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Social support networks and religiosity in rural South India

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In recent years, scientists based in a variety of disciplines have attempted to explain the evolutionary origins of religious belief and practice[1–3]. Although they have focused on different aspects of the religious system, they consistently highlight the strong association between religiosity and prosocial behaviour (acts that benefit others). This association has been central to the argument that religious prosociality played an important role in the sociocultural florescence of our species[4–7]. But empirical work evaluating the link between religion and prosociality has been somewhat mixed[8–11]. Here, I use detailed, ethnographically informed data chronicling the religious practice and social support networks of the residents of two villages in South India to evaluate whether those who evince greater religiosity are more likely to undertake acts that benefit others. Exponential random graph models reveal that individuals who worship regularly and carry out greater and costlier public religious acts are more likely to provide others with support of all types. Those individuals are themselves better able to call on support, having a greater likelihood of reciprocal relationships. These results suggest that religious practice is taken as a signal of trustworthiness, generosity and prosociality, leading village residents to establish supportive, often reciprocal relationships with such individuals.

Multiple facets of religion have been suggested as drivers of prosociality. Believing in supernatural agents, particularly ones who observe transgressions and mete out punishment, may make individuals behave less selfishly[12,13]. Religious acts that entail serious risks and sizeable investments of time, energy and money may credibly convey a person's commitment to the community and its moral tenets[14–17]. Collective rituals in particular may foster strong bonds between co-participants and help them to conceive of themselves as members of a larger moral community[18,19]. Religious acts and the commitments that underly them may therefore help individuals establish trusting relationships, especially within the religious community[20–23]. Organized into these trusting, cohesive groups, religious communities may then be subject to cultural group selection, further promoting in-group favouritism and out-group competition[17,24]. Collectively, this body of work suggests that those who evince greater religiosity should be more generous, trustworthy and cooperative, particularly towards co-religionists.

Despite the consistent theoretical emphasis on religion's role in fostering prosociality, empirical studies investigating the prosociality of religious individuals have found mixed results[8–11,25]. Studies using economic games have found evidence for or against the relationship between religiosity and prosociality each about half of the time[9]. Studies that prime subjects to think of supernatural agents have generally found them to have a significant positive effect on prosocial behavior, particularly for religious individuals, but secular primes evoking ideas of law and civic responsibility induce similar effects[26]. These mixed results may be due in part to the artificial, anonymous context of many of these studies, which sacrifice the nuances of real life for the ability to isolate the variable of interest and draw conclusions about causality. The few naturalistic, quantitative studies that have been done have found more consistent associations with generosity and cooperativeness, especially when it is directed to co-religionists[27–30], but these studies often still rely on economic games and anonymous donations to evaluate prosociality, rather than real-life behaviour.

The shift from anonymous and artificial contexts to real life allows for an important observation: in many cases, a prosocial act is done in response to a request for help. Opportunities to engage in prosocial behaviour may therefore depend on requesters' perceptions of the giver. The relationship between religiosity and prosociality may then be largely driven by how religious action shapes people's perceptions of those actors. If costly religious acts are reliable signals of commitment and trustworthiness[15–17], onlookers should react to those signals, adjusting their perceptions and actions in response. Experimental evidence suggests that people see those who attend religious services, follow religious prohibitions or wear markers of religious devotion as kinder, more moral and more trustworthy[23,31–35]. What has yet to be reliably established is whether those shifts in perception are accompanied by shifts in behaviour. When choosing with whom to form trusting, cooperative relationships, do people take into account the religious behaviours of their potential partners?

Here, I draw on measures of religious practice and social support network data from two villages in South India to evaluate whether a person's religious action influences whether others will ask her for support. In previous work[36], I have shown that people who invest more in the religious life of these villages are recognized as not only devout, but also as having a suite of prosocial qualities. Given that villagers perceive those who demonstrate greater religiosity as having these prosocial qualities, we can expect that villagers should consequently be more likely to go to such individuals for help and assistance. And, if religious practice helps to establish trusting relationships, then religious individuals should be more likely to have reciprocal relationships with their peers.

Research was carried out in two neighbouring villages in Tamil Nadu, India, called by the pseudonyms 'Teṉpaṭṭi' and 'Aḷakāpuram'. Although located near the Vaigai River, the surrounding area is mostly dry scrubland chequered with irrigation-fed rice paddies. For most villagers, agriculture sustains for only a few months (and then only when the irrigation waters have been sufficient), so for most of the year, villagers work as wage labourers cutting wood, making bricks, doing construction work or taking part in the government's subsidized work scheme. Like much of South Asia[37–40], these villages have experienced substantial sociodemographic changes in the past decades, with lowered morbidity and mortality

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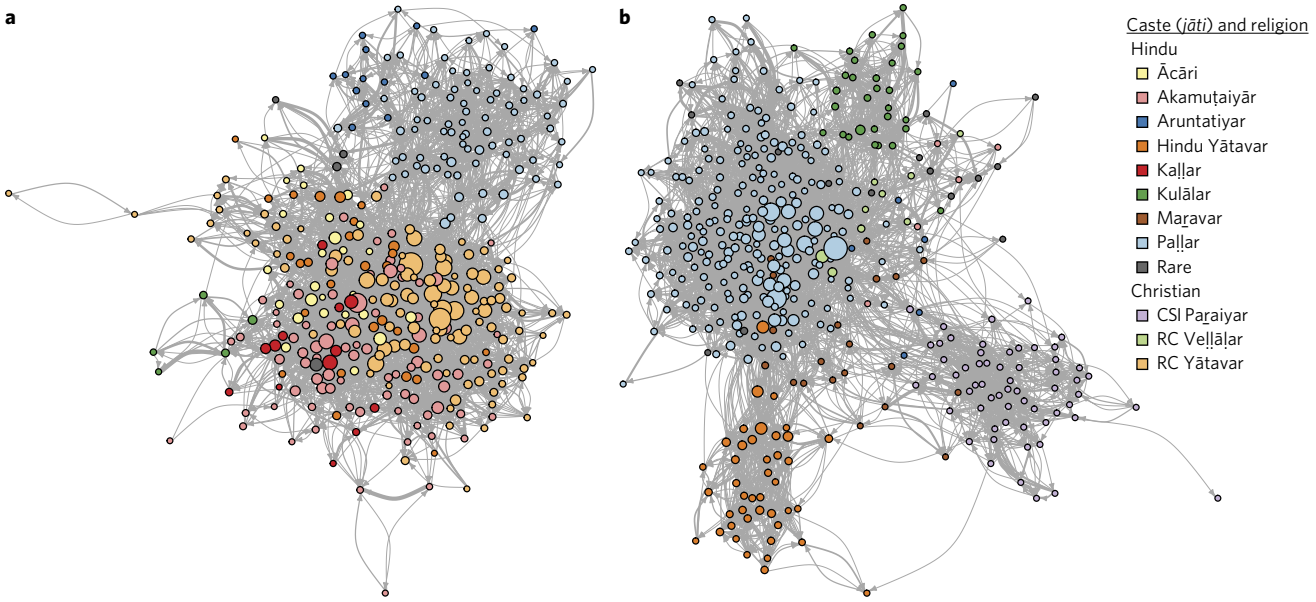

Figure 1 | Social support networks of the adult residents of Teṉpaṭṭi and Aḷakāpuram. a, Teṉpaṭṭi ($N = 362$). **b**, Aḷakāpuram ($N = 420$). Nodes are coloured by caste and sized by eigenvector centrality. Edges are directed (with an arrow directed from the person requesting support to the person providing it) and weighted by the number of types of support requested of that individual. The node layout is determined using the Fruchterman–Reingold algorithm. CSI, Church of South India; RC, Roman Catholic.

rates, smaller completed family size and a foreshortening of women's reproductive lifespan, increases in educational attainment and a greater integration into the regional and international workforce.

Residents of Teṉpaṭṭi and Aḷakāpuram rely on one another for many types of support. People often hear about wage labour opportunities through peers. Farmers plant and harvest their fields with the help of friends and relatives. Most villagers form microfinance loan groups to get access to bank loans. Neighbours watch one another's children, run errands, lend foodstuffs and report on the day's gossip. In all of these ways, the residents of these villages provide one another with social support. As many of the forms of work in these villages are highly variable and plagued by uncertainty, these relationships, and the social capital that they provide[41], are an important resource for residents. Behaviours that foster supportive, trusting relationships should therefore be particularly important for risk buffering in these marginal settings.

The villages are relatively small, each with roughly 400 adult residents in some 200 households (see Supplementary Table 1). A variety of caste (*jāti*) and religious communities are represented. The castes represented in these villages are 'Backward' or 'Scheduled', according to Indian government terminology. Hindus, from a number of different caste groups, form the majority in both villages, but there are additionally Catholic, Protestant (Church of South India) and non-denominational evangelical Christians. The Catholic and Protestant communities are exclusively one caste group in each village. Relations between castes and religious groups are generally good, although caste-based discrimination is still a reality. Kinship and caste are strong structuring forces, as is apparent in the social support networks of the two villages (Fig. 1).

Villagers demonstrate their religious devotion in various ways. Each village has Hindu temples and shrines, as well as Catholic and Protestant churches. Most Christian villagers attend Sunday services in the village or nearby towns. Hindu residents often visit local temples each week (typically on Tuesday or Friday), and residents in Teṉpaṭṭi can attend a monthly worship at the temple for the village goddess Māriyammaṉ. Christmas, New Year's Eve and Easter are important celebrations for Christian residents. Catholics in each village organize a festival for their church's patron saint, in which they carry images of the saint through the village. Hindu residents celebrate various holidays (such as Naravatri, Deepavali and Thai Pongal). They often attend festivals at regional temples and organize their own at temples in the villages. Often, as a part of these festivals, people choose to fulfil religious vows, acts of devotion carried out in thanks for divine favour. The particular form that the vow takes is the decision of the devotee, and the reason for its enactment is typically kept private. Vows can entail costly investments of time, energy and money. They are usually preceded by a period of fasting: abstaining from alcohol and meat, remaining abstinent, skipping the midday meal, going without shoes, bathing daily and avoiding conflict with others. Many Hindu residents of Teṉpaṭṭi fulfil vows at the annual festival for Māriyammaṉ, carrying pots of milk to be poured over the image of the goddess, carrying flaming firepots, and piercing their bodies with hooks or spears. Individuals also go on pilgrimage to sites such as the Murugan temple at Palani or the Catholic pilgrimage site of Vailankanni. Over the course of a year, most villagers undertake some sort of public religious action, such as fulfilling a vow or visiting a temple or church. In addition to these formal religious acts, a small number of Hindu villagers spontaneously become possessed by the deity, with the energy and grace (*aruḷ*) of the divine coursing through their bodies as they flail and dance. This form of possession is largely, although not exclusively, seen as indicative of the devotion and worthiness of the possessed. These different forms of religious action (regular worship, public religious acts and possession) are widely observed by other villagers, and so are potentially used as signals of a person's character and commitment, influencing how others react to and relate with that individual.

To study the association between religious practice and people's supportive relationships, I model the social support networks of the villages using exponential random graph models (ERGMs), which predict the likelihood of a tie, given individual, interpersonal and structural terms (see the Methods section). I find that people are more likely to go to a person for support if that person worships regularly or undertakes greater and costlier public religious acts. In contrast, people are less likely to go to someone for support if that person becomes possessed. The main results are shown in Table 1,

Table 1 | ERGM results for religiosity variables, for the full support networks.

	Estimate	S.E.	Odds ratio	*P*-value
Teṉpaṭṭi				
Regular worship ('no' = 0)	0.119	0.035	1.126	0.0007
Possession ('no' = 0)	−0.141	0.062	0.869	0.0239
Weighted public religious acts	0.014	0.004	1.014	0.0001
Aḷakāpuram				
Regular worship ('no' = 0)	0.241	0.057	1.272	<0.0001
Possession ('no' = 0)	−0.074	0.069	0.929	0.2834
Weighted public religious acts	0.006	0.003	1.006	0.0338

S.E., standard error.

with the full model parameters in the Supplementary Information. People who worship regularly are 1.1 times as likely to have a support tie as those who do not in Teṉpaṭṭi, and 1.3 times as likely in Aḷakāpuram. People who undertake two difficult and costly acts increase the odds of a tie to 1.2 in Teṉpaṭṭi and 1.1 in Aḷakāpuram. Possession decreases the odds of a tie, with those who become possessed being 0.9 times as likely to have a tie as those who do not in both villages (although the effect is not significant in Aḷakāpuram). The model results can be used to calculate the predicted likelihood of a tie. For example, a 30-year-old woman of the Akamuṭaiyār caste living in Teṉpaṭṭi is predicted to be asked for support by someone of the same gender and caste, and with one friend in common, about 4.1% of the time. If she worships regularly, that increases to 4.6% of the time, and if she does one difficult and costly public religious act, there is predicted to be a tie 4.4% of the time. If she becomes possessed, there is predicted to be a tie 3.5% of the time.

Since regular worship and greater and costlier public religious acts correlate with an improved reputation for prosociality[36], it is possible that the association of a support tie with regular worship and public religious action is due exclusively to the greater recognition as generous. Including a person's reputation as generous[36] does decrease the effect size and significance of regular worship, but does not substantially alter the effect size of possession and public religious acts (see Supplementary Tables 9 and 11). This suggests that regular worship is most strongly associated with generosity, and that this association may be mediating the propensity of an individual to rely on a person for support.

It is possible that certain types of support are more closely linked to people's religious action. To evaluate this, the same models are rerun with distinct networks for the different types of support: behavioural assistance, emotional support and companionship, financial aid, vouched support, and guidance (see the Methods section). Estimates for the religious variables are shown in Table 2 and full model results are in the Supplementary Information. The general pattern is consistent with the aggregate network results: regular worship and public religious action generally result in significantly greater likelihood of a tie, whereas possession has a negligible or negative effect on the likelihood of a support tie. There are some differences between the two villages, with regular worship having a lesser effect and public religious acts a somewhat stronger effect in Aḷakāpuram. This is likely to be due to the different patterns of religious practice in the two villages: whereas Teṉpaṭṭi has a temple that is popular with many residents, Aḷakāpuram does not have such a temple, and consequently no Hindu residents worship regularly. As such, the effect of regular worship in Aḷakāpuram is largely captured by the variables for caste and religious denomination. Across the two villages, greater and costlier public ritual acts are associated with increased tie likelihood for all five support types. Possession does not have a significant effect on any support type in Teṉpaṭṭi, but in Aḷakāpuram it is most notably associated with a decreased likelihood of being asked to vouch for someone (coming to their aid, helping them to secure work or navigate bureaucracy). Regular worship is most consistently associated with an increased likelihood of providing others with behavioural assistance, guidance and vouched support. As with the aggregate support network, including individuals' reputation for generosity in the models sizeably decreases the effect size and significance of regular worship across all support types (see Supplementary Tables 13 and 15).

If people investing more in the religious life of the village are seen as being of better character and more prosocial, then they may be better able to establish trusting, reciprocal relationships. This can be tested with additional ERGMs, this time with the underlying network reduced to include only reciprocal edges. An edge is considered reciprocal even if the type of support being given in either direction differs. Results are shown in Table 3 (see full model results in the Supplementary Information). The results are consistent across the two villages. The odds of having a reciprocal tie for a person who worships regularly are 1.3 times the odds for someone who does not. A person undertaking two difficult and costly acts is 1.2 times as likely to have a reciprocal tie as someone not undertaking public religious acts. Possession has no significant effect on the likelihood of a reciprocal tie. Here too, the addition of an individual's reputation for generosity most substantially decreases the effect size and significance of regular worship (see Supplementary Tables 17 and 19).

The data presented here provide substantive evidence that villagers use the religious action of others not only to shape their opinions of their peers[36], but also to shape their relationships with them. Villagers are more likely to rely on a person for support if that person worships regularly and undertakes costly public religious action. Regular worship and costly public religious action also increase the likelihood of reciprocal relationships, suggesting that

Table 2 | ERGM estimates for religiosity variables, for each of the five support types.

	Behavioural	Emotional	Financial	Vouched	Guidance
Teṉpaṭṭi					
Regular worship ('no' = 0)	0.221***	0.258***	0.392***	0.292***	0.281***
Possession ('no' = 0)	−0.168	−0.128	−0.144	−0.204	−0.207
Weighted public religious acts	0.028***	0.014*	0.016*	0.026***	0.024**
Aḷakāpuram					
Regular worship ('no' = 0)	0.267**	0.183†	0.170	0.274**	0.471***
Possession ('no' = 0)	0.016	−0.293*	−0.256†	−0.565***	−0.132
Weighted public religious acts	0.021***	0.019***	0.030***	0.024***	0.018***

***$P < 0.001$, **$P < 0.01$, *$P < 0.05$, †$P < 0.10$.

Table 3 | ERGM results for religiosity variables, for the reciprocal networks.

	Estimate	S.E.	Odds ratio	*P*-value
Teṉpaṭṭi				
Regular worship ('no' = 0)	0.278	0.087	1.320	0.0015
Possession ('no' = 0)	−0.173	0.152	0.841	0.2528
Weighted public religious acts	0.017	0.008	1.017	0.0380
Aḷakāpuram				
Regular worship ('no' = 0)	0.235	0.132	1.265	0.0746
Possession ('no' = 0)	−0.103	0.140	0.902	0.4599
Weighted public religious acts	0.018	0.005	1.018	0.0006

the trust engendered through these religious acts helps individuals to build mutually supportive relationships. In contrast, possession has a negligible or negative impact on others relying on a person for support and does not increase the likelihood of reciprocal relationships. Finally, insofar as the network captures actual provisioning of support, the findings reported here also provide strong evidence that greater evinced religiosity is indeed associated with prosociality: people who worship regularly and undertake costly public religious acts are more likely to undertake acts that benefit others.

When the analysis is broken down into the various types of support, the models reveal that regular worship and public religious acts have a largely consistent effect across all types of support. Rather than greater religiosity being associated with a particular type of supportive relationship, there is instead a general increase in the proclivity of people to go to such individuals for help. It seems that religious individuals are perceived as being reliable helpers regardless of the type of support. When a person is in need, the question is not what is needed, but rather who will be willing to provide it; those who worship regularly and undertake greater and costlier public religious acts are often those to whom people turn.

Throughout this study, I have distinguished between three modes of religious action: regular worship, public religious acts and possession. I do so because these different forms of action make very different demands of the devotee and are viewed in very different ways by onlookers. The focused intensity of festival vows and pilgrimages, the consistent commitment of time to regular worship, the frenetic physicality of possession: these are not equivalent acts. Given these distinctions, it is not surprising that each modality has a unique impact on the likelihood of a support relationship.

Across each test, possession has a negligible or negative effect on the likelihood of someone being named as providing support. In these villages, possession by a god is generally seen in a good light, evidence of the ardent devotion (*bakti*) and spiritual purity of the possessed. When someone is possessed, she gives up control of her body to the divine, remembering little of the experience afterwards. In the moment of possession, onlookers see the deity as being in control, not the possessed vessel[42]. As such, onlookers may see the possessed as devout, but glean little additional information about their character and commitments. Clearer in people's minds is the strong cultural association of possession with disenfranchised individuals, particularly lower-class and lower-caste women[43]. A person's possession, then, may more readily be interpreted as signalling social marginalization than anything about the underlying character and prosociality of the individual. Tellingly, for possession, the largest decrease in the likelihood of a tie is for vouched support, the type of assistance that can only be provided by high-status individuals. Importantly, people who become possessed always undertake additional modes of religious action, meaning that the negative effect of possession is partly compensated by the other religious action carried out. The general association of greater evinced religiosity and increased prosociality therefore still holds, although it is important to recognize the distinctions between the various modes of religious practice in terms of their form, costs and potential signal value.

In most of the analyses reported here, the effect of regular worship is somewhat larger than that of the weighted tally of public religious acts: to equal the effect size of regular worship, a person would have to undertake more and costlier public religious acts than are typically done. This suggests that regular worship is more indicative of trustworthiness and prosociality (among the signals of religiosity). This is further supported by the observation that including each person's reputation for generosity in the models decreases the effect of regular worship while leaving the effect of public religious action largely untouched. Ethnographic observation suggests that the relatively stronger association of regular worship with generosity is due in part to their differences in form. Whereas regular worship is marked by uniformity and synchrony, public religious acts are opportunities for differentiation and distinction. Public religious acts are closely observed and commented upon, often by large crowds of onlookers. The opportunity for distinction means that there is a possibility of aggrandizement. When such an opportunity exists, others may be sceptical of the motivations behind the act. In short, costly public religious practice, with its drama and extravagance, can be aggrandizing, whereas regular worship cannot. When choosing whom to approach for support, signals that may imply some desire for personal aggrandizement relative to others are not reassuring[44,45]. Instead, demonstrations of a lack of interest in such status-seeking behaviour, and so a more convincing adherence to the selfless, prosocial precepts of the group, will be reassuring. Consequently, although both acts increase the likelihood of a support tie, regular worship has a larger effect.

These findings could give the impression that religious individuals are overburdened with requests for assistance, preyed on by those who see them as generous dupes. This would, however, neglect the obligation to reciprocate[46,47]. Although social ties can sometimes be a burden[48], they are often also a source of strength. Indeed, a recent study has found that greater social connectedness is associated with lower stress and better health (as proxied by fibrinogen level)[49]. Providing support to others means that one is more able to draw on support oneself. The finding that regular worship and public religious action increase the likelihood of a reciprocal tie further shows how religious practice may foster strong, trusting relationships. The general increased likelihood of ties associated with religious practice, coupled with the effects of kinship, caste homophily and shared partners, suggests that religious individuals have both strong, cohesive bonds within their own community, and supportive relationships beyond it. Providing support to others is also one of the primary ways in which Tamils express and gain respect and prestige[50]. Enacting these religious signals of commitment, then, helps individuals to forge trusting relationships with one another, building greater individual social capital and bolstering their reputational standing[41,51].

Importantly, the audience commenting on and evaluating the religious action of devotees is the whole village (and far beyond the confines of the village, too). Whereas much of the previous work looking at the relationship between religiosity and social support has found that there are benefits to closer ties with co-religionists[52,53], the strengthening of social relationships reported here are not solely realized through connections with co-religionists or fellow caste members[31]. Of course, the likelihood of a tie is much greater between people of the same family, caste, religion or neighbourhood, but the ERGMs show an effect of religiosity even once kinship, caste and religious denomination have been accounted for. Even people who do not worship the same gods are attending to the religious practice of their peers and using it to shape their impressions of and relationships with them.

Previous work on the relationship between religion and prosociality has highlighted a seeming contradiction: although people regularly perceive religious individuals as more prosocial, studies evaluating their 'actual' prosociality have found mixed results[8–11,25]. In the realities of life, however, this distinction may not be particularly meaningful. If people perceive those who demonstrate greater religiosity as more prosocial[36], then those are the individuals to whom they will turn when they are in need of assistance. The findings presented here suggest that, consequently, religious individuals are indeed more likely to support others, and that they are themselves able to gain through those exchanges. These associations ultimately lend support to the evolutionary theory of the origins of prosocial religions.

Methods

These findings result from 20 months of fieldwork conducted in Teṉpaṭṭi and Aḷakāpuram, between October 2011 and August 2013. Data were gathered through various methods, including structured and unstructured interviews, a household survey, and a survey on reputation and social support conducted with adult residents. The fieldwork was approved by the Stanford University Human Subjects Institutional Review Board.

Religious practice. Information on villagers' religious practice covers three distinct modalities: (1) regular worship at a church or temple, (2) public religious acts and (3) possession. Individuals are recorded as worshipping regularly if they self-reported worshipping at a church or temple at least once a week, and/or if they were named as doing so by key informants in lists generated with the author. Individuals are reported as recurrently becoming possessed if they were named as such by key informants in a list generated with the author. The variable for public religious acts covers acts carried out over the previous year, reported during the household census. These acts can range from simply making an offering at a nearby temple to sacrificing a goat to carrying a firepot in a festival. Given the variable nature of these acts, the tally of acts is weighted to account for the relative difficulty, pain and monetary cost entailed in each act. This weighting is based on a sorting task conducted with a random sample (stratified by religion and caste) of 37 residents. Each act is weighted doubly, once for difficulty or pain (which were found to be equivalent) and once for monetary cost. An act that is of low cost and low difficulty and pain (such as making an offering at a temple) is given a score of 2, while a highly difficult, painful and costly act (such as firewalking or piercing one's cheeks with a spear) is given a score of 6. Most residents are involved in the religious life of the village. Eighty-two per cent of Protestant (CSI) residents attend Sunday services at their church, and 72% of Catholics attend mass. There is no organized worship at a temple in Aḷakāpuram (so no Hindu residents are recorded as worshipping regularly), whereas in Teṉpaṭṭi 44% of Hindu residents visit the Māriyamman temple each week. Eighty per cent of villagers had undertaken at least one public religious act in the previous year. Possession is a much rarer occurrence and is isolated to Hindu residents: 7% of the Hindu population becomes possessed on a fairly regular basis. Further information on villagers' religious action is included in the Supplementary Information.

Social support networks. Social support network data result from a survey conducted with adult residents of the two villages ($N = 782$, 97%). All survey respondents provided oral consent. Using the 'name generator' approach[54], respondents were asked to free-list those individuals who had provided them with 12 different types of social support in the past few months. The particular set of questions is the result of interviews and focus groups with villagers used to establish salient supportive relationships, and a series of drafts and revisions looking to elicit the range of support types while minimizing repetitive prompts. The questions are meant to elicit (1) friendship and emotional support ('Emotional support and companionship'; tie types: conversation partners, close friends), (2) relationships of instrumental aid ('Behavioural assistance'; tie types: borrowing items, running errands, babysitting), (3) financial assistance ('Financial aid'; tie types: borrowing petty cash, loans), (4) facultative relationships in which one person vouches for another ('Vouched support'; tie types: help in finding work, aid when there is some problem, help from a person of 'high position' in navigating bureaucracy), and (5) guidance ('Guidance'; tie types: discussing important matters, getting advice). On average, each interviewee named 17 individuals, with some named repeatedly for an average total of 30 mentions. The analyses reported here limit the full network to ties between those who conducted the survey. The two villages are analysed separately. The survey methodology and descriptive statistics of the networks are reported in the Supplementary Information.

Covariates. Basic demographic information (age, gender, caste, years of education, household wealth) was reported in the household survey. Religious denomination is included within the caste identification, so that individuals who are of nominally the same caste are divided by religious denomination (for example Hindu and Catholic Yātavars). Residents also reported their kinship relationships, which are represented as a kinship network of close kin (including parents/children, siblings and spouses). Two measures of prominence are included: (1) whether the individual has ever held a position in the informal village committee or the local government *panchayat*, gathered by consulting local records and interviewing key informants, and (2) the person's reputation for being generous, gathered as part of a reputation survey done in conjunction with the social support survey[36]. Distances between households were calculated using ArcGIS 10.0. Basic demographic information on the two villages is included in the Supplementary Information.

Analysis. The network data are constructed in the R software environment[55] using the igraph package[56] and analysed with the statnet suite of packages[57]. Exponential random graph models (ERGMs) allow for the inclusion of node-level (individual), dyad-level (interpersonal), and network-level (structural) components in the model[58–61]. Various covariates are included: individual (node) age, gender, caste, wealth, and past or current committee membership; interpersonal (dyad) gender homophily, caste homophily, kinship, difference in the number of years of education, distance between households, and reciprocity. The models include various structural dependence terms, including geometrically weighted edgewise shared partners (GWESP), a measure of transitivity and the clustering of networks, and geometrically weighted dyad-wise shared partners (GWDSP)[58,62]. The religiosity measures are included in the model as a factor attribute for incoming ties only, meaning that the effect of religiosity is only being evaluated for the effect it has on others naming the person as providing them with support; this isolates the effect of people naming an individual for her religiosity from the effect of an individual's own religiosity on the likelihood of a supportive relationship. The networks used here are treated as directed and unweighted, except for the reciprocal network, which is undirected. Further details on the ERGMs can be found in the Supplementary Information.

Data availability. Those interested in accessing the anonymized data should contact the author.

Code availability. The R code for processing and analysing the data is available through GitHub at https://github.com/eapower/NatHumBehavCode.

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Author contributions

E.A.P. designed the research, collected the data, analysed the data and wrote the paper.

Additional information

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Competing interests

The author declares no competing interests.