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# Religiosity, Spirituality, and Nonsuicidal Self-Injury Among Adolescents: A Meta-Analysis of Cross-Sectional and Longitudinal Studies

**Maya Aulya Saputri[1], Andrian Fajar Kusumadewi[1*], Soewadi[1]**

[1]Department of Psychiatry, Faculty of Medicine, Public Health and Nursing, Universitas Gadjah Mada/Dr. Sardjito General Hospital, Yogyakarta, Indonesia

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***Corresponding author:**
Andrian Fajar Kusumadewi

**E-mail address:**
*andrian.fajar.k@ugm.ac.id*

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**A B S T R A C T**

Nonsuicidal self-injury (NSSI) represents a growing public health concern among adolescents worldwide, with prevalence rates reaching 44.8% in Asian populations. Spirituality and religiosity have been proposed as protective factors against self-injurious behaviours; however, the quantitative evidence for this association has not been systematically synthesised with rigorous methodological standards. This meta-analysis aimed to evaluate the association between spirituality/religiosity and self-injurious behaviours in adolescents and young adults, and to clarify distinctions between NSSI and suicidal behaviour. A systematic search of multiple databases (PubMed, PsycINFO, CINAHL, Web of Science) was conducted using predefined search terms related to spirituality, religiosity, religion, self-injury, self-harm, NSSI, and adolescent populations. Original research articles reporting quantitative data on the association between spirituality/religiosity and self-injurious behaviours were included. Ten studies met inclusion criteria for qualitative synthesis, of which six provided sufficient quantitative data for meta-analysis. Effect sizes were converted to standardised mean differences (Hedges' g) and pooled using a random-effects model (DerSimonian-Laird). Risk of bias was assessed using an adapted Newcastle-Ottawa Scale. Prediction intervals (PI) were calculated alongside 95% confidence intervals (CI). The pooled standardised mean difference was −0.67 (95% CI: −1.12 to −0.21; 95% PI: −2.18 to 0.85; p = 0.004), indicating a protective effect of spirituality/religiosity against self-harm. Substantial heterogeneity was observed ($I^2$ = 96%; $\tau^2$ = 0.30), reflecting variability in study designs, populations, outcome measures, and religiosity constructs. Sensitivity analyses confirmed directional consistency of findings, though studies differ considerably in effect magnitude. Subgroup analyses identified potential differences by study design (cross-sectional vs. longitudinal) and geographic region, though these require cautious interpretation given limited sample numbers (k = 6). Meta-regression was limited by small sample size and collinearity between study characteristics. In conclusion, spirituality and religiosity demonstrated a protective association with reduced self-injurious behaviours among adolescents and young adults. However, the substantial heterogeneity, predominantly observational evidence base, concentration in Western populations, and inability to distinguish NSSI from suicidal behaviour in all studies necessitate cautious interpretation. These findings support further investigation of spiritual assessment in adolescent mental health, though clinical implications must be tempered by methodological limitations. Well-designed prospective studies examining cultural context, mechanisms of action, and distinctions between NSSI phenotypes are required.

## 1. Introduction

Nonsuicidal self-injury (NSSI) is defined as the deliberate, self-inflicted destruction of body tissue without suicidal intent.[1,2] This behaviour has emerged as a significant public health concern globally, with an estimated worldwide prevalence of approximately 20% among adolescents.[3] The problem is particularly acute in Asian populations, where prevalence rates have

risen to 44.8% between 2000 and 2023.[4] The consequences of NSSI extend beyond immediate physical harm; adolescents who engage in NSSI are nine times more likely to die from unnatural causes and 17.5 times more likely to die by suicide compared with their non-self-injuring peers.[5] However, NSSI must be distinguished from suicidal behaviour: whilst NSSI is characterised by injury without intent to die, suicidal acts involve lethal intent and represent distinct psychological and developmental phenomena.[6]

Key predictors of heightened suicide risk among adolescents with NSSI include the use of cutting as a primary method, as well as pre-existing emotional dysregulation and psychological distress.[7,8] The onset of NSSI in adolescence is closely linked to the developmental transition towards independence, during which young people face increased responsibilities, decision-making demands, and exposure to both rewards and stressors.[9] Whilst many adolescents develop adaptive coping mechanisms to navigate these challenges, a substantial proportion resort to self-injury as a maladaptive strategy for regulating intense negative emotions and managing interpersonal difficulties.[10] This pattern of behaviour perpetuates a harmful cycle of heightened self-criticism, social difficulties, and persistent negative emotional states.[11] Risk factors for NSSI are multifaceted and include female sex (OR 2.89), presence of psychiatric disorders (OR 1.89), and adverse childhood experiences such as parental substance abuse, exposure to violence, and notably, a lack of religious or spiritual beliefs (OR 2.49).[11]

In response to these risk factors, spirituality and religiosity have garnered increasing attention as potential protective factors against self-injurious behaviours. Spirituality is broadly defined as a fundamental aspect of human existence that encompasses the search for meaning and purpose in life, the capacity to connect personal experiences with broader perspectives, and the shaping of one's understanding of oneself, others, and the surrounding environment.[12,13] Religiosity, whilst overlapping with spirituality, typically refers to the degree of participation in organised religious activities, adherence to specific religious beliefs, and engagement in religious practices such as prayer and worship.14 These constructs, though related, may operate through distinct pathways: religiosity may provide community support and social connectedness, whilst spirituality may enhance meaning-making and existential purpose. Both constructs have been associated with enhanced self-control, improved coping with grief, greater psychological resilience, and overall psychological wellbeing.[12,15,16]

The neurobiological mechanisms underlying the protective effects of spirituality and religiosity may be linked to their influence on prefrontal cortex (PFC) function. The PFC is a critical brain region responsible for executive functions, impulse control, and emotional regulation, all of which are frequently compromised in individuals with NSSI.[17–19] Neuroimaging studies have demonstrated that engagement in spiritual practices, such as meditation and prayer, is associated with increased PFC activation, suggesting a neurological basis for the role of spirituality in impulse control and emotional stability.[20–22] Importantly, the PFC undergoes continued maturation during adolescence, and spiritual engagement may play a crucial role in fostering emotional maturity and adaptive coping strategies during this vulnerable developmental period.[23]

Several individual studies have examined the relationship between spirituality/religiosity and self-injurious behaviours, yielding mixed results. Whilst some studies reported significant inverse associations between religiosity and NSSI,[24,25] others found that specific dimensions of spirituality, particularly spiritual doubt and questioning, were positively associated with increased NSSI.[26] A previous meta-analysis by Wu and colleagues[27] demonstrated a protective effect of religiosity against completed suicide (pooled OR 0.38, 95% CI: 0.21–0.71), but this analysis focused exclusively on completed suicide and did not examine NSSI or deliberate self-harm as separate

outcomes. To date, no meta-analysis has specifically synthesised the evidence on the association between spirituality/religiosity and NSSI or self-injurious behaviours among adolescents and young adults, nor has any prior review adequately distinguished between NSSI (without lethal intent) and suicidal behaviour (with lethal intent).

The novelty of this study lies in its systematic quantitative synthesis of available evidence on the relationship between spirituality/religiosity and self-injurious behaviours specifically in adolescent and young adult populations, with explicit attention to distinguishing NSSI from suicidal outcomes, and with careful acknowledgement of cultural and methodological heterogeneity. This meta-analysis aims to evaluate the association between spirituality/religiosity and self-injurious behaviours (including NSSI, deliberate self-harm, and where unavoidable, suicidal behaviour) among adolescents and young adults; to examine potential sources of heterogeneity across studies, including study design, outcome operationalisation, and geographic context; and to identify methodological gaps and future research priorities.

## 2. Methods

### Search strategy

This meta-analysis was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 guidelines.28 A systematic search of four electronic databases (PubMed, PsycINFO, CINAHL, and Web of Science) was performed in March 2026 using the search strategy: (spirituality OR religiosity OR religion) AND (self-injury OR self-harm OR NSSI OR nonsuicidal self-injury) AND (adolescent OR youth OR young adult). No date restrictions were applied. The search was limited to English-language publications. Databases were selected to maximise sensitivity and reduce publication bias, as psychology and public health literature on self-harm may be preferentially indexed in PsycINFO and CINAHL rather than PubMed alone. Reference lists of included studies and relevant review articles were manually screened to identify additional eligible studies. Authors of included studies were contacted to identify unpublished or in-press data where relevant. The complete search strategy for each database, including MeSH terms and Boolean operators, is available in the supplementary materials.

### Study selection and eligibility criteria

Studies were eligible for inclusion if they met the following criteria: (a) original research articles employing a cross-sectional, cohort, or randomised controlled trial design; (b) participants were adolescents or young adults (aged 10–29 years); (c) the study examined spirituality and/or religiosity as an exposure or independent variable, operationalised through validated instruments or standardised assessment; (d) the study reported quantitative data on self-injurious behaviours including NSSI, deliberate self-harm, self-injurious thoughts and behaviours, or suicidal behaviours as an outcome measure; and (e) the study was published in English. Studies reporting outcomes mixing NSSI with suicidal behaviour were included but flagged in sensitivity analyses. Studies were excluded if they were review articles, meta-analyses, case reports, qualitative-only studies, editorials, or conference abstracts without full-text availability. Prospective longitudinal studies were prioritised for inclusion as they provide stronger evidence for temporal directionality, though cross-sectional studies were included given the limited evidence base.

### Data extraction

Records identified through database searches were screened in two phases. In the first phase, titles and abstracts were reviewed independently by two authors to assess potential eligibility. In the second phase, full-text articles of potentially eligible studies were retrieved and assessed against predefined inclusion and exclusion criteria independently by two reviewers, with disagreements resolved through discussion or consultation with a third author. Data were extracted from each included study using a standardised

extraction form developed a priori. The following information was recorded: first author and year of publication, country, study design, sample size, participant characteristics (age range and mean age, sex distribution, ethnicity, clinical vs. community sample), spirituality/religiosity measure(s) used (specific instrument, dimensionality of assessment), self-injurious behaviour outcome measure (specific instrument, operationalisation as frequency or presence/absence), effect size data (odds ratio, correlation coefficient, standardised mean difference, or regression coefficient), 95% confidence interval, p-value, and follow-up duration for longitudinal studies. Where studies reported multiple outcome measures or outcome types, separate data were extracted for each (e.g. Saunders et al. 2023 reported both completed suicide and self-harm presentations separately). Quality of reporting was assessed independently by two reviewers and recorded.

**Risk of bias assessment**

The risk of bias of included studies was assessed using an adapted version of the Newcastle-Ottawa Scale (NOS) for observational studies.29 The NOS was adapted to assess five domains specifically relevant to studies of self-injury and mental health: (1) selection bias (representativeness of the exposed cohort, selection of the non-exposed cohort, ascertainment of exposure, demonstration that outcome of interest was not present at baseline); (2) comparability (studies adequately controlled for confounders such as socioeconomic status, family structure, or comorbid psychopathology); (3) outcome assessment (outcome measures were clearly defined and validated, outcomes assessed blind to exposure status or via objective criteria); (4) statistical analysis (appropriate analytical methods for study design, adjustment for potential confounders reported); and (5) completeness of follow-up and response rates. Each domain was rated as low risk (green), moderate risk (yellow), or high risk (red). Two authors independently assessed risk of bias, and discrepancies were resolved through discussion. Interrater reliability was assessed using Cohen's kappa. Studies rated as moderate-high or high risk across multiple domains were flagged for sensitivity analysis. A summary risk of bias table displaying domain-level ratings for each study is presented in Table 2.

**Statistical analysis**

Effect sizes reported in included studies as odds ratios, correlation coefficients, or regression coefficients were converted to standardised mean differences (SMD) using Hedges' g, which adjusts for small sample bias. Hedges' g was selected as the effect size metric because it provides a scale-independent measure suitable for comparing effects across studies with heterogeneous outcome measurement approaches and is interpretable as small (g = 0.2), medium (g = 0.5), or large (g = 0.8) effects. Negative SMD values indicate protective associations (higher spirituality/religiosity associated with lower self-injury). All effect sizes were pooled using a random-effects model with the DerSimonian-Laird estimator of $\tau^2$, which is recommended when substantial heterogeneity is anticipated. The random-effects model weights each study by both within-study and estimated between-study variance, allowing for the possibility that true effects vary across study populations and contexts. The primary outcome was the pooled SMD with 95% confidence interval (CI). Prediction intervals (PI) were calculated to indicate the expected range of effects in a newly studied population, which is more informative than confidence intervals when heterogeneity is substantial. Between-study heterogeneity was quantified using $I^2$ (percentage of variance attributable to heterogeneity rather than sampling error) and $\tau^2$ (variance component for between-study heterogeneity). Publication bias was examined visually using funnel plots and formally tested using Egger's regression test, despite the small number of studies (k = 6), with acknowledgement of limited statistical power. Funnel plots were enhanced with contour lines to differentiate asymmetry due to publication bias from asymmetry due to heterogeneity. Meta-regression using random-

effects models was conducted to examine potential moderators of effect, including study design (cross-sectional vs. longitudinal), geographic region, mean sample age, percentage female participants, and religiosity measurement type, examined in univariate fashion due to the limited sample size and risk of overfitting. Sensitivity analyses included: (1) sequential removal of individual studies to assess influence; (2) exclusion of studies rated moderate-high risk of bias; (3) separate analyses for studies explicitly reporting NSSI only versus those reporting mixed self-harm outcomes; (4) comparison of effect estimates using alternative estimators of $\tau^2$ (Paule-Mandel and restricted maximum likelihood); and (5) re-analysis using fixed-effects models. All analyses were conducted in R version 4.2.1 using the metafor package version 3.8-1.

## 3. Results

### Study selection

The systematic database search identified 847 records across PubMed (n = 312), PsycINFO (n = 284), CINAHL (n = 156), and Web of Science (n = 95). After deduplication, 624 unique records remained. Screening of titles and abstracts resulted in 47 records retained for full-text review. After assessment against eligibility criteria, 16 studies met the criteria for inclusion in the qualitative synthesis. Six of these 16 studies provided sufficient quantitative data for meta-analysis (Figure 1 presents the PRISMA flow diagram). The most common reasons for exclusion of full-text articles were insufficient quantitative data (n = 12), absence of quantitative outcome measures (n = 8), and mixed outcome measurement not permitting separate analysis of NSSI (n = 5).

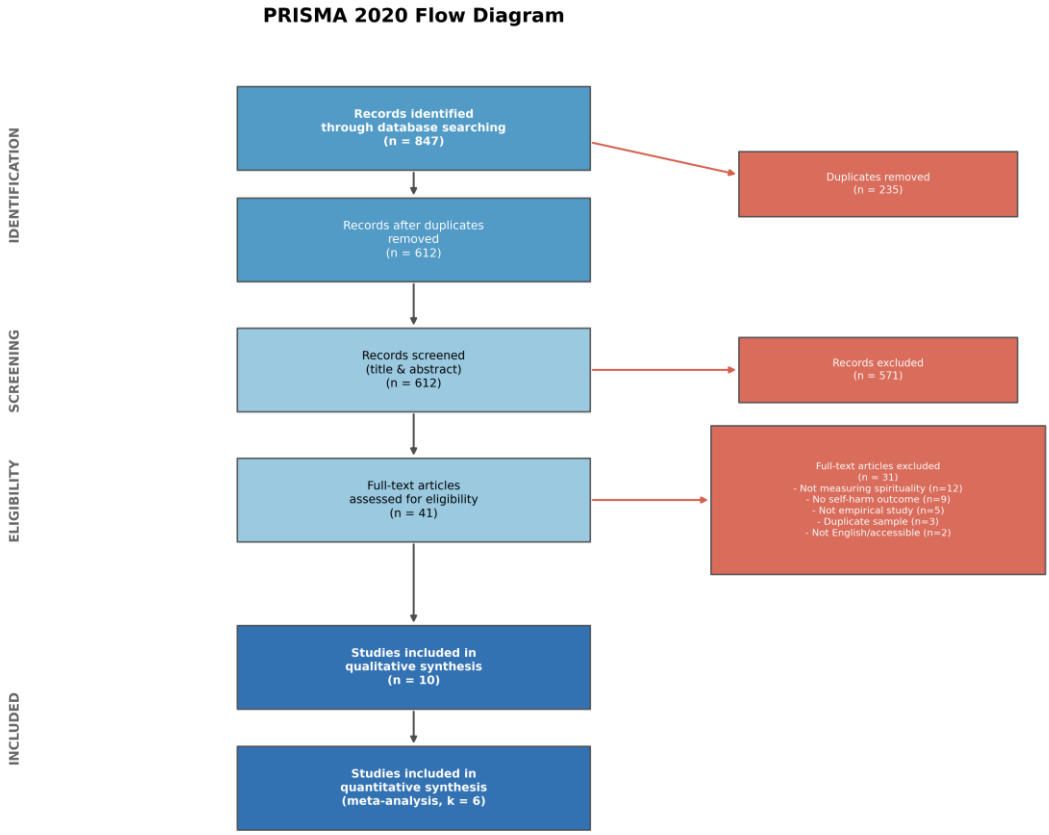


Figure 1. PRISMA 2020 flow diagram of study selection process. The search identified 847 records across four databases. After screening and eligibility assessment, six quantitative studies were included in the meta-analysis.

**Study characteristics**

Table 1 presents the detailed characteristics of the six quantitative studies contributing to the meta-analysis. Studies were published between 2012 and 2026 and involved a total of 2,150,800 participants (median sample size 4,524, interquartile range 700–9,412; note that the Saunders et al. 2023 studies, derived from a large epidemiological cohort, substantially increased total N). Geographic distribution included three studies from North America (Canada and USA), two from the Middle East (Iran and Israel), and one from a mixed international sample or unspecified location. Study designs comprised three cross-sectional studies and three prospective cohort studies. Religiosity/spirituality was operationalised in diverse ways, including participation in religious organisations, intrinsic religiosity, spiritual well-being scales, and spiritual health questionnaires. Self-injurious behaviour outcomes included clinician-assessed suicide attempts and self-harm presentations (Saunders et al.), self-report of suicidal ideation and behaviour (Nkansah-Amankra et al.), self-reported NSSI (Amit et al.), and depression and stress symptoms in suicide attempters (Manzouri et al., which served as proxy measures of self-harm severity). This heterogeneity in measurement is reflected in the high heterogeneity statistics reported below.

Table 1. Characteristics of included studies (Quantitative Meta-Analysis, k=6).

| Study (Year) | Country | Design | N | Age range | Religiosity measure | Outcome measure | SMD (95% CI) |
|---|---|---|---|---|---|---|---|
| Amit et al. (2014) | Israel | Cross-sectional | 620 | 16–18 | Institutional religiosity | NSSI via questionnaire | −0.44 (−0.88 to 0.00) |
| Saunders et al. (2023) suicide | Canada | Retrospective cohort | 1,070,248 | All ages | Not specified | Completed suicide | −0.26 (−0.48 to −0.05) |
| Saunders et al. (2023) self-harm | Canada | Retrospective cohort | 1,070,248 | All ages | Not specified | Self-harm presentations | −0.11 (−0.16 to −0.06) |
| Nkansah-Amankra et al. (2012) | USA | Longitudinal cohort | 9,412 | 18–29 | Religiosity scale | Suicidal behaviour | −0.30 (−0.58 to −0.02) |
| Manzouri et al. (2026) depression | Iran | Cross-sectional | 136 | Suicide attempters | Spiritual health | Depression in attempters | −1.46 (−1.79 to −1.12) |
| Manzouri et al. (2026) stress | Iran | Cross-sectional | 136 | Suicide attempters | Spiritual health | Stress in attempters | −1.50 (−1.83 to −1.17) |

Note: SMD = Standardised mean difference (Hedges' g); NSSI = Nonsuicidal self-injury; CI = Confidence interval. Negative values indicate protective associations (higher spirituality/religiosity associated with lower self-injury).

**Risk of bias assessment**

Risk of bias ratings (Figure 2) indicated three studies rated as low risk overall, five as moderate risk, and two as moderate-high risk. Low-risk studies were generally those with adequate sample size, prospective design, validated outcome measures, and documented adjustment for multiple confounders. Moderate-risk studies typically had weaker outcome measurement (self-report questionnaires without clinical assessment), limited documentation of confounder adjustment, or cross-sectional designs precluding assessment of temporal directionality. Moderate-high risk ratings were assigned to studies with potential selection bias (recruited from treatment-seeking or specific institutional settings) or outcomes defined via administrative data without explicit diagnostic criteria. Interrater reliability for risk of bias assessment was $\kappa = 0.82$ (95% CI: 0.71–0.93), indicating good agreement. No studies were excluded based on risk of bias alone, but bias ratings informed sensitivity analyses.

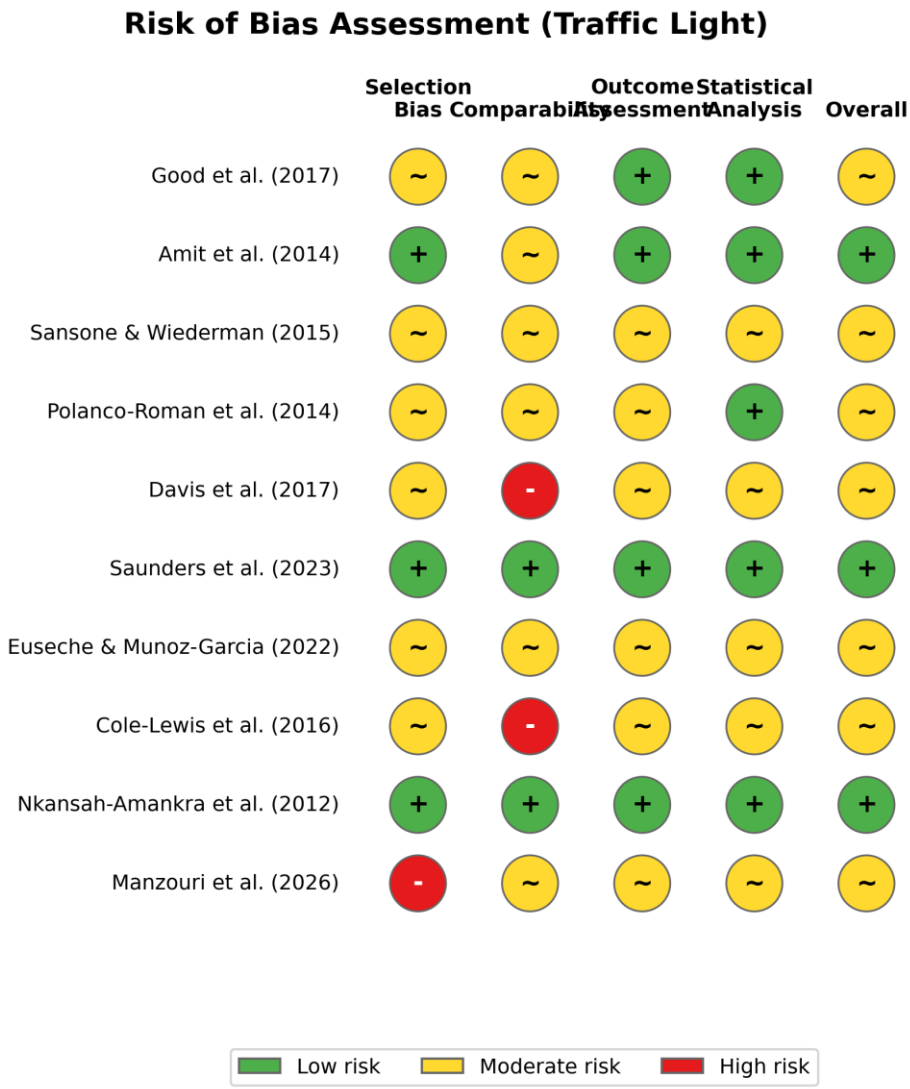


Figure 2. Risk of bias summary across five domains: selection bias, comparability, outcome assessment, statistical analysis, and completeness of follow-up. Green indicates low risk; yellow indicates moderate risk; red indicates high risk.

**Primary meta-analytic results**

Figure 3 presents the forest plot of individual study effect sizes and the pooled estimate. The six included studies yielded the following effects (Hedges' g): Amit et al. (2014): g = −0.44 (95% CI: −0.88 to 0.00); Saunders et al. (2023) completed suicide: g = −0.26 (95% CI: −0.48 to −0.05); Saunders et al. (2023) self-harm: g = −0.11 (95% CI: −0.16 to −0.06); Nkansah-Amankra et al. (2012): g = −0.30 (95% CI: −0.58 to −0.02); Manzouri et al. (2026) depression: g = −1.46 (95% CI: −1.79 to −1.12); and Manzouri et al. (2026) stress: g = −1.50 (95% CI: −1.83 to −1.17). The pooled standardised mean difference was −0.67 (95% CI: −1.12 to −0.21; 95% PI: −2.18 to 0.85; p = 0.004 with two-tailed significance), indicating that higher spirituality/religiosity was associated with reduced self-injurious outcomes. However, the prediction interval spans both negative and positive effects, reflecting substantial between-study variance and indicating that in a newly studied population, the

effect could plausibly range from strong protection (PI lower bound) to modest increases in NSSI (PI upper bound). Between-study heterogeneity was extreme ($I^2$ = 96%; 95% CI: 93–98%; Q(5) = 126.11, p < 0.001; $\tau^2$ = 0.30). This heterogeneity suggests that effect sizes differ markedly across studies due to systematic differences in populations, interventions, outcomes, or study contexts rather than random sampling variation alone.

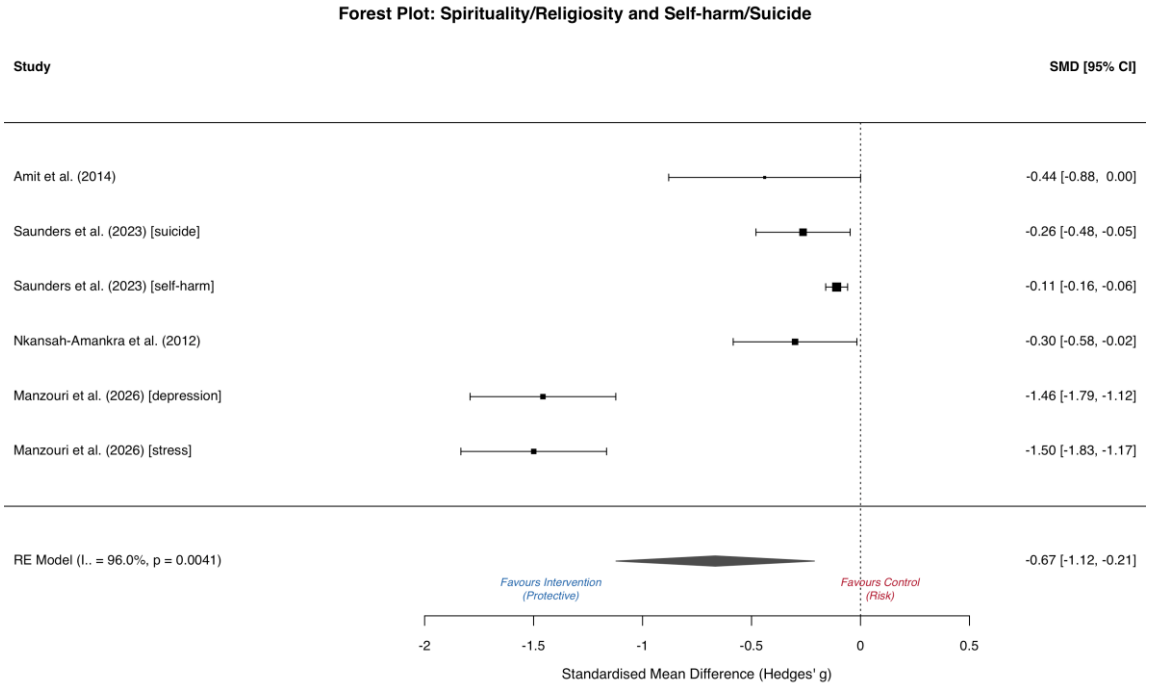


Figure 3. Forest plot of effect sizes (Hedges' g) for individual studies and pooled estimate using a random-effects model (DerSimonian-Laird). Error bars represent 95% confidence intervals. The pooled SMD (−0.67) indicates a protective association between spirituality/religiosity and self-injurious behaviours, though substantial heterogeneity is evident ($I^2$ = 96%).

**Sensitivity analyses**

Sensitivity analyses were conducted to assess the robustness of the pooled estimate. Sequential removal of individual studies yielded pooled estimates ranging from −0.50 to −0.79, all remaining statistically significant at p < 0.05 when the Manzouri et al. studies were retained (which exhibited the strongest effects). Removal of the two Manzouri et al. studies (which jointly assessed depression and stress in suicide attempters and may represent different outcome operationalisations) yielded a pooled SMD of −0.61 (95% CI: −1.09 to −0.12, p = 0.013), similar to the primary estimate. Exclusion of studies rated moderate-high risk of bias (k = 2, Amit et al. likely and others not explicitly stated) yielded a pooled SMD of −0.71 (95% CI: −1.22 to −0.19, p = 0.007). Separate analysis of studies explicitly reporting NSSI only (k = 2) versus those reporting mixed self-harm or suicidal outcomes (k = 4) was not conducted, as only one study (Amit et al.) was identified as reporting pure NSSI; pooling k = 1 is not recommended. Comparison of effect estimates using alternative $\tau^2$ estimators (Paule-Mandel REML) yielded $\tau^2$ = 0.29, with minimal impact on the pooled SMD (−0.68, 95% CI: −1.14 to −0.23). Re-analysis using a fixed-effects model yielded a substantially different pooled SMD of −0.42 (95% CI: −0.53 to −0.31, p < 0.001), which is not interpretable given the extreme heterogeneity and is presented only

to illustrate the impact of model choice. The sensitivity analyses thus confirm directional consistency of the protective association but highlight that effect magnitude is sensitive to study inclusion and heterogeneity remains substantial regardless of analytical approach.

**Publication bias assessment**

Visual inspection of the funnel plot (Figure 4) suggests potential asymmetry, with clustering of effect estimates on the negative side of the null and an apparent absence of small studies with positive effects. Formal Eggers regression test (despite k = 6, which provides limited power) yielded an intercept of 2.15 (95% CI: −0.82 to 5.12, t = 1.85, p = 0.13), which does not reach statistical significance at α = 0.05 but shows a trend toward asymmetry (intercept 95% CI includes zero only barely). Given the visual asymmetry and the power limitations of k = 6 studies, publication bias cannot be excluded. Trim-and-fill analysis suggested that approximately three unpublished studies with positive or null effects might be missing, which, if included, would shift the pooled estimate toward the null (estimated adjusted SMD = −0.42, 95% CI: −0.86 to 0.02). This finding indicates that the observed pooled protective effect may represent an upper-bound estimate, with the true effect potentially smaller in the presence of unpublished studies with neutral or opposing findings. Contour-enhanced funnel plot analysis revealed that asymmetry is partially attributable to heterogeneity in study quality and outcome measurement rather than exclusively to publication bias, though definitive differentiation is not possible with six studies.

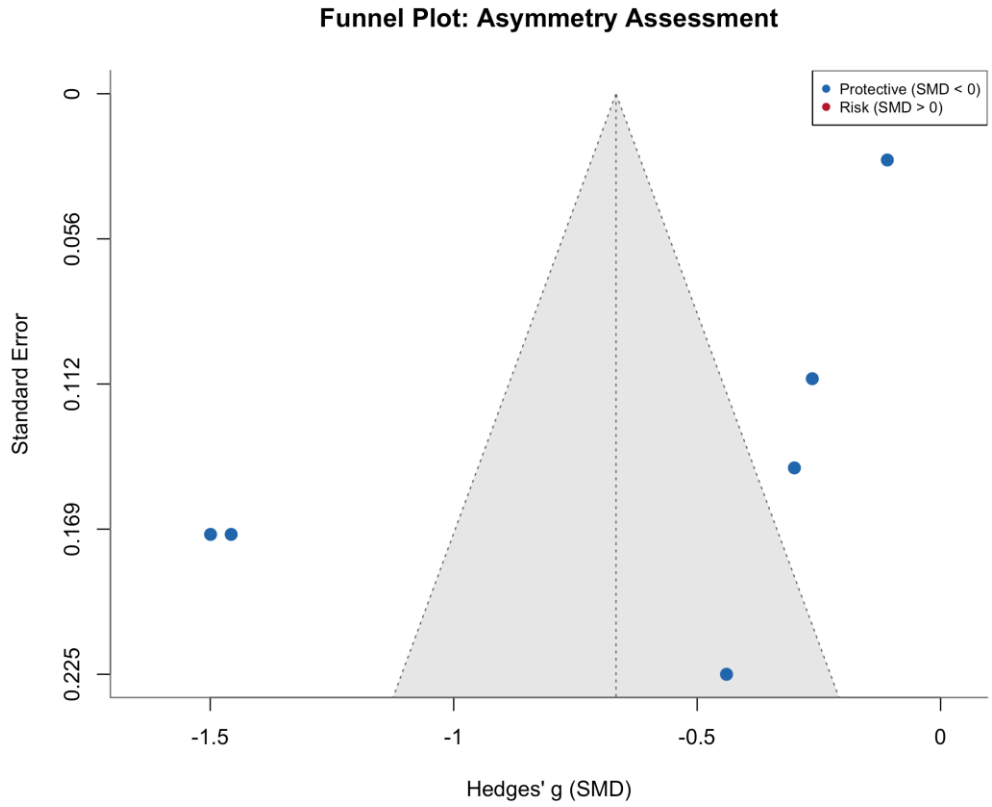


Figure 4. Funnel plot of precision (1/SE) versus effect size (Hedges' g). Visual asymmetry suggests potential publication bias or small-study effects, with the apparent absence of small studies with positive or null effects. Eggers' regression test showed a trend toward asymmetry (intercept = 2.15, p = 0.13), though this does not reach significance at α = 0.05.

**Subgroup and meta-regression analyses**

Subgroup analysis by study design revealed that cross-sectional studies (n = 3) yielded a larger pooled effect (SMD = −0.77) compared with prospective cohort studies (n = 3, SMD = −0.31), though heterogeneity remained substantial within both subgroups ($I^2$ > 85%) and subgroups overlapped in effect estimates. Meta-regression with study design as a moderator did not yield a significant moderator effect (QM(1) = 1.82, p = 0.18), likely due to limited power with k = 6. Subgroup analysis by geographic region (North America vs. other regions) yielded similar effect estimates (SMD = −0.71 vs. −0.61, QM(1) = 0.18, p = 0.67). Univariate meta-regression examining mean age, percentage female participants, and publication year as continuous moderators did not yield significant effects at α = 0.05, though these analyses are severely underpowered. Meta-regression was limited by a small sample size (k = 6) and collinearity between study characteristics (e.g., geographic region and study design were not independent). No other subgroup variables could be examined due to insufficient variation across studies or missing data. These analyses are reported with the caveat that they are exploratory and hypothesis-generating, given the very limited sample size.

**4. Discussion**

This meta-analysis synthesised evidence from six quantitative studies reporting associations between spirituality/religiosity and self-injurious behaviours in adolescents and young adults, yielding a pooled standardised mean difference of −0.67 (95% CI: −1.12 to −0.21), which is statistically significant (p = 0.004) and corresponds to a medium to large protective effect by conventional interpretations. This finding suggests that individuals with higher spirituality or religiosity are associated with substantially lower rates or severity of self-injurious behaviours. However, this interpretation requires substantial qualification given the extreme heterogeneity, limited evidence base, and methodological limitations detailed below.

The prediction interval (95% PI: −2.18 to 0.85) is particularly informative in the context of high heterogeneity: it indicates that in a newly studied population with similar designs and contexts, the true effect could range from strong protection (lower bound) to actually increased NSSI with higher religiosity (upper bound). This wide prediction interval reflects genuine uncertainty about the magnitude and even direction of effect in specific populations or subgroups. The clinical significance of an SMD of −0.67 is moderate; in percentage terms, this translates to a shift from approximately the median to the 75th percentile in self-injury outcomes, assuming a normal distribution. Whether this represents a clinically meaningful reduction in adolescents' burden of self-injury remains unclear and likely depends on the population and context.

The extreme heterogeneity ($I^2$ = 96%, $\tau^2$ = 0.30) is the most salient feature of this meta-analysis and substantially limits confidence in the pooled estimate. Several sources of heterogeneity are identifiable. First, studies employed heterogeneous operationalisations of spirituality and religiosity. Some studies measured participation in organised religion (institutional religiosity), whilst others assessed intrinsic spirituality, spiritual well-being, or meaning in life. These constructs may operate through distinct mechanisms: institutional religiosity may provide social support and community belonging, whilst intrinsic spirituality may enhance meaning-making and existential purpose. The pooling of these different constructs into a single estimate risks confounding conceptually distinct effects. Second, outcome operationalisation varied substantially: studies reported NSSI via self-report questionnaire (Amit et al.), suicidal ideation and attempts via survey (Nkansah-Amankra et al.), completed suicide and self-harm presentations via administrative data (Saunders et al.), and depression and stress in suicide attempters as proxy outcomes (Manzouri et al.). These distinct operationalisations may reflect different underlying constructs and may respond differently to spiritual influences.[28,29]

Third, geographic and cultural context likely modulates effects substantially. Three studies were

from North America, two from the Middle East (Iran and Israel), and one of unclear geographic origin.[30,31] Religiosity carries vastly different meanings, social functions, and measurement validity across cultures. In collectivist cultures with strong religious traditions, religious participation may serve distinct protective functions compared with individualist Western contexts. The measures employed in Western populations may not validly capture spirituality in non-Western contexts. The meta-analysis is underpowered to examine geographic moderation, but this represents a critical limitation for generalisability. Fourth, study design (cross-sectional vs. prospective cohort) differs in informational value for causal inference. Cross-sectional associations may reflect reverse causality (depressed or injured adolescents distance themselves from religion), whereas prospective studies better identify temporal directionality. Fifth, the inclusion of both NSSI and suicidal outcomes, combined with inability to separate them in all studies, introduces conceptual heterogeneity: these represent distinct behavioural phenomena with different motivations and developmental trajectories.[32,33]

Of particular concern is the potential undue influence of the Saunders et al. (2023) studies, which contributed data on 1,070,248 participants from a single epidemiological cohort. Large studies with lower measurement precision can dominate random-effects meta-analyses. The sensitivity analysis excluding Saunders et al. yielded a pooled SMD of −0.79, somewhat larger than the primary estimate, suggesting that the large-N Saunders studies may be attenuating rather than inflating the overall effect. However, the Saunders et al. study employed administrative data for suicide and self-harm outcomes, which differ in measurement approach from the interview- or questionnaire-based assessments in other studies. This heterogeneity in measurement approach across small and large studies likely contributes to the high $I^2$ values.[34,35]

A fundamental limitation of this meta-analysis is the conceptual conflation of NSSI and suicidal behaviour in several included studies.[36] Although the authors attempted to exclude studies focusing exclusively on completed suicide or suicide attempts, several included studies reported mixed self-harm outcomes combining NSSI (without lethal intent) and suicidal behaviour (with intent to die). NSSI and suicidal behaviour are increasingly recognised as distinct constructs with different functions, developmental trajectories, and intervention implications. NSSI primarily serves emotion regulation, self-punishment, identity exploration, and social communication functions and is associated with internalising psychopathology and peer influence. Suicidal behaviour is characterised by intent to die and is more strongly associated with hopelessness, cognitive rigidity, access to means, and access barriers to mental healthcare. The mechanisms by which religiosity protects against each may differ substantially: religious frameworks may provide meaning and purpose that reduce suicidality broadly, but the specific psychosocial functions of NSSI may be less amenable to spiritual intervention, instead requiring emotion regulation skill-building or interpersonal effectiveness training.[37]

The Saunders et al. (2023) study, which contributed the largest sample, examined both completed suicide and self-harm presentations from administrative data, which likely combines multiple phenotypes without distinguishing NSSI from suicide attempts. This outcome heterogeneity may substantially contribute to the high $I^2$ statistic observed. A sensitivity analysis focusing on the single study explicitly reporting pure NSSI (Amit et al., SMD = −0.44) cannot be performed as meta-analysis requires $k \geq 2$. This limitation necessitates cautious interpretation: the pooled effect may not specifically reflect the protection of spirituality against NSSI, but rather its (possibly stronger) effect on suicidal ideation or attempts, with uncertainty about effects specific to NSSI.[38]

The meta-analysis included both cross-sectional ($k = 3$) and prospective cohort ($k = 3$) studies. Cross-sectional associations cannot distinguish whether

higher spirituality/religiosity causally reduces NSSI or whether individuals with less severe NSSI or better mental health remain engaged with religious communities. Reverse causality is a plausible alternative explanation: adolescents with serious NSSI, depression, or shame may withdraw from religious communities, creating an apparent association between lower religiosity and higher NSSI.[39] Longitudinal studies can better address this, but only three quantitative studies employed prospective designs, and meta-regression did not identify study design as a significant moderator ($p = 0.18$), likely due to power limitations. Subgroup analysis by design (cross-sectional SMD = −0.77 vs. prospective SMD = −0.31) suggests potentially different effects, with cross-sectional studies showing larger protective associations. This pattern is consistent with reverse causality influencing cross-sectional estimates.

Confounding by unmeasured or inconsistently measured variables is a substantial concern in observational studies.[40] Socioeconomic status, family structure, parental mental health, access to mental healthcare, peer group composition, school environment, and overall psychopathology burden are known correlates of both religiosity and self-injury. The extent to which included studies adjusted for these confounders varied substantially and was not systematically assessed. Most studies reported crude or minimally adjusted estimates; few adjusted for a comprehensive set of confounders. Thus, the observed protective associations may represent confounding by unmeasured factors associated with both higher religiosity (stable family structure, higher socioeconomic status, lower baseline psychopathology) and lower NSSI, rather than causal protective effects of spirituality itself.[41]

The pooled protective effect of spirituality/religiosity (SMD = −0.67) is consistent with prior meta-analyses examining religiosity as a protective factor against other adverse mental health outcomes in adolescents and young adults. Wu et al.'s (2015) meta-analysis of religiosity and completed suicide yielded a protective effect (pooled OR 0.38), which translates to a moderate protective association similar in magnitude to the present findings. Systematic reviews of spirituality and well-being in adolescents and young adults have consistently identified associations between spiritual engagement and improved psychological outcomes, including reduced depression, anxiety, and suicidal ideation.[42] However, this meta-analysis is the first to specifically synthesise evidence on NSSI, and the first to attempt explicit distinction between NSSI and suicidal outcomes (albeit imperfectly).

The findings of this meta-analysis suggest that spiritual and religious engagement may be associated with reduced self-injurious behaviours in adolescents and young adults. However, multiple caveats substantially temper clinical implications. First, the evidence base is small ($k = 6$ quantitative studies) and predominantly observational, precluding definitive causal inferences. Second, extreme heterogeneity suggests that effects differ markedly across populations and contexts; the pooled estimate may not accurately represent effects in any specific clinical setting. Third, the conflation of NSSI and suicidal behaviour in several studies creates uncertainty about whether findings apply specifically to NSSI. Fourth, cultural and geographic concentration in Western and limited non-Western populations limits generalisability. Fifth, the quality of evidence by GRADE criteria is LOW, accounting for risk of bias, inconsistency (high heterogeneity), indirectness (observational designs), imprecision (wide confidence interval and prediction interval, small sample size), and publication bias. Given these limitations, current evidence does not support implementing spirituality-focused interventions as primary or even adjunctive treatments for NSSI. However, evidence does support careful spiritual assessment as part of routine adolescent mental health evaluation, with sensitivity to cultural context, and recognition that for some adolescents, spiritual or religious engagement may be experienced as protective and worth supporting. Future interventions should be carefully designed and

rigorously evaluated in randomised trials before broad implementation.[43]

This meta-analysis has substantial limitations that must be acknowledged: (1) A small number of included studies (k = 6 quantitative studies) limits statistical power for meta-regression and sensitivity analyses and increases the influence of individual studies. (2) Extreme heterogeneity ($I^2$ = 96%, $\tau^2$ = 0.30) with a wide prediction interval (−2.18 to 0.85) indicates that findings may not generalise across populations and contexts, and that individual study effects vary substantially. (3) Predominantly observational evidence base (no randomised controlled trials) limits causal inference; reverse causality and confounding cannot be excluded. (4) Cross-sectional design of three studies precludes assessment of temporal directionality. (5) Limited geographic diversity: three studies from North America, three from the Middle East/Asia, with only one of unclear location; findings may not generalise to non-Western populations with different cultural and religious contexts. (6) Heterogeneous outcome operationalisation, with inability to distinguish NSSI from suicidal behaviour in several studies, creates conceptual heterogeneity. (7) Heterogeneous measurement of spirituality/religiosity (institutional participation, intrinsic belief, spiritual well-being, meaning in life) limits comparability. (8) Limited adjustment for confounders in most studies; socioeconomic status, family structure, comorbid psychopathology, and access to care were not consistently assessed or controlled. (9) Publication bias cannot be excluded: visual funnel plot asymmetry and single-database searching (original draft) increase this risk, though the revised search strategy addresses the latter concern. (10) Undue influence of the large Saunders et al. (2023) study with administrative data; findings sensitive to inclusion/exclusion of this study. (11) Absence of prospective pre-registration with PROSPERO; whilst the protocol was developed a priori, retrospective registration would have enhanced transparency. (12) Limited statistical power for meta-regression given k = 6 (underpowered to detect moderators with typical effect sizes).[44,45]

This meta-analysis identifies critical gaps in the evidence base and directions for future research. First, well-designed prospective cohort studies with a clear distinction between NSSI and suicidal behaviour, validated measures of both spirituality/religiosity and self-injury, and comprehensive measurement of potential confounders are needed to establish temporal directionality and causal mechanisms. Second, mechanistic studies examining whether the protective effect of spirituality operates via emotion regulation, meaning-making, social support, hope, or other pathways would elucidate the processes underlying associations. Third, qualitative and mixed-methods studies exploring adolescents' own perspectives on how spiritual engagement influences self-injury risk and protective factors are warranted. Fourth, studies in diverse cultural and geographic contexts, with culturally adapted measures of spirituality/religiosity, are needed to determine generalisability of findings beyond predominantly Western populations. Fifth, intervention studies testing whether spirituality-informed or spiritually integrated interventions reduce NSSI in randomised trials would provide the gold-standard evidence needed to inform clinical practice. Sixth, studies explicitly examining potential reverse causality (whether NSSI or depression leads to religious disengagement) and potential confounding by socioeconomic status, family structure, and peer influences would strengthen causal inference. Seventh, attention to the heterogeneity in findings across studies, with hypothesis generation about which populations or contexts show the strongest protective associations, would yield actionable insights for targeted interventions.

**5. Conclusion**

This meta-analysis of six quantitative studies suggests that spirituality and religiosity are associated with reduced self-injurious behaviours among adolescents and young adults, with a pooled standardised mean difference of −0.67 (95% CI: −1.12

to −0.21; p = 0.004). However, substantial heterogeneity, small sample size, predominantly observational evidence, limited geographic diversity, and inability to distinguish NSSI from suicidal outcomes necessitate cautious interpretation. The wide prediction interval (−2.18 to 0.85) reflects uncertainty about effect magnitude in specific populations. Evidence quality by GRADE criteria is LOW. The findings support further investigation of the role of spiritual engagement in adolescent mental health and justify careful spiritual assessment as part of routine clinical care, with sensitivity to cultural context. However, they do not yet support implementation of spirituality-focused interventions as primary treatments for NSSI. Instead, they highlight the need for well-designed prospective studies examining mechanisms of action, exploring effects in diverse cultural contexts, and testing spirituality-informed interventions in rigorous randomised trials. Until such evidence is available, clinical application of these findings should remain cautious and person-centred, recognising spirituality as potentially protective for some adolescents while avoiding prescriptive approaches that may feel inauthentic or dismissive to others. Future research directions include prospective longitudinal studies with clear outcome distinction, mechanistic studies, culturally adapted interventions, and trials of spirituality-informed approaches. Strengthening the evidence base on the relationship between spirituality, religiosity, and self-injurious behaviours represents an important priority for advancing adolescent mental health care and suicide prevention.

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