

The Relationship between Spirituality, Stress and Physical Health: Mediation or Moderation?

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Abstract

Although the relationship between stress and physical health has been investigated extensively, not much is known about the possible influence of spirituality in this process. This study explores the possibility of a moderation model in which spirituality acts as a moderator, and a mediation model in which stress is the mediating factor. Levels of spirituality (SAIL), self-reported spirituality ('do you consider yourself to be a spiritual person'), stress (PSS-10) and general (GHQ-28) and physical health (subscale Somatic Symptoms from GHQ-28) are assessed in a randomly collected sample of 113 adults. The results suggest that a difference exists between spirituality as measured by the SAIL and self-reported spirituality. In addition, higher levels of spirituality were related with lower levels of stress and better physical health. Self-reported spirituality, stress and general or physical health fitted with a moderator model, in which self-reported spirituality acted as the moderator. Spirituality, stress and general health fitted with a mediation model, in which stress is the mediating factor. However, the mediation model was found to be statistically less convincing, implying the moderator model to be more plausible. Taken together, these results suggest that spirituality could be beneficial in reducing stress and hereby possibly protecting and improving physical health. However, future research should further investigate the conceptualization of spirituality and by using longitudinal data explore the precise influence of spirituality on stress and physical health.

Preface

Spirituality and religion are one of many topics that keep fascinating me. Their metaphysical nature makes them both interesting and difficult to grasp. Nevertheless, actual effects of spirituality can be seen in our day to day lives. Therefore I have known for a long time that I wanted to research spirituality during my master. Luckily my supervisor Henk Schut gave me the freedom to conduct my own research on this topic. Because of this curiosity for the effect of spirituality I was able to stay interested and motivated during this research, even when statistics turned out to be a little more complicated than expected. I am also very grateful to have had Henk Schut as my supervisor, for he has given me much freedom, and also has found the time in his incredibly busy schedule to have brainstorm session with me and reply to my emails (during the night).

I would also like to thank my parents Helma and Ger, who have supported me during all my years of school and university. They thought me to have trust in my own skills and are always there to support and motivate me. I would also like to thank my sister Malou, who has always been an inspiration to me and for helping me whenever I needed it, despite of her own busy life as a PhD student.

Furthermore I would like to thank Sjoerd for his support. Also because he would brainstorm with me especially in the early phase of my writings and always had a critical yet open minded view on my theories and on science in general. I would also like to thank Cerina, with who I have spent several Sundays locking ourselves in my room to focus on our thesis or other assignments (despite our adventurous Saturday nights).

And at last I would also like to thank Aretha, Ludwig, Chet, Nina, Bob D., Duke, Éric, Dave, Paul, Otis, Frederic, and Dizzy for creating an inspiring surrounding in which I could write my thesis.

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Introduction

Whether it is traffic jams or deadlines, taking care of a newborn child or losing a spouse, everyday hassles or major life events; they can cause stress. Although stress can be useful when a person needs to perform, enduring stress can have negative consequences. Research has shown that stress induces several bodily changes that prepare the body to react according to the demands of the situation (van Doornen, 2004). However, when stress and thus these bodily changes are enduring, they can have a negative effect on physical health (McEwen, 1998; van Doornen, 2004). As shown by Tosevski and Milovancevic (2006) in their overview, a relationship has been established between chronic stress and the onset of several physical disorders and the worsening of already existing physical health issues. Since stress has become a prevalent concern in our modern society, it is important to further investigate how and when the relationship between stress and physical health is influenced. With this information, physical health issues caused by stress can possibly be prevented and diminished.

Evidently, much research has been conducted on reducing stress and subsequently positively influencing physical health (e.g. see Grossman, Niemann, Schmidt, & Walach, 2004 for an overview). However, very few studies have focused on the possible influences of spirituality (spirituality defined as *“one’s striving for an experience of connection with the essence of life”* (de Jager Meezenbroek et al., 2012, p. 142) in this process.

During the last decades, the relationship between religion/spirituality and physical health has been extensively investigated, and beneficial results have been found. On the other hand, few studies have been conducted on the link between religion, spirituality and (reduced) stress. Nevertheless, religion and especially spirituality seem to become increasingly important and prominent in people’s daily lives (de Jager Meezenbroek et al., 2012), in research (George, Larson, Koenig, & McCullough, 2000), as well as in the clinical health setting (Sawatzky, Ratner, & Chiu, 2005). It has been noted that religion, as well as spirituality, can be of great support during the recovery of an illness or during the terminal phase of an illness (Koenig, 2007). It therefore seems interesting to investigate the possibility of a beneficial buffering effect of spirituality during a period of stress.

The aim of this study is to further explore the possible relationship between spirituality, stress and physical health and to establish in what way spirituality can positively influence physical health when a person experiences stress.

To investigate this idea it is important to explore what kinds of relationships have already been established between spirituality and physical health, and spirituality and stress. However, before these studies are discussed, a brief explanation of the concept of spirituality and its

differences and similarities with regard to religion will be presented. Furthermore, the importance of this differentiation and the implications for research will be addressed.

Religion & Spirituality

Religion and spirituality are different, yet connected, concepts (Hill & Pargament, 2003; Saucier & Skrzypińska, 2006). The use of either of these concepts therefore determines the instruments, results and possible generalization of results. What is commonly seen as the most important difference between religion and spirituality is that religion is linked to and defined by a formal religious institution while spirituality is not (George et al., 2000). However, being religious does not exclude being spiritual; spirituality can be seen as an important part of religion. Moreover, religion is defined as a format in which people pursue or practice spirituality (Hill & Pargament, 2003). Hence, it could be said that a person cannot be religious without being spiritual, though a person can be spiritual without being religious. For instance, one could believe in an afterlife but not consider him or herself to be a member of a religious denomination. Therefore, the results of research investigating spirituality and thus including religious as well as spiritual participants, will give a better reflection of the population than a homogeneous religious sample will.

This differentiation between religion and spirituality becomes increasingly evident in our modern society. Research suggests that nowadays interest in spirituality rises and at the same time the number of people claiming to be spiritual yet not religious grows (King et al., 2013; Miller & Thoresen, 2003).

Evidently, the instruments must be in accordance with the chosen concept in order to conduct valid research. Yet, the concepts of religion and spirituality are often used in an interchangeable manner and thereby making the claimed interpretations and generalizability of the results liable (Hall, Meador, & Koenig, 2008). This differentiation between religion en spirituality and the importance of it will be kept in mind when the following studies on spirituality and physical health are presented.

Spirituality & Physical Health

Several studies positively linked religion/spirituality (Ironson et al., 2002; Krupski et al., 2006) and spiritual wellbeing (Lawler-Row & Elliott, 2009) to physical health, quality of life (Sawatzky et al., 2005) and the severance of experienced physical symptoms (Krupski et al., 2006; Nelson et al., 2009). In addition, the meta-analyses by George et al. (2000) and Seybold and Hill (2001) presented a positive relationship between spirituality and physical health. The samples in most studies however are quite selective (e.g. terminally ill patients, chronic pain patients, and elderly patients), the results from the aforementioned studies therefore are limited in their generalizability. It is possible that a

person suffering from a serious illness finds more support in spirituality and is perhaps more benefited by it. Additionally, the cross sectional design of these studies disables the researchers to make causal claims about the relationship between religion/spirituality and physical health.

Pargament, Koenig, Tarakeshwar, & Hahn (2004) conducted a longitudinal study, investigating the effect of religious coping on spirituality and physical health with medically ill, elderly hospitalized participants. Among other results, evidence was found for a positive relationship between spirituality and physical health. Religious coping predicted spirituality outcome and religious coping methods at base-line and follow-up predicted changes in health status from base-line to follow-up. Even though longitudinal studies can clarify more about the causality between spirituality and physical health and the longer term influence of spirituality on physical health, the possibility of a confounding factor is present. Furthermore, it should be noted that both longitudinal studies and cross-sectional studies conceptualize and measure religion as well as spirituality in a different way. Hence different constructs have been measured and therefore the comparison of the results is most difficult.

Despite these inadequacies in the design of the studies the results suggest a positive relationship between spirituality and better physical health. However, it remains unclear whether spirituality could also positively influence physical health during a period of stress. Possibly spirituality directly affects physical health or it could act as a buffer during a period of stress. Therefore in the next section, the relationship between spirituality and stress will be further explored.

Spirituality & Stress

Although less extensive research has been conducted on the relationship between spirituality and stress, some positive results have been found. Delgado (2007) for example, shows a negative correlation between spirituality and perceived stress, indicating that higher levels of spirituality were linked with lower levels of perceived stress. Tuck, Alleyne and Thinganjana (2006) conducted a longitudinal study on spirituality and perceived stress and found a negative correlation between spirituality and perceived stress as well. However, both studies have some limitations with regard to the sample. The participants in the study by Delgado (2007) were COPD patients, whereas the participants in the study by Tuck et al. (2006) were members of a religious congregation, both limiting the generalizability of the results.

Nevertheless, the results do fit with the transactional stress and coping model by Lazarus and Folkman (1984). According to this model, a stressful situation requires people to construct cognitive appraisals of the situation and coping strategies that follow from these appraisals. A primary appraisal is made to determine if the event is threatening, controllable, and predictable. In addition,

a secondary appraisal is made to determine the discrepancy between what the situation requires and what the individual is capable of (van Doornen, 2004). These appraisal processes are under the influence of, among others, personal beliefs (Park, 2005) and subsequently affect the efficiency of the coping strategy (Aldwin & Park, 2004). Spirituality is thus suggested to (positively) influence the initial appraisal of the situation and the stressor, as well as the existence of the discrepancy created in the secondary appraisal (Park, 2005; Tuck et al., 2006). Therefore, the outcome of the stressful situation (i.e., the amount of perceived stress) can be positively influenced by spirituality. Labbé and Fobes (2010) for instance, showed that higher levels of spirituality are related to better coping with a stressful situation.

Spirituality also seems to be related to stress resilience (Southwick, Vythilingam, & Charney, 2005) and lower levels of psychological distress (Carmody, Reed, Kristeller, & Merriam, 2008; Johannessen-Henry, Deltour, Bidstrup, Dalton, & Johansen, 2013). The participants in the study by Carmody et al. (2008) participated in a mindfulness-based stress reduction program. Pre- and post-program measures of spirituality and psychological distress were conducted. It was found that post-program measures of spirituality and psychological distress were higher and lower respectively, than the pre-program measures. This indicates that an increase in spirituality is related to a decrease in psychological distress. These results however cannot clarify the direction of the relationship between spirituality and physical health.

A study conducted by Ironson et al. (2002) on spirituality in relation to long survival in people with AIDS showed that higher levels of spirituality are related to lower levels of cortisol, a neurohormone associated with stress. However, the selectiveness of the sample (i.e., HIV-seropositive patients) prevents the results from being generalized to other populations. Moreover, the study was cross-sectional and therefore other factors could have influenced levels of spirituality and levels of cortisol.

Nevertheless, these results suggest that there could be a relationship between spirituality and lower levels of stress, and therefore possibly relate to less physical health problems. However the precise manner in which spirituality, stress and physical health are related remains unclear.

Spirituality, Stress & Physical Health – Mediation or Moderation?

Very few studies have linked spirituality, stress and physical health and therefore not much is known about the possible relationship between these three concepts. However, recently more attention is being paid to the possible biological factors, instead of psycho-social factors, that relate spirituality to better physical health (George, Ellison, & Larson, 2002). Cortisol is one of these factors and since cortisol is associated with stress, a link between spirituality, lower levels of stress and better physical

health would thus be possible. As previous research has shown, higher levels of spirituality were related to lower levels of cortisol and positive health outcomes (Ironson et al., 2002). Assuming that spirituality indeed affects experienced stress, and thereby affects physical health, it could be that stress will be the mediating factor in the relationship between spirituality, and physical health.

This suggests that the relationship between these three concepts would fit a mediation model. In addition, the results in the aforementioned studies seem to correspond to two (a and b) of the established conditions for a mediation model (Baron & Kenny, 1986): (a) variations in levels of spirituality account for variations in stress, (b) variations in stress account for variations in physical health, and (c) a relationship is present between spirituality and physical health, but when (a) and (b) are controlled for this relationship will no longer be significant. The relationship between spirituality and physical health as stated in (c) is according to the previous mentioned results most likely; though whether this relationship will no longer be significant when controlling for (a) and (b) has not been investigated yet.

However, intuitively one might expect spirituality to be the mediating factor in the relationship between spirituality, stress and physical health. This would suggest that variations in levels of stress will account for variations in levels of spirituality. Despite this seemingly logic interpretation, research has shown that levels of stress, or perceived life threat do not relate to higher levels of spirituality (Chen & Koenig, 2006; Laubmeier, Zakowski, & Bair, 2004). One of the basic criteria for a mediation model is thus not fulfilled when spirituality is seen as the mediator. It is more likely that a reduction in experiences stress could be the explanatory factor in the relationship between higher levels of spirituality and better physical health. Nonetheless, perceived stress may not be the only possible mediating factor in this relationship (for example George et al., 2002), but this exceeds the aim of this study.

Nevertheless, there are some indications too that the relationship between spirituality, stress and physical health would fit a moderation model. In this model spirituality is considered to be the moderator. For instance, research shows an interaction effect for stress and spirituality on physical health (Chung, 2010) and subjective wellbeing (Fabricatore, Handal, & Fenzel, 2000). Spirituality as a moderator will thus affect the direction and/or the strength of the relationship between stress and physical health (Baron & Kenny, 1986). Consequently spirituality could be seen as a buffer that protects a person against the negative effects of stress on physical health.

It is interesting to note that both the mediation and the moderation model seem appropriate for describing the possible relationship between spirituality, stress and physical health. The purpose of the present study therefore is to investigate whether a correlational relationship can be found between spirituality, stress and physical health and whether this data will fit a mediation and/or moderation model. It is hypothesized that higher levels of spirituality are related to better physical

health and lower levels of stress. Secondly, it is hypothesized that this relationship will fit a mediation model, wherein stress will act as a mediator. In addition it is hypothesized that this relationship will also fit a moderation model, wherein spirituality will act as a moderator.

Methods

Procedure

With regard to the subject of the research and critique on other researches, it was decided to randomly select adult participants. The complete questionnaire was programmed in *Survalyzer*, which allowed the participants to fill in the questionnaire online. Possible participants were addressed through the use of social media and online forums, during a three month period. In addition, flyers and posters were made to distribute in supermarkets and mailboxes outside the city center of Utrecht. Through these messages participants were noted that after participating in the research they would find out how high or low they had scored on spirituality, stress and health. In addition all participants would have a chance on winning a gift card worth 20 Euros. At the start and end of the questionnaire it was made clear to the participant that all data would remain anonymous. If interested, participants could provide their email address to receive the final research results and/or to win the gift card.

Participants

The total sample included 125 participants. However, only 115 participants filled in all questionnaires and therefore ten participants were excluded from the dataset. Moreover, two participants scored extremely high (more than two standard deviations from the mean) on several questionnaires and were considered to influence the results too much. The remaining 113 participants consisted of 46 men with a mean age of 36.1 years (SD = 13.9) and 67 woman with a mean age of 33.8 years (SD = 11.6). Their education level ranges from only primary school (0.9%), *MAVO* (3.5%), *HAVO/VWO* (15.0%), *Lagerberoepsonderwijs* (2.7%), Vocational Education (8.8%), University of Applied Sciences (34.5%), and University (34.5%). Most of the participants (50.4%) have an income less than 2.000 euros per month, while 20.4 percent has an income between 2.000 en 3.000 euros per month and 20.9 percent has an income of 3.000 euros or more per month. In addition, 57.5 percent of the participants main occupation is work, 24.8 percent being a student and the remaining 17.7 percent is either unemployed, taking care of a household, unable to work, retired or a volunteer. With regard to their religious denomination or philosophy 25.7 percent claimed to not have a specific religious denomination or philosophy, 47.8 percent said to believe 'there is more between heaven and earth', 11.5 percent was classified as Atheists, 8.8 percent as Christian, 3.5 percent as Buddhist, 0.9 percent

as Hindu, 0.9 percent as Muslim and 0.9 percent as Humanist. Self-reported spirituality was assessed with the question 'do you consider yourself to be a spiritual person?' where an average score was found of 2.87 ($SD = 1.06$) on a 5-point Likert-scale ranging from 1 'not at all' to 5 'to a very high degree'.

Measures

First, demographic data were obtained with the use of several basic questions. In addition several questions were asked with regard to the participant's main occupation and religion or philosophy.

Spirituality was assessed with the Dutch version of the Spiritual Attitude and Involvement List (SAIL). This questionnaire measures spirituality as defined previously. The SAIL consists of 26 items that tap seven subscales: Meaningfulness, Trust, Acceptance, Caring for Others, Connectedness with Nature, Spiritual Activities and Transcendent Experiences. The participants responded to the items on a 5-point Likert-scale, ranging from 1 'not at all' to 5 'to a very high degree'. The SAIL has showed sufficient validity and reliability (de Jager Meezenbroek et al., 2012).

Stress was assessed by the Dutch version of the shortened Perceived Stress Scale (PSS-10), with well-established validity and reliability (Cohen, Kamarck, & Mermelstein, 1983). The PSS-10 consists of 10 items about the participant's feelings and thoughts during the last month with regard to perceived stress, and four filler items. The participant responds on a 5-point Likert-scale ranging from 0 'never' to 4 'very often'.

The Dutch version of the General Health Questionnaire (GHQ-28) was used to measure physical and psychological health along four subscales: somatic symptoms, anxiety and insomnia, social dysfunction and depression. Originally each subscale consisted of seven items. However with regard to the research question it was decided to leave out three items from the depression scale because these items were particularly negatively loaded and could influence the further responses of the participants. Each item is rated on a 4-point Likert-scale ranging from 0 'better than usual' to 3 'much worse than usual'. Subsequently these ratings are summed to obtain a total score on general health, with higher scores indicating poorer general health. In addition, the score on the subscale Somatic Symptoms of the GHQ was calculated to obtain information on the participant's physical health status. The GHQ-28 has showed sufficient validity and reliability (Koeter & Ormel, 1991).

Statistical Analysis

SPSS for windows version 20.0 was used to analyze the data. First the mean scores on spirituality (SAIL), stress (PSS), general health (GHQ) and physical health (GHQ_PH) were calculated. In addition the variables spirituality and stress were divided in three groups (low, medium, high) based on the percentiles. All variables, except for general health were normally distributed and therefore a

logarithmic transformation was applied on the GHQ score which led to a normal distribution of the data. For testing the possible moderator model a factorial between groups analysis of covariance (ANCOVA) was used to explore whether spirituality and/or stress had a significant effect on general and physical health, while controlling for covariates, and whether an interaction effect between spirituality and stress could be found. Preliminary analyses were conducted to ensure no violation of the assumptions of normality, linearity, multicollinearity and homoscedasticity. For testing the possible mediation model a hierarchical regression model was computed wherein stress was tested as possible mediating factor to the relationship between spirituality and general or physical health. Additionally Pearson product-moment correlation coefficients were used to explore the correlations between several variables. The level of significance was set at $p \leq .05$.

Results

First, the relationship between spirituality (SAIL), stress (PSS), physical health (GHQ_PH), general health (GHQ) and self-reported spirituality (SPIRI) was investigated using Pearson product-moment correlation coefficient (Table 1). Significant correlations between all questionnaires were found, indicating that higher levels of spirituality are related to lower levels of stress and better physical and general health. Furthermore, the relationship between self-reported spirituality and the seven subscales of the SAIL were explored using a Pearson product-moment correlation coefficient. Only the subscales Caring for Others ($r(113) = .28, p < .01$), Spiritual Activity ($r(113) = .62, p < .01$) and Transcendent Experiences ($r(113) = .55, p < .01$) were significantly correlated with self-reported spirituality. A Pearson product-moment correlation coefficient showed a significant positive correlation between spirituality as assessed by the SAIL questionnaire and self-reported spirituality as assessed by the question 'do you consider yourself to be a spiritual person', $r(113) = .51, p < .01$.

Table 1

Pearson Product-Moment Correlations of Several Questionnaires

Questionnaire	PSS	GHQ_PH	GHQ	SPIRI
SAIL	-.33**	-.32**	-.40**	.51**
PSS	-	.69**	.85**	.12
GHQ_PH	-	-	.84**	.10
GHQ	-	-	-	.10

Note. SAIL=Spiritual Attitude and Involvement List, PSS=Perceived Stress Scale,

GHQ_PH=Subscale Somatic Symptoms of the GHQ, GHQ=General Health Questionnaire

SPIRI=Self-reported Spirituality

** $p < .01$

Demographic Variables & Covariates

Using Pearson product-moment correlation coefficient, small to medium significant correlations were found between several demographic variables and the total score on the questionnaires (Table 2). Age ($r(113) = -.20, p < .05$) was found to correlate significantly with the SAIL but not with self-reported spirituality. To further explore this difference, the relationship between this variable and the subscales from the SAIL were measured using Pearson product-moment correlation coefficient. The results showed a significant correlation between Age and the subscale Meaningfulness, $r(113) = -.34, p < .01$.

Table 2

Pearson Product-Moment Correlations of Demographic Variables and Questionnaires

Demographic variable	SAIL	PSS	GHQ_PH	GHQ	SPIRI
Age	-.20*	.13	.16	.17	-.07
Education	-.13	-.30**	-.34**	-.26**	-.23*
Income	.05	-.18	-.19*	-.19*	-.16

Note. SAIL=Spiritual Attitude and Involvement List, PSS=Perceived Stress Scale, GHQ_PH=Subscale Somatic Symptoms of the GHQ, GHQ=General Health Questionnaire SPIRI=Self-reported Spirituality

* $p < .05$. ** $p < .001$.

To explore the possible influence of confounding variables, several independent sample t-tests and one-way ANOVA's were conducted with the demographic variables as independent variables and total scores on the questionnaires as dependent variables. The results showed a significant difference in the total PSS score for males ($M = 15.46, SD = 6.89$) and females ($M = 19.52, SD = 8.13$; $t(111) = -2.78, p < .01$, two-tailed). As well as for low, middle and higher education, $F(2,110) = 7.31, p < .001$. In addition, a significant difference in the total SAIL score was found for participants with children ($M = 88.21, SD = 12.98$) and participants without children ($M = 82.43, SD = 11.76$; $t(111) = -2.22, p < .05$, two-tailed). However, no significant difference was found for the variable Children on self-reported spirituality. Therefore additional independent sample t-tests were conducted with Children as the independent factor and the subscales from the SAIL is the dependent factors. The results showed a significant difference in the score on the subscale Meaningfulness for participants with children ($M = 10.90, SD = 2.11$) and participants without children ($M = 9.12, SD = 2.23$; $t(111) = -3.75, p < .05$, two tailed).

In order to calculate whether these variables could be used as covariates in further analyses, the independence of the independent variables (total score PSS or total score SAIL) and possible covariates was tested using an ANOVA. The results showed that gender was independent from the

total PSS score, $F(80, 113) = 1.19, p >.05$, and therefore only the variable Gender will be added as a covariate in the analyses.

Mediation Model

To test the hypothesis that spirituality can account for a significant proportion of the variance in physical health beyond that accounted for by stress and gender, a hierarchical multiple regression analysis was conducted with physical health as the dependent variable. In step 1 gender and stress accounted for a significant 47.8% of the variance in physical health, $R^2 = .48, F(2, 110) = 50.38, p <.001$. In step 2 spirituality accounted for an additional non-significant .7% of the variance in physical health, $\Delta R^2 = .01, \Delta F(1, 109) = 1.40, p >.05$. The model as a whole explained 48.5% of the variance in physical health, $F(3, 109) = 34.20, p <.001$, however only stress was a significant predictor ($beta = .35, p <.001$). These results indicate that after controlling for stress, spirituality does not explain any variance in physical health and thus these results do not fit with the mediation model.

Subsequently, a hierarchical multiple regression analysis was conducted with general health as the dependent variable. In step 1 of the analysis, gender and stress accounted for a significant 73.9% of the variance in general health, $R^2 = 0.74, F(2, 110) = 155.54, p <.001$. In step 2, spirituality was added to the equation and accounted for an additional significant 1.0% of the variance in general health, $\Delta R^2 = .01, \Delta F(1, 109) = 4.37, p <.05$. The model as a whole explained 75.0% of the variance in general health, $F(3, 109) = 108.32, p <.001$. Only stress and spirituality were statistically significant predictors with stress recording a higher beta value ($beta = .84, p <.001$) than spirituality ($beta = -.11, p <.05$). These results indicate that after controlling for stress, spirituality explains a small amount of the variance in general health. This does fit partly with the mediation model wherein stress acts as the mediator between spirituality and general health.

Moderator Model

Subsequently a two-way ANCOVA was conducted with physical health as the dependent variable and spirituality and stress as the independent variables. To investigate a possible interaction effect a product variable of spirituality and stress was calculated and added as a factor in the ANCOVA.

After adjusting for gender, the interaction effect between spirituality and stress was not statistically significant, $F(98, 5) = .45, p >.5$. A main effect was found for stress on physical health [$F(2, 103) = 21.54, p <.001$] with a large effect size (partial eta squared = .30) (Figure 1). Gender did not have a significant effect. These results indicate that the relationship between spirituality, stress and physical health does not fit with a moderation model.

Additionally a two-way ANCOVA was conducted to explore the impact of spirituality and stress on general health. After adjusting for gender, the interaction effect between spirituality and

stress was again not statistically significant, $F(51, 32) = 1.55, p >.05$. A statistically significant main effect was found for spirituality [$F(2, 103) = 3.60, p <.05$] with a small effect size (partial eta squared =.07). In addition, a main effect was found for stress [$F(2, 103) = 69.44, p <.001$], with a large effect size (partial eta squared =.57) (Figure 2). Gender did not have a significant effect in this ANCOVA either. These results indicate that the relationship between spirituality, stress and general health does not fit with a moderation model.

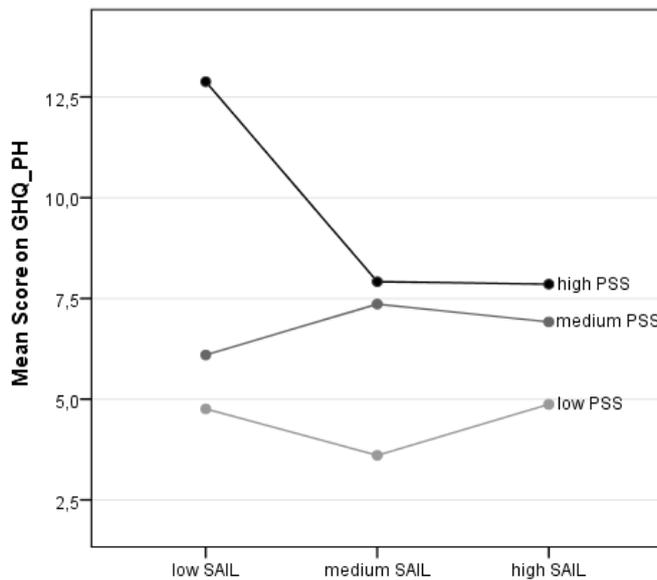


Figure 1. Comparison of the mean score on physical health for low, medium and high spirituality and stress scores.

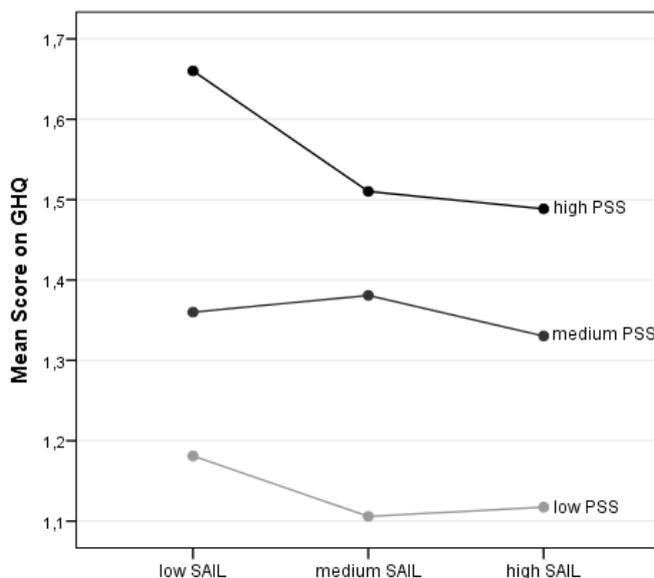


Figure 2. Comparison of the mean score on general health for low, medium and high spirituality and stress scores.

Additional Statistics with Self-Reported Spirituality

As previously mentioned, a Pearson product-moment correlation coefficient showed a significant positive correlation between the SAIL questionnaire and Self-Reported Spirituality, $r(113) = .51, p < .01$. According to the guidelines (Cohen, 1988) this is considered to be a large correlation. However, for two instruments claiming to measure the same construct (i.e. level of spirituality) this correlation might be considered too low. Therefore an additional hierarchical multiple regressions analysis and ANCOVA were conducted with self-reported spirituality as the independent variable.

Additional Mediation Model

To test the hypothesis that self-reported spirituality can account for a significant proportion of the variance in physical health beyond that accounted for by stress and gender, a hierarchical multiple regression analysis was conducted with physical health as the dependent variable. In step 1 of the hierarchical multiple regression analysis gender and stress accounted for a significant 47.8% of the variance in physical health, $R^2 = 0.48, F(2, 110) = 50.4, p < .001$. In step 2, spirituality was added to the regression equation and accounted for 0.0% of the variance in physical health. The model as a whole explained 47.9% of the variance in physical health, $F(3, 109) = 33.35, p < .001$. These results indicate that self-reported spirituality, stress and physical do not fit with the mediation model.

In addition, a regression analysis was conducted with general health as the dependent variable. In step 1 gender and stress accounted for a significant 74.0% of the variance in general health, $R^2 = 0.74, F(2, 110) = 155.54, p < .001$. In step 2, spirituality was added to the regression equation and accounted for 0.0% of the variance in general health. The model as a whole explained 74.0% of the variance in physical health, $F(3, 109) = 102.81, p < .001$. These results indicate that self-reported spirituality, stress and general health do not fit with the mediation model either.

Additional Moderation Model

Subsequently a two-way ANCOVA was conducted with physical health as the dependent variable and self-reported spirituality and stress as the independent variables. Before conducting the ANCOVA, the self-reported spirituality scores were divided in two groups (low and high) according to the median. To investigate a possible interaction effect a product variable of self-reported spirituality and stress was calculated and added as a factor in the ANCOVA. The interaction effect between self-reported spirituality and stress on physical health was statistically significant, $F(51, 46) = 1.77, p < .05$, with a large effect size (partial eta squared = .66). A statistically significant main effect was found for stress [$F(2, 106) = 16.53, p < .001$], and the effect size was large (partial eta squared = .24) (Figure 3). Additionally, the ANCOVA was conducted with general health as the dependent variable. A significant interaction effect was found for self-reported spirituality and stress, $F(51, 46) = 1.86, p < .05$. A

statistically main effect was found for stress [$F(2, 106) = 64.9, p < .001$], and the effect size was large (partial eta squared = .55) (Figure 4). Gender did not have a significant effect in either of the ANCOVAs. These results suggest that self-reported spirituality, stress and general health, as well as physical health, fit with a moderator model, in which self-reported spirituality acts as the moderator. Self-reported spirituality thus has a buffering effect in the relationship between stress and general and physical health.

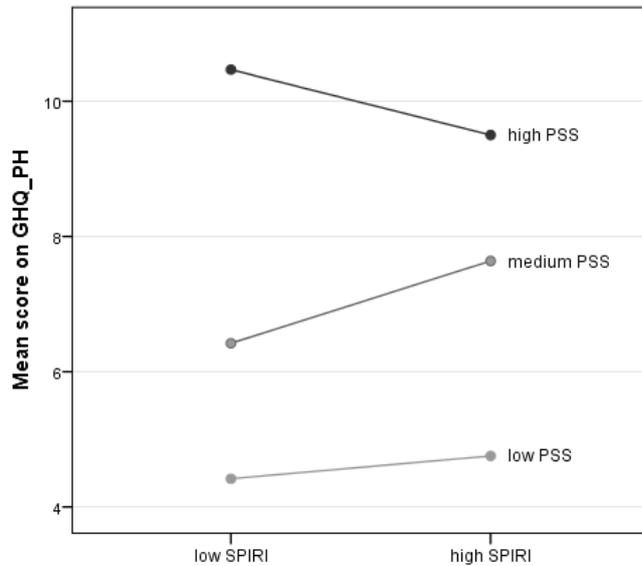


Figure 3. Comparison of the mean score on physical health for low, medium and high self-reported spirituality and stress scores.

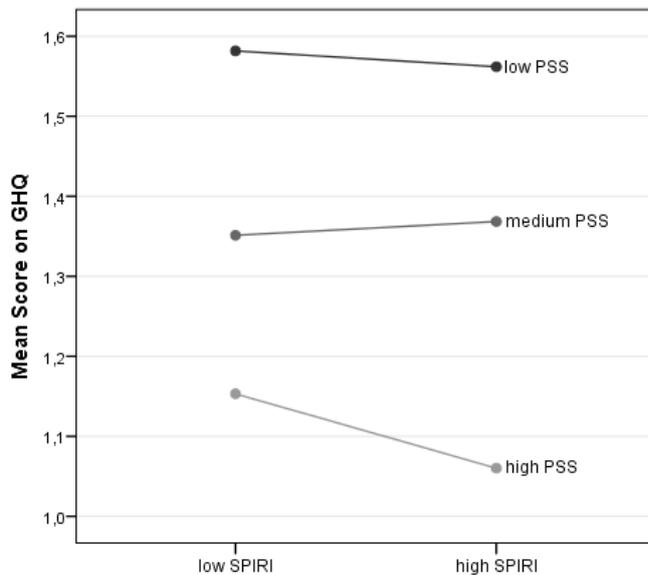


Figure 4. Comparison of the mean score on general health for low, medium and high self-reported spirituality and stress scores.

Finally, the demographic variables Income, Education, Children, and Age were separately added to the ANCOVA together with self-reported spirituality and stress. Only the variable Children showed a significant interaction with the product variable of self-reported spirituality and stress, with either physical health [$F(2,100) = 5.52, p < .001$] or general health [$F(2,100) = 5.00, p < .001$] as the dependent variable. Hence the moderator effect of spirituality on the relationship between stress and physical or general health is different for people with or without children.

Discussion

The present study investigated the relationship between spirituality, stress and physical health. It was hypothesized that higher levels of spirituality are related to lower levels of stress and better physical health. Furthermore it was hypothesized that these three variables would fit a mediation model as well, in which stress would be the mediating factor. In addition, it was hypothesized that these three variables would fit a moderator model, in which spirituality acts as the moderator.

The results showed that higher levels of (self-reported) spirituality are related to a lower level of stress and better general and physical health. Furthermore, the relationship between self-reported spirituality, stress and general or physical health fits a moderation model in which self-reported spirituality acts as the moderator and thus influences the relationship between stress and health. Spirituality (as measured by the SAIL), stress and general health fit a mediation model as well, in which stress acts as the mediator of the relationship between spirituality and general health. Stress therefore can be (one of) the explanatory factor(s) through which spirituality and health are related. However, although spirituality in the mediation model significantly contributes to changes in general health after controlling for stress, this contribution is quite small and non-significant when the dependent variable is physical health. Moreover, in the analysis with self-reported spirituality as an independent variable no significant results were found either. This suggests that this mediation model is less plausible than the moderator model.

Possibly the role of spirituality in both models depends on different aspects of spirituality. Perhaps only certain aspects of spirituality would fit with the mediation. For instance, meditation has previously shown to be related to stress reduction (Carmody et al., 2008; Shapiro, Astin, Bishop, & Cordova, 2005). Nevertheless, it is possible that the moderation model gives the best description of the relationship between spirituality, stress and health. The influence of spirituality could then be seen as a buffer during a period of stress. In addition, Labbé and Fobes (2010) showed that higher levels of spirituality are related to better coping with a stressful situation. It is possible that this mechanism exists because spirituality alters the way a stressful situation is perceived and thereby influencing the level of stress. When the transactional stress and coping model by Lazarus and

Folkman (1984) is used to explain stress, one can say that spirituality can influence the initial appraisal of the situation and the appraisal of one's capabilities to handle this situation. Spirituality could function as a buffer on which one can rely during a period of stress. Furthermore, Park and Folkman (1997) developed a coping model based on a process of meaning making. This model distinguishes between the appraised meaning of the situation, and the basic view of how the world is supposed to be (global meaning). A global meaning consists of a person's (spiritual) beliefs and goals a person wants to achieve. When someone encounters a stressful situation two things can happen: a person can reappraise the situation in order to make it match the global beliefs, or a person can adjust his or her global beliefs. This can help a person regain the feeling of control and comprehensibility of the situation and reduce perceived stress. In this study, only the number of children, interacted with self-reported spirituality and stress on physical health. It is plausible that having children alters the appraisal of a situation, or one's global meaning and thereby influencing perceived stress. For instance, to raise a child as good as possible might be a global goal in life. When this person encounters a stressful situation his or her priorities might be with their children and therefore could classify the situation as more or less urgent with regard to raising one's children. This could subsequently increase or decrease the perceived level of stress.

Furthermore, in this study several correlations were found between demographic factors and the spirituality. A remarkable finding was that the level of education was negatively correlated with self-reported spirituality, indicating that higher educated participants considered themselves to be less spiritual. Previous studies also found that higher levels of education and intelligence were related to lower levels of spirituality or religiousness (Lewis, Ritchie, & Bates, 2011; Lynn, Harvey, & Nyborg, 2009). Lewis et al. (2011) suggest that higher levels of intelligence are related to greater cognitive skills and therefore these people are capable of creating more individualistic attitudes. Moreover, they might experience an intellectual conflict with the stated beliefs and arguments from certain religions or spiritual traditions. At the same time however, the level of education was not related to the score on the SAIL. This could indicate that the way one views his or her spirituality is different from the spirituality measured by the SAIL. This study indeed found that the SAIL did not highly correspond to the question "do you consider yourself to be a spiritual person?", even though the authors of the SAIL defined the concept spirituality in the same way (de Jager Meezenbroek et al., 2012). Possibly the lay-men's view of spirituality might differ from the experts view on spirituality that was used to design the SAIL. Researchers claim that people tend to describe spirituality in terms of a specific religion, while the aim of the SAIL is to cover spirituality in a broader way (de Jager Meezenbroek et al., 2012). Moreover, in this study self-reported spirituality was found to be related to only three sub-scales of the SAIL, of which two subscales highly correlated, namely Spiritual Activity and Transcendent Experiences. A similar result can be found with de Jager

Meezenbroek et al. (2012). Apparently the lay-men's view of spirituality is more related to these two subscales in contrast to the other five subscales, namely Caring for Other, Meaningfulness, Trust, Acceptance and Connectedness with Nature (see Appendix 1 for an overview of all seven subscales and corresponding items). When the subscales are further explored and explained in different words, it could be said that Spiritual Activity is about actively practicing spirituality and Transcendent Experiences is about consciously experiencing spirituality. Caring for Others, Meaningfulness, Trust, Acceptance and Connectedness with Nature are aspects that are concerned with a certain view of life and lifestyle and are possibly less prone to or do not directly stem from spiritual or religious convictions. In other words, perhaps a certain degree of spirituality is 'required' in order to conduct spiritual activities and experience transcendence. Therefore people might not consider themselves to be spiritual because the two factors they believe are highly related to spirituality are consisted with a certain amount of spirituality which they feel they do not have. These are obviously merely exploring thoughts that require further investigation. However, the current results reveal a discrepancy between a concept researchers attempt to study and what might actually be of importance to the population. This is an important notion since it complicates the generalizability of the results from previous conducted studies and should be kept in mind when future studies are designed.

Another interesting finding is that age was positively correlated with the SAIL, indicating that an older age was related with a higher score on the SAIL. On the other hand, age was not related with self-reported spirituality. In addition, whether the participant had children or not was positively related to the SAIL, indicating that people with children scored higher on the SAIL, however this was not related to self-reported spirituality. Apparently, a certain aspect of spirituality as measured by the SAIL is of importance for these two groups. Further analysis showed that the subscale Meaningfulness correlated with the age of the participant and whether the participant has children or not. It is likely that elderly have more experiences that have led them to clarify their meaning and purpose in life. In addition, raising children might become a purpose in life and give meaning as well.

A limitation to this study however is the fact that the sample of this study consisted of mainly highly educated participants who saw themselves mostly as 'somewhat' spiritual. Perhaps a sample with a more evenly distributed level of spirituality and education level will improve the generalizability of the results. Another limitation of this study is its cross-sectional design which does not allow for any causal claims to be made. A longitudinal study could clarify more about the causality between spirituality and physical health and the longer term influence of spirituality on physical health. Furthermore, the questionnaires were answered online. Therefore the surrounding in which the participant was situated could not be controlled for. Possibly factors in the surrounding such as the presence of other people, sounds, or other distractions, influenced the responses of the participants. Another limitation of this study is the inevitable influence of culture on the results. It is possible, yet

not investigated, that people in the city differ from people who live in rural areas on spirituality. Furthermore, the Dutch norms and values could possibly influence people's responses. Therefore it is, at least before more research is done, difficult to generalize the results to different parts of the Netherlands or to other countries.

Nevertheless, this study differs from previous studies because of the distribution of religious denominations among the participants. Not only religious people but also non-religious people and their spirituality have been investigated. Furthermore, the focus of this study is on physical health. Previous studies have explored the relationship between religion/spirituality and physical health by either looking at very specific symptoms (e.g. chronic pain, life expectancy with HIV patients), or by using a questionnaire that focusses on specific health complaints (e.g. "does your health limit you in climbing several flights of stairs?"). In this study, the General Health Questionnaire was used to obtain information about people's general health, and by further analyzing the subscale Somatic Symptoms the participant's physical health status was obtained as well. Hereby a more general assessment of the participant's physical health was conducted. This is important, because the results can apply to a wider range of individuals (anyone experiencing negative consequences of stress) and not only to patients. However, future research should further investigate the direction of the relationship between spirituality, stress and physical health in order to implement the results in services that promote physical health during stress.

In addition, the measurement of spirituality requires further research as well. Possibly the 'objective' measure of spirituality (by using the SAIL, FACIT etc.) does give a clear view on how spiritual a person is according to the experts. However, one should bear in mind that spirituality is a dynamic phenomenon occurring in ever changing individuals (Hill & Pargament, 2003). Spirituality could therefore mean something different to a person in every aspect and moment of a person's life. Research has for example shown that religion and spirituality is of greater importance to elderly (Idler et al., 2003; Koenig, Larson, & Matthews, 1996) and likewise for pregnant women (Callister & Khalaf, 2010). In addition, spirituality can be of great support during the recovery of an illness or during the terminal phase of an illness (Koenig, 2007). Thus, in order to explore whether spirituality can help people during stress, future research could investigate during what types of stressful situations spirituality can or cannot help.

In conclusion, this study implies the presence of a moderator for the relationship between spirituality, stress and physical health and carefully suggests the existence of a mediation model for the relationship between certain aspects of spirituality, stress and physical health. Future research could further investigate the conceptualization of spirituality and take a closer look at the differentiation between the lay-men's view and expert's view on this matter. In addition, the dynamic nature of spirituality should be taken into account when participants are measured on this

concept. Furthermore, the relationship between spirituality, stress and physical health could be further specified and explored in longitudinal studies. In this way the results can be implemented in services that promote physical health in (non-)hospitalized individuals who are experiencing stress.

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Appendix I

Items from the Spiritual Attitude and Involvement List (de Jager Meezenbroek et al., 2012) sorted by subscale.

Trust

I approach the world with trust
In difficult times, I maintain my inner peace
Whatever happens, I am able to cope with life
I try to take life as it comes

Meaningfulness

I know what my position is in life
I experience the things I do as meaningful
My life has meaning and purpose

Connectedness Nature

The beauty of nature moves me
When I am in nature, I feel a sense of connection

Acceptance

I accept that I am not in full control of the course of my life
I accept that I am not able to influence everything
I am aware that each life has its own tragedy
I accept that life will inevitably sometimes bring me pain

Caring for Others

It is important to me that I can do things for others
I am receptive to other people's suffering
I try to make a meaningful contribution to society
I want to mean something to others

Spiritual Activities

There is a God or higher power in my life that gives me guidance
I talk about spiritual themes with others (themes such as the meaning of life, death or religion)

I meditate or pray, or take time in other ways to find inner peace

I attend sessions, workshops etc. that are focused on spirituality or religion

Transcendent Experiences

I have had experiences during which the nature of reality became apparent to me

I have had experiences in which I seemed to merge with a power or force greater than myself

I have had experiences in which all things seemed to be part of a greater whole

I have had experiences where everything seemed perfect

I have had experiences where I seemed to rise above myself