

Prayer as an antidepressant mediating the relation between religion/spirituality and individual well-being

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Abstract

Religion and spirituality are associated with better health, higher quality of life and longer life expectancy. Although questions regarding the underlying causality remain, it is possible that the activity of praying plays a mediating role in putative faith-related benefits. Neuroimaging studies link prayer to increased activity of brain areas which are part of the reward system and, specifically, to areas in which reduced activity has been associated with anhedonia, a key feature of depression. By reducing anhedonia, prayer may therefore exert an antidepressant effect. Psychological studies suggest that praying may indeed reduce depressive symptoms. However, the support for this hypothesis is very limited. Most of the few studies which have been conducted on the relation between prayer and depression exhibit methodological limitations and implicational ambiguity. Still, this essay encourages the engagement in prayer, as research tends suggest a beneficial effect.

Table of contents

1. Introduction, research question and outline of the essay
2. The general relation between religion/spirituality and longevity, health and well-being
3. Neuroimaging studies on the relation between prayer and depression
4. Psychological studies on the relation between prayer and depression
5. Conclusion
6. References

1. Introduction and research question

As Jesus went on from there, two blind men followed him, calling out, "Have mercy on us, Son of David!" When he had gone indoors, the blind men came to him, and he asked them, "Do you believe that I am able to do this?" "Yes, Lord," they replied. Then he touched their eyes and said, "According to your faith let it be done to you"; and their sight was restored. [...] – Matthew 9:27-30

Accounts of faith-related healings like these can be found throughout religious texts. And even today, reports of alleged medical miracles at places of pilgrimage are heard. From a scientific perspective, the notion of medical interference by a supernatural entity raises skepticism at the least – and rightfully so. Indeed, even a religious person may be inclined to take such accounts rather at anecdotal value than as a fact. But can there be more to the picture than mere storytelling and wishful thinking? Is it possible that faith and health are indeed connected and that the belief in God positively affects our mental and physical well-being?

This essay focusses on the relation between prayer and depression as a potential mediator of the putative health benefits associated with religion and spirituality. First, the general relationship of faith with quality of life, health and life expectancy will be reviewed. Then, the neural correlates of prayer and their relevance to depression as well as psychological studies assessing the relationship will be investigated. Methodological concerns and limitations of the corresponding published studies as well as suggestions for future research will be discussed.

2. The general relation between religion/spirituality and longevity, health and well-being

The scientific literature shows that religion and spirituality are positively associated with longevity, health and quality of life. In other words, those who believe live longer, healthier and happier lives. In 2000, McCullough, Hoyt, Larson, Koenig, and Thoresen conducted a meta-analysis on the relation between religious involvement and all-cause mortality. Including data of 42 independent samples, involving almost 126.000 participants, they found an odds-ratio of 1.29, which meant that, on average, people with high religious involvement were 29% more likely than those with lower involvement to be alive at the time of a follow-up assessment, which usually took place several years later. The authors concluded that the association was affected by differences in research design, sample characteristics (age, gender and whether a clinical population was sampled), and measurement of religious involvement but nonetheless “robust and on the order of magnitude that has come to be expected for psychosocial factors”. This finding is supported by a review of Powell, Shahabi, and Thoresen (2003) including 9 studies, which were conducted with healthy participants and mostly based on representative samples. After adjusting for “demographic, socioeconomic and health-related confounders” and for “healthy lifestyle, social support, and depression”, a reduction in mortality risk of 25% was found for church/service attenders. They also reviewed a small number of prospective studies on cardiovascular disease mortality and concluded that religion or spirituality was associated with a reduced risk, which was largely mediated by a healthier lifestyle. However, they did not find evidence for an association between religion or spirituality and a slower progression of cancer or between depth of religiousness and mortality. They even found evidence for an association of religion or spirituality with impaired recovery from acute illness. This inverse relation may, at least partially, be mediated by negative religious coping, such as the impression of having been abandoned by God, which was found in two of the reviewed studies. Further support for a beneficial association with mortality comes from a systematic review of Chida, Steptoe, and Powell (2009), who included 69 studies with healthy and 22 with diseased participants. A combined hazard ratio of 0.82 for religiosity/spirituality was found for healthy participants, which translates to a 18% higher chance to still be alive at the time of the follow-up assessment, which usually took place a few years later. This relation was largely not dependent on “behavioral factors (smoking, drinking, exercising, and socioeconomic status), negative affect, and social support” and of the different aspects of religiosity/spirituality measured the strongest effects were observed for organizational activity, such as church attendance. The authors also report a beneficial association of religiosity/spirituality with cardiovascular mortality. However, no association with mortality was found for the diseased participants (combined hazard ratio = 0.98), which may at least partially be explained by the general lack of investigation of organizational activity in studies with diseased participants, which Paloutzian and Park (2014) note in response to the study. Regarding mental health, a meta-analysis was conducted by Hackney and Sanders (2003) assessing the relation with different types of religiousness.

Including 34 studies, they found a mean correlation of 0.09, which means that religiosity was weakly associated with better mental health. This relation was more pronounced for personal devotion and ideological religion than for institutional religiousness. The authors also mentioned eight previously conducted meta-analyses and reviews on the association between religion and mental health and concluded that most supported a positive relation. Smith, McCullough, and Poll (2003) conducted a meta-analysis on the relation of religiousness with depressive symptoms. They included 147 independent investigations, involving a total of almost 100,000 participants, and found a correlation of -0.096, which means that religiosity was weakly related to fewer depressive symptoms. The authors concluded that this relation was not affected by differences in gender, age or ethnicity but was more pronounced in studies including participants who were affected by stress related to recent events in their lives. They further concluded that negative religious coping as well as extrinsic religious orientation, which means the engagement in religious activities as a means to a non-religious end, was related to more depressive symptoms. Dew et al. (2008) conducted a review including 115 articles regarding the association between religion/spirituality and psychiatric symptoms in adolescents. Based on the 21 articles they reviewed involving depression, they could not find support for a positive relation with religion/spirituality. They did, however, find a favorable link with substance use in the 61 corresponding articles reviewed. Regarding the association of spirituality and quality of life, Sawatzky, Ratner, and Chiu (2005) conducted a meta-analysis including 62 independent effect sizes. They found a correlation of 0.34, which means that spirituality is moderately related to a higher quality of life. The strength of this relation was found to vary with the measurement differences of both variables but was not found to be affected by other variables such as demographics, religious affiliation and sampling method, which the authors attribute to limitations related to the sample of the studies included.

Overall, the literature shows that religion and spirituality are positively associated with longevity, health and well-being. The obvious and most important question to logically follow this observation, however, is why this association exists. Unfortunately, there is no easy answer to this question. Most of the studies conducted in this field of research are correlational in nature, which makes causal inferences difficult. From the findings summarized above, one may readily conclude that being religious has a positive effect on health, which may be true. But it would also be possible that better health makes people more religious or that health problems cause people to believe less in God. One study included in the review of Dew et al. (2008) suggests exactly that. Horowitz and Garber (2003) conducted one of the few longitudinal studies on the relation between religiosity and depression, which allow causal inference to be drawn in a slightly more valid manner. Like the outcome of the review itself, the results of the three other longitudinal studies included did not point to a clear relationship between the variables. Horowitz and Garber (2003), however, who followed 240 adolescents over the course of 6 years found a positive association which was chronologically reversed: adolescents with depressive episodes in grades 7-10 showed lower religious attendance in grade 12. Of course, the possibility of a relation in one direction is not excluded by an observation of a relation in the other direction, the link may be bidirectional. It is possible that religious attendance causes less depression and that less depression causes more religious attendance. But something entirely different is thinkable as well. Both occurrences may have been caused by a third factor that has not been considered yet. For example, if the family of the adolescent breaks apart, such an event may trigger a depression right away. Likewise, the church community may not appear that welcoming anymore because the

divorce of the parents may not be in line with conservative values, which may result in less attendance. This scenario would also fit well with the study of Smith et al. (2003) who found that the relation between religiousness and fewer depressive symptoms, which translates to the relation between depression and lower religiousness, is particularly strong when stress is inflicted by recent life events. It should be clear that despite the presence of large-scaled meta-analyses, attempting to determine the exact strength of associations between variables, and potential moderators and mediators, without the influence of confounds, the interpretation of these associations does not come easily. Future studies with well-engineered research designs will be necessary to advance our understanding. Longitudinal studies similar to the one of Horowitz and Garber (2003) would certainly be of value, preferably assessing individual changes in faithfulness and in engagement in several religious activities in relation to variables of health and well-being on multiple occasions over a long period of time. Also, experimental designs utilizing faith-related activities while comparing respective health and quality of life assessments to those of control groups may provide more insight into the causality of the observed relationships. For the purpose of this essay, however, it will be assumed that religion and spirituality are causally related to longevity, health, and well-being in a beneficial manner.

3. Neuroimaging studies on the relation between prayer and depression

Many possible factors of religion and spirituality may play a role in the association with the aforementioned benefits. Neuroscientific research has indicated that one of the mediating links may be an antidepressant effect caused by the activity of prayer. Schjødt, Stødkilde-Jørgensen, Geertz, and Roepstorff (2008) conducted an fMRI study with 20 young Danish Christians. Brain activity was measured while the participants performed two types of prayer, the Lord's prayer and a personal prayer. This was done in order to assess possible differences between a more ritualistic, formal style of prayer and a more improvisational style. A rhyme which was well-known to the participant and "wishful praying to Santa Claus" were chosen as controls, respectively. In a region of interest analysis of the caudate nucleus, increased activity of the structure in the right hemisphere of the brain was observed during prayer. The activity appeared to be strongest when the Lord's prayer was performed. The caudate nucleus is a brain area considered to be part of a set of neural structures called the reward system. As the name implies, the activity of this system is involved in different kinds of pleasurable emotions and other reward-related processes. Roughly speaking, the absent or impaired ability to perceive positive emotions is called anhedonia, which is a key feature of depression. It may therefore be that by facilitating positive emotions through an increased activity in the caudate nucleus, prayer exerts an antidepressant effect. It must be noted, however, that this hypothesis is grounded on a thin basis of empirical support. Other studies have been conducted on the relation between prayer and brain activity without observing changes in the caudate nucleus. In fact, Schjødt et al. (2008) pointed out that in a separate but similar pilot study, which they conducted with eight Danish Christians, no evidence for an increased activity of the caudate nucleus during prayer was found. However, as the activity of the caudate nucleus is associated with repetitively performed behaviors, they attributed the difference in findings to the fact that the participants of the pilot study did not pray frequently whereas the participants of the former study prayed on a weekly basis. But besides the possible involvement of the caudate nucleus in the putative antidepressant effect of prayer, other brain areas may play a role as well. The reward system includes areas of the brainstem, diencephalon, limbic system, basal

ganglia, and cortical structures such as the prefrontal cortex and the insula. For a more accurate interpretation of research findings it may be beneficial to also determine what changes in brain activity are associated specifically with anhedonia. Preda (2014), who reviewed brain imaging studies on the matter, reports that anhedonia was related to reduced activity the prefrontal cortex, anterior cingulate cortex, which can be considered part of the prefrontal cortex and the limbic system, insula, ventral striatum, which is part of the basal ganglia, and possibly other areas. Unsurprisingly, all of these areas are part of the reward system. Zhang et al. (2016) conducted a meta-analysis of fMRI studies on brain activity related to anhedonia. As anhedonia also appears in schizophrenia, they used a transdiagnostic approach including 33 studies on depression and 24 studies on schizophrenia. In total, data from 986 patients was compared with data from 1041 healthy participants. They found evidence for decreased activity in the caudate nucleus, globus pallidus, and putamen, which are all part of the basal ganglia, red nucleus, which is part of the brainstem, pulvinar nucleus, ventral lateral nucleus, and medial dorsal nucleus, which as thalamic nuclei are part of the diencephalon, hippocampus, parahippocampus, and amygdala, which are part of the limbic system. Except for the red nucleus and the parahippocampus, all of these structures are included in the reward system. They also found evidence for decreased activity in the medial frontal gyrus, part of which belongs to the prefrontal cortex, which is part of the reward system as well. Changes in activity were also observed in the middle frontal gyrus and in the inferior frontal gyrus, which partially belong to the prefrontal cortex. However, activity was found to be both decreased and increased. Also, the authors also report evidence for decreased activity in the culmen, which is a cerebellar structure, in the superior temporal gyrus, middle temporal gyrus, and even increased activity in the fusiform gyrus and in the middle occipital gyrus. None of these structures are considered part of the reward system. It is thinkable that these changes in activity relate to other features of, or processes associated with, anhedonia, possibly of perceptual or cognitive nature. There are indications for the cerebellum to play a role in reward-related functions (Moulton, Elman, Baccara, Goldstein, & Borsook, 2013; Caligiore et al., 2017) and the superior temporal gyrus is known to be involved in the perception of emotional facial expressions (Bigler et al., 2007; Radua et al., 2010), but arguments and indications could be found to relate most brain areas to emotions or reward in one way or another. Indeed, the extend of structures included in the reward system and related to anhedonia would allow for a large proportion of neuroimaging studies in general to be somehow related to these functions. For example, Schjødt, Stødkilde-Jørgensen, Geertz, and Roepstorff (2009) further analyzed the data of Schjødt et al. (2008), who found an increased activity of the caudate nucleus during prayer, and also observed increased brain activity during the control condition: when the participants performed the rhyme or “wishful praying to Santa Claus”, increased activity in the prefrontal cortex, superior temporal cortex, parietal cortex, parieto-occipital cortex, occipital cortex, and supplementary motor area was observed, compared to the prayers. The majority of areas is neither included in the reward system nor related to anhedonia, and the increased activity of the occipital cortex, which overlaps with the middle occipital gyrus, is even partially associated with increased anhedonia. However, the prefrontal cortex is included in the reward system and respective activity associated with reduced anhedonia, and the activity of the superior temporal cortex, which is part of the superior temporal gyrus, is also related to reduced anhedonia. An argument supporting an antidepressant effect of the control condition could thus also be formed, conflicting with the interpretation of the increased caudate nucleus activity during prayer as support for countering depression. What further complicates the interpretation of neuroimaging studies on prayer is the fact that all of the brain areas included in the reward system or related to anhedonia are

also associated with other functions, and that a change in activity therefore does not need to reflect processes involved in emotion or reward. For example, the caudate nucleus has also been linked to memory, learning, sleep, language, decision-making, and the preparation and modulation of physical movements. The great extent of structures associated with the reward system and anhedonia and the multifunctionality of these structures do not imply that correct interpretations of brain activity cannot be derived at but that findings must be viewed in a critical light and from different angles. Despite the difficulty of an interpretation, two more studies on the relation of prayer and brain activity should be mentioned. Newberg, Pourdehnad, Alavi and d'Aquili (2003) performed a SPECT study with three Franciscan nuns. After performing about 50 minutes of meditative prayer, their brain activity was measured. When compared with a baseline scan conducted immediately before the meditation, a large number of region of interest analyses revealed increased activity of the prefrontal cortex, inferior frontal lobe and inferior parietal lobe. The prefrontal cortex is part of the reward system and has been linked to anhedonia. The inferior frontal lobe overlaps with the lower part of the prefrontal cortex and is thus partially included in the reward system and somewhat related to anhedonia. However, the inferior parietal lobe is not known to play a role in these respects. It appears that the study provides some but limited support for a link between prayer and reduced anhedonia. It can be argued, however, that the sample size was very small and that brain activity was not measured during prayer but subsequently. In fact, a break of about 20 minutes took place between the meditative prayer and the brain scan. Observable, prayer-related brain activity may have had faded already to a large degree at the time of measurement. Newberg et al. (2001) performed a similar SPECT study with eight Tibetan Buddhists, each of whom had meditation experience for at least 15 years, meditating for about one hour most of the days. After a baseline scan, a period of meditation for about one hour, and a break of about 20 minutes, the brain activity of the participants was measured. Many region of interest analyses were performed and increased activity was observed in the prefrontal cortex, inferior frontal lobe, cingulate gyrus, sensorimotor cortex, midbrain and thalamus. As discussed in the context of the previous study, the prefrontal cortex is part of the reward system and related to anhedonia, and so is the inferior frontal lobe to the degree that it overlaps with the prefrontal cortex. Regarding the cingulate gyrus, the authors reported increased activity in three parts: the anterior, the posterior, and the body. The anterior cingulate gyrus is included in the reward system and has been related to anhedonia. However, it can be considered part of the prefrontal cortex, which has already been mentioned. The posterior part and the body of the cingulate gyrus are neither part of the reward system nor related to anhedonia. The same is true for the sensorimotor cortex. The midbrain is the part of the brainstem containing the ventral tegmental area and the substantia nigra, which are part of the reward system, amongst a number of other areas. The midbrain also contains the red nucleus, which has been associated with anhedonia. The thalamus consists of different nuclei, several of which are considered part of the reward system and are related to anhedonia. Taken together, it can be said that the study provides moderate support for an association between prayer and reduced anhedonia. All in all, neuroimaging studies provide some evidence for an antidepressant quality of prayer. However, this evidence is very limited given the small number of studies published on this issue and the multitude of possible interpretations of the findings. It appears that much more research is necessary before the current indications can be drawn into a conclusion on the matter.

4. Psychological studies on the relation between prayer and depression

Arguably of more practical importance than investigating hypotheses on the neural mechanisms which may reflect a putative antidepressant effect of prayer is the question whether this hypothesized relationship actually exists. Several studies have investigated the relation between prayer and depression. Maltby, Lewis, and Day (2008) asked 173 adults questions about their frequency, experience, type, and social context of prayer, along with the General Health Questionnaire-28, which also assesses depressive symptoms. Less depression was found in those who prayed together with others, who experienced prayer as a deep spiritual event bringing them closer to God, and who engaged in colloquial, ritual, and meditative prayer. Colloquial prayer was defined by an improvisational style and by asking God for immaterial goods, ritual prayer on the other hand as reciting fixed texts, and meditative prayer as thinking about God and the Bible and as listening to His answers to prayers. Less depression was also related to praying more often and to petitional prayer, which is characterized by asking God for material goods; however, these findings were not significant. Bradshaw, Ellison, and Flannelly (2008) analyzed data of an online survey conducted with 1629 adults in 2004, including questions about prayer frequency, perception of God, and the Symptom Assessment-45 Questionnaire, which assesses depression and other forms of psychopathology. Although the authors did not report a corresponding assessment of significance, a weak relation between frequent prayer and less depression was observed. However, they also computed two regression models attempting to predict depression from the frequency of prayer and the perception of an either loving or distant God. The models were controlled for religious attendance, social support, atheism, and several demographic variables. In both models, they observed a weak relation between a higher frequency of prayer and more depression. Participants who perceived God as less loving and more distant were also found to be more depressed. Furthermore, the positive relation between prayer frequency and depression was strongest when God was perceived as less loving. The observation that more praying is associated with more depression appears to stand in contrast with the results of the previous study. However, as Bradshaw et al. (2008) also observed that frequent prayer was related to less depression when they analyzed the raw data, the fact that the regression models were controlled for a number of variables may explain the difference in findings. The notion that more prayer is related to less depression may suggest that praying counters depression, in the same way as a depressive effect of prayer may be inferred when praying more is associated with more depression. However, as both studies were correlational, the reverse may also be true, namely that depression influences praying behavior, and it is even possible that no direct causal link between the two variables exists. Because of this ambiguity, correlational studies can hardly provide arguments to whether prayer exerts an antidepressant effect. Just as to be able to draw conclusions on the effects of religion and spirituality in general on health, well-being, and longevity, different research designs are needed to clarify this matter. Lindenthal, Myers, Pepper, and Stern (1970) conducted a longitudinal study, in which 938 adults were interviewed twice, at the beginning and at the end of a two-year period. During the first interview, the participants were asked questions about their mental health and church attendance. The second interview assessed the presence of different life events during the past year which the authors labeled "crises", and included questions about a change in attendance at the time of crisis and about an engagement in prayer at the time in order to ask for help with the crisis. The authors reported that participants turned to prayer in response to crisis and that the worse their mental health was the more they did so. Interestingly, they reported a reversed relationship for church attendance: in times of crisis,

participants attended less, and the more psychiatric symptoms they had, the less they attended. It needs to be mentioned that the study has significant limitations. First, no statistical tests were reported, and it is questionable whether hypotheses were even formally tested. Therefore, it is not possible to confidently draw conclusions from this study. Second, the so-called life crises included events like getting married and a child starting in school. Even though the authors referred to two external studies on stress and crisis on which the list of events was partially based, it seems reasonable to doubt the validity of these events as criteria for life crisis. However, several subcategories of events did not seem to include items which could be generally associated with joy and these categories also seemed to follow the general trends observed with regard to prayer, for which they were reported. The inclusion of questionable items as crisis events may therefore not have been a substantial issue, at least in the context of prayer. Regardless, the assessment of mental health included several psychiatric symptoms and was not limited to depression, and no assessment of mental health was conducted during the second interview, which would have allowed a comparison including the role of prayer; these factors further impair the ability to draw inferences from this study regarding the putative antidepressant effect of prayer. Also, prayer frequency was not directly investigated. Participants were asked: “When (specific event) occurred, did you pray for help in meeting crisis?” Although it may seem unlikely, it is possible that participants did not indeed pray more in response to crisis but rather shifted the focus of their prayers accordingly. However, in spite of the limitations and the restraints of comparability, the study still suggests that a relation between frequent prayer and more depression may be attributable to a behavioral consequence of the mental condition rather than to a depression-inducing effect of prayer. Ai et al. (2010) conducted a prospective study investigating the influence of several religious variables on the post-operative condition of patients undergoing open-heart surgery. A preoperative assessment included questions about the perceived importance and benefit of prayer, and about the intention to pray in order to deal with the side-effects of the surgery. Preoperative depression was assessed with the Center for Epidemiologic Studies Depression Scale, which was also part of the follow-up survey 30 months after surgery. Based on the data of 292 patients and after controlling for several demographics, medical comorbidity, cardiac condition, preoperative depression, perceived social support, and other variables, patients with more favorable attitudes towards and a higher intention to engage in prayer were found to exhibit less postoperative depression. It should be noted that the authors did not assess actual engagement in prayer and that it is not certain whether praying can be derived from the variables measured. Also, the feeling of reverence during prayer and other religious activities was assessed before surgery and found to be predictive of more postoperative depression. Measures of private and subjective religiosity, both seemingly related to prayer, were included in the preoperative assessment as well but were not found to be significantly related to depression after surgery. Despite the methodological concerns and additional findings, however, the study still provides support for an antidepressant effect of prayer.

5. Conclusion

Taken together, there is some evidence for the hypothesis that prayer counters depression. This evidence, however, is limited and needs further investigation. Given the current findings, it seems likely that if depression is affected by prayer, this influence rather is of positive than of negative nature. As such, prayer appears to fit well as a mediator into the notion of a beneficial influence of religion and spirituality on health, well-being, and longevity. Although

future studies with well-engineered research designs are crucial to deepen our understanding of the matter, this essay mildly encourages the engagement in prayer, as it appears to be of benefit to the individual.

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