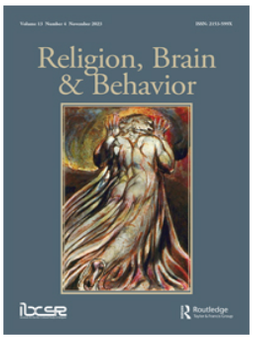

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The role of religion in adolescent mental health: faith as a moderator of the relationship between distrust and depression

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ABSTRACT

It has recently been shown that interpersonal distrust predicts depressive symptoms in middle adolescence, and this finding has been interpreted in light of Social Safety Theory, which views distrust as an index of social threat. Here we hypothesize that religiousness provides social safety and may counteract the sense of social threat indexed by distrust. Religiousness should therefore act as a moderator between interpersonal distrust and depression. Using a nationally representative birth cohort from the UK, we provide evidence in favor of this hypothesis, even after controlling for stratum disadvantage and socioeconomic characteristics, sex, ethnicity, and multiple confounders on the level of the individual (BMI, chronic illness, cognitive ability, risk-taking, experiencing bullying, dietary habits, chronotype, physical activity and screen time), family context (frequency of eating meals together, maternal mental health), and neighborhood ecology (NO_2 levels of air pollution).

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Religiousness; interpersonal trust; Social Safety Theory; social cognition; depression; oxytocin; adolescence

Introduction

Adolescent depression (Blakemore, 2019; Thapar et al., 2012) is one of the leading contributors to global disease burden in this age group (Daly, 2022; Wilson & Dumornay, 2022), and a major cause of poor educational outcomes (Wickersham et al., 2021). The overall impact of adolescent depression extends beyond this period of life, however, as it predicts later emotional problem trajectories, chronic illness, and lower personal income (Kessler, 2012; Mullen, 2018). The bidirectional links between adolescent depression and its social-developmental contexts, including the crucial role of peer relationships (Adedeji et al., 2022), are already well-known (Aseltine et al., 1994; Green et al., 2005). However, a recent unifying framework, provided by Social Safety Theory (Slavich, 2020; Slavich et al., 2023), allows us to understand more broadly why these associations are forged in the first place, especially during adolescence, a key period of social development (Tsomokos & Flouri, 2023).

Social Safety Theory (SST)

Based on evolutionary arguments (Slavich et al., 2023), SST posits that social bonding and belonging constitute a fundamental organizing principle of human behavior (Slavich, 2020). Humans have

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evolved to seek and thrive in environments that are socially safe, namely, prosocial milieus that select for social-cognitive competences such as mentalisation and perspective-taking (Hare, 2017), and for social-affective competences like empathy (Carter, 2014). Broadly speaking, our reciprocally "warm" in-group affiliations are counterbalanced by the "cold" and sometimes aggressive attitudes towards out-groups (Choi & Bowles, 2007). Synthesizing previous research, SST maintains that social safety is central to our health and adjustment, while social threat is harmful to it (Slavich, 2022). There are several, complex factors that come together to account for this, but they partly involve the fact that social threats engage neural circuits that upregulate immune system components implicated in inflammatory responses (Furman et al., 2019; Hostinar et al., 2014); in the short term, this is beneficial in terms of accelerated wound healing and recovery, but in the long term, causes hypervigilance, affective disorders, and physiologically damaging oxidative stress (Chen & Nuñez, 2010).

As a result, in the framework of SST, the presence of real or perceived social threats must be a contributing factor to the psychogenesis of adolescent depression (Murphy et al., 2013; Slavich et al., 2010). There is, of course, a great variety of such threats to one's sense of belonging (Allen et al., 2021; Arslan, 2021; Haslam et al., 2009; Tomova et al., 2021). But given that interpersonal trust is essential for social bonding and the development of healthy relationships throughout the life span (Rotenberg, 2001; Uslaner, 2002), it would be natural to assume that *distrust* towards other people tracks a fundamental threat to one's sense of social safety.

Distrust and depression

We recently provided evidence for an association between distrust and depression in adolescence (Tsomokos & Slavich, 2023). The findings were in line with a large, longitudinal study from South Korea (Kim et al., 2012), which was, however, using data drawn from an adult population. These two studies provide at least some initial cross-cultural evidence for the role of distrust in the pathogenesis of depression, in line with the expectations of SST. Furthermore, the link between interpersonal distrust and depression has been examined recently from a neurobiological perspective (Fermin et al., 2022), where it was shown that the volume reduction that occurred in certain brain areas associated with social cognition (Blakemore, 2008; Frith, 2007), was similar between depressive patients and healthy participants reporting high levels of interpersonal distrust.

Religion, trust, and mental health

Religion, faith, and spirituality are terms that have been deployed differently depending on the context (Clarke, 2009; Koenig, 2015), and their operationalization has not always been clear (Villani et al., 2019). In what follows, we do not consider the spiritual or dogmatic context of any particular faith, nor the defining features of any religion. By "religion" we simply mean the individual's status of *religiousness*, namely, whether an adolescent is religious or not (dichotomous variable). By "faith" we mean the broad religious affiliation that the adolescent reported (categorical variable) in the Millennium Cohort Study (MCS). The available MCS data did not allow for a finer differentiation between religious beliefs and behaviors, that is, our primary independent variable (religiousness) necessarily encapsulates both belief and religious service attendance, rituals, praying, and social signaling (Sosis & Alcorta, 2003), among other behaviors that are differentially associated with prosociality and trust (Aksoy & Wiertz, 2023; Sosis, 2005; Valente & Okulicz-Kozaryn, 2021), in turn differentially related to health and well-being (Chen et al., 2021).

Crucially, religiousness has been associated with subjective well-being in various studies (Dunbar, 2021, 2022; Steger & Frazier, 2005; Tiliouine et al., 2009), and is known to predict better mental health (Hoogeveen et al., 2022; Mohr et al., 2006; Moreira-Almeida et al., 2006), in both adult (AbdAleati et al., 2016; Malinakova et al., 2020) and adolescent populations (Cotton et al., 2006; Estrada et al., 2019; Fruehwirth et al., 2019). As a result, a research question can be formulated

inspired by Social Safety Theory. Does religiousness foster a sense of social safety and, therefore, act as a moderator between social threat and psychopathology?

Aims of the study

In the present work we examined the role of religiousness as a moderator between interpersonal distrust and self-reported depressive symptoms in middle adolescence, using public data from a longitudinal birth cohort, the UK's Millennium Cohort Study, that has followed around 19,000 children since they were born during 2000–2002. When they were 14 years old, cohort members were administered a series of questionnaires, including a Mood and Feelings Questionnaire (Angold et al., 1995), as well as a battery of cognitive and neuropsychological tests. Our primary research question was whether religiousness lessens the impact of interpersonal distrust on adolescent depression.

In particular, our hypothesis was that religiousness would predict lower scores on the self-reported perception of interpersonal distrust, in turn associated with lower scores in the Mood and Feelings Questionnaire (MFQ). Motivated by SST, we expected this moderating effect to be especially pronounced for adolescents reporting a high level of interpersonal distrust. To account for potential confounding, we included covariates linked with both the outcome and the exposure variable, or with the outcome alone, but that were not instrumental or on the direct path between the two (VanderWeele, 2019). These can be grouped into the following categories: *socioeconomic variables* (area stratum, family income, maternal education); *cohort member characteristics* (sex, ethnicity, vocabulary ability, attitude to risk-taking) and *individual context* (chronic illness, body-mass index, habits such as eating fruit and vegetables, having regular physical activity and the amount of time spent on screens, being bullied physically or online, as well as chronotype); *family context* (how often the family has meals together, whether the cohort member has moved schools, and maternal mental health); and, finally, *neighborhood characteristics* (NO_2 air pollution levels, which also acts as a proxy measure for road traffic). Based on the MCS dataset, mental health outcomes in middle adolescence have been associated with sex, ethnicity, and family characteristics (Patalay & Fitzsimons, 2018); fruit and vegetable consumption (Hoare et al., 2020); BMI (Patalay & Hardman, 2019); bullying (Sharpe et al., 2022); and neighborhood ecology (Mueller & Flouri, 2021). Other studies have provided evidence for the mental health impact of moving schools (Singh et al., 2014), regular family meals (Agathão et al., 2021), maternal mental health (Blakemore, 2019; Fitzsimons et al., 2017), risk-taking attitudes and chronotype (Zhang et al., 2017, 2022). These variables have also been associated with interpersonal trust: for instance, there are known associations of trust and socioeconomic factors (Graafland & Lous, 2019), language ability in adolescence (Clarke et al., 2023), risk-taking attitudes (Cruwys et al., 2021), physical activity (Papa, 2019), dietary (Mieziene et al., 2019) and family meal habits (Smith et al., 2020).

Methods

Participants and analytic sample

More than 19,000 children born in 2000–2002 were tracked by the MCS (Joshi & Fitzsimons, 2016) in regular survey sweeps every 2–3 years. The sampling frame was initially provided by electoral wards, as detailed by Plewis et al. (2004), such that it adequately represented families living in high child-poverty areas in all four UK countries, and families in high ethnic-minority wards in England. The information was obtained via interviews with the primary adult respondent (this was the mother in most cases), and self-completion questionnaires in the child's home. UK Multi-Center Ethics Committees provided ethical approval, while parents gave informed consent prior to all interviews; cohort members provided their consent at age 14 years (sweep 6 of the survey), when over 11,700 families remained in the study. In particular, the sweep at age 14 years

included 11,717 singletons or first-born twins or triplets. In this study, our analytic sample was composed of these cohort members, but who also had valid data on the self-reported MFQ (outcome variable). Given this condition, 11,045 cohort members (50% female) remained in the analytic sample.

Measures and procedures

Self-reported depression (age 14)

The outcome (dependent) variable was the total score from the 13 items in the short Mood and Feelings Questionnaire (MFQ), which was completed by the cohort members at the age 14 sweep. Items included statements such as "I cried a lot," "I found it hard to think properly or concentrate," and "I thought nobody really loved me." Cohort members could choose among three responses: "not true" (numerical score of 0), "sometimes" (1), or "true" (2). Therefore, the total score was a ratio variable ranging from 0 to 26.

Interpersonal distrust (age 14)

The exposure (independent) variable was the self-reported level of interpersonal trust. Cohort members were asked how much they trust others ("On a scale from 0-10, where 0 means not at all and 10 means completely, how much would you say you trust other people?") and their responses were recoded by the survey team to range from 1 to 11. In our study, *distrust* was an interval variable ranging from 1 (completely trusting others) to 11 (not at all).

Religion (dichotomous) & religious faith (categorical)

The moderator variable was dichotomous with values "Religious" or "Not religious." These two values were derived from the self-reported religious faith (affiliation), a categorical variable with several values that were grouped into 5 categories: "Judeo-Christian," "Muslim," "Dharmic," "Other," and "Not religious." Judeo-Christian group included Jewish, Church of England, Catholic, Protestant, and all other Christian denominations, while Dharmic included Buddhist, Hindu, and Sikh. The moderating variable in our analysis was the dichotomous predictor, capturing cohort members' religiousness status, but the categorical case was also used for further insights.

Covariates

Socioeconomic variables. Social background was approximated by the survey's sampling variable (*Stratum*) which corresponds to a type of electoral ward within each UK country and tracks the area's socioeconomic deprivation based on the Child Poverty Index (CPI). Each UK country has two strata: advantaged and disadvantaged, with area disadvantage being determined by whether a ward was in the upper quartile (poorest 25%) of the CPI. However, in England, a third stratum (ethnic minority) indexed areas from the 1991 Census with at least 30% of their population falling into the Census-defined categories of "Black" (Black Caribbean, Black African and Black Other) or "Asian" (Indian, Pakistani and Bangladeshi). As a result, in England only, the disadvantaged stratum included wards that were not in the ethnic minority stratum, but still fell into the upper CPI quartile. The advantaged stratum included wards which were neither in an ethnic minority stratum nor in the CPI's poorest 25%. The family's *income* was provided in OECD equivalised income quintiles (interval variable from 1 to 5). *Maternal education* was the highest educational level of the main respondent (this was the mother, in the vast majority of families) attained by the age 14 sweep, based on the UK's National Vocational Qualifications and its equivalents (numerical variable ranging from 1 to 6).

Individual characteristics and context. *Sex* (male or female) and *ethnicity* (White, Mixed, Indian, Pakistani and Bangladeshi, Black or Black British, Other Ethnic group including Chinese or Other) were provided by the main respondent and the possible values for these variables were

determined by the UK Census. Vocabulary ability (*word score*) was measured by showing a word (such as "conceal") and asking the cohort member to pick the right synonym ("hide") among several options; this was an interval variable ranging from 1 to 20 in our sample. The self-reported attitude to *risk-taking* (cohort members were asked how willing they were to take risks) was an interval variable from 1 (never) to 11 (always). In terms of the context of a cohort member's daily life, we used categorical variables with yes/no values reported either by the mother (presence of *chronic illness*) or the cohort member (at least two portions of daily *fruit eating* or *vegetable eating*). Body-mass index (*BMI*) was a derived, numerical variable, and school-night *chronotype* was an interval variable from 1 (going to bed before 9pm) to 5 (after midnight). Cohort members reported weekly frequency of moderate to vigorous *physical activity* (from 1, not at all, to 5, every day), and the amount of *screen time* watching TV, playing videos, or on a computer (from 1 to 8). Finally, cohort members reported on how often other children hurt or picked on them weekly (*physical bullying* variable, ranging from 1, never, to 6, most days) or through cyber bullying (*online bullying* variable ranging from 1 to 6).

Family context. The mother responded on how often they had *family meals* together during the previous week (from 1, not at all, to 4, every day); whether the cohort member had *moved school* (yes or no); whether the mother had ever been diagnosed with depression or anxiety (*maternal mental health*, yes or no).

Neighborhood context. A linked MEDIX variable provided the area's level of nitrogen dioxide (NO_2) in deciles (Church & Midouhas, 2016).

Analytic strategy

Sample bias and missing data

We performed unweighted, descriptive analyses, firstly to identify any differences between participants in the analytic sample and those excluded from it and, secondly, to ensure that the missingness in our analytic sample was both low and did not follow certain patterns (namely, to ensure that values were Missing at Random). This step also informed the imputation process later on.

Plots and correlations

To gain a better understanding of the data, we produced a bar chart showing the mean MFQ scores for each religious affiliation, as well as violin boxplots of MFQ scores against each affiliation. The violin plots allow us to inspect the local density estimates in addition to the summary statistics in each case, thus ensuring that there is no exceptional underlying structure to the data of any one group, for instance, in terms of an unusual set of outliers (Hintze & Nelson, 1998; Ho et al., 2019). Further, we interrogated the data with a violin boxplot of the moderator against MFQ scores only in the case of cohort members reporting high distrust scores. Bivariate analyses accompanied these plots, and a correlation matrix was produced for the numerical variables used in the final, fully adjusted model.

Survey-weighted, imputed models

Turning to a weighted analysis, we started with (null) unadjusted linear regression models, with and without the moderator, and then entered our covariates progressively over 6 models with various degrees of adjustment. In the first step (baseline Model 1), we only adjusted for stratum, as in equation (1) below. (Following convention, we always denote unstandardized coefficients with "b" and standardized ones with "β").

$$MFQ = a + \ b_1 \cdot Distrust + b_2 \cdot Stratum \tag{1}$$

In the second model, we added sex and religion, as in equation (2).

$$MFQ = a + b_1 \cdot Distrust + b_2 \cdot Stratum + b_3 \cdot Sex + b_4 \cdot Religion \quad (2)$$

In the third model (minimally adjusted model 3), we added ethnicity, family income, and maternal education. In the next step (model 4), we added word score, attitude to risk-taking, chronic illness, BMI, fruit and vegetable eating, physical activity, screen time, and frequency of family meals. In the next step (model 5), we added the remaining covariates, namely, bullying victimization physically and online, having moved school, chronotype, maternal mental health, and air pollution (NO_2). In the final, fully adjusted model (6), we also added the distrust-religion interaction term, that is, $b_{int} \cdot Distrust \times Religion$, to examine whether religion moderates the relationship between distrust and MFQ scores. Missing data was imputed using multiple imputation by chained equations (Raghunathan et al., 2001), and the imputed datasets were combined following Rubin's rules (Rubin, 1987). All calculations were performed using R (R.Core.Team, 2021) with the "mice" package (van Buuren & Groothuis-Oudshoorn, 2011). Further details on the analysis, imputation process, missingness, multiple regression models, plots, and additional information can be found in the Supplemental Online Material (SOM, 2023).

Results

Sample bias and missingness

In line with typical non-response patterns seen in MCS, the 672 (6%) cohort members who were excluded from the analytic sample moderately over-indexed white males, were less ethnically diverse and came from less advantaged strata with lower levels of income and maternal education. The mean score of distrust towards others was moderately higher (Cohen's $d = 0.18$), but religiousness was the same as in the analytic sample. Further details can be found in Table 1.

In the analytic sample, strata, sex, MFQ (outcome) and religion (moderator) variables did not have any missing data. Distrust (exposure) variable had very few missing values (27), as did ethnicity (79), income (10), air pollution (8), chronotype (14), and both forms of bullying (< 16). Other variables had higher missingness, ranging from BMI with 436 (4%) to area safety with 1142 (10%) and maternal mental health with a maximum of 1993 (18%) missing values. Further information on bias and missingness can be found in the SOM (SOM, 2023).

Plots and correlations

Violin boxplots and bar charts of mean MFQ scores stratified by religious affiliation are shown in Figure 1. Overall, the non-religious group of adolescents ($N = 5606$, 51%) had moderately higher, $t(11015.43) = 7.63$, $p < .001$, Cohen's $d = 0.15$, 95% $CI[0.11, 0.18]$, mean total MFQ score ($M = 5.94$, $SD = 6.07$) compared to the religious group ($M = 5.09$, $SD = 5.60$).

All three main categories of religious affiliation, namely, the Judeo-Christian group ($N = 3896$, 35%), Muslim ($N = 1076$, 10%), and Dharmic ($N = 307$, 3%), had lower mean total MFQ compared to the non-religious group. Muslim adolescents had the lowest score of all ($M = 4.50$, $SD = 5.26$), $t(1672.60) = -8.02$, $p < .001$, Cohen's $d = -0.25$, 95% CI [−0.32, −0.19]. We note that Muslim adolescents also had the highest mean distrust ($M = 5.09$, $SD = 2.25$) compared to any group, including the non-religious ($M = 4.65$, $SD = 2.15$).

We found a moderately strong correlation between MFQ and distrust, $r(n = 11016) = .37$, $p < .001$. In line with previous studies (Jarbin et al., 2020), the short MFQ had excellent internal consistency in our sample (Cronbach's $\alpha = .93$). The correlation matrix for all numerical variables in our study is shown in Table 2.

Table 1. Sample bias: unweighted variable distribution between the analytic sample and the rest of the MCS (at age 14) for most variables of interest.

	Sample $n = 11045$ (94%)	Rest of MCS6 $n = 672$ (6%)	*Statistic*	*p*
Categorical, *n* (%)				
Sex				
Female	5567 (50%)	271 (40%)	25.32	< .001
Male	5478 (50%)	401 (60%)		
Religion				
Religious	5439 (49%)	150 (22%)	0.878	.349
Not religious	5606 (51%)	173 (26%)		
Chronic illness (Yes)	1563 (14%)	196 (30%)	142.23	<.001
Mat. mental health (Yes)	2634 (24%)	182 (27%)	31.54	<.001
Stratum				
England – Adv.	3085 (28%)	152 (23%)	26.38	<.001
England – Dis.	2667 (24%)	207 (31%)		
England – Ethnic	1466 (13%)	95 (14%)		
Wales – Adv.	520 (5%)	22 (3%)		
Wales – Dis.	1051 (10%)	75 (11%)		
Scotland – Adv.	657 (6%)	31 (5%)		
Scotland – Dis.	542 (5%)	32 (5%)		
N. Ireland – Adv.	437 (4%)	20 (3%)		
N. Ireland – Dis.	620 (6%)	38 (6%)		
Ethnicity				
White	8730 (79%)	234 (35%)	14.73	.012
Mixed	520 (5%)	14 (2%)		
Indian	298 (3%)	5 (1%)		
Pakistani, Bangl.	789 (7%)	37 (6%)		
Black, Black Brit.	355 (3%)	8 (1%)		
Other ethnic	274 (2%)	3 (0%)		
Numerical, mean (se)				
Income (min 1, max 5)	3.21 (.01)	2.53 (.05)	12.24	<.001
Mat. Edu. (min 1, max 6)	3.92 (.01)	3.22 (.06)	10.54	<.001
Fam. meals (min 1, max 4)	3.18 (.01)	3.07 (.04)	2.76	.006
Bullied online (min 1, max 6)	1.45 (.01)	1.65 (.09)	−2.21	.029
Chronotype (min 1, max 5)	2.95 (.01)	2.82 (.07)	1.84	.066
Risk-taking (min 1, max 11)	7.12 (.02)	6.32 (.19)	4.17	<.001
Screen Time (min 1, max 8)	5.20 (.01)	4.92 (.10)	2.87	.004
Word Score (min 1, max 20)	8.11 (.03)	6.28 (.14)	12.71	<.001
NO_2 (min 1, max 10)	6.29 (.03)	6.60 (.11)	−2.66	.007
Area safety (min 1, max 4)	3.40 (.01)	3.25 (.03)	4.66	<.001

Note. Statistic and *p*-values reported are χ^2-tests (t-tests) for categorical (numerical) variables.|"Adv." ("Dis.") stands for Advantaged (Disadvantaged); "Mat." for Maternal; "Fam." for Family; (min *i*, max *j*) stand for minimum and maximum values.

Table 2. Correlation matrix for all numerical variables in the fully adjusted model.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
MFQ (1)												
Distrust (2)	**.37**											
Cyber bullying (3)	**.40**	**.20**										
Phys bullying (4)	**.39**	**.22**	**.41**									
BMI (5)	**.12**	**.07**	**.04**	.02								
Chronotype (6)	**.23**	**.12**	**.14**	**.05**	**.07**							
Screen time (7)	**.13**	**.05**	**.05**	**.04**	**.08**	**.15**						
Air pollution (8)	−.01	**.06**	**−.06**	**−.05**	.00	**−.07**	**.05**					
Risk-taking (9)	**.07**	**−.08**	.06	.02	−.01	**.14**	.01	−.01				
Phys activity (10)	**−.13**	**−.10**	−.00	**−.05**	**−.13**	**−.05**	**−.13**	**−.05**	**.17**			
Word score (11)	.02	−.02	**−.05**	**.06**	**−.04**	**.04**	**−.06**	−.02	**.06**	**−.04**		
Maternal edu (12)	−.01	**−.04**	−.02	**.05**	**−.08**	−.01	**−.07**	**−.13**	**.07**	**.05**	**.25**	
Income (13)	**−.04**	**−.10**	**−.04**	.03	**−.12**	**−.07**	**−.09**	**−.15**	**.04**	**.05**	**.25**	**.57**

Note. Pearson's correlation coefficients (values shown in bold for $p < .05$).

Finally, some additional insight into our data is provided with a violin boxplot for the high-distrust subgroup in Figure 2. We define this subgroup as cohort members with a self-reported distrust score of 9 ($N = 400$), 10 ($N = 184$), or 11 ($N = 134$), namely, the top-3 possible values of the

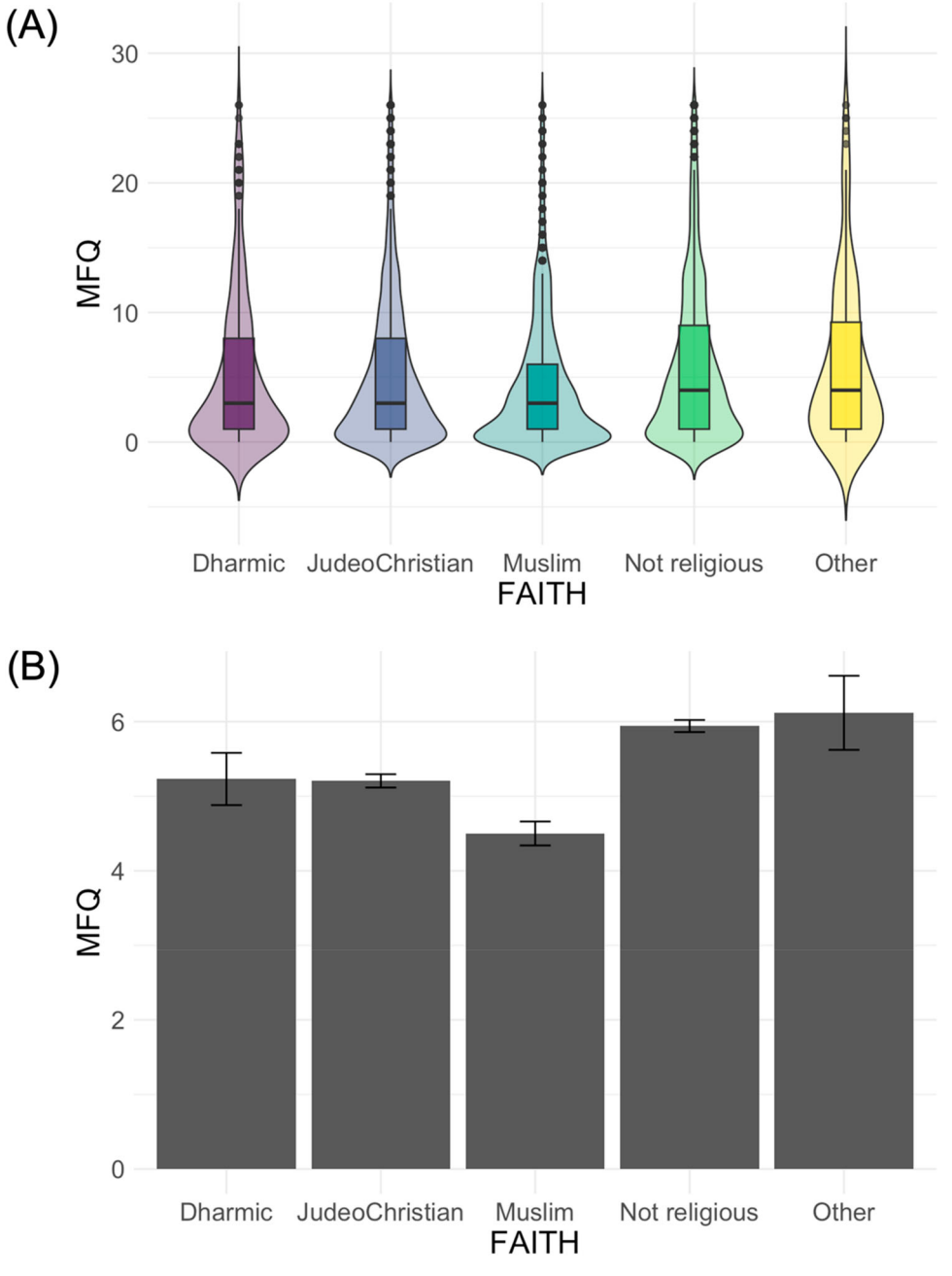

Figure 1. Plots of MFQ scores against religious affiliation: (A) violin boxplots, and (B) bar charts showing mean scores and standard errors.

exposure variable. This group of $N = 718$ adolescents (66% female, 45% religious) included 325 (45%) cohort members on or above the accepted clinical threshold of MFQ score of 12 (Angold et al., 1995; Jarbin et al., 2020). The broken red line in Figure 2 depicts this threshold. Cohort members in the "not religious' group had moderately higher mean MFQ score ($M = 12.13,\ SD = 7.57$) compared to the "religious" group ($M = 9.50,\ SD = 7.38$), $t(692.94) = 4.69$, $p < .001$, Cohen's $d = 0.35,\ 95\%\ CI[0.20,\ 0.50]$. Most notably, the non-religious group had a mean score just

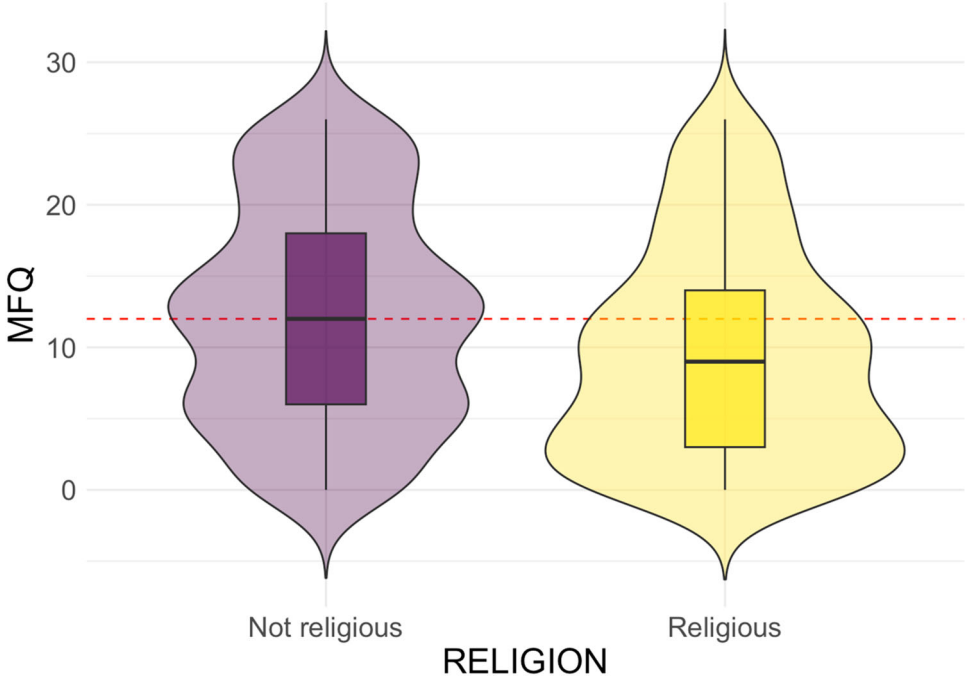

Figure 2. Violin boxplot of MFQ score against religion (religious / not religious) for the group with high distrust (top-3 scores of self-reported distrust).

Table 3. Weighted, imputed, multiple regression models 1 (baseline) to 6 (fully adjusted with interaction), showing unstandardized coefficients and standard errors.

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
(Intercept)	0.984***	0.394	1.109*	−1.668*	−5.165***	−5.469***
	(0.207)	(0.222)	(0.426)	(0.814)	(0.753)	(0.761)
Distrust	1.009***	0.924***	0.913***	0.882***	0.607***	0.671***
	(0.039)	(0.037)	(0.036)	(0.035)	(0.033)	(0.044)
England – Disadv.	−0.327	−0.240	−0.410*	−0.406*	−0.185	−0.183
	(0.197)	(0.181)	(0.186)	(0.184)	(0.171)	(0.171)
England – Ethnic	−1.435***	−1.015***	−0.647*	−0.392	−0.002	−0.001
	(0.217)	(0.239)	(0.316)	(0.301)	(0.269)	(0.270)
Wales – Adv.	−0.062	−0.001	−0.072	−0.055	−0.086	−0.066
	(0.341)	(0.349)	(0.345)	(0.313)	(0.296)	(0.301)
Wales – Disadv.	−0.080	−0.086	−0.389	−0.314	−0.390	−0.386
	(0.247)	(0.238)	(0.251)	(0.241)	(0.234)	(0.235)
Scotland – Adv.	−0.232	−0.268	−0.279	−0.280	−0.834**	−0.822**
	(0.276)	(0.265)	(0.263)	(0.260)	(0.263)	(0.261)
Scotland – Disadv.	−0.017	−0.056	−0.229	−0.291	−0.608*	−0.622*
	(0.316)	(0.307)	(0.307)	(0.311)	(0.287)	(0.284)
NI – Adv.	−0.391	0.004	−0.222	0.063	−0.202	−0.227
	(0.399)	(0.350)	(0.354)	(0.334)	(0.298)	(0.298)
NI – Disadv.	−0.595	−0.216	−0.721*	−0.557	−0.972**	−1.003**
	(0.336)	(0.325)	(0.349)	(0.335)	(0.311)	(0.311)
Sex: Female		2.607***	2.579***	2.600***	2.324***	2.321***
		(0.143)	(0.140)	(0.144)	(0.129)	(0.129)
Religious		−0.775***	−0.542***	−0.426**	−0.313*	0.442
		(0.146)	(0.155)	(0.152)	(0.132)	(0.292)
Ethnicity: Mixed			0.230	0.246	0.504	0.510
			(0.359)	(0.357)	(0.323)	(0.321)
Indian			−0.953*	−0.779*	−0.005	−0.020

(*Continued*)

Table 3. Continued.

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
			(0.378)	(0.344)	(0.324)	(0.319)
Pakistani Bangl.			−1.450***	−1.174***	−0.255	−0.236
			(0.314)	(0.294)	(0.286)	(0.289)
Black			−1.498***	−1.564***	−0.470	−0.432
			(0.384)	(0.386)	(0.356)	(0.354)
Other Ethnic			−0.090	0.058	0.615	0.634
			(0.582)	(0.542)	(0.459)	(0.462)
Income			−0.262*	−0.121	0.064	0.064
			(0.125)	(0.112)	(0.103)	(0.104)
Maternal Edu.			0.068	0.051	−0.034	−0.034
			(0.193)	(0.186)	(0.158)	(0.158)
Word Score				0.088	0.052	0.051
				(0.047)	(0.041)	(0.041)
Risk-Taking				0.333***	0.210***	0.212***
				(0.032)	(0.029)	(0.029)
Illness: Yes				1.528***	0.915***	0.918***
				(0.216)	(0.187)	(0.187)
BMI				0.001***	0.001***	0.001***
				(0.000)	(0.000)	(0.000)
Fruit Eat.				−0.695***	−0.382**	−0.385**
				(0.143)	(0.132)	(0.131)
Vegetables Eat.				−0.225	−0.182	−0.181
				(0.134)	(0.126)	(0.126)
Phys. Active				−0.124	−0.146*	−0.147*
				(0.071)	(0.062)	(0.062)
Screen Time				0.271***	0.165***	0.166***
				(0.048)	(0.043)	(0.043)
Family Meals				−0.169	−0.049	−0.052
				(0.168)	(0.142)	(0.142)
Phys. Bullied					0.946***	0.945***
					(0.060)	(0.059)
Cyber Bullied					1.255***	1.258***
					(0.082)	(0.082)
Chronotype					0.796***	0.791***
					(0.073)	(0.073)
Mat. Mental H.: No					−0.682***	−0.678***
					(0.161)	(0.160)
NO_2					−0.041	−0.040
					(0.026)	(0.026)
Distrust*Religious						−0.154*
						(0.063)
R^2	0.137	0.185	0.189	0.232	0.374	0.374
Nobs	11045	11045	11045	11045	11045	11045

***$p < 0.001$; **$p < 0.01$; *$p < 0.05$ | Adv. (Advantaged), Disadv. (Dis-advantaged), NI (Northern Ireland), Edu. (Education), Eat. (Eating), Mat. (Maternal), H. (Health).

above the clinical threshold that is used as an indication for the possible presence of adolescent depression, while the religious group was substantially below this threshold.

Survey-weighted, imputed regression models

Table 3 shows the complete results for all the models (unstandardized coefficients) after they have been imputed. The fully adjusted model (6) with the interaction term explains more than a third of the total variance in MFQ scores, and the coefficient for the distrust-religion interaction remains significant even in this case, $b_{int} = -0.154$, $t(11014) = -2.446$, $p = .014$, CI 95% [−0.278, −0.031].

Note that, for all models, the standardized coefficients are provided in the Supplemental Online Material (SOM, 2023) but for the unimputed case only, since there is no universally accepted process for calculating standardized coefficients with pooled results of multiple imputations (Van

Ginkel et al., 2020; Yuan & Chan, 2011). From there we obtain the largest coefficient—the strongest predictor of adolescent depression in our model—for female sex, $\beta_3 = 0.375$, $t(7649) = 14.985$, $p < .001$, CI 95%[0.326, 0.424]. The next two (joint-second) predictors were physical bullying, $\beta_{17} = 0.239$, $t(7649) = 15.484$, $p < .001$, CI 95%[0.208, 0.269] and distrust, $\beta_1 = 0.239$, $t(7649) = 14.682$, $p < .001$, CI 95%[0.207, 0.271]. These were more than twice as large as the effect of maternal mental health, and several times larger than income, BMI, and screen time. By comparison, for religiousness, $\beta_4 = -0.074$, $t(7649) = -3.164$, $p = .002$, CI 95%[−0.120, −0.028], which also was several times larger than income and twice as predictive as diet (fruit eating). For all models, the interaction effect was of the same order, ranging from around −0.040 to $\beta_{int} = -0.066$, $t(7649) = -2.510$, $p = .013$, CI 95%[−0.117, − 0.014].

Discussion

The results of the present study support the hypothesis that religiousness moderates the association between self-reported scores of interpersonal distrust and mean number of depressive symptoms, captured via self-reported MFQ scores at the age 14 sweep in the Millennium Cohort Study. The moderation effect was robust even after full adjustment with potential confounders at four levels in a biopsychosocial model, including socioeconomic variables, individual characteristics, family context, and features of the built environment. Motivated by Social Safety Theory (Slavich, 2020), our primary research question was whether religiousness fosters social safety and, therefore, acts as a moderator in the relationship between social threat (distrust) and pathogenesis in adolescence (depressive symptoms).

The broader question is about the role of religion in mental health and adjustment, and multiple viewpoints have been put forward to answer this during the last two decades (Emmons & Paloutzian, 2003; Lucchetti et al., 2021; Pargament & Raiya, 2007; Vishkin et al., 2014). The contribution of the present study is to connect the role of religion, at least in middle adolescence, with the beneficial and protective effects of social safety, which counteract the sense of social threat tracked by distrust. This connection certainly has been anticipated by the corpus of previous research on belonging (Allen & Kern, 2017; Riley, 2019), social capital (Almedom, 2005; McPherson et al., 2014), and attachment (Kirkpatrick, 2005). From the point of view of attachment theory (Kirkpatrick & Shaver, 1992), in particular, secure, avoidant, and ambivalent attachment to a higher spiritual power have been examined, and corresponding outcomes in psychological adjustment have been identified in the literature (Cooper et al., 2009; Ellison et al., 2012; Horton et al., 2012; Parenteau et al., 2019), while it is known that trust and attachment styles interact in human relationships (Baldwin, 1992; Givertz et al., 2013), and that the relationship between the two constructs becomes particularly relevant during adolescence (Moretti & Peled, 2004; Mónaco et al., 2019; Therriault et al., 2021).

However, the results reported in this study should be placed in the context of several limitations. First, the findings are correlational in nature, and causal claims cannot be made in any direction. Second, one has to consider the possibility of residual confounding; for instance, it could be that adolescents who self-report as religious (or not religious) tend to under-report (or over-report) depressive symptoms (as stated in the MFQ) due to particular biases that emerge in their scoring. There is no way of addressing this limitation without additional information, not currently available in the Millennium Cohort Study, and potentially augmenting it with data from qualitative research. Third, and perhaps most crucially, the lived experiences and meaning systems of adolescents who self-report as being religious remain inaccessible. Fourth, Millennium Cohort Study data are representative of the youth population in the UK, and we cannot address any cross-cultural differences. Fifth, distrust tracks a sense of social threat in an adolescent's life—but the MCS data we have available did not allow us to explore more deeply the nature of this distrust, for instance, with a suitable multi-item trust scale (Yamagishi & Yamagishi, 1994).

Despite these limitations, the present study offers new insights into the association between distrust and depressive symptoms in adolescence, and the role of religiousness. Using Social Safety Theory as a theoretical framework, we have interpreted the degree of interpersonal distrust experienced by adolescents as a proxy measure for the sense of social threat, a risk factor for the pathogenesis of depression, while religiousness was viewed as fostering social safety, a protective factor that was found to moderate depressive symptoms. However, an important open question for future research is which facets of religiousness afford the most protective role against adolescent depression. On a first level of analysis, further investigation could distinguish broadly between *doxis* and *praxis*, namely, spiritual belief and religious practice (Kendler et al., 2003; Smart, 1996). On a second level, research could investigate the differential impact on adolescent depression of belief dimensions—such as, belief in an afterlife, or the existence of a watchful God—and that of behavioral dimensions, which include attendance in places of worship, praying, fasting, and meditation (Lewis et al., 2011). In this context, and given that adolescence is a period of increased social activity and integration, the role of social signaling warrants further exploration (Sosis, 2005). Of course, adolescents live their lives in a variety of simultaneous groupings other than their religious community, including an extended family, sports groups, social groups, and many others, all of which may have a protective effect, but our focus here was simply on the benefits that religious adherence might have in mitigating symptoms of depression. Our results show that, notwithstanding the fact that many other types of social grouping might have beneficial effects, the influence of religious affiliation on its own is strong enough to circumvent any positive or negative effects that might arise from being involved with other types of groups.

An interesting question that is raised from our findings concerns the potential neuroendocrinological pathways implicated in the moderating effect of religiousness on depression. There are various possibilities, and we cannot offer anything but an initial hypothesis at this stage, along the following lines. The current consensus is that prosocial behaviors and social cognitive abilities in humans are tracked by the neuroendocrine network of the social brain, and that oxytocin—a neuropeptide hormone—modulates the function of this network (Marsh et al., 2021). There is still considerable debate around the link between interpersonal trust and oxytocin (Declerck et al., 2020; Yan & Kirsch, 2021), evidence for which had been presented originally by Kosfeld et al. (2005). The debate continues partly because of the technical challenges involved in measuring oxytocin levels (Tabak et al., 2023), and partly because of the inherent complexity in completely disentangling trust from other prosocial, cooperative behaviors (Helliwell et al., 2017). However, oxytocin pathways (that is, oxytocin, vasopressin, and corresponding receptors) appear to be of central importance for social function, and—under certain conditions—oxytocin fosters a sense of social safety and connectedness towards the in-group (Carter, 2014), although not towards the outgroup (Egito et al., 2020). Therefore, it would be reasonable to expect that dysregulation of the oxytocin system would lead to the opposite of this, i.e., a sense of social threat and disconnectedness-distrust towards others. In turn, this would contribute to the pathogenesis of depression. Evidence has been presented in this direction, showing that oxytocin dysregulation is linked with depression (Neumann & Landgraf, 2012; Veiga et al., 2022; Xie et al., 2022), possibly through oxytocin's interactions with inflammatory factors that modify reactions to stressors (De Cagna et al., 2019; Heinrichs et al., 2003; McQuaid et al., 2014). This has led several researchers to investigate treatments based on intranasal oxytocin, both for depression and conditions in which social cognition is impaired (De Cagna et al., 2019; Quintana et al., 2021; Scantamburlo et al., 2015; Winterton et al., 2021). In addition, religiousness has been found to correlate positively with the level of plasma oxytocin (Kelsch et al., 2013), the level of endogenous oxytocin (Holbrook et al., 2015), and the amount of administered oxytocin (Van Cappellen et al., 2016). Therefore, future research could address these oxytocin pathways (Eckstein et al., 2019; Olff et al., 2013), which we hypothesize to be involved in the attenuating effect of religiousness (social safety upregulating oxytocin receptors) on distrust (social threat downregulating oxytocin receptors).

Additional future work should investigate the present findings further as a function of religious faith: for instance, we found that adolescents who reported their religious affiliation as "Muslim" had the lowest level of self-reported depressive symptoms (Figure 1), but relatively higher values of distrust towards others compared to their religious peers, possibly pointing to the increased rates of victimization experienced by this group of adolescents in the UK (Francis & McKenna, 2018). This finding confirms early research into religious affiliation differences, which had indicated that the belief in religious faith coping efficacy was strongest in the Muslim group (Loewenthal et al., 2001).

Disclosure statement

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

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Data availability statement

The data that support the findings of this research are publicly available under license from the UK Data Service, University of Essex, University of Manchester and Jisc (https://ukdataservice.ac.uk/). The data had been fully anonymised and no additional ethics approvals were required for our study.

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