



# Spirituality/religiosity and cardiovascular system

VE Valenti<sup>1\*</sup>, RJ Quitério<sup>2</sup>, V Barnabé<sup>3</sup>, LL Ferreira<sup>1</sup>, LC Abreu<sup>4</sup>

## Abstract

### Introduction

Spirituality/religiosity is associated to well-being. In this article, we describe the association between spirituality/religiosity and cardiovascular system.

### Materials and methods

We performed searches using Medline, SciELO, Lilacs and Cochrane databases using crossing between the keywords “spirituality,” “cardiovascular system,” “parasympathetic nervous system,” and “sympathetic nervous system.”

### Results

The electronic search yielded 65 references by crossing the terms “spirituality” and “cardiovascular system.” Among these, the first round of elimination resulted in exclusion of 55 titles and abstracts that were not clearly related to the subject of the review. The titles of the remaining 10 abstracts were submitted to a final evaluation that accounted for the inclusion criteria. An investigation into the reference lists confirmed the absence of relevant documents. Summaries of the analysed studies were selected.

### Discussion

Among 10 studies selected, 8 of them indicated that spirituality/religiosity is very important for the cardiovascular system, whereas only 2 found no significant association between the two variables in women.

### Conclusion

We suggest that spirituality/religiosity is an alternative and non-pharmacological therapy for cardiovascular disorders.

### Introduction

Several studies have examined the relationship between spirituality/religiosity (S/R) and physical health. Although the difficulties related to the experimental procedures and the mechanisms involved are there, a significant association is found with physiological processes and cardiovascular disease or physical health, constituting possibly as means of prevention, recovery and cure of diseases<sup>1,2</sup>. The effects of S/R on risk factors, cardiovascular mortality and other diseases have shown conflicting results because their relationship is extremely complex, ranging from decision-making, which is under individual's control, to genetic and environmental factors.

The acute physiological changes occurring during prayer and meditation have been extensively studied and show a decrease in sympathetic nervous system activity, oxygen consumption, respiratory rate and minute ventilation. Prayer or mantra recitation has been linked with higher levels of cardiac autonomic control<sup>3</sup> and increased baroreflex sensitivity<sup>3</sup>, conditions that are associated with a reduced risk of cardiac arrhythmias and cardiac mortality<sup>3</sup>. A reduction in the activity of the

sympathetic nervous system may be beneficial for patients with coronary heart disease, as shown by findings of increased exercise tolerance and delayed onset of electrocardiographic signs of ischaemia in the patients enrolled in a transcendental meditation programme<sup>3</sup>.

Higher levels of spiritual well-being in long term were found significantly associated with healthier levels of blood pressure, cholesterol, body mass index, blood glucose<sup>2</sup>, stress<sup>4</sup>, inflammatory markers<sup>2,5,6</sup>, nervous system activity<sup>4,6</sup>, cortisol<sup>2,6</sup>, contributing to lower risk of cardiovascular disease and mortality<sup>3,4</sup>. It seems that the R/S predicts significantly greater longevity<sup>5</sup>.

The possible evidence for the association between R/S and reduced cardiovascular risk is less consistent in other studies<sup>3</sup>. Among the Caucasian and African-American midlife women in the Study of Women's Health Across the Nation<sup>7</sup> and in a prospective cohort study involving more than 5000 healthy men and women enrolled in the Multi-Ethnic Study of Atherosclerosis<sup>3</sup>, higher daily spiritual experience scores were not found associated with reduced cardiovascular risk. Other studies conducted in heart attack survivors with depression and low social support did not show an association between daily spiritual experience scores, church attendance or frequency of private spiritual activity and non-fatal cardiac events<sup>3</sup>.

Although emotional states, behaviours and feelings, and latent and active energy in the human psyche are influenced by religiosity, the relationship between R/S and health-related practical implications should be investigated and considered by

\* Corresponding author

Email: vitor.valenti@gmail.com

<sup>1</sup> Departamento de Fonoaudiologia, Centro de Estudos do Sistema Nervoso Autônomo (CESNA), UNESP, Marília, SP, Brasil

<sup>2</sup> Faculdade de Filosofia e Ciências, Departamento de Fisioterapia e Terapia Ocupacional, UNESP, Marília, SP, Brasil

<sup>3</sup> Department of Environmental Health, Harvard Medical School of Public Health, 665 Huntington Avenue, II-219 Boston, MA 02115, USA

<sup>4</sup> Faculdade de Medicina do ABC, Departamento de Morfologia e Fisiologia, Santo André, SP, Brasil

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health professionals and the scientific community. Thus, the purpose of this article is to discuss the relationship between the S/R system and cardiovascular health.

### Materials and methods

Medline (PubMed; US National Library of Medicine National Institutes of Health) and Science Direct (Scopus) databases were searched using the following keywords: “spirituality,” “cardiovascular system,” “parasympathetic nervous system,” and “sympathetic nervous system.” We used the “related articles” key in PubMed, which allowed us to collect the references of studies recovered during our research.

Publications were included in the analysis if any of their titles or abstracts were available in English. The review started in October 2013 and completed by January 2014.

The studies were selected by a reviewer (the primary author) and supervised by a senior author. On the basis of the titles and abstracts, we excluded manuscripts that were unclear in relation with the focused subject. Subsequently, all of the selected titles and abstracts were submitted for the final evaluation, which considered inclusion criteria. The reference lists were independently checked to identify studies of possible relevance that were not found by electronic search.

Publications were also excluded if appeared before 2008. Other related studies (found in the same database) that offered additional relevant information were also examined. Each publication was reviewed to identify the author, study period, objective and main contributions to the theme.

The data were plotted and organised into a table with types of selected studies and their main findings. All authors followed the Association for Medical Ethics ethical rules for disclosure.

### Results

The electronic search yielded 65 references by checking the terms “spirituality” and “cardiovascular system.” Among these references, the first round of elimination resulted in the exclusion of 55 titles and abstracts that were not clearly related to the subject of the review. An investigation into the reference lists confirmed the absence of relevant studies. The titles of the remaining 10 abstracts were submitted for a final evaluation that accounted for the inclusion criteria. Summaries of the analysed studies were selected.

Table 1 presents the list of references used in this review according to the styles; all studies were published in journals indexed in Medline, SJR-SCOPUS and JCR-ISI.

Table 2 shows the main findings of the studies selected for the review.

### Discussion

Considering that there are growing literature data indicating that S/R is associated with optimistic health responses, mainly regarding the cardiovascular system, we investigated published studies on the relevance of S/R for cardiovascular disorders. Among 10 studies selected, 8 indicated that S/R is very important for the cardiovascular system, whereas only 2 found no significant association between the two variables in women.

We revised studies that evaluated spirituality in cardiac rehabilitation programmes<sup>8</sup>. All studies investigated 1636 patients in phase 2 cardiac rehabilitation programmes. The spiritual interventions reported were spiritual programmes and relaxation sessions. Two studies showed preliminary evidence that supports the need of further exploration of spiritual interventions in cardiac rehabilitation programmes. Other studies, such as multiple prospective cohort and case-control studies, report the findings that linked S/R with decreased cardiovascular mortality and morbidity<sup>6,9</sup>. A cross-sectional investigation performed in a rural population in India showed that prayer and yoga events in men were associated with reduced prevalence of coronary heart disease<sup>10</sup>. Moreover, another study performed in a predominantly Muslim and Christian population observed that S/R measurement was inversely associated with acute coronary events<sup>11</sup>. In this study, it is assumed that S/R exerts positive cardiovascular effects regardless of the religion.

Nevertheless, two studies enrolled in our review did not find a significant association between S/R and cardiovascular risk reduction in women in different conditions<sup>3,7</sup>.

Fitchett and Powell<sup>7</sup> used the Daily Spiritual Experience Scale developed by Underwood and Teresi<sup>12</sup> based

**Table 1** Publications and types of study related to molecular imaging in inflammation and calcification in cardiovascular diseases and only cardiovascular inflammation for each modality

| Type of study | Medline | JCR-ISI | SJR-Scopus |
|---------------|---------|---------|------------|
| Review        | 3       | 3       | 3          |
| Experimental  | 7       | 7       | 7          |
| Totals        | 10      | 10      | 10         |

JCR-ISI, Journal Citation Reports; Medline, Medical Literature Analysis and Retrieval System Online; SJR-Scopus, SCImago Journal Rank

**Table 2** Summary of articles related to spirituality and cardiovascular system

| Author, reference                       | Main findings                                                                                                                                                                                                                                    |
|-----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Nadarajah et al. <sup>8</sup>           | The study provided empirical support to explore spiritual interventions in cardiac rehabilitation protocols that aim to improve the psychosocial and emotional status of the subjects.                                                           |
| Lucchese and Koenig <sup>5</sup>        | The mechanism proposed for effects of spirituality/religion on cardiovascular system is based on psychosocial and behavioural pathways, suggesting the significant effect that those factors exert on risk of developing cardiovascular disease. |
| Salmoirago-Blotcher et al. <sup>3</sup> | The dimension of religion/spirituality was not associated with a reduced cardiovascular risk in postmenopausal women.                                                                                                                            |
| Fitchett and Powell. <sup>7</sup>       | Daily spiritual experiences were not indicated to be protective for hypertension in midlife women.                                                                                                                                               |
| Anyfantakis et al. <sup>2</sup>         | The authors reported beneficial effects of religiosity/spirituality on cardio-metabolic determinants. Religiosity/spirituality was inversely associated with hypertension and diabetes.                                                          |
| Moeini et al. <sup>21</sup>             | It is shown that spiritual care programme presented positive effects on spiritual well-being of patients with cardiac ischaemia.                                                                                                                 |
| Kurita et al. <sup>17</sup>             | Spiritual activation in elderly subjects with weekly 30-minute sermons by chaplains improved heart rate variability and plasma IL-10/IL-6 ratios.                                                                                                |
| Cooper et al. <sup>4</sup>              | The authors indicated that coping with racism through prayer is able to present cardiovascular benefits in African-American women.                                                                                                               |
| Berntson et al. <sup>19</sup>           | Spirituality was associated with increased cardiac autonomic regulation, suggesting the positive effects of spirituality on the cardiovascular system.                                                                                           |
| Lucchetti et al. <sup>22</sup>          | The study indicated that spirituality/religiosity is important for mortality delay, comparable to different usual health interventions such as consumption of fruit and vegetables.                                                              |

on an eight-item self-administered questionnaire measuring spiritual experiences to quantify the feeling of being close to God (or the transcendent) and daily experiences that grow out of that closeness<sup>12</sup>. It was observed that higher scores of the Daily Spiritual Experience Scale were not significantly associated with lower values of systolic

blood pressure in midlife women; the scores on the Daily Spiritual Experience Scale were shown not to indicate protection against hypertensive status or incident hypertension<sup>7</sup>. In line with this finding, Salmoirago-Blotcher et al.<sup>3</sup> focused on the frequency of meditation, religious texts reading or prayer and found that the dimension of

S/R was not significantly associated with decreased cardiovascular risk. The references mentioned above are not supported by previous studies suggesting S/R to be associated with a lower cardiovascular risk<sup>6,8</sup>.

The association between S/R and cardiovascular disease has been described in a recent review<sup>13</sup>. In this study, the positive effects of S/R on reduction of cardiovascular risk factors mentioned are: improvement in cardiovascular function, inflammatory markers, coronary arterial disease, hypertension, cerebrovascular disorders, cardiac surgery outcomes, overall mortality and cardiovascular mortality. Among the explanatory mechanism proposed by the authors included were psychological pathways, social pathways, supernatural pathways and behavioural pathways. In the same review the authors have proposed interesting interventions based on spirituality. A brief spiritual history of the patient consists of the patient's religious denomination, S/R beliefs that may influence conflict with medical treatment decisions, participation in any faith (religious or spiritual) community, and whether supportive S/R beliefs that help in coping (or that may induce distress) and other spiritual necessities are related to the patient's health or health care<sup>13</sup>.

Anyfantakis et al.<sup>2</sup> investigated associations between S/R and cardiovascular clinical, biochemical and imaging indicators. The authors used the Royal Free Interview for Spiritual and Religious Beliefs tool to evaluate S/R. This tool is based on the strength and consequences of faith<sup>14</sup>. It was found that participants with high scores, i.e. high S/R, presented inverse association with the development of diabetes mellitus, hypertension and cardiovascular disorders. Highly religious subjects presented reduced carotid intima media thickness and decreased



levels of plasmatic cortisol (stress hormone) compared with not highly religious individuals. The study reported positive correlation between S/R, sense of coherence and a favourable cardiovascular profile, indicated by cardiovascular-healthy conditions and reduced preclinical predictors of atherosclerosis. Religious connection exerts a protective effect on determining positive health behaviours and personal lifestyle<sup>1</sup>. For instance, the Orthodox Christian diet is featured by high consumption of vegetables, legumes and fruits, and low intake of saturated fatty acids<sup>15</sup>. Interestingly, a previous study suggested that experiences of worship activities and feelings of group membership may inhibit the production of stress hormones that damage immune system function<sup>16</sup>. Furthermore, participation in religious groups was shown to increase social outcomes through social coherence by creating perceptions of a supportive environment and feelings of connection within a homogenous social network sharing common values and profile<sup>1,16</sup>. Taken together, it is suggested that a combination of social interaction and habits is involved in exerting positive effects of S/R on the cardiovascular system.

A recent study investigated the effects of spiritual activation through chaplain liturgies on interleukins and heart rate variability in elderly individuals (above 60 years old)<sup>17</sup>. The procedure of spiritual activation was based on five experienced and licensed chaplains that provided liturgies once a week for approximately 30 minutes over 10 years. During chaplain liturgies, hymns were sung with organ accompaniment before and after a sermon. The authors reported that chaplain liturgies were able to increase parasympathetic tone and increase plasma levels of anti-inflammatory cytokines. It was suggested that spiritual activation improves cardiac

autonomic regulation, stabilises proinflammatory pathways and activates the immune system<sup>17</sup>. Considering that parasympathetic activation influences the immunological system, i.e. vagus nerve activity inhibits macrophage activation and the synthesis of tumour necrosis factor in the reticuloendothelial system through the release of acetylcholine<sup>18</sup>, we may postulate that the increase in parasympathetic regulation of the heart induces the improvement in the immune system in the subjects that participated in the chaplain liturgies. In this context, it may be suggested that activation of the emotions through spirituality is an important health-care strategy for attenuating and preventing cardiovascular disorders in elderly subjects.

Berntson et al.<sup>19</sup> showed that the aspect of spirituality was associated with cardiac autonomic regulation analysed with heart rate variability and was able to predict heart rate variability. The authors suggested a protective effect of spirituality on the autonomic regulation of the heart investigated through religious well-being score, multi-dimensional relationship satisfaction questionnaire, aggregates measure of spirituality, Big "Three" scale and psychosocial characteristics. These data support previous studies that showed positive effects of spirituality on the cardiovascular system<sup>2,8,20,21</sup>.

Lucchetti et al.<sup>22</sup>, in a systematic review, showed that the positive effect of S/R on mortality is similar to that exerted by other health interventions, such as food intake. Furthermore, the authors also suggested that its impact was higher than many health interventions currently indicated for therapy. The review showed reduced mortality rate in subjects that attended religious services once a week or more compared with subjects that participated in religious services less

than once a week<sup>23</sup>. Powell et al.<sup>24</sup> reported a 25% decrease in mortality and indicated that church/service attendance has protective effect against death in healthy people. In addition, similar results were observed for fruit and vegetables treatments<sup>25</sup>, and better outcomes were found when compared with air-bag use<sup>26</sup> and pneumococcal vaccination<sup>27</sup>.

The role of spirituality/religiosity was also investigated in cardiovascular responses induced by stress<sup>4</sup>. It was observed that participants showed the postulated relations between use of prayer on coping and positive levels of cardiovascular stress responses regarding diastolic blood pressure reactivity, post-stress recovery diastolic blood pressure and heart rate variability after stress recovery. This study indicated that prayer used to cope with racism-related stress may be related to improved cardiovascular health. Another study found in our review evaluated the effect of spiritual care programme on spiritual well-being of patients with cardiac ischaemia admitted in a coronary care unit<sup>21</sup>. Considering its reported positive effects, implementation this spiritual care programme by nurses in patients with cardiac ischaemia is suggested as it may be an appropriate method to improve patients' spiritual well-being.

## Conclusion

This review showed that S/R presents a significant association with the cardiovascular system. The references cited in our review suggest the effect of S/R on prevention or treatment of cardiovascular diseases and indicate that is also relevant for cardiac surgery recovery. An important message in our review is that S/R may be indicated as a complementary and non-pharmacological therapy for cardiovascular disorders.

## Abbreviation list

S/R, spirituality/religiosity.

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