1.27	0.225	0.17	0.06–0.48	0.001
Middle religiosity × non-religious supporter	0.46	0.15–1.37	0.164	0.12	0.03–0.51	0.004
High religiosity × non-religious supporter	1.40	0.44–4.49	0.571	0.11	0.02–0.66	0.015
Covariates included		yes			yes	
Number of mothers		517			447	
Number of supporters		1999			997	
Marginal R^2/Conditional R^2		0.159/0.490			0.297/0.460	

Note: Full models with covariates and random effects are accessible from Table S2 in SM.

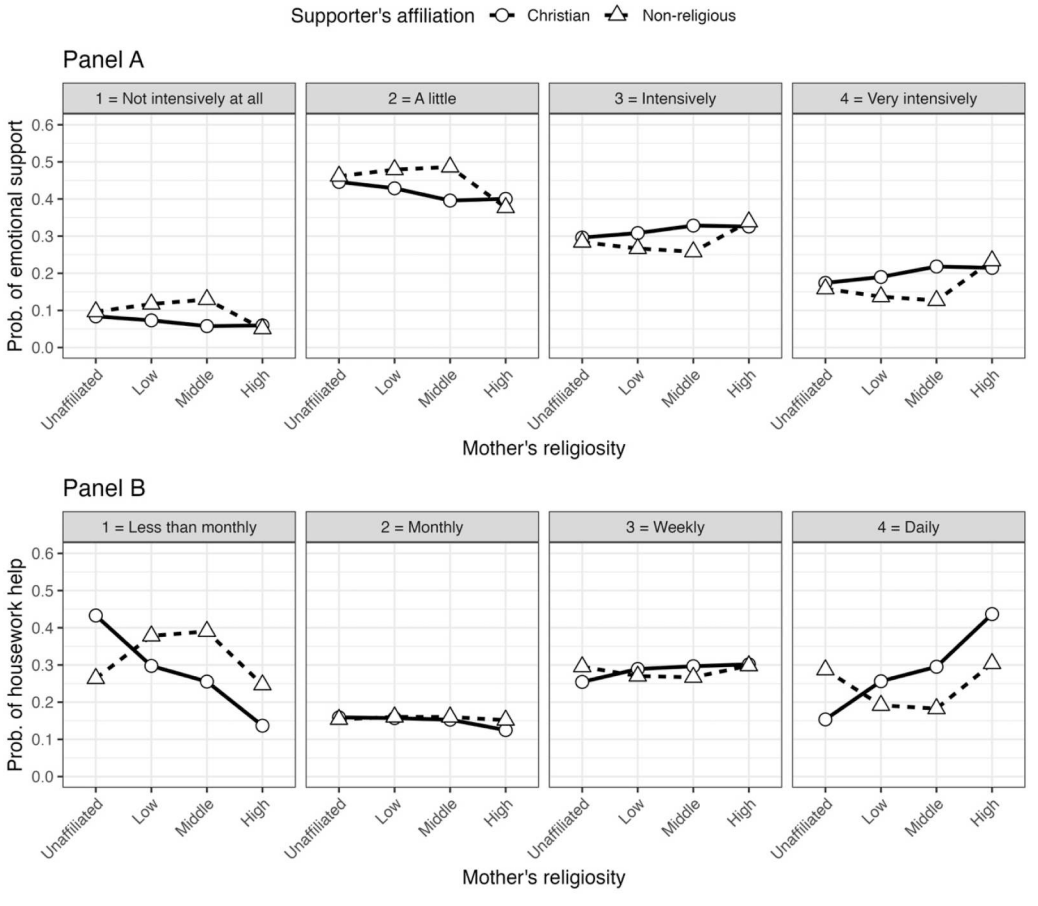

Figure 3. Predicted probability of social support (main models). In panels A and B, each of the four plots shows the association between mother's religiosity and the probability that supporters provide the specific type of help with the defined frequency (in label).

Housework help

Table 5 (Model 2) suggests that affiliated mothers received more housework help from Christian supporters and that these differences were positively associated with a mother's religiosity. As compared to unaffiliated mothers, the odds ratios of receiving housework help from Christian supporters were 2.57, 3.52, and 9.98 for low, middle, and high religiosity mothers respectively. Non-religious supporters had 3.30 higher odds than Christian supporters of providing housework help to unaffiliated mothers. These associations negatively interacted, thus the effects of mothers' religiosity on received support were lower among non-religious supporters than among Christian supporters.

Figure 3 displays the predicted probabilities of the two models reported in Table 5. In panels A and B, each of the four plots shows the association between mothers' religiosity and the probability that supporters provide the specific type of help within the defined frequency (the gray label). Panel A indicates that the largest difference between emotional support provided by Christian and non-religious supporters is in the case of mothers of middle religiosity. Yet, overall, the probabilities are similar across supporters when we consider all four categories of maternal religiosity. On the other hand, panel B shows large differences between Christian and non-religious supporters in their sensitivity to maternal religiosity. For example, Christian supporters are more likely to provide housework help less than monthly to unaffiliated mothers, as compared to highly religious mothers, but these probabilities are almost equal among non-religious supporters. The opposite dynamics are revealed by the right plot in panel B where Christian supporters are more likely to provide daily housework help to highly religious mothers as compared to the unaffiliated.

An interesting observation in Figure 3 is that non-religious supporters provide less support to low and middle religious mothers but roughly equal support to highly religious mothers and unaffiliated mothers. Thus, we additionally calculated that non-religious supporters provided more support to unaffiliated mothers compared to low-religious mothers (OR = 0.44, 95% CI = [0.19–1.01]) and middle religious mothers (OR = 0.40, 95% CI = [0.11–1.56]), although the confidence intervals in both cases crossed one. However, we found no evidence that non-religious supporters provide either more or less support to highly religious mothers as compared to unaffiliated mothers (OR = 1.14, 95% CI = [0.24–5.52]). We also calculated that middle religious (OR = 0.35, 95% CI = [0.05–2.70]) and low religious (OR = 0.39, 95% CI = [0.07–2.17]) mothers received less housework support from non-religious supporters than highly religious mothers. Again, confidence intervals of these estimates included one and thus the evidence is very weak. Since none of the additional results provides conclusive results, we did not calculate *p*-values adjusted for multiple testing and we below discuss these results with caution.

Robustness checks

We conducted five robustness analyses of both emotional support and housework assistance that varied important parameters with theoretically and methodologically relevant consequences. The first robustness model included a control variable asking mothers to what extent they would hypothetically ask the supporter for help during times of hardship. Inclusion of this variable controls for the fact that mothers have different expectations about supporters' involvement. The second robustness model included hired help as a separate fixed effect because only mothers who are wealthy enough can afford paid helpers, which could bias the results. The third robustness model dropped mothers' partners as they share the household, and likely the offspring, with mothers. A fifth robustness model dropped unaffiliated mothers and instead of supporters' affiliation, uses the match between supporters' and mothers' denomination as an interaction term, which allows us to target the effect of 18 specific denominational ingroups displayed in Table 3. All robustness models show that the main results are robust to these specifications. Here, we show the results of the fifth model (Table 6, Figure 4). These analyses demonstrate that there is no difference in

Table 6. Cumulative link model of the association between mothers' religiosity and social support moderated by a match between supporters' and mothers' denomination.

	Model 1: Emotional support			Model 2: Housework help		
Predictors	OR	95% CI	*p*	OR	95% CI	*p*
Mother's religiosity (reference: Low religiosity)						
Middle religiosity	1.56	0.89–2.75	0.122	1.34	0.78–2.31	0.287
High religiosity	1.63	0.90–2.96	0.107	4.65	2.33–9.28	<0.001
Match between supporter's and mother's denomination (reference: match)						
Not matched	1.14	0.82–1.59	0.443	0.57	0.33–0.98	0.043
Middle religiosity × Match	0.65	0.33–1.29	0.220	0.60	0.19–1.92	0.388
High religiosity × Match	0.73	0.35–1.51	0.393	0.21	0.05–0.90	0.035
Covariates included	yes			yes		
Number of mothers	321			283		
Number of supporters	1379			675		
Marginal R^2/Conditional R^2	0.168/0.489			0.333/0.487		

Note: Full models with covariates and random effects are accessible from Table S7 in SM.

emotional support to mothers of various religiosity by supporters who share a denomination with mothers and those who do not share a denomination. However, there is evidence that supporters who share a denomination, as compared to those who do not, provide more housework assistance to highly religious mothers than to low-religious mothers. For results of robustness models 1–4 see Tables S3–S6 in SM.

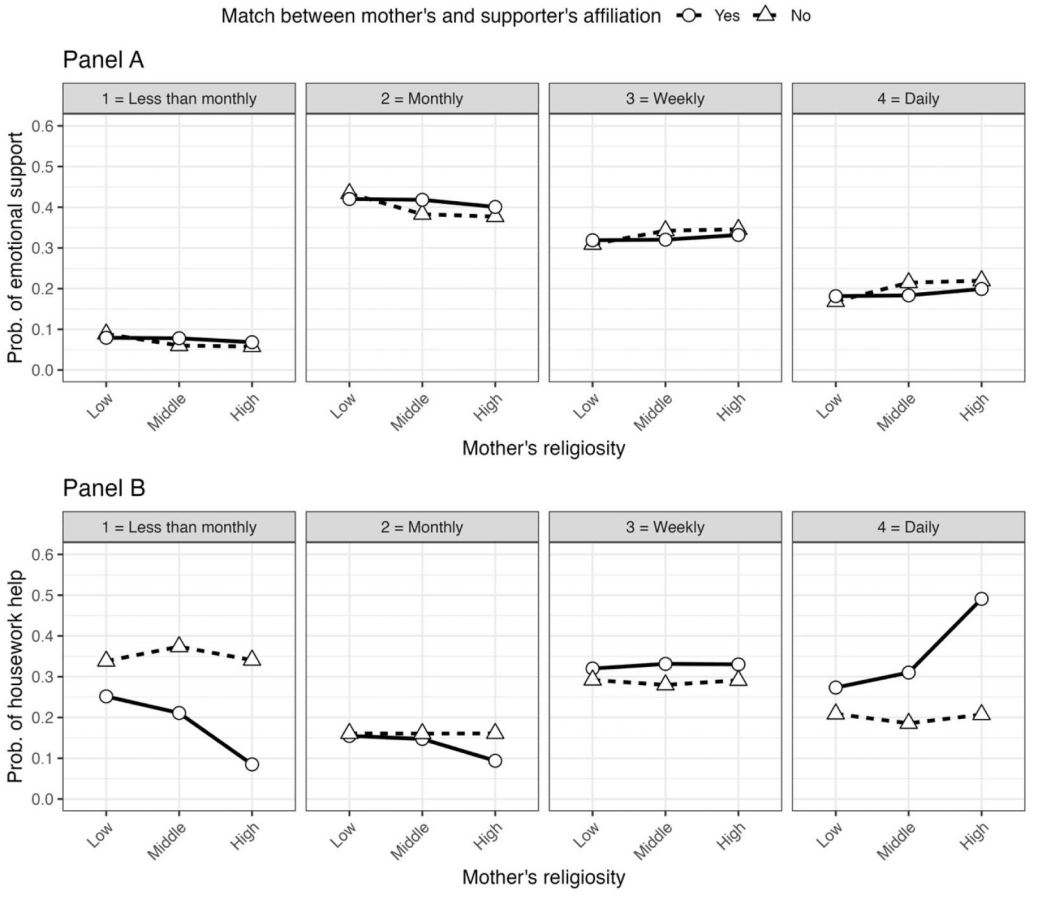

Figure 4. Predicted probability of social support. Panels A and B show the association the association between mother's religiosity and probability that supporters provide the specific type of help with the defined frequency (in label).

Discussion

The motivation for this study was to test basic hypotheses derived from two main frameworks of religious cooperation, namely parochial cooperation and its extended version of generalized cooperation. According to the religious parochial cooperation framework, mechanisms related to religious affiliation promote prosociality toward other members of the same religious group (Isler et al., 2021; Lang et al., 2019; Norenzayan et al., 2016; Shaver, Lang, et al., 2018). A generalized religious cooperation hypothesis adds that in some socio-ecological contexts, religion may increase prosocial acts toward ingroups *and* outgroups (Hall et al., 2015; McCullough et al., 2016; Pasek et al., 2023; Preston et al., 2010; Preston & Ritter, 2013). While the empirical base, drawn from experimental literature, supports both hypotheses, studies exploring daily interactions in the real world are rare and, to date, have not compared the effects of religiosity on cooperation across both ingroups and outgroups (Cairang et al., 2023; Power, 2017b; Sear et al., 2002).

Here, we investigated whether more religious mothers in the greater Pittsburgh area receive more support from their Christian and non-religious supporters. First, we found a positive association between maternal religiosity and housework assistance received from supporters of the same religion and denomination, which directly supports the religious parochial hypothesis. This result was expected as religious parochial cooperation is observed across a number of studies (Isler et al., 2021; Lang et al., 2019). A more important question addressed here was the association between maternal religiosity and support from non-religious supporters. We did not observe such an association, suggesting support for the strictest interpretation of the religious parochial hypothesis with no extension to generalized prosociality. Experiments from the US context previously found effects that religious markers extend across religious boundaries (Hall et al., 2015; McCullough et al., 2016), while similar work in Mauritius found religion to promote cooperation primarily among ingroups (Shaver, Lang, et al., 2018). Comparing our results with previous experimental studies utilizing US samples suggests that the nature of interactions from the real world, such as help with tasks in the house, often provided by close friends or relatives, are fundamentally different from the anonymous economic games investigated in laboratory settings.

Since our measure of religiosity is operationalized through self-reports of behaviors, including attendance at public collective religious meetings, the result is congruent with arguments that the institutional aspects of religion have ingroup effects, while the belief aspects of religion have more generalized effects (Pasek et al., 2023; Preston et al., 2010; Preston & Ritter, 2013; Shackleford et al., 2024). Using a different measure of religiosity that includes beliefs and a personal relationship to God may yield different results. In our design, however, using questions related to verbally stated belief may yield null results simply because we were not studying associations between religiosity and cooperation provided by participants, but rather the support those participants received. Supporters in our sample may be ignorant to the participants' intensity of religious beliefs as this is private information only accessible to participants. This suggests that religious practice reported by participants may serve as a display of their beliefs, recognized and encoded by their supporters (Rappaport, 1999). As such, our findings cannot be entirely interpreted using the framework of the minimal group paradigm (Balliet et al., 2014; Tajfel, 1970; Tajfel et al., 1971) applied to religion because the ingroup in our study was not a simple dichotomous category stated by participants or manipulated by researchers. Ingroup membership is rather performed and displayed by participants with various intensities. This performance may provide more accurate information about mothers' commitment to the religious group, and acceptance of ingroup values, than simple verbal statements (Rappaport, 1999).

Thus, we ground our interpretation of our results in the costly signaling theory of religion (CSTR; Irons, 2001; Sosis, 2003) and credibility enhancing displays (CREDs; Henrich, 2009). According to CSTR, religious behaviors, while costly in terms of energy, time, and at times money, honestly communicate the signaler's commitment to cooperation with other group members. CREDs propose that the verbal propositions of beliefs are more trusted when accompanied by

congruent behaviors. The religiosity variable in our study was operationalized using frequency of participation in public and private religious events and activities. Such an operationalization is associated with costs because participating mothers must invest their time in these religious activities. Taking these two frameworks together (Chvaja & Řezníček, 2019), we speculate that the mechanism behind our results is the signaling of belief to coreligionists. Mothers who frequently participate in various religious activities might do so because they believe in the normative prescriptions of their religious denomination. Mothers' behavioral religiosity can thus serve as an honest signal of her personal beliefs and commitment to the religious group. While our data do not allow us to test this speculative narrative specifically, previous studies show that costly signals can distinguish between cooperators and freeriders in a laboratory setting (Lang et al., 2022, 2024) and that costly religious behaviors may increase perceived trustworthiness among coreligionists (Chvaja et al., 2023; Hall et al., 2015; Purzycki & Arakchaa, 2013).

The experimental literature on CSTR further suggests that the effects of costly religious acts on perceived trustworthiness may transcend the boundaries of religious groups, such as when Muslims evaluate Christians performing costlier religious signals as more trustworthy (Hall et al., 2015). However, the same study shows that the effects within religions are stronger than across religions (Hall et al., 2015). Similarly, another study that used badges of Christianity demonstrated that wearing Ash Wednesday ashes increased perceived trustworthiness as rated by Christians and non-Christians, but more so among Christians (McCullough et al., 2016). A recent study found that the effects of costly signals (operationalized as pilgrimages of varying length) on signalers' perceived trustworthiness are strongest when all parts of the signaling system, namely signaler, receiver, and the signal itself, are related to the shared religious tradition (Chvaja et al., 2023). The authors of that study argued that the mechanism responsible for their findings is that religious signal receivers are better culturally equipped to encode religious signals and relate them to cooperative norms. This interpretation does not automatically predict no effect of religious signals among non-believers, because even non-believers may be, under some ecological conditions, familiar with the rituals and norms of religious ideologies present in their socio-cultural context but not to the same extent as other members of the religious group. This interpretation (Chvaja et al., 2023) is congruent with one of the original contentions of CSTR, that in a long run, costly signals are only effective within specific religious groups, and not among secular groups (Sosis & Bressler, 2003).

Signaling theories may also help to interpret why we did not observe any association between maternal religiosity and emotional support. Emotional support is less dependent on the physical closeness of the person who is supported, because it might be done over phone, while housework help, by definition, needs the supporter to be physically present, at least when they provide the help (our data on where supporters reside support such a reasoning; see section S1 in SM). Therefore, supporters who provide housework help may live closer to the mother and thus be more likely to observe a mother's religious behavior in public or even in private. Such speculation is congruent with a costly signaling approach, because when people cannot observe religious signals, they can hardly behave accordingly.

We did find that secular supporters provided housework assistance more often to secular mothers than to low and middle religious mothers, although these finding are not statistically significant. This result is expected based upon the minimal group paradigm (Tajfel, 1970). Research consistently suggests that people are extremely sensitive to cues of ingroup membership (Balliet et al., 2014), and being non-religious in contemporary USA may be a strong signal of shared norms and values. In the greater Pittsburgh area, only 18% of residents are unaffiliated, while 78% are Christians, with the rest religious others. Religious individuals may interpret non-religious people as a perceived threat, further bolstering the effects of an ingroup bias (Majolo & Maréchal, 2017; Puurtinen et al., 2015) and signaling to group members (Lang et al., 2024). An important question potentially opening directions for future studies is whether time consuming behavioral cues of membership in secular groups, with their own ideology and norms, such as is found among sports fans, would produce the same ingroup effects as religiosity among coreligionists

(Chvaja et al., 2023). Previous behavioral economic experiments have found that cooperation does not differ between members of Greek fraternities that practice costly hazing rituals, and social clubs with fewer costly requirements (Shaver, Divietro, et al., 2018). These results may, however, vary across secular groups, or when measuring daily interactions rather than cooperation in economic games.

Our results are also congruent with the "Religious Alloparenting Hypothesis' (Shaver et al., 2019), which predicts that religious mothers receive more support from coreligionists, who can help to mitigate the trade-off between quantity and quality of offspring (Lawson & Mulder, 2016) by providing crucial social support to mothers. We conducted additional analyses accessible from SM (Table 8) suggesting that religious mothers receive more overall housework assistance as well as emotional support from others. Our data do not test the latter proposition of the Religious Alloparenting Hypothesis, that support from coreligionists allows mothers to have more children, or buffers against the quality-quantity trade-off, but we provide evidence for the aspect of the theory proposing that maternal religiosity returns more support from coreligionists.

Our study has several limitations. First, our data do not allow us to detail the full social network of individuals such as in studies conducted in India (Power, 2017a, 2017b, 2018) and Tibet (Cairang et al., 2023; Ge et al., 2024). This prevents us from estimating the probability that mothers receive support from a specific member of the community, because the network in our data is composed of people who provided specific pre-defined types of support (e.g., financial support or food-giving), and to whom mothers provided such assistance. We could have used the whole ego-network and assigned zeros to members of ego-networks who provided support in other domains of support but not housework assistance or emotional support. This would increase the sample size and be inclusive of more people who interacted with participants. However, there might be people not reported by mothers for any type of support from whom mothers would expect support or, on the other hand, there may be people listed in their ego-network who are not supposed to support mothers in other domains of support (e.g., a neighbor who mows the lawn may not be expected to provide emotional support). Any analysis that includes the full ego-network would be misleading in that sense. Therefore, we can only estimate the effects of our interaction term on support among supporters, not on the decision to help, which means that we had to drop from the analyses mothers who received no emotional support (8.8%) or housework help (21.2%) from anyone. A possible solution would be to analyze the data at the level of the mother (rather than supporter) and estimate how much support mothers receive from all supporters on average or in total. However, these results would also be misleading as it would prevent us from controlling for the relationship between supporters and mothers, which is crucial for unbiased results. Close relatives' religiosity, such as the religiosity of participants' parents, strongly affects maternal religiosity, and this could mean that religious mothers receive more support from religious supporters not because these supporters are religious, but because they are kin. Only when we used supporters as the unit of observation, were we able to control for their relationship to the mother.

Our method of collecting data on support does come with specific benefits when compared to some other studies. First, studies collecting full community social networks (Cairang et al., 2023; Ge et al., 2024; Power, 2017a, 2017b, 2018) to study religious behavior and cooperation build the social network out of people in one (or more) villages, thus omitting supporters from distant places. But some kinds of support, for example, emotional support, may be provided by people who do not live in the same area as the focal participant. Therefore, previous studies utilizing a social network approach may miss important data which may lead to biased conclusions. Second, while previous studies measure hypothetical help by asking people whether they would ask a specific person for help or whether they think the person is generous, our data include retrospective questions on frequency of support actually received.

A second limitation is related to the fact that our data were self-reported by mothers. Participating mothers could systematically underreport support from someone with whom the mother currently has a strained relationship, such as with the husband's mother (Fischer, 1983). Mothers

might also forget sporadic help. Moreover, people might overreport their actual religious behavior when they feel they are unable to meet normative standards. Shaver et al. (2021) document that Fijian mothers overreport their religious attendance as a result of childcare responsibilities that restrict their ability to participate in religious activities. A similar dynamic might result in younger women in our sample overreporting their religious behaviors more than older women whose children are grown. We attempted to address the problem of self-report by utilizing measures that avoid vague time intervals and vague frequences. For example, private religious behaviors were reported for the past seven days and collective religious behaviors for four weeks. Moreover, participants self-reported the exact number of religious behaviors. We believe that tighter time scales and answers of exact numbers decrease biases. Yet, future studies that utilize observational data (Page et al., 2019; Shaver et al., 2021) or GPS location (Pope, 2024) would directly address this limitation.

A third limitation is that our sample is not entirely random nor representative of the U.S. population. While the initial pre-selection process was random, factors such as monetary rewards and additional snowball sampling may have introduced confounding effects on the final sample.

A final limitation of our study is its cross-sectional design, which prevents us from causally interpreting our results. Although we included covariates as suggested by a DAG, it is still possible that mothers become more religious as they receive more support from religious people. Such an interpretation, however, would carry important insights into our understanding of the transmission of religious beliefs and practices. Research on cultural evolution and cultural learning indicates that people adopt cultural traits that are frequent in the population (Henrich & Boyd, 1998; Muthukrishna et al., 2016) and that cultural traits of cooperative norms should be even more attractive due to their individual benefits (Muthukrishna et al., 2016). If religious people help mothers more because of their belief in a religious system (Norenzayan et al., 2016), mothers may tend to adopt religious beliefs and practices of their supporters and become more religious. An explanation that the two processes—that religious supporters help mothers because they are religious, and that mothers are becoming more religious because they receive support from religious people—are mutually reinforcing appears probable to us, yet future longitudinal studies and natural experiments must disentangle possible causal paths.

To conclude, it has been long argued that religions as systems of norms, supernatural beliefs, and rituals have evolved to solve socioecological challenges, with the problem of group cooperation being one of the most significant facing all human groups (Purzycki et al., 2022; Purzycki & Sosis, 2022). Here we demonstrate that religious practice may be beneficial in terms of social support received from other religious people. This is especially important for participants in our sample, women with dependent offspring. We believe that religious practices could have evolved to mark a membership in the religious group but also to display the intensity of commitment to the group's core norms, values, and other members. Other people of the group may then use these cues of religiosity to decide how much to help the person in question.

Note

1. We are using "we" to make it clear that the paragraph is mostly based on the work done by some authors of the current paper within the same project as the current paper.

Author contribution

Conceptualization: R.C.; Funding acquisition: M.S., R.So., R.Se, J.S.; Data collection: L.S., M.S.; Data curation: R.C., A.H., L.S.; Formal analysis: R.C.; Methodology: all authors; Visualization: R.C.; Writing —original draft: R.C.; Writing —review and editing: all authors.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Data and statistical script

The statistical script associated with this study is made public https://osf.io/6mpbe/. However, since the data we use in this study are part of larger project and will be made public in a future, we cannot currently share the raw dataset. Therefore, we provide access to the processed dataset prepared for analyses. Reader may go through the full script or skip the data curation part directly to load prepared dataset and run the statistical models.

Funding

This work was supported by grants from the John Templeton Foundation (61426), Templeton Religion Trust (TRT2022-30378), and the Templeton World Charity Foundation (33466).

Supplementary online material

This study includes Supplementary material in the form of a pdf document: https://osf.io/t4yvz. This document contains supplementary figures, explanations, and tables.

ORCID

Radim Chvaja http://orcid.org/0000-0002-1560-1197
Mary K. Shenk http://orcid.org/0000-0003-2002-1469

References

Atkinson, Q. D., & Bourrat, P. (2011). Beliefs about God, the afterlife and morality support the role of supernatural policing in human cooperation. *Evolution and Human Behavior*, *32*(1), 41–49. https://doi.org/10.1016/j.evolhumbehav.2010.07.008

Axelrod, R. (1984). *The evolution of cooperation*. Basic Books.

Balliet, D., Wu, J., & De Dreu, C. K. W. (2014). Ingroup favoritism in cooperation: A meta-analysis. *Psychological Bulletin*, *140*(6), 1556–1581. https://doi.org/10.1037/a0037737

Bastian, B., Jetten, J., & Ferris, L. J. (2014). Pain as social glue: Shared pain increases cooperation. *Psychological Science*, *25*(11), 2079–2085. https://doi.org/10.1177/0956797614545886

Bird, R. B., Ready, E., & Power, E. A. (2018). The social significance of subtle signals. *Nature Human Behaviour*, *2*(7), 452–457. https://doi.org/10.1038/s41562-018-0298-3

Brandt, J., & Hagge, K. S. (2020). Education and social support: Do migrants benefit as much as natives? *Comparative Migration Studies*, *8*(1), 1–40. https://doi.org/10.1186/s40878-020-00199-w

Bulbulia, J. (2024). Methods in causal inference. Part 1: Causal diagrams and confounding. *Evolutionary Human Sciences*, *6*, e40. https://doi.org/10.1017/ehs.2024.35

Bulbulia, J., Schjoedt, U., Shaver, J. H., Sosis, R., & Wildman, W. J. (2021). Causal inference in regression: Advice to authors. *Religion, Brain & Behavior*, *11*(4), 353–360. https://doi.org/10.1080/2153599X.2021.2001259

Bürkner, P.-C., & Vuorre, M. (2019). Ordinal regression models in psychology: A tutorial. *Advances in Methods and Practices in Psychological Science*, *2*(1), 77–101. https://doi.org/10.1177/2515245918823199

Cairang, D., Ge, E., Du, J. and Mace, R. (2023). Sex differences in costly signaling in rural Western China. *Evolution and Human Behavior*, *44*(2), 80–87. https://doi.org/10.1016/j.evolhumbehav.2023.02.009

Christensen, R. H. B. (2018). Cumulative link models for ordinal regression with the R package ordinal. *Journal of Statistical Software*, 1–40.

Chvaja, R. (2024). The impact of ritual participation on perceived moral objectivity: A longitudinal investigation of the U.S. adolescents. *Journal for the Scientific Study of Religion*, *63*(4), 773–790. https://doi.org/10.1111/jssr.12920

Chvaja, R., Chinchilla, J., Gomez, Á, & Lang, M. (2023). Religious costly signal induces more trustworthiness than secular costly signal: A study of pilgrimage to Santiago de Compostela. *European Journal of Social Psychology*, *53*(6), 1294–1308.

Chvaja, R., Horský, J., Lang, M., & Kundt, R. (2022). Positive association between ritual performance and perceived objectivity of moral norms. *The International Journal for the Psychology of Religion*, *33*(2), 115–135. https://doi.org/10.1080/10508619.2022.2121454

Chvaja, R., Kundt, R., & Lang, M. (2020). The effects of synchrony on group moral hypocrisy. *Frontiers in Psychology*, *11*(544589), 1–11. https://doi.org/10.3389/fpsyg.2020.544589

Chvaja, R., & Řezníček, D. (2019). An integrative framework of commitment displays in religious systems. *Human Ethology*, *34*, 41–52. https://doi.org/10.22330/he/34/041-052

Coall, D. A., & Hertwig, R. (2010). Grandparental investment: Past, present, and future. *Behavioral and Brain Sciences*, *33*(1), 1–19. https://doi.org/10.1017/S0140525X09991105
Colleran, H. (2020). Market integration reduces kin density in women's ego-networks in rural Poland. *Nature Communications*, *11*(1), 1–9. https://doi.org/10.1038/s41467-019-14158-2
Diener, E., Northcott, R., Zyphur, M. J., & West, S. G. (2022). Beyond experiments. *Perspectives on Psychological Science*, 1–19. https://doi.org/10.1017/9781108277679.002
Fischer, L. R. (1983). Mothers and mothers-in-law. *Journal of Marriage and Family*, *45*(1), 187–192. https://www.jstor.org/stable/351307
Fischer, R., Callander, R., Reddish, P., & Bulbulia, J. (2013). How do rituals affect cooperation? *An experimental field study comparing nine ritual types. Human Nature*, *24*, 115–125. https://doi.org/10.1007/s12110-013-9167-y
Fischer, R., & Xygalatas, D. (2014). Extreme rituals as social technologies. *Journal of Cognition and Culture*, *14*(5), 345–355. https://doi.org/10.1163/15685373-12342130
Ge, E., DongZhi, C., & Mace, R. (2024). Religiosity and gender bias structure social networks. *Evolutionary Human Sciences*, 1–38. https://doi.org/10.1017/ehs.2024.16
Ginges, J., Hansen, I., & Norenzayan, A. (2009). Religion and support for suicide attacks. *Psychological Science*, *20*(2), 224–230. https://doi.org/10.1111/j.1467-9280.2009.02270.x
Ginges, J., Sheikh, H., Atran, S., & Argo, N. (2016). Thinking from God's perspective decreases biased valuation of the life of a nonbeliever. *Proceedings of the National Academy of Sciences of the United States of America*, *113*(2), 316–319. https://doi.org/10.1073/pnas.1512120113
Goodwin, G. P., & Darley, J. M. (2008). The psychology of meta-ethics: Exploring objectivism. *Cognition*, *106*(3), 1339–1366. https://doi.org/10.1016/j.cognition.2007.06.007
Graham, J., & Haidt, J. (2010). Beyond beliefs: Religions bind individuals into moral communities. *Personality and Social Psychology Review*, *14*(1), 140–150. https://doi.org/10.1177/1088868309353415
Greene, J. (2013). *Moral tribes: Emotion, reason, and the gap between us and them*. The Penguin Press.
Haidt, J. (2013). *The righteous mind: Why good people are divided by politics and religion*. Penguin Books.
Hall, D. L., Cohen, A. B., Meyer, K. K., Varley, A. H., & Brewer, G. A. (2015). Costly signaling increases trust, even across religious affiliations. *Psychological Science*, *26*(9), 1368–1376. https://doi.org/10.1177/0956797615576473
Hamilton, W. D. (1964). The genetical evolution of social behaviour. I. *Journal of Theoretical Biology*, *7*, 1–16. https://doi.org/10.1016/0022-5193(64)90038-4
Henderson, C. E., Hayslip, B., Sanders, L. M., & Louden, L. (2009). Grandmother-Grandchild relationship quality predicts psychological adjustment among youth from divorced families. *Journal of Family Issues*, *30*(9), 1245–1264. https://doi.org/10.1177/0192513X09334913
Henrich, J. (2009). The evolution of costly displays, cooperation and religion: Credibility enhancing displays and their implications for cultural evolution. *Evolution and Human Behavior*, *30*(4), 244–260. https://doi.org/10.1016/j.evolhumbehav.2009.03.005
Henrich, J., & Boyd, R. (1998). The evolution of conformist transmission and the emergence of between-group differences. *Evolution and Human Behavior*, *19*, 215–241. https://doi.org/10.1016/S1090-5138(98)00018-X
Hrdy, S. B. (2009). *Mothers and others: The evolutionary origins of mutual understanding*. The Belknap Press.
Hungerman, D. M. (2011). The effect of education on religion: Evidence from compulsory schooling laws. *Journal of Economic Behavior & Organization*, *104*, 52–63. http://www.nber.org/papers/w16973
Irons, W. (2001). Religion as a hard-to-fake sign of commitment. In R. Nesse (Ed.), *Evolution and the capacity for commitment* (pp. 292–309). Russell Sage.
Isler, O., Yilmaz, O., & John Maule, A. (2021). Religion, parochialism and intuitive cooperation. *Nature Human Behaviour*, *5*(4), 512–521. https://doi.org/10.1038/s41562-020-01014-3
Jong, J., Whitehouse, H., Kavanagh, C., & Lane, J. (2015). Shared negative experiences lead to identity fusion via personal reflection. *PLoS One*, *10*(12), 1–12. https://doi.org/10.1371/journal.pone.0145611
Kemkes-Grottenthaler, A. (2005). Of grandmothers, grandfathers and wicked step-grandparents. *Differential impact of paternal grandparents on grandoffspring survival. Historical Social Research*, *30*(3), 219–239.
Kirk, D. (1996). Demographic transition theory. *Population Studies*, *50*(3), 361–387. https://doi.org/10.1080/0032472031000149536
Kramer, K. L. (2024). Allocare. In J. Koster, B. Scelza, & M. K. Shenk (Eds.), *Human behavioral ecology* (pp. 283–306). Cambridge University Press.
Lang, M., Bahna, V., Shaver, J. H., Reddish, P., & Xygalatas, D. (2017). Sync to link: Endorphin-mediated synchrony effects on cooperation. *Biological Psychology*, *127*, 191–197. https://doi.org/10.1016/j.biopsycho.2017.06.001
Lang, M., Chvaja, R., & Purzycki, B. G. (2024). The role of costly commitment signals in assorting cooperators during intergroup conflict. *Evolution and Human Behavior*, *45*(2), 131–143. https://doi.org/10.1016/j.evolhumbehav.2024.01.003
Lang, M., Chvaja, R., Purzycki, B. G., Václavík, D., & Staněk, R. (2022). Advertising cooperative phenotype through costly signals facilitates collective action. *Royal Society Open Science*, *9*(202202), 1–19.
Lang, M., & Kundt, R. (2023). The evolution of human ritual behavior as a cooperative signaling platform. *Religion, Brain & Behavior*, 1–23. https://doi.org/10.1080/2153599X.2023.2197977

Lang, M., Mitkidis, P., Kundt, R., Nichols, A., Krajcíková, L., & Xygalatas, D. (2016). Music as a sacred cue? Effects of religious music on moral behavior. *Frontiers in Psychology*, *7*(JUN), 1–13. https://doi.org/10.3389/fpsyg.2016.00814

Lang, M., Purzycki, B. G., Apicella, C. L., Atkinson, Q. D., Bolyanatz, A., Cohen, E., Lesorogol, C., Mathew, S., Handley, C., Kundtova, E., Mcnamara, R. A., Moya, C., Placek, C. D., Vardy, T., Weigel, J. L., Willard, A. K., Xygalatas, D., Norenzayan, A., & Henrich, J. (2019). Moralizing gods, impartiality and religious parochialism across 15 societies. *Proceedings of the Royal Society B: Biological Sciences*, *286*(20190202), 1–10.

Lawson, D. W., & Mulder, M. B. (2016). The offspring quantity-quality trade-off and human fertility variation. *Philosophical Transactions of the Royal Society B: Biological Sciences*, *371*(1692), 1–11. https://doi.org/10.1098/rstb.2015.0145

Lim, C., & Putnam, R. D. (2010). Religion, social networks, and life satisfaction. *American Sociological Review*, *75*(6), 914–933. https://doi.org/10.1177/0003122410386686

Lynch, R., Schaffnit, S., Sear, R., Sosis, R., Shaver, J., Alam, N., & Blumenfield, T. (2022). Religiosity is associated with greater size, kin density, and geographic dispersal of women's social networks in Bangladesh. *Scientific Reports*, 1–15. https://doi.org/10.1038/s41598-022-22972-w

Majolo, B., & Maréchal, L. (2017). Between-group competition elicits within-group cooperation in children. *Scientific Reports*, *7*(43277), 1–9. https://doi.org/10.1038/srep43277

McCullough, M. E., Swartwout, P., Shaver, J. H., Carter, E. C., & Sosis, R. (2016). Christian religious badges instill trust in Christian and non-Christian perceivers. *Psychology of Religion and Spirituality*, *8*(2), 149–163. https://doi.org/10.1037/rel0000045

Mocan, N., & Pogorelova, L. (2017). Compulsory schooling laws and formation of beliefs: Education, religion and superstition. *Journal of Economic Behavior and Organization*, *142*, 509–539. https://doi.org/10.1016/j.jebo.2017.07.005

Muthukrishna, M., Morgan, T. J. H., & Henrich, J. (2016). The when and who of social learning and conformist transmission. *Evolution and Human Behavior*, *37*(1), 10–20. https://doi.org/10.1016/j.evolhumbehav.2015.05.004

Norenzayan, A., Shariff, A. F., Gervais, W. M., Willard, A. K., Mcnamara, R. A., Slingerland, E., & Henrich, J. (2016). The cultural evolution of prosocial religions. *Behavioral and Brain Sciences*, *39*, 1–65. https://doi.org/10.1017/S0140525X14001356

Norris, P., & Inglehart, R. (2004). *Sacred and secular: Religion and politics worldwide*. Cambridge University Press.

Nowak, M. A., & Highfield, R. (2012). *Supercooperators: Altruism, evolution, and why we need each other to succeed*. Canongate.

Page, A. E., Thomas, M. G., Smith, D., Dyble, M., Viguier, S., Chaudhary, N., Salali, G. D., Thompson, J., Mace, R., & Migliano, A. B. (2019). Testing adaptive hypotheses of alloparenting in Agta foragers. *Nature Human Behaviour*, *3*(11), 1154–1163. https://doi.org/10.1038/s41562-019-0679-2

Pasek, M. H., Kelly, J. M., Shackleford, C., White, C. J. M., Vishkin, A., Smith, J. M., Norenzayan, A., Shariff, A., & Ginges, J. (2023). Thinking about God encourages prosociality toward religious outgroups: A cross-cultural investigation. *Psychological Science*, *34*(6), 657–669. https://doi.org/10.1177/09567976231158576

Petts, R. J. (2015). Parental religiosity and youth religiosity: Variations by family structure. *Sociology of Religion: A Quarterly Review*, *76*(1), 95–120. https://doi.org/10.1093/socrel/sru064

Pew. (2014). *Religious landscape study*. https://www.pewresearch.org/religious-landscape-study/database/metro-area/pittsburgh-metro-area/.

Pope, D. G. (2024). *Religious worship attendance in America: Evidence from cellphone data*. http://www.nber.org/papers/w32334.

Power, E. A. (2017a). Discerning devotion: Testing the signaling theory of religion. *Evolution and Human Behavior*, *38*(1), 82–91. https://doi.org/10.1016/j.evolhumbehav.2016.07.003

Power, E. A. (2017b). Social support networks and religiosity in rural South India. *Nature Human Behaviour*, *1*(3), 1–6. https://doi.org/10.1038/s41562-017-0057

Power, E. A. (2018). Collective ritual and social support networks in rural South India. *Proceedings of the Royal Society B: Biological Sciences*, *285*(20180023), 1–7. https://doi.org/10.1098/rspb.2018.0023

Preston, J. L., & Ritter, R. S. (2013). Different effects of religion and God on prosociality with the ingroup and outgroup. *Personality and Social Psychology Bulletin*, *39*(11), 1471–1483. https://doi.org/10.1177/0146167213499937

Preston, J. L., Ritter, R. S., & Ivan Hernandez, J. (2010). Principles of religious prosociality: A review and reformulation. *Social and Personality Psychology Compass*, *4*(8), 574–590. https://doi.org/10.1111/j.1751-9004.2010.00286.x

Purzycki, B. G., Apicella, C., Atkinson, Q. D., Cohen, E., McNamara, R. A., Willard, A. K., Xygalatas, D., Norenzayan, A., & Henrich, J. (2016). Moralistic gods, supernatural punishment and the expansion of human sociality. *Nature*, *530*(7590), 327–330. https://doi.org/10.1038/nature16980

Purzycki, B. G., & Arakchaa, T. (2013). Ritual behavior and trust in the Tyva Republic. *Current Anthropology*, *54*(3), 381–388. https://doi.org/10.1086/670526

Purzycki, B. G., Bendixen, T., Lightner, A. D., & Sosis, R. (2022). Gods, games, and the socioecological landscape. *Current Research in Ecological and Social Psychology*, *3*, 1–10. https://doi.org/10.1016/j.cresp.2022.100057

Purzycki, B. G., & Sosis, R. (2022). *Religion evolving: Cultural, cognitive, and ecological dynamics*. Equinox.

Puurtinen, M., Heap, S., & Mappes, T. (2015). The joint emergence of group competition and within-group cooperation. *Evolution and Human Behavior*, *36*(3), 211–217. https://doi.org/10.1016/j.evolhumbehav.2014.11.005
R Core Team. (2024). *R: A language and environment for statistical computing*. R Foundation for Statistical Computing.
Rabinowitch, T. C., & Knafo-Noam, A. (2015). Synchronous rhythmic interaction enhances children's perceived similarity and closeness towards each other. *PLoS One*, *10*(4), 1–10. https://doi.org/10.1371/journal.pone.0120878
Rappaport, R. (1999). *Ritual and religion in the making of humanity*. Cambridge University Press.
Reddish, P., Bulbulia, J., & Fischer, R. (2013). Does synchrony promote generalized prosociality? *Religion, Brain & Behavior*, *4*(1), 1–17. https://doi.org/10.1080/2153599X.2013.764545
Reddish, P., Tong, E. M. W., Jong, J., Lanman, J. A., & Whitehouse, H. (2016). Collective synchrony increases prosociality towards non-performers and outgroup members. *British Journal of Social Psychology*, *55*, 722–738. https://doi.org/10.1111/bjso.12165
Reher, D. S. (2011). Economic and social implications of the demographic transition. *Population and Development Review*, *37*, 11–33. https://www.jstor.org/stable/41762397
Riolo, R. L., Cohent, M. D., & Axelrod, R. (2002). Does similarity breed cooperation? *Nature*, *418*(August), 499–500.
Rossano, M. J. (2010). *Supernatural selection: How religion evolved*. Oxford University Press. https://doi.org/10.1177/002205749504101204
Schaffnit, S. B., & Sear, R. (2017). Support for new mothers and fertility in the United Kingdom: Not all support is equal in the decision to have a second child. *Population Studies*, *71*(3), 345–361. https://doi.org/10.1080/00324728.2017.1349924
Sear, R. (2016). Beyond the nuclear family: An evolutionary perspective on parenting. *Current Opinion in Psychology*, *7*, 98–103. https://doi.org/10.1016/j.copsyc.2015.08.013
Sear, R., & Coall, D. (2011). How much does family matter? Cooperative breeding and the demographic transition. *Population and Development Review*, *37*(SUPPL. 1), 81–112. https://doi.org/10.1111/j.1728-4457.2011.00379.x
Sear, R., & Mace, R. (2008). Who keeps children alive? A review of the effects of kin on child survival. *Evolution and Human Behavior*, *29*(1), 1–18. https://doi.org/10.1016/j.evolhumbehav.2007.10.001
Sear, R., Steele, F., McGregor, I. A., & Mace, R. (2002). The effects of kin on child mortality in rural Gambia. *Demography*, *39*(1), 43–63. https://doi.org/10.2307/3088363
Shackleford, C. M., Pasek, M. H., Vishkin, A., & Ginges, J. (2024). Palestinians and Israelis believe the other's God encourages intergroup benevolence: A case of positive intergroup meta-perceptions. *Journal of Experimental Social Psychology*, *110*(104551), 1–10. https://doi.org/10.1016/j.jesp.2023.104551
Shaver, J. H., Chvaja Radim, S., Hassan, L., Badje, A., Cerami, J., Prentice, C., Sear, A., Shenk, R., K, M., & Sosis, R. (2024). Religious involvement is associated with higher fertility and lower maternal investment, but more alloparental support among Gambian mothers. *American Journal of Human Biology*, *36*, e24144. https://doi.org/10.1002/ajhb.24144
Shaver, J. H., Divietro, S., Lang, M., & Sosis, R. (2018). Costs do not explain trust among secular groups. *Journal of Cognition and Culture*, *18*, 180–204. https://doi.org/10.1163/15685373-12340025
Shaver, J. H., Lang, M., Krátký, J., Klocová, E. K., Kundt, R., & Xygalatas, D. (2018). The boundaries of trust: Cross-religious and cross-ethnic field experiments in Mauritius. *Evolutionary Psychology*, *16*(4), 1–15. https://doi.org/10.1177/1474704918817644
Shaver, J. H., Power, E. A., Purzycki, B. G., Watts, J., Sear, R., Shenk, M. K., Sosis, R., & Bulbulia, J. A. (2020). Church attendance and alloparenting: An analysis of fertility, social support and child development among English mothers. *Philosophical Transactions of the Royal Society B: Biological Sciences*, *375*(1805), 1–15. https://doi.org/10.1098/rstb.2019.0428
Shaver, J. H., Sibley, C. G., Sosis, R., Galbraith, D., & Bulbulia, J. (2019). Alloparenting and religious fertility: A test of the religious alloparenting hypothesis. *Evolution and Human Behavior*, *40*(3), 315–324. https://doi.org/10.1016/j.evolhumbehav.2019.01.004
Shaver, J. H., White, T. A. J., Vakaoti, P., & Lang, M. (2021). A comparison of self-report, systematic observation and third-party judgments of church attendance in a rural Fijian Village. *PLoS One*, 1–13. https://doi.org/10.1371/journal.pone.0257160
Sheppard, P., & Sear, R. (2016). Do grandparents compete with or support their grandchildren? In Guatemala, paternal grandmothers may compete, and maternal grandmothers may cooperate. *Royal Society Open Science*, *3*(4), 1–10. https://doi.org/10.1098/rsos.160069
Smith, J. M., Pasek, M. H., Vishkin, A., Johnson, K. A., Shackleford, C., & Ginges, J. (2022). Thinking about God discourages dehumanization of religious outgroups. *Journal of Experimental Psychology: General*, *151*(10), 2586–2603. https://doi.org/10.1037/xge0001206.supp
Soler, M. (2012). Costly signaling, ritual and cooperation: Evidence from Candomblé, an Afro-Brazilian religion. *Evolution and Human Behavior*, *33*, 346–356. https://doi.org/10.1016/j.evolhumbehav.2011.11.004
Sosis, R. (2003). Why aren't we all hutterites? *Costly signaling theory and religious behavior. Human Nature*, *14*(2), 91–127.

Sosis, R., & Bressler, E. R. (2003). Cooperation and commune longevity: A test of the costly signaling theory of religion. *Cross-Cultural Research*, *37*(2), 211–239. https://doi.org/10.1177/1069397103251426

Sosis, R., & Ruffle, B. J. (2003). Religious ritual and cooperation: Testing for a relationship on Israeli religious and secular kibbutzim. *Current Anthropology*, *44*(5), 713–722.

Spake, L., Hassan, A., Schaffnit, S. B., Alam, N., Amoah, A. S., Badjie, J., Cerami, C., Crampin, A., Dube, A., Kaye, M. P., Kotch, R., Liew, F., McLean, E., Munthali-Mkandawire, S., Mwalwanda, L., Petersen, A. C., Prentice, A. M., Zohora, F. tuz, Watts, J., … Shaver, J. H. (2024). A practical guide to cross-cultural and multi-sited data collection in the biological and behavioural sciences. *Proceedings of the Royal Society B: Biological Sciences*, *291*(20231422), 1–12. https://doi.org/10.1098/rspb.2023.1422

Spake, L., Schaffnit, S. B., Page, A. E., Hassan, A., Lynch, R., Watts, J., Sosis, R., Sear, R., Shenk, M. K., & Shaver, J. H. (2024). Religious women receive more allomaternal support from kin in two low-fertility countries. *Evolution and Human Behavior*, *45*(3), 268–280. https://doi.org/10.1016/j.evolhumbehav.2024.04.001

Stark, R. (2001). Gods, rituals, and the moral order. *Journal for the Scientific Study of Religion*, *40*(4), 619–636.

Tajfel, H. (1970). Experiments in intergroup discrimination. *Scientific American*, *223*(5), 96–103. https://doi.org/10.2307/24927662

Tajfel, H., Billig, M. G., Bundy, R. P., & Flament, C. (1971). Social categorization and intergroup behaviour. *European Journal of Social Psychology*, *1*(2), 149–178. https://doi.org/10.1002/ejsp.2420010202

Textor, J., van der Zander, B., Gilthorpe, M. S., Liśkiewicz, M., & Ellison, G. T. (2016). Robust causal inference using directed acyclic graphs: The R package 'dagitty'. *International Journal of Epidemiology*, *45*(6), 1887–1894. https://doi.org/10.1093/ije/dyw341

Tomasello, M. (2009). *Why we cooperate*. The MIT Press.

Tsang, J. A., Al-Kire, R. L., & Ratchford, J. L. (2021). Prosociality and religion. *Current Opinion in Psychology*, 40, 67–72. https://doi.org/10.1016/j.copsyc.2020.08.025

Uhrin, M., & Bužeková, T. (2022). The role of subtle signals linked to religious rituals in the evaluation of newcomers by a village community. *Slovak Ethnology*, *70*(2), 210–227. https://doi.org/10.31577/SN.2022.2.19

United States Census Bureau. (2024). https://www.census.gov/quickfacts/fact/table/pittsburghcitypennsylvania/INC910221#INC910221

Unwin, T., Klein, D., Toyama, K., Association for Computing Machinery, & Institute of Electrical and Electronics Engineers. (2010). Open Data Kit: Tools to build information services for developing regions. *Proceedings of the 4th ACM/IEEE International Conference on Information and Communication Technologies and Development : London, United Kingdom, 13th-16th December 2010*, 1–12. https://doi.org/10.1145/2369220.2369236

Whitehouse, H., & Lanman, J. A. (2014). The ties that bind us. *Current Anthropology*, *55*(6), 674–695. https://doi.org/10.1086/678698

Widman, D. R., Corcoran, K. E., & Nagy, R. E. (2009). Belonging to the same religion enhances the opinion of others' kindness and morality. *Journal of Social, Evolutionary, and Cultural Psychology*, *3*(4), 281–289. https://doi.org/10.1037/h0099316

Willard, A. K., & Cingl, L. (2017). Testing theories of secularization and religious belief in the Czech Republic and Slovakia. *Evolution and Human Behavior*, *38*(5), 604–615. https://doi.org/10.1016/j.evolhumbehav.2017.01.002

Xygalatas, D., Mitkidis, P., Fischer, R., Reddish, P., Skewes, J., Geertz, A. W., Roepstorff, A., & Bulbulia, J. (2013). Extreme rituals promote prosociality. *Psychological Science*, *24*(8), 1602–1605. https://doi.org/10.1177/0956797612472910

Yilmaz, O., & Bahçekapili, H. G. (2015). Without God, everything is permitted? The reciprocal influence of religious and meta-ethical beliefs. *Journal of Experimental Social Psychology*, *58*, 95–100. https://doi.org/10.1016/j.jesp.2015.01.003