

Religion- and Spirituality-Based Effects on Health-Related Components with Special Reference to Physical Activity: A Systematic Review

Joanna Kruk ^{1,*}  and Basil Hassan Aboul-Enein ^{2,3}¹ Faculty of Physical Culture and Health, University of Szczecin, 71-065 Szczecin, Poland² Department of Health Science, Johnson & Wales University, Providence, RI 02903, USA; basil.aboulenein@jwu.edu or basil.aboul-enein@lshtm.ac.uk³ Faculty of Public Health and Policy, London School of Hygiene & Tropical Medicine, London WC1H 9SH, UK

* Correspondence: joanna.kruk@usz.edu.pl

Abstract: The positive effects of religion and/or spirituality through faith-based interventions on health and promoting health programs have been well documented over the last two decades. Research indicates that faith-related programs can motivate increased physical activity, among other behaviors. This review summarizes the literature on how religion and spirituality beliefs and practices support physical, mental, and psychosocial health, focusing primarily on physical activity. A literature search was conducted using databases (Medline/PubMed, Science Direct) and Google Scholar, with search terms like “religion”, “spirituality”, “physical activity”, “physical exercise”, and “health” to identify relevant studies from 2017 to 2023. Thirteen studies were selected, including seven cross-sectional designs, four randomized controlled trials, and two cohort studies. Eleven of these studies reported positive effects of religious faith, religiosity, and spirituality interventions on increasing physical activity or reducing sedentary behavior. These findings confirm that greater religious commitment is positively associated with better health outcomes, including increased physical activity. This research suggests that further studies are needed to identify specific religiosity/spirituality variables in the context of physical activity association and to clarify the underlying mechanisms. Such insights may inform the development of intervention programs aimed at promoting physical activity and strengthening health associations.



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1. Introduction

Numerous studies have examined the effects of religiosity (R) and spirituality (S), (R/S), on health-related components (Seeman et al. 2003; Schlundt et al. 2008; Basu-Zharku 2011; Koenig 2012; VanderWeele 2017; Kang et al. 2020; Kvesić et al. 2020; Svensson et al. 2020; de Diego-Cordero et al. 2022; Aggarwal et al. 2023). The terms R and S are multidimensional constructs having different definitions, although they are related to each other (Paul Victor and Treschuk 2020; Gschwandtner 2021; Koenig et al. 2023). These constructs have been widely discussed in the literature and applied in a variety of contexts (Koenig 2012; Koenig et al. 2023). Evidence has shown much controversy and disagreement concerning definitions of these terms. According to Koenig (2012) “religion involves beliefs, practices, and rituals related to the transcendent”; R is an organized system that operates symbols, facilitating closeness to the sacred or transcendent (Koenig et al. 2023). In turn “Spirituality is intimately connected to supernatural, the mystical, and to organized religion”, although it also extends beyond R and begins before it, whereas faith is often correlated with R and S and is more personal (Koenig 2012). The literature data have maintained that R/S may positively change the health behaviors of both healthy people and patients with chronic diseases and cancer survivors, providing community support and self-acceptance regardless

of religious affiliation (Powell et al. 2003; Seeman et al. 2003; Rassouli et al. 2015; Lumpkins et al. 2019; Hamdan et al. 2020). Research findings have shown a strong correlation of R/S with some determinants of physical health for pain, fatigue, physical well-being, mental health (depression, anxiety, emotional well-being), and psychosocial health (social distress, social well-being, social relationships and activity, support, or distress) (Salsman et al. 2015; Sherman et al. 2015; Shattuck and Muehlenbein 2020).

Recent evidence maintains that R/S faith creates optimism and quality of life (Salsman et al. 2015). A recently published review investigating the relation of R and S to lifestyle practices in religious communities (McManus 2024) reported that religious practices and communal living positively affect successful aging and well-being in older individuals. Improving quality of life and social interactions was reported to be positively correlated with S/R. Evidence has shown that social theories are well established to describe PA behaviors (Bauman et al. 2012; Stehr et al. 2021). According to these theories, individuals' PA behaviors are determined by several factors, like interpersonal, physical, cultural, social, environmental (Alves and Oliveira 2018). A recent qualitative study by Stehr et al. (2021) presented two cognitive theories: the Theory of Planned Behavior and the Self-Determination Theory. Based on these theories, the authors suggest that the interplay between individuals' beliefs and motivation is essential regarding PA among older people and can explain the complexity of their behavior. In a previous article, we explored faith-based health promotion interventions on Latino and African American populations (Blankinship et al. 2021). We demonstrated that faith-based health programs might affect positive healthy lifestyle, including long-term physical activity/physical exercise (PE), (PA)/(PE), cultural appropriateness, social community support, and self-efficacy. Moreover, evidence has shown that R and S play important roles in enhancing sports performance and contributing to athletes' well-being (Noh et al. 2023). In addition, PA and sports have been closely linked regarding their effect on health-related components. Findings on the positive effect of R/S on the increase in PA is essential because physical inactivity, obesity/overweight, poor diet, and psychological stress, as well as other unhealthy behavioral risk factors, are initiators of oxidative stress (OS) and inflammation of the factors accompanying numerous chronic diseases, including cancer incidence and progression (Irwin 2009; Kruk et al. 2019a, 2019b). In addition, a sedentary lifestyle and obesity are prevalent among cancer survivors (Irwin 2009). Regular PA has been regarded as an integral part of promoting physical and mental health and well-being and as a tool to prevent and manage several chronic diseases (Saxena et al. 2005; Warburton et al. 2006; Koenig 2012; Neuffer et al. 2015; VanderWeele 2017). However, supportive evidence shows that the global prevalence of physical inactivity remains high. According to the World Health Organization data, "Globally, 1 in 4 adults do not meet the global recommended levels of physical activity", i.e., engaging in regular aerobic PA at least 150–300 min/week of moderate-intensity (3–<6 METs) or at least 75–150 min/week of vigorous-intensity activity (≥ 6 METs) or the equivalent combination of both intensities of activity (Bull et al. 2020). Physical inactivity has been regarded as the principal factor increasing overweight and obesity, which, together with unhealthy diets, leads to obesity-related disease burden and mortality worldwide. Consequently, there is a need to develop appropriate, cost-effective PA interventions to reduce sedentary lifestyles. One approach proposed is to use the R- and S-based programs (Blankinship et al. 2021). Given these facts, it is essential to recognize how R and S may stimulate individuals to undertake PA. This is important, especially since R/S plays an essential role in many people's daily lives and PA is an integral part of people's lives (Almaraz et al. 2022). The literature to date mostly emphasizes the R/S contribution to mental rather than physical health benefits (Vitorino et al. 2018; Lucchetti et al. 2021). Moreover, the scientific literature relating specifically to the impact of R and S on levels of PA is limited, reports scarce findings, and is based most often on cross-sectional studies (Almaraz et al. 2022; de Diego-Cordero et al. 2022; Aggarwal et al. 2023). The high percentage of adults who do not reach the current public health recommendations for PA for increased life expectancy and the essential impact of physical inactivity on chronic and age-dependent

diseases support the need to update findings focusing on the association between R/S and PA as a potential factor in healthcare. Referencing the meta-analysis by Jim et al. (2015) that reported the beneficial effects of R and S on cancer patients' health and a similar role of PA (Saxena et al. 2005; Warburton et al. 2006; Neuffer et al. 2015), understanding the biological mechanisms operating between these factors is necessary. Therefore, this paper aims to review the impact of religious faith and spiritual practice on health components, mainly PA/PE. The objective of this paper was to (1) highlight briefly the beneficial role of R and S in health-related components: physical health, psychosocial health, mental health, and psychological well-being; (2) identify the post-2017 scientific literature evidence on the effect of R and S on engaging in PA/PE; and (3) discuss the biological plausibility of these putative associations. We also highlight areas for future studies.

2. Materials and Methods

2.1. Study Design

This systematic review briefly demonstrates actual knowledge about the effect of R and S on human health and analyzes the effect of these terms on involvement in PA.

2.2. Search Strategy

We followed the PRISMA quality standards methodology for reporting in this review. The review design involved a literature search in July 2022, which was updated in December 2023. The articles were searched and selected using the databases Medline/PubMed and Science Direct, along with Google Scholar (first 100 hits). In addition, we manually searched the reference lists of relevant articles, reviews, and meta-analysis papers. The terms "religion", "spirituality", "physical activity", "physical exercise", and "health" were applied as search terms, linked to each other through the Boolean operators "OR" and "AND": ("spirituality" OR "spiritualities" OR "Religion" OR "Religions" OR "Religious") AND "Physical Activity" OR "Physical Exercises" OR "Exercises" OR "Sports").

2.3. Selection Criteria

The following inclusion criteria were defined: (1) observational studies and experimental studies published between January 2017 and December 2023, (2) reviews and meta-analyses, (3) studies of individuals aged ≥ 18 years, (4) studies published only in peer-reviewed journals in English, (5) studies with PA/PE and R/S measurement tools, (6) studies providing quantitative information on the associations between R/S and PA. The interaction of R and S on health-related components was examined separately by reviewing the literature on this topic. We excluded individuals under 18 years of age and studies based on small sample sizes of participants.

2.4. Data Extraction

Both authors reviewed the titles and abstracts of the retrieved articles independently for inclusion against the eligibility criteria. Any disagreements were resolved through discussion. The extracted data include name of first author, year of publication, country, study design, aim of a study, participants' characteristics, study sample, instruments used to measure R and S, evaluation of PA/PE (self-reported or objectively measured), main results (odds ratios (ORs) with corresponding 95% confidence intervals (CIs), logistic regression coefficient, changes in PA dimension).

3. Results

3.1. Selected Articles

Figure 1 shows the flow diagram of the included and excluded articles.

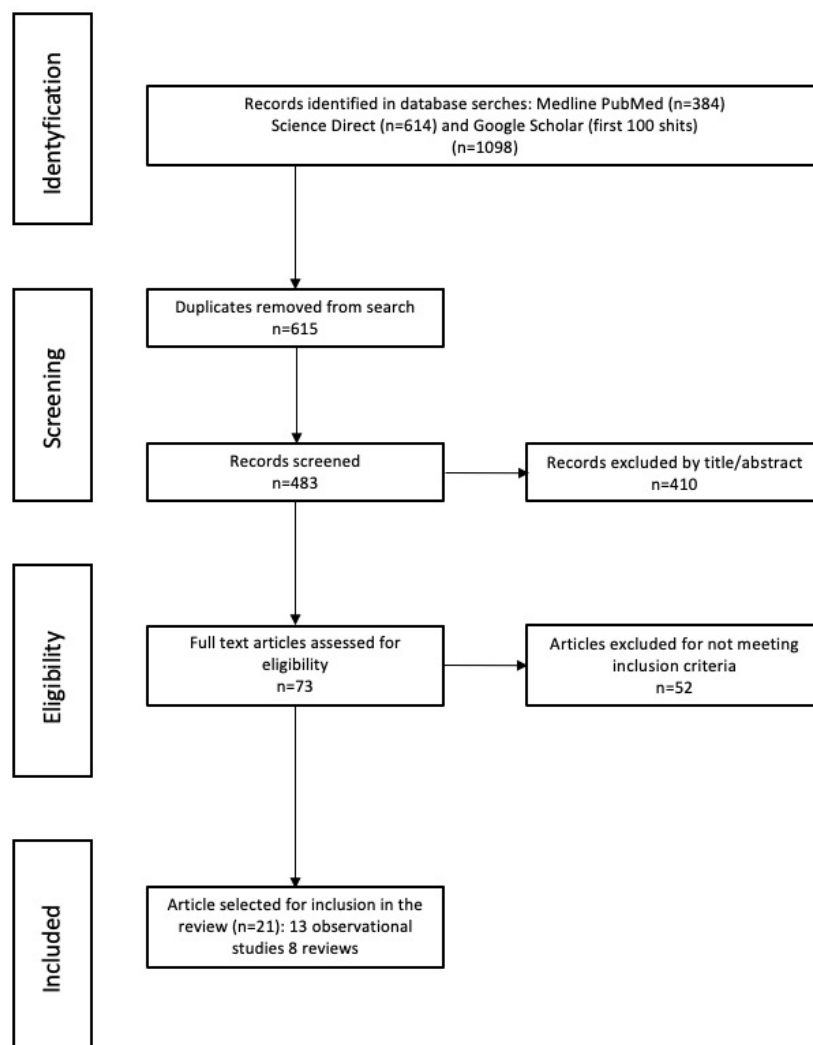


Figure 1. Flow diagram of the literature review process.

A total of 1098 potential articles were originally retrieved. After removing duplicates ($n = 615$) and excluding records by titles and abstracts, we evaluated the full texts of 73 articles. Finally, 21 were included in this review, reporting the association of R and S with PA/PE. Of the included studies, 13 were observational studies, and 8 were reviews and meta-analysis research; the remaining studies ($n = 52$) did not meet inclusion criteria. We also identified additional articles through other sources (reference lists of selected articles, Google Scholar to present briefly the role of R and S in physical and mental health).

3.2. Role of Religion and Spirituality in Mental and Physical Health

Much effort has been devoted to addressing the association of R and S with health-related determinants among either healthy people or people suffering from chronic diseases (Salsman et al. 2015; Sherman et al. 2015; Ferreira et al. 2020; Kopeyko et al. 2020; Moreira et al. 2020; Shattuck and Muehlenbein 2020; Borges et al. 2021; Reisi et al. 2021; Almaraz et al. 2022). Research has generated interactions of R and S with several components of physical health, social well-being and community support, mental health, and psychological well-being, among others (Figure 2).

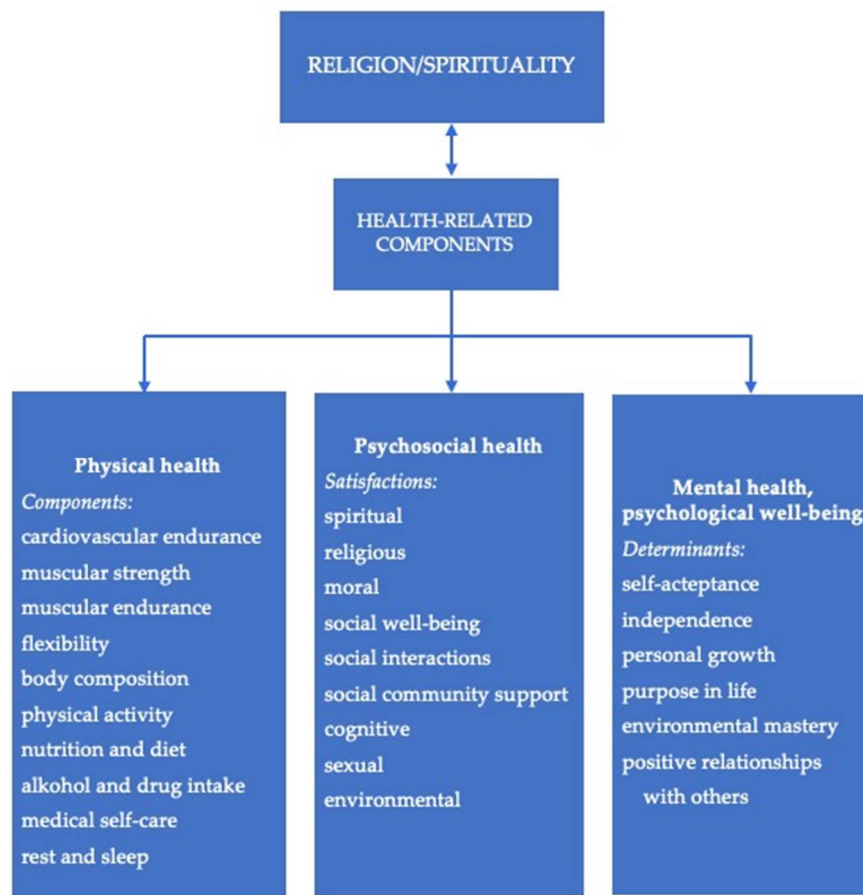


Figure 2. Schematic presentation of the interaction between religion and/or spirituality and health-related components (after Shojaee and French 2014; Gonçalves et al. 2017; Rathod 2021; Almaraz et al. 2022; Hussain and Cunningham 2023; Koenig et al. 2023).

In this regard, the recent review by Doyle and Link (2024) demonstrated the tripartite model of health incorporating social, physical, and mental health localized in the human body, including the mind. The authors defined social health as “adequate quantity and quality of relationships in a particular context to meet an individual’s need for meaningful human connection.” Through a longitudinal study of three cohorts of different ages, Chen et al. (2021) found that religious beliefs and religious service attendance are essential forms of social integration potentially correlated with greater longevity, better mental health, healthier lifestyles, and greater psychosocial well-being. A large part of these studies focused on the relationship between R and S and mental health among patients diagnosed with cancer (Salsman et al. 2015; Sherman et al. 2015; Reisi et al. 2021). Because of space limitations, we will limit their presentation to representative reviews and observational studies. A systematic review of ten selected studies among healthy people by Borges et al. (2021) found that higher R or S levels among individuals were significantly associated with higher health-related quality-of-life domains such as physiological and social relationships and being prepared for environmental problems, e.g., pollution and global warming. The R and S aspects significantly impacted feelings of optimism, inner strength, hope, and happiness. Most studies deal with health problems in cancer patients as they are exposed to chronic stress that negatively affects many mental health outcomes. Cancer also negatively alters cancer survivors, as well as their family members, generating a disturbance in physical health and various mental health issues, such as feelings of fear, pain, anxiety, depression, sleep disturbance, and often hopelessness (Sun et al. 2019; Hashemi et al. 2020). Evidence has shown that R and S may be an effective approach to maintaining mental health and help in coping with cancer-related symptoms, thus improving physical and mental well-being

(Rassouli et al. 2015; Salsman et al. 2015; Gonçalves et al. 2017; Ferreira et al. 2020; Yan et al. 2020; Almaraz et al. 2022; Goerge et al. 2023). Although research examining spiritual care relevant to cancer-related health outcomes is limited, current findings suggest moderate effects of spirituality in reducing anxiety and depression and improving well-being. Salsman et al. (2015) reviewed 148 studies with over 39,000 cancer cases, finding that greater R or S scores were correlated modestly with mental health. The effect depended on the R and S dimensions (affective and behavioral) and mental health domains (emotional well-being, general/cancer-specific distress, anxiety, depression). Another review of observational studies (n = 8) conducted in Iran from 2006 to 2020 by Reisi et al. (2021) on the effect of R/S on anxiety and depression in cancer patients confirmed a significant positive role of greater religious commitment toward coping with anxiety and depression. Jim et al. (2015) reviewed 101 articles that included 32,000 adult cancer patients, noticing a positive association between R/S with affective domains (feelings, emotions, attitudes), cognitive domains (knowledge, development of intellectual skills), and physical health outcomes. The authors found a statistically significant association between increased overall R/S and better overall physical health and functional well-being among cancer cases. Psychosocial health has also been the subject of several studies concerning R/S. For example, a meta-analysis by Sherman et al. (2015) of 78 studies with 14,277 individuals diagnosed with cancer dealing with the association of social health with overall R and S and their dimension with behavioral R/S reported that social health outcomes were modestly associated with the overall terms. Another review of 37 studies carried out between January 2009 and January 2019 by Ferreira et al. (2020) showed that R/S positively influence the biopsychosocial health of cancer patients, observing improved acceptance of cancer treatment, positive effects of the therapy, and greater hope of recovery. The suggestion that these terms consist of an essential coping strategy in psychological stress linked with cancer disease was also reported by Borges et al. (2021). Likewise, the observational studies (Al Eid et al. 2020; Hamdan et al. 2020; Kvesić et al. 2020; Kowalczyk et al. 2022), focusing on the role of R/S in the adaptation of cancer patients to the disease and the treatment, have confirmed that patients sought help in faith and spirituality. Also, the findings of an observational study that tested 294 cancer patients of both sexes from Saudi Arabia confirmed that the R and S support programs are an essential source for the patients' social enhancement and healthcare delivery (Koenig et al. 2023). In turn, a cross-sectional study of 100 oncology patients and 80 internal medicine patients, carried out by Kvesić et al. (2020), observed that a lower level of religiousness is correlated with higher severity of psychological symptoms. Further, an observational study by Al Eid et al. (2020) examined 329 women with breast cancer in Saudi Arabia, reporting a statistically significant positive moderate correlation between the level of religiosity and psychological resilience independent of the stage of cancer and the duration of cancer treatment. They concluded that increased religiosity and psychological resilience are essential for cancer patients' mental health outcomes. It is interesting to note that R and S can also help oncologists cope with negative emotions when working with their patients (Kowalczyk et al. 2022). The authors analyzed data from 60 medical clinicians specializing in oncological radiotherapy. The finding is that the R or S terms can help clinicians manage the challenging negative emotions connected with their work with cancer patients. Similarly, the current reviews show that practicing R or S is associated with better health and well-being. For example, Aggarwal et al. (2023) reported that religiosity and spirituality are positively correlated with mental well-being and health outcomes in adolescents, based on 45 longitudinal and 29 interventional studies. Also, a systematic review and meta-analysis of 18 clinical trials by de Diego-Cordero et al. (2022) reported that spiritual interventions decreased mental health symptoms, increased well-being, and elevated spirituality levels. Moreover, Almaraz et al. (2022) reviewed articles published between 2015 and March 2022 (26 articles selected), generally reporting a positive correlation of R/S with physical health in cancer patients. However, they also noticed a negative correlation. Also, earlier systematic reviews of RCTs by Gonçalves et al. (2017) (30 studies) demonstrated small benefits from R/S regarding physical health

outcomes or quality of life in chronic patients, healthy individuals, and healthcare professionals. The reported findings have shown that recent research concentrated mainly on the effect of R/S on mental health and well-being. To summarize the above findings, the observed inconsistency in influence magnitudes may be due to methodological differences among studies, such as study design and the methods used to measure R/S variables, type of faith-based intervention, and health outcomes. Well-designed RCTs could provide valuable information on how these variables can influence health outcomes and identify more precise operating mechanisms between these variables.

3.3. Religion, Spirituality and, Physical Activity

3.3.1. Findings from Reviews

From a total of 1098 citations, we identified seven systematic reviews (five published between 2017 and 2023 and two dated from 2012) which summarized the previous evidence in this area.

To our knowledge, epidemiological research explicitly focused on the impact of R or S on PA was the subject of a limited number of reviews (Bopp et al. 2012; VanderWeele 2017; Parra et al. 2018; Moreira et al. 2020; Noh and Shahdan 2020; Maroney et al. 2023). Bopp et al. (2012) analyzed 19 faith-based interventions, focusing on spiritual or Biblical components and 8 faith-based interventions examining the effect of engaging PA within the African American community. They found increased PA in 12 of the 19 faith-based studies and four faith-based interventions among church members. However, the findings in most of these studies were based on self-reported PA. Koenig (2012) reviewed 37 studies on the relationship between R/S and exercise and PA published through 2010. The authors noticed that most studies reported a positive effect of R/S on health: 22 of the 37 reported significant positive associations between R/S and increased PA or engaging in exercise, and 6 reported inverse associations. Furthermore, of the 21 studies evaluated by the author as having the highest quality, 16 found positive relationships between these variables. Parra et al. (2018) reviewed 18 randomized and nonrandomized controlled trials on the PA interventions for adults associated in faith-based church organizations, mainly in the US, published through January 2016. They found increased PA and positive effects on their members' health outcomes and physical fitness. The authors concluded that faith-based organizations provide support for the promotion of PA, and they mention the need for high-quality RCTs to improve the strengths of the evidence. In turn, a review by VanderWeele (2017) on the association between religion and PE and the power of faith-based intervention on diet quality and exercise suggested the positive effect of religion on promoting greater PE, with the effect dependent on the type of religious group. A systematic review of eight cohort and case-control studies, published between 2011 and 2017 by Moreira et al. (2020) on the effect of R and S on PA promotion, reported that spiritual practices such as prayer, awareness of God, spiritual meaning, and forgiveness can have a positive effect on participation in PA. In turn, a review by Noh and Shahdan (2020) on the role of R/S in sports performance (reviewed 56 articles) also reported a positive effect of these variables for athletes, e.g., through coping strategies, anxiety reduction, healing, and well-being. Another systematic review by Maroney et al. (2023) analyzed the effectiveness of church-based interventions for cardiovascular disease risk factors, including low PA. The authors analyzed 16 RCTs, three nonrandomized trials, and six pre–post comparisons. They found significant increases in PA in 12 studies and no significant effects of religious intervention in the remaining studies.

3.3.2. Findings from Experimental Studies

Characteristics of the included experimental studies are shown in Table 1.

From a total of 1098 citations, we identified 13 original studies which were eligible and met inclusion criteria, with the year 2023 showing 4 (30.8%) articles. Regarding the country of origin, eight were studies from the USA, two studies were developed in Europe, with one study consisting of international research involving several European countries,

and the remaining studies were developed in Australia, Malaysia, and South Korea (one study each).

Table 1. The effects of religion and/or spirituality on engaging in physical activity/physical exercise.

Author/Year/Location/Reference	Design, Sample/Period/Objectives	Religion/Spirituality Assessment/Instruments	PA/PE Detection	Main Results	Author's Conclusions
Ahrenfeldt et al. 2018, Europe	Longitudinal study (11 years); cohort n = 23,864, aged 50+ years. Religion: Protestants, Catholic, Orthodox, Muslims, others (13.4%), none. To examine association between religiousness and lifestyle determinants	Self-reported participation in a religious organization, frequency of praying during the past month, religious education, and affiliation	Answers on three questions informing about frequency of engaging in PA of moderate and vigorous intensity	Praying or participation in religious organization lowered risk of physical inactivity: OR = 0.88 (0.79–0.98), OR = 0.54 (0.48–0.61); or performing no vigorous PA: OR = 0.92 (0.85–0.98), OR = 0.63 (0.58–0.68), respectively	Strong positive association between R and PA and lifestyle for the more religious people
Ansari et al. 2017, USA	RCT; n = 132 women (aged 25–60 years), African American, Hispanic/Latina; religion: Protestant, Catholic, Jewish, other, nonreligious; 6-month intervention. To determine the impact of R and S on PA and diet	The National Institute of Aging/Fetzer Short-Form Questionnaire for Measurement of Religiousness and Spirituality (testing traditional religion/non-institutional spirituality)	The International Physical Activity Questionnaire Long Form (IPAQ). Self-reported walking, leisure-time, and total PA over the last 7 days were measured	Insignificantly increased total, leisure time PA and walking by 413, 432, and 64 MET-min/wk, respectively, vs. baseline	There was no association between R/S and changes in PA and diet
Arredondo et al. 2017, USA	RCT; 436 Latina adults aged 18–65 years from 16 Catholic churches; 12-month PA intervention. To evaluate the impact of faith-based intervention to promote PA	Participants declared attending church for the next 24 months	Accelerometer; assessed moderate to vigorous leisure PA; self-reported activity measure using the World Health Organization's Global Physical Activity Questionnaire (GPAQ)	Significant increase in PA duration by 22 min/wk (accelerometer usage) and by 40 min/wk (self-reported leisure-time PA) relative to baseline	A faith-based intervention significantly increases PA of moderate to vigorous intensity
Buro et al. 2023, USA	Cross-sectional; 257 Black prostate cancer survivors aged ≥ 20 years, mean age 68.7 years. To examine relation between religiosity and cancer fatalism in relation to PA levels	Religiosity assessed by the Lukwago Religiosity scale: low religious belief, religious belief, religious behavior, high religiosity (high belief and behavior)	Valid in cancer survivors: Godin–Shephard Leisure-Time Physical Activity Questionnaire; PA duration (min/wk) and intensity (METs) assessment; activity dichotomized as meeting the ACS guidelines	Weekly duration PA was positively correlated with religiosity ($\beta = 0.54$); no significant interaction between religiosity and PA of moderate intensity; negative association between fatalism and meeting ACS guidelines (OR = 0.87 (0.77–0.99))	Religiosity may be positively associated with some forms of PA
Goerge et al. 2023, USA	Cros-sectional; 323 breast cancer survivors, 59.1 years. To examine the effect of spirituality on PA and sleep duration	Validated measures for spirituality using questionnaire (the range of spirituality scores 7–48)	The Arizona Activity Frequency Questionnaire (a modified version); engaging in all domains of PA (min/wk) was determined	Positive association between spirituality score and higher levels of PA; activity duration ≥ 681 min/wk, OR = 1.90 (1.03–3.50); meeting PA guidelines (≥ 150 min/wk), OR = 1.78 (1.0–2.98)	Higher spirituality scores increased the likelihood of practicing PA

Table 1. Cont.

Author/Year/ Location/Reference	Design, Sample/ Period/Objectives	Religion/Spirituality Assessment/ Instruments	PA/PE Detection	Main Results	Author's Conclusions
Hussain and Cunningham 2023, USA	Cross-sectional; 177 Muslim women living in USA and 322 living in 34 countries aged 18–65 years. To examine association between religious identity and PA	Questionnaire measuring religious identity and reporting that Islam is essential part of women's personality	Questionnaire assessed PA using a single question about the likelihood of engaging in moderate intensity activity during the next free weeks	Religious identity was significantly associated with PA intentions ($\beta = 4.746$), as well as with self-reported PA ($\beta = 7.344$)	Positive correlations between religious identity and predicted PA intention in Muslim women
Kang et al. 2020, South Korea	Cohort study; 973 participants (47.8% men): 345 Christian, 153 Roman Catholic, 308 Buddhist, 163 non-religious aged ≥ 18 years; April 2009–June 2011. To examine the association between religion and health behavior	Religious affiliation and status were determined	Duration and intensity of PA in the last 7 days tested using IPAQ—Short Form	Significant increase in vigorous PA; OR = 2.20 (1.31–3.67) only in Catholics; decreased alcohol drinking in Christians vs. control	Positive significant association between religiosity and vigorous PA in Catholics
Noh et al. 2023, Malaysia	Cross-sectional; 689 volunteers (390 males, 299 females) aged 18–65 years; Religion: Islam (77.4%), Christianity (12.2%) Buddhism (6.8%) Hinduism (3.5%) Catholicism (0.1%). To examine impact of religious faith on PA	Strength of religious faith measured using the Santa Clara Strength of Religious Faith Questionnaire (41 items)	Self-administered Physical Activity Questionnaire (type, intensity, and duration of moderate and vigorous PA evaluated); the Physical Activity and Leisure Motivation Scale for motivation of recreational activity used	Positive correlations between extrinsic motivation to engage in PA and intrinsic motivation to exercise; there was no association between these motives and engaging in activity	Religious faith did not mediate changes in PA
Silfee et al. 2017, USA	Cross-sectional; 602 Latino and Hispanic adults aged 21–85 years. To examine the association between spirituality, PA, and sedentary lifestyle	Spirituality assessed by the Daily Spirituality Experience Scale; religion determined by frequency of going to church or to a religious service in the past month	The Women's Health Initiative Brief Physical Activity Questionnaire and the Sedentary Behavior Questionnaire; walking and leisure-time PA weekly duration and frequency measured	Significantly decreased sedentary behavior ($\beta = -0.12$, $p = 0.004$) in men and non-significant increase in engaging in >150 min/week PA caused by higher spirituality; OR = 1.12 (0.91–1.38)	Spirituality reduces a sedentary lifestyle, especially in men. A lack of association between spirituality and PA dose exceeding ACS guidelines
Svensson et al. 2020, Denmark	Cross-sectional; 1024 individuals aged 29–60 years. To examine association between religiosity and health related risk factors	Questionnaire assessed religious attendance in churches/mosques and prayer/meditation practice; last year	Questionnaire assessed PA: Categorization: inactive (primarily sedentary behavior); active (participation in sport competition or recreational sports ≥ 4 h/wk, or walking/cycling or heavy gardening)	Physically inactive individuals reporting opening towards church/mosque attendance had lower risk of disease vs. individuals not practicing religion, OR = 0.60 (0.40–0.90)	Religious practice may be positively correlated with health lifestyle determinants, including PA

Table 1. Cont.

Author/Year/ Location/Reference	Design, Sample/ Period/Objectives	Religion/Spirituality Assessment/ Instruments	PA/PE Detection	Main Results	Author's Conclusions
Waters et al. 2018, Australia	Cross-sectional; 185 students at a Catholic University (76% females), aged 18–34 years; 13 options for religious affiliation, a 7-day recall. To examine association between religion and spirituality, recreational PA, and sedentary lifestyle	17 questions from the Spiritual and Religious Attitudes in Dealing with Illness Questionnaire relating to beliefs and levels of engagement	Four questions from IPAQ used for leisure time PA and five question for sedentary behavior	Respondents with high scores in spiritual practice components undertook moderate PA; frequency and duration were age dependent: the highest frequency in group 20–24 years (OR = 2.21) and longest duration in 20–24 years (0.69 h) vs. other age groups	Spirituality may increase PA, causing undertaking more frequently exercise of moderate intensity
Whitt-Glover et al. 2017, USA	RCT; African American women aged >18 years from 31 churches (each church 12–15 women); women divided into: faith-integrated (Group 1), secular intervention (Group 2), controls (Group 3). To compare a faith-integrated and a secular intervention group regarding PA with controls	Faith curriculum included biblical scripture and faith tenets. Secular curriculum was similar but did not include references to scripture or faith tenets	Physical activity measured using pedometer and accelerometer; women participated in 24 sessions weekly for four months (16 sessions) and monthly for four months (4 sessions)	Significantly increased daily walking over baseline by 1451, 1107 steps/day after 10 months of intervention in Groups 1 and 2, respectively, vs. Group 3; increases kept up after 22 months in Group 1.	The faith-integrated intervention allows short- and long-term increasing of PA
Wilcox et al. 2018, USA	RCT; 54 churches; 1308 participants; religions: Presbyterian, African, Methodist, Baptist; interventions: churches 36, control churches 18; mean age 53 years (12-month study). To study countrywide adoption, reach, and effectiveness from faith and increases in recreational PA	Implementation of religion and faith program in church attendance; committees focused on creating opportunity for exercise, sharing messages about PA, distributing bulletins, and engaging pastors in PA	Overview of PA using six questions from the 2010 Behavioral Risk Factor Surveillance System PA module; pedometer measurements; classification into two PA levels: inactive (<10 min/wk) and regularly active (≥150 min/wk of moderate PA or ≥75 min/wk of vigorous PA or an equivalent combination)	Intervention church attendees reported more frequent PA opportunities, messages, and pastor support vs. control church attendees; lower proportion of physically inactive attendees in intervention churches vs. control churches (24 month maintenance); Cohen's d for continuous out-come (0.96)	The intervention program, despite the minimal training and intervention duration, may be suited for wider dissemination, particularly in predominantly African American churches

Abbreviations: OR, odds ratio; PA, physical activity; ACS, American Cancer Society; β , logistic regression coefficient; IPAQ, International Physical Activity Questionnaire; RCT, randomized controlled trial.

Considering the study methodology, seven studies (Silfee et al. 2017; Waters et al. 2018; Svensson et al. 2020; Buro et al. 2023; Goerge et al. 2023; Hussain and Cunningham 2023; Noh et al. 2023) used a cross-sectional design, four were RCTs (Ansari et al. 2017; Arredondo et al. 2017; Whitt-Glover et al. 2017; Wilcox et al. 2018), and two were cohort studies (Ahrenfeldt et al. 2018; Kang et al. 2020). Eleven studies used validated questionnaires and self-reports to obtain information on engagement in PA practice and two studies (Whitt-Glover et al. 2017; Wilcox et al. 2018) used electronic devices for PA assessment. The sample size ranged from 177 to 23,864; in four studies (Ansari et al. 2017; Whitt-Glover et al. 2017; Goerge et al. 2023; Hussain and Cunningham 2023), only women participated, and in

one study (Buro et al. 2023) only men participated. The remaining eight studies included individuals of both genders. Two studies (Ansari et al. 2017; Waters et al. 2018) estimated the effect of R and S in cancer survivors.

Regarding the R and S variables used, six studies (Ahrenfeldt et al. 2018; Kang et al. 2020; Svensson et al. 2020; Buro et al. 2023; Hussain and Cunningham 2023; Noh et al. 2023) reported the effect of the R variable on PA, two studies (Silfee et al. 2017; Goerge et al. 2023) reported the impact of the S variable, two studies (Ansari et al. 2017; Waters et al. 2018) used R and S variables, and three studies (Arredondo et al. 2017; Whitt-Glover et al. 2017; Wilcox et al. 2018) developed faith-based interventions. Nine of thirteen studies reported a relationship between R/S variables and PA; the remainder considered PA as one of the health-related behavior components (Ansari et al. 2017; Ahrenfeldt et al. 2018; Kang et al. 2020; Svensson et al. 2020). A detailed description of the objectives, the type of design, the main characteristics of participants, a description of R/S and PA measures, and the results is shown in the table.

Eleven of thirteen studies reported quantitative data, providing odds ratios (ORs) (Silfee et al. 2017; Ahrenfeldt et al. 2018; Waters et al. 2018; Kang et al. 2020; Svensson et al. 2020; Buro et al. 2023; Goerge et al. 2023;), the regression coefficient β (Hussain and Cunningham 2023), or correlation coefficient (Silfee et al. 2017; Buro et al. 2023; Noh et al. 2023) for daily walking steps (Whitt-Glover et al. 2017), energy expenditure (Ansari et al. 2017), or increased duration of activity (Arredondo et al. 2017). It must be underlined that the methods used in these studies were quite heterogeneous, thus ruling out the possibility of carrying out an overall quantitative estimate of the R/S effect on PA. Two of the thirteen studies (Ansari et al. 2017; Noh et al. 2023) found no association between R or S faith and PA. The remainder of the studies reported positive correlations between R/S and PA. The effect of spirituality was examined in healthy students (Waters et al. 2018) and among breast cancer survivors (Goerge et al. 2023). Both studies reported increased activity for a higher spirituality score. Waters et al. (2018) noticed that frequency, duration, and increased activity levels were age-dependent. A study by Goerge et al. (2023) demonstrated that the magnitude of the association ranged from a 78% increase in PA meeting the activity guidelines to a 90% increase for engaging in activity at least 681 min/wk. A statistically significant effect of spirituality on decreased sedentary behavior was also found in Latino and Hispanic men (Noh et al. 2023). Regarding the association between religious practice and faith-integrated interventions, reduced sedentary behavior was reported in the seven studies (Arredondo et al. 2017; Whitt-Glover et al. 2017; Ahrenfeldt et al. 2018; Wilcox et al. 2018; Kang et al. 2020; Buro et al. 2023; Hussain and Cunningham 2023). The results were distributed between a decrease in physical inactivity in participants who prayed or participated in a religious organization (by 12% and 46%, respectively) (Ahrenfeldt et al. 2018), the increased opportunity to engage in PA practice more frequently (Wilcox et al. 2018), the positive correlation between religion and PA intention in Muslim women (Hussain and Cunningham 2023), a two-fold increase in practicing vigorous activity (OR = 2.20) in Catholics (Kang et al. 2020), an increased weekly duration of PA (Arredondo et al. 2017; Buro et al. 2023), and increased daily walking over baseline (Whitt-Glover et al. 2017).

4. Discussion

First, this review summarizes the results of the research on the relationship between R/S and PA practice. We also summarize the research on the role of R/S in human health. Overall, previous reviews and the current review indicate a great potential for R/S to influence health-related components. We found that the literature presented in this article documented the epidemiological evidence and provided strong support for a positive correlation between R/S variables and some determinants of health outcomes regarding an influence on mental health and physical health outcomes or at least the correlation between these variables. This topic has been considered in relation to healthy people and patients with chronic diseases, particularly cancer patients. We believe the retrieved representative reviews and meta-analyses demonstrate previous and recent interest in the topic. The

extracted studies have shown mixed results depending on the study design in which the R/S variables were measured. We observed that although this research topic is of great interest, a relatively small number of studies are focused on the effect of R/S on the physical health component—PA practice; the most recent research in this area mainly focuses on mental health and psychological well-being. Regarding the effect of R/S on PA, the majority of analyzed observational studies were carried out in developed countries, mainly in the USA, causing the findings to be difficult to generalize for populations in less developed countries, which have other demographic, social, and cultural characteristics that influence the health and disease process (Noh and Shahdan 2020). This highlights the need for future epidemiological observational studies to fill the gap in this field of research. Considering the objective of examining the effect of the R/S variables on PA practice, we found that the authors of the included studies in this review most often used validated questionnaires as instruments, such as the Daily Spirituality Experience Scale (Sun et al. 2019), the Lukwago Religiosity Scale (Chen et al. 2021), the Fetzer Short-Form Questionnaire for Measurements of Religiousness and (Goerge et al. 2023), and the Santa Clara Strength of Religious Faith Questionnaire (Hashemi et al. 2020). They gathered information on religious affiliation, frequency of praying, meditation practice, religious organization, etc. The other methods included a Faith and Secular Curriculum questionnaire to measure participation in biblical scripture and faith tenets (Kowalczyk et al. 2022) or questions regarding the frequency of attendance in a religious organization and frequency of praying (Parra et al. 2018). Thus, spiritual practice and religious expressions are different between the studies.

Regarding measures of PA, only two studies (Arredondo et al. 2017; Wilcox et al. 2018) applied objective measurements of PA levels using accelerometers and pedometers. The other studies carried out a subjective estimation of activity based on valid questionnaires or answers to questions about the type, frequency, intensity, and duration of PA practice (Lee et al. 2011; Ahrenfeldt et al. 2018). Electronic movement monitors provide objective activity measures but are non-practical in large-scale cohort studies. In turn, evidence indicates that the reliability of findings using a questionnaire is often insufficient in contrast to its validity, and very few developed questionnaires show both features well (validity and reliability) (Helmerhorst et al. 2012). For example, the International Physical Activity Questionnaire (IPAQ) appears to have good validity but worse reliability (Lee et al. 2011). Although there are concerns about repeatability and agreement for activity classification, both forms of the IPAQ (short and long) are commonly used to assess PA. Another questionnaire, the Global Physical Activity Questionnaire (GPAQ), was also used in the reviewed articles as a tool that minimizes difference in PA assessment between different countries. Its features increase usage compared to the IPAQ short and long forms (Stelmach 2018). Both questionnaires, IPAQ and GPAQ, allow us to estimate all domains of activity and their components and time in a sitting position.

It is known that self-reported PA/PE practices are often overestimated. This observation is seen in Arredondo et al.'s study (2017) (Table 1), where the authors reported significant increases in PA duration measured using an accelerometer and those reported by participants (22 min/wk and 40 min/wk, respectively).

Among the studies analyzed in this review, 11 reported consistent findings of the positive effects of religious faith or R/S intervention on the increased practice of PA or reduction in sedentary behavior, showing moderate to significant effects. Four studies (RCTs) (Ansari et al. 2017; Arredondo et al. 2017; Whitt-Glover et al. 2017; Wilcox et al. 2018) had an intervention design with intervention time ranging from 4 to 12 months, and two of them assessed PA using electronic devices (Al Eid et al. 2020; Kowalczyk et al. 2022). The R/S intervention programs also varied greatly in their mode and demographic factors. Regarding the reviewed studies in this article, the small number of studies, variations in the applied faith-based interventions, and large heterogeneity among the chosen research regarding the categorization of PA made meta-analysis impossible. However, the present study indicates a statistically significant positive effect of R/S on practicing PA/PE observed in approximately 85% of the retrieved studies. This finding agrees with

the findings of the above-reported previous reviews on this topic (Bopp et al. 2012; Koenig 2012; VanderWeele 2017; Moreira et al. 2020; Noh and Shahdan 2020). It is worthwhile to add that the above-reported findings in the above reviews, as well as our findings, have shown mixed results, i.e., some studies did not confirm a direct correlation between R/S and PA. It may depend on how the R/S variables were operationalized and how PA was assessed (among other factors).

Due to a similar health benefit exerted by regular moderate to vigorous PA regarding mental and physical health, social interactions, and psychological well-being, physically active people may be more likely to engage in religious and spiritual practices. Research undertaken in the exercise and sports sciences has shown the correlation between happiness and sports participation (Balish et al. 2016) and between happiness and religious practice (Balish et al. 2016; Rizvi and Hossain 2017). In turn, the recent study by Tejero-Gonzales (Tejero-González 2020) on a large sample size (2378 individuals) reported the highest level of happiness in people who both participate in sports and practice a religion. However, a small correlation size was found. Benefits of co-exercise between sports participation and the use of sport in religion, including strengthening national unity, church membership, self-discipline, and coping with uncertainty, were reported (Wankel and Berger 1990; Jona and Okou 2013; Malm et al. 2019).

Although the biological processes responsible for the R/S effect on health-related components are not fully understood, several biologic pathways have been hypothesized: R/S are associated with lowered blood pressure, decreased levels of diabetes, and lowered cardiovascular risk markers and inflammatory markers (T cells, CRP, neutrophils/monocytes) (Seeman et al. 2003; Duru et al. 2010; Shattuck and Muehlenbein 2020). The researchers have maintained that the beneficial effect of the R/S variables could originate from the reduction in psychological stress levels and depression, followed by a reduction in inflammation. These interesting findings are the natural extension of earlier studies by Seeman et al. (2003). The authors reported that greater religious commitment is linked with lower blood pressure and reduced prevalence of hypertension, lower cholesterol and stress hormone levels, better lipid profiles, and improved immune functions. They also observed lower OS and better health outcomes. Regular moderate to vigorous PA with appropriate resting periods is a well-established component of a healthy lifestyle, as are medicine for treating inflammatory diseases (Cerqueira et al. 2020) and reducing fatigue and depression in cancer patients (Odynets et al. 2019). The health benefits of PA/PE are achieved by reduction in visceral adipose tissue and obesity, an increase in insulin sensitivity, improvement of lipid and carbohydrate metabolism, activation of redox-sensitive signaling, reduction in inflammation and oxidative stress, enhancement of immune system response by increasing the circulation of immune cells, enhancement of the expression of genes responsible for the generation of antioxidant enzymes, reduction in pro-inflammatory cytokines, increase in anti-inflammatory cytokines (IL-10, interleukin-1 receptor IL-1Ra), and reduction in psychological stress, among others (You et al. 2013; Silverman and Deuster 2014; Kruk et al. 2019b; Cerqueira et al. 2020). It is plausible that an increase in PA among participants exposed to the various R/S variables may partially explain the mechanism of their positive effects on physical and mental health indicators.

The present review has several limitations. Likewise, as with most reviews, this review was based mainly on cross-sectional surveys; only four RCTs were included in the study. The RCTs also have some limitations due to the absence of double blinding. Perhaps including a sample that is not religious as a control group could exhibit a more significant association between religion and PA. Also, a longitudinal study could better recognize whether religiosity exerts an increase in PA. In addition, we selected and analyzed only studies in English that met our inclusion criteria and excluded other studies. We also observed the limited number of research studies in the literature focused closely on this topic and often a lack of demography, which is one of the factors considered by authors as potential confounders in the R/S and PA relation. Another limitation was the difficulty in conducting a meta-analysis to calculate the total magnitude of the R/S effect

on PA components due to different study designs and methodologies of R/S measures, overlapping between their terms, and different methods of PA measurement. However, both systematic reviews and meta-analyses are affected by selective publishing of articles and reported studies bias, which can lead to the overestimation of the correlation between the considered variables.

Among the advantages of this review is an analysis of the current studies based on relatively large sample sizes and the provision of information on measuring R/S and PA/PE assessment using validated tools in most of the studies. Another strength of our article is the restriction of the effect of R/S on changes in PA practice and the presentation of the studies that focused on correlation between these terms and PA, as well as those reporting results of religious intervention programs developed to increase engagement in PA/PE. Regardless of the diversity in aims and objectives of the analyzed published studies and methodological diversity, we were able to present the beneficial impact of R and S on PA practice and to identify research gaps in this area.

5. Conclusions

This review summarizes and demonstrates the current research results on the correlation between the R and S variables and PA/PE practice. The review reports briefly the literature findings on the role of R and S beliefs and practices in physical, mental, social health, and psychosocial well-being. Evidence continues to support earlier findings that individuals who are more involved in R or S practice can experience benefits in physical and mental health and better coping, e.g., with cancer-specific distress, anxiety, and depression. The findings suggest that more outstanding religious commitment may be positively associated with increased PA. We found that religious practice, spirituality, or faith interventions generally significantly reduced sedentary behavior among church/mosque members and were positively correlated with PA components (increased frequency of exercise practice, longer timing of exercise, higher levels of activity, regardless of gender). However, we also observed no association between religious faith and PA or faith-based interventions' possibility to increase moderate activity in participants meeting the PA guidelines. It should be underlined that the literature data in this field are yet scarce, as are the religious intervention programs. The current review discovers difficulties in quantitatively measuring the impact of the individual components of R and S in research on physical health. Therefore, the available evidence does not yet deliver recommendations for these variables' use regarding PA practice. The methodological limitations, such as multicomponent R/S intervention, PA assessment, and a limited number of studies specifically focused on this association, are partially responsible for such a statement. Despite the limitations, our review demonstrates that R/S and faith-based interventions may be promising actions for motivation to undertake increased PA and positive behavioral change. Biological mechanisms operating between the R/S variables and PA practice require future studies to enhance the understanding of correlations. Considering the commonly known benefits of regular moderate to vigorous PA and the reported increases in activity in individuals more involved in R/S practice, we can suggest that an increase in PA/PE and sports practice may partially explain the role of R and S in the biological benefits. Because many questions linked to these possible associations exist, more research in this field is needed. New studies should have high quality and be well-designed, double-blinded RCTs and longitudinal observational studies with a larger sample size design. They should include members of different religious types, consider R/S variables and confounding factors increasing/decreasing the R/S and PA correlation effect size, and be based on proper validated measures of these variables.

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