Beyond the Socially Desirable: Longitudinal Evidence on Individual Prayer-Wellbeing Associations

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ABSTRACT

The often touted positive association between religion and wellbeing is mainly based on evidence from cross-sectional studies. This is problematic because such studies tend to draw conclusions at the individual level despite reporting associations at the group level. In addition to this fallacy, inferences at the group level are also likely to be inflated by the social desirability effect, which may further exacerbate misrepresentations of the individual level. To avoid these pitfalls, we examined prayer-wellbeing (P-WB) associations and social desirability effects at both levels, using single-level and multilevel regression analysis on a longitudinal dataset. Weekly reports of prayer and wellbeing from 282 frequently praying Danish Christians, totaling 4254 complete responses, were combined with a comprehensive background questionnaire featuring a social desirability measure targeting the religious domain.

A typical weak positive P-WB association was observed at the group level, which disappeared when controlling for social desirability. At the individual level, the average association across individuals was positive after controlling for social desirability. This overall relationship, however, conceals considerable individual variance with almost a fourth of the estimated individual P-WB associations going in the negative direction, emphasizing the need to be cautious when extrapolating group-level data to the individual level. These findings suggest that cross-sectional studies may oversimplify the P-WB relationship, especially, if the social desirability effect is ignored.

Introduction

Religion and wellbeing research is one of the most prolific areas in the study of religion. Although findings are inconsistent, the majority of studies seem to support a positive association between religion and various subjective wellbeing measures, e.g., more happiness (Lewis & Cruise, 2006), less depression (Smith et al., 2003), greater life satisfaction, positive affect, and higher morale (Koenig & Larson, 2001). The cross-sectional (C-S) study design is now the primary tool of inquiry, replacing the introspective methods of the early psychologists of religion. Surveys and scales are not only easy to administer, the resulting quantitative data analyses also offer superior reliability over individual assessments, and thus appears to be a logical improvement. Reliability, however, is not the same as valid interpretations. Wellbeing effects can only occur within individuals, which means in order to claim wellbeing effects, researchers ought to repeatedly measure their variables of interest within individuals. Nonetheless, it has been common practice to report associations

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between individuals as evidence of mental health effects of religion (Banthia et al., 2007; Ellison et al., 2001; Maltby et al., 1999; Nooney & Woodrum, 2002; Poloma & Pendleton, 1991). This practice introduces a discrepancy between the question asked and the answer given due to an underlying assumption that correlations between individuals may validly substitute correlations within individuals. The practice was first described by Robinson in 1950 (Robinson, 1950) and later termed “the ecological fallacy” (Selvin, 1958). Surely, similar correlations can occur at different levels, but Robinson showed that they might just as well go in opposite directions. In other words, prayer-wellbeing (P-WB) associations between individuals might be positive, but mathematics suggests the associations within individuals could be in any directions because the two levels are independent of each other. Thus, the only reasonable assumption about correlations at different levels is that they are almost certainly not equal. Consequently, it is paramount that researchers measure variables at the actual level of interest. This could largely be accomplished by conducting longitudinal studies and performing analyses on individual variables such as the coefficients of individual religion-health associations, e.g., whether praying more or less than usual is associated with changes in wellbeing.

Few religion-wellbeing studies have used longitudinal data (not including clinical intervention studies with pre- and post-measures)(Altizer et al., 2014; Andersson, 2008; Fitchett et al., 1999; Hui et al., 2015; Kashdan & Nezlek, 2012; Keefe et al., 2001; King et al., 2007; Kivelä et al., 1996; Krause & Hayward, 2013; Nguyen et al., 2010; Ronneberg et al., 2016; Sun et al., 2012). Most consist of only two or three time points measured several months or years apart. This is not a limitation per se, but it provides a poor basis for examining individual associations. In addition, at least two studies obtain 5–6 measurement points (Altizer et al., 2014; Sun et al., 2012), and two studies obtain 14 and 30 measurements, respectively (Kashdan & Nezlek, 2012; Keefe et al., 2001). These last two studies find overall positive associations between spirituality and wellbeing measures, but both fail to provide information on the variation in individual relationships, e.g., on how many individuals that showed a negative relationship. These longitudinal studies improve on cross-sectional designs. Kashdan and Nezlek (2012), in particular, open for the prospect of establishing the causal relationship between spirituality and wellbeing using hierarchical linear models. To our knowledge, no longitudinal studies have yet reported the variance in individual-level associations between religion and wellbeing measures.

In light of “the ecological fallacy” one might ask why so many C-S studies do find a positive religion-wellbeing association at the group level (Koenig, 2001). One general explanation may be the well-known publication bias toward positive findings in social science (Mlinarić et al., 2017), while a narrow explanation may be related to the combination of single measurements and self-report in C-S analyses. Self-reports tend to be biased in the direction of what is socially desirable. The social desirability effect is a general problem in self-report measures, especially, in the context of intimate and personal questions pertaining to sexual and political orientations and religiosity. Indeed, social desirability has been found to inflate the self-report measures of both subjective wellbeing and religiosity (De Oliveira Maraldi, 2018; Jones & Elliott, 2017). Measuring two constructs at the same time, which are both subject to social desirability effect, is likely to introduce a bias in C-S-data. Nevertheless, social desirability effects are rarely measured and controlled for (De Oliveira Maraldi, 2018), leaving open the possibility that social desirability is the third variable which explains a typical weak, but positive association between religion and wellbeing at the group-level.

Social desirability effects may be controlled by using existing scales designed to probe the tendency to exaggerate one's personal religiosity as well as health. The Indiscriminate Proreligiousness Scale (ProRel), for example, was developed in 1987 and correlates with the Marlowe-Crowne social desirability scale (Pargament et al., 1987), but ProRel is stronger associated with scores on religious variables like Allport's Intrinsic-Extrinsic religion orientations, orthodoxy, and behavioral measures as prayer frequency and church attendance. It also correlates with mental health variables such as Rosenberg’s self-esteem scale, behavioral attributes of psychosocial competence and sense of self-efficacy with only
slightly smaller strength than the Marlowe-Crowne social desirability scale (Pargament et al., 1987). However, ProRel is rarely used in C-S studies.

Another way of abating the social desirability problem is to focus on individual variance in longitudinal data. Participants’ desire to exaggerate their religiosity and health becomes less important in longitudinal data because positive or negative associations between religion and wellbeing over time (individual slope coefficients) can be demonstrated irrespective of any tendencies to score high on scale values (individual mean levels).

Present study

In this study, we investigate the relationship between religion and health on both group and individual levels by using single-level and multilevel regression methods on a longitudinal dataset. Weekly reports of prayer and wellbeing from 282 frequently praying Danish Christians, totaling 4254 complete responses, were combined with a comprehensive background questionnaire featuring the ProRel scale (see Methods). Life satisfaction, positive feelings, and happiness items were used as our wellbeing measure in line with previous research. Prayer frequency was used as our religiosity measure. Prayer frequency is a dimension that has been studied extensively over the last decades, but it is easily problematized by its simplistic nature. Prayer frequency ignores variabilities in prayer content, behavior, and intention, which have all been associated with wellbeing measures (Ai et al., 2002; Krause & Hayward, 2013; Ladd & Spilka, 2006; Laird et al., 2004; Poloma & Pendleton, 1991). In this study, however, our ambition is not to investigate the complex nature of prayer psychology, which would require a multidimensional measure of prayer, but instead to explore the problems and possible solutions in Prayer-wellbeing research. Praying and prayer frequency, in particular, is well suited for longitudinal analysis, because it tends to vary more in individuals over time than other commonly used measures of religion such as subjective religiosity (e.g. self-rated religiosity and salience), modes of religiosity (intrinsic, extrinsic, quest) and organizational religious activities (e.g., church attendance and other church-related activities). Focusing on prayer frequency allows us to examine the theoretical question whether individuals who pray more than usual are associated with an increase or decrease of reported wellbeing, possibly, despite group averages to suggest the opposite.

Method

Sampling

In order to analyze the relationship between prayer and wellbeing in praying practitioners, we recruited a sample of adult Danish Christians with regular prayer activities, who were willing to respond to our questionnaire once a week over several months. To obtain a dedicated sample, who would commit to completing the study, we turned to a purposive sampling method in which personal contact and distribution of flyers were used at events expected to include a high concentration of Christians with active prayer lives, e.g., Bible camps, Christian festivals, prayer meetings in different churches, and Danish Christian Facebook groups.

Design

The study consisted of three smartphone-enabled questionnaires administered via e-mail in the following order: (1) a brief sociodemographic questionnaire (2) a longitudinal weekly questionnaire and (3) a comprehensive background questionnaire. The weekly questionnaire was administered until we had obtained 20 weeks of data for each participant. After completion, they were compensated with either a gift card worth a 100 Danish kroner or the same amount of money donated to a Christian charity organization called IMPACT worldwide. In addition, they could choose to receive a report of the study results. We enrolled new participants beginning in summer 2014 until summer 2015.
The sociodemographic questionnaire

The sociodemographic questionnaire recorded gender, age, income, and occupation among other things. Due to the heightened risk of drop out in longitudinal studies and due to the importance of basic sociodemographic data, we administered this questionnaire along with the first of the weekly questionnaires, instead of including it in the background questionnaire.

The weekly questionnaire

The longitudinal prayer and wellbeing variables were part of an 18 item weekly questionnaire (for a list of all 18 items, see S1). Participants were invited to answer the questionnaire every Tuesday morning. Those who failed to respond within the first 24 hours received a reminder. Fifty hours after the initial invitation we closed the data collection of the week. The prayer item was phrased: “The number of times I’ve been praying a free, personal prayer is approximately … (Since my last response, however maximum within the last seven days)” and response options were pre-coded in 12 intervals of five prayers with the upper and lower exceptions of 0 prayer and >50 prayers. Thus, for all the analyses, the prayer variable consists of a single frequency item coded with higher scores indicating a higher frequency.

The wellbeing variable was construed as the mean score of three Likert-scale items (“I feel satisfied with my life these days,” “I feel happy these days,” and “I predominantly have positive feelings these days”). Response options ranged from 0 (“not at all like me”) to 9 (“very much like me”). Prayer and wellbeing comprise our level 1 variables in our multilevel regressions because they constitute our lowest (most detailed) level of measurement by varying within individuals.

The background questionnaire

Pargament, who developed the ProRel scale, has described indiscriminate proreligiousness as a “tendency to respond to religious material in an implausible positive manner” (Pargament et al., 1987). Without distinction, people with this tendency evaluate all religious beliefs, experiences, and practices in a favorable manner, hence the term “indiscriminate proreligiousness.” The ProRel scale consists of two sub-scales; one relating to the congregational domain and the other relating to the domain of personal religiosity. Due to issues with the length of the background questionnaire, we only included the latter, which consists of 12 true or false questions constructed in a way that makes affirmative answers very unlikely to be true. For example, “I never disobey the teachings of my faith” or “Sometimes I feel that the teachings of my religion ask too much of me.” (Reverse scored) (Pargament et al., 1987). The possible range of scores is 0–12 with high scores indicating a more indiscriminate view. ProRel is our level 2 variable in our multilevel regressions because it constitutes our highest (least detailed) level of measurement by varying only between individuals. In addition to ProRel, we included both customized items and scale measures for other study purposes, including the Big Five personality traits (NEO-PI-R) (McCrae & Costa, 2007), Need for closure (NFC) (Roets & Van Hiel, 2011), Locus of Control (LOC) (Rotter, 1966), Tellegen’s Absorption Scale (TAS) (Tellegen & Atkinson, 1974; Zachariae et al., 2000), Orthodoxy (from the Post-Critical Belief Scale, Duriez et al., 2007), Avoidant/Anxious attachment styles (Fraley et al., 2011), and meaningfulness/meaninglessness (Pedersen et al., 2018).

Ethics

The study was registered under the Danish Data Protection Agency which accepted our procedures for participant security, including anonymization of personal data (#2014-41-3341). The participants were given detailed information about the study in a written format, and written informed consent was given in the form of participants’ name and/or e-mail address. Deregistered participants with more than one weekly response were offered compensation.

Data availability

Find the data here: https://osf.io/na7m4/?view_only=c0f77b89a65247efa0b977aad4b36d79
Data analysis

Following the tradition in religion-wellbeing research, which predominantly has focused on the effects of religion on wellbeing, wellbeing is treated as the dependent variable in our analysis, even though the authors suspect that wellbeing also affects religious practice.

Group-level analysis: single-level regressions

For all group-level analyses, we used individual participant means of prayer and wellbeing measures. First, we calculated Pearson’s correlation coefficient between ProRel and participant means of wellbeing and prayer in our sample. Then, we modeled the prayer-wellbeing association between individuals by regressing wellbeing on measures of prayer (Model 1) and finally we controlled for ProRel (Model 2). In Model 1 and 2, the prayer variable was centered on the median of all responses (11–15 weekly prayers).

Individual-level analysis: multilevel regressions

We fitted three linear multilevel models to model prayer-wellbeing associations within-individuals, conceptualizing the data as hierarchically nested, i.e. weeks nested within individuals. All models allowed for a random slope and intercept, and in all models, the level 1 variable, frequency of prayer, was added as an individual mean-centered covariate, which makes results interpretable within individuals (Raudenbush & Bryk, 2002).

In Model 3, we modeled wellbeing as a linear effect of the frequency of prayer. In Model 4, we investigated the effect of frequency of prayer on wellbeing by adding the level 2 variable, ProRel, as a covariate to the fixed part of the model. This means that the model only allows ProRel to influence the intercept, i.e. the level of wellbeing within a person. To allow ProRel to influence not only the level of wellbeing but also the slope, i.e. the association between wellbeing and frequency of prayer, we added an interaction term between ProRel and frequency of prayer (Model 5).

In order to examine the effect of attrition, we repeated model 3 only on non-completing participants (S2 Text). Furthermore, in a sensitivity analysis, we tested the effect of time participating in the study on prayer frequency (S3 Text). We did this, because some participants remarked that the weekly questionnaire worked as a reminder for their prayer practice.

All models were checked by visual inspection of residual plots, and for the linear mixed models, we also checked the distribution of intercepts and slopes (Rabe-Hesketh & Skrondal, 2012; Raudenbush & Bryk, 2002). We checked the assumption of linearity by examining individual participant plots of wellbeing against prayer. For the statistical analyses, we used R 3.2.4, R Studio 0.99.878 and the following packages: lme4, lmerTest, stats, and ggplot2 to perform linear mixed models and to make graphs with results.

Response rate

We recruited 356 participants and 284 responded to at least one questionnaire. Of the 284 respondents, 88.7% (N = 252) replied to the sociodemographic questionnaire and 65.6% (N = 186) responded to the background questionnaire. In this questionnarie, 60.2% (N = 171) of participants responded 20 times to the weekly questionnaire (or 21 times due to an error), 9.9% (N = 28) responded to 11–19 questionnaires, 29.2% (N = 83) responded to 1–10 questionnaires, and finally, 0.7% (N = 2) did not respond to any of the weekly questionnaires. Participants with more than one response to the weekly questionnaire were included in the prayer-wellbeing analyses (282 participants, providing a total of 4254 complete weekly reports) (Figure I).
**Results**

**Sample characteristics**

Our sample included 163 women, 89 men, and 32 individuals who did not report their gender. Their age ranged from 18 to 79 years ($M = 37.61$, $SD = 16.38$) and was skewed toward younger participants with the typical participant being 23–24 years old. The ProRel sample mean was 5.25 ($SD = 2.50$) with scores ranging from 0 to 11. The group mean of wellbeing was 5.78 ($SD = 1.52$), and individual participant means for wellbeing ranged from 1.03 to 8.93 and their standard deviations from 0.19 to 3.24 (excluding participants with only one response). The most commonly observed prayer frequency was 6–10 prayers a week. The distribution of prayer responses skewed toward the lower end, but with a long tail and a ceiling effect. Participant means ranged from 0.4 to 11 (an average of 11 indicates more than 50 prayers every week) with some participants reporting the same amount of prayer every week and others using most of the spectrum. In other words, participants demonstrate considerable variance in both individual means and individual variation for prayer frequency (Figure IIa).

**Group-level analysis: associations between individuals**

As expected, we found ProRel to be significantly and positively correlated with individual means of both prayer ($r = 0.19$, 95% confidence interval (CI) = [0.04; 0.32]) and wellbeing ($r = 0.24$, 95%
CI = [0.10; 0.37]). Regressing wellbeing on prayer resulted in a statistically significant and positive association (0.11, 95% CI = [0.04; 0.18]) (Table 1). This means that comparing two participants with a difference of one unit in prayer practice (1 unit = 1–5 prayers), the one with the higher score would on average score 0.11 point higher on our wellbeing scale. Since the analysis compares people with different levels of prayer and wellbeing, the result can support neither the contention that individuals who increase their amount of prayer will also increase their level of wellbeing nor the other way around. Because we centered the prayer variable on the median, the intercept in Model 1 tells us the estimated level of wellbeing is 5.72 (95% CI = [5.54; 5.90]) for a person who at average prays 11–15 times a week. Including ProRel in Model 2 made the intercept drop to 5.20 (95% CI = [4.74; 5.65]),

Table 1. Group-level associations (single-level regression).

<table>
<thead>
<tr>
<th></th>
<th>Model 1 (N = 282)</th>
<th>Model 2 (N = 186)</th>
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<tbody>
<tr>
<td>Wellbeing (95% CI)</td>
<td>Wellbeing (95% CI)</td>
<td></td>
</tr>
<tr>
<td>Intercept</td>
<td>5.72 (5.54; 5.90)</td>
<td>5.20 (4.74; 5.65)</td>
</tr>
<tr>
<td>Prayer</td>
<td>0.11 (0.04; 0.18, ( p = .004 ))</td>
<td>0.05 (−0.04; 0.13, ( p = .291 ))</td>
</tr>
<tr>
<td>ProRel</td>
<td>0.12 (0.05; 0.20, ( p = .002 ))</td>
<td></td>
</tr>
</tbody>
</table>
which is then the estimated level of wellbeing for a person who at average prays 11–15 times a week and has a ProRel score equal to zero. The model further revealed a statistically significant and positive association between ProRel and wellbeing (0.12, 95% CI = [0.05; 0.20]). Importantly, including ProRel rendered the association between prayer and wellbeing non-significant (0.05, 95% CI = [−0.04; 0.13]).

**Individual-level analysis: associations within individuals**

Model 3 showed that participants at their individual mean level of prayer on average had a wellbeing score of 5.77 (95% CI = [5.60; 5.95]) (Table 2). It also showed that an increase of one prayer unit on average was associated with a weak but statistically significant increase in wellbeing within individuals (0.07, 95% CI = [0.01; 0.13]). Although the confidence interval implies that we can be fairly certain that the mean level of individual P-WB associations is higher than zero, we find that the estimated individual slopes ranged from −0.56 to 0.8. In other words, a significant number of participants showed negative P-WB associations (Figure IIb and c). Based on this observation, we decided to explore the individual P-WB associations by splitting the sample into subgroups with negative (lower 25% (≤−0.008)), weak or neutral (middle 50% (−0.008 < x < 0.131)), and positive (upper 25% (≥0.131)) P-WB coefficients in order to profile them on the trait dimensions collected in the background questionnaire. In this exploratory and uncorrected analysis, the subgroups revealed similar scores on most trait dimensions. Only three out of 14 dimensions revealed significant differences (for a plot with all comparisons, see supplementary material, S4). Notably, we found that participants with positive P-WB associations scored lower on our social desirability measure (ProRel) compared to participants with negative P-WB associations (p = .0092) (Figure IIId).

When social desirability (ProRel) was entered in Model 4, the intercept dropped as the reference person became someone at their mean level of prayer, but with a ProRel score on 0. In Model 4, ProRel was significant and positively related to wellbeing (0.13, 95% CI = [0.05; 0.21]). Unlike the group-level model, this time the effect of prayer remained significant (0.09, 95% CI = [0.02; 0.16]) after controlling for ProRel.

When we allowed ProRel to influence not only the level of wellbeing but also the association between wellbeing and prayer (Model 5), we observed a weak, significant, and negative interaction (−0.03, 95% CI = [−0.06; −0.001]), meaning that higher scores on ProRel were associated with the lower effect of prayer on wellbeing. Note that this interaction is also reflected in the observed link between P-WB associations and ProRel in our subgroup analysis (Figure IIId). For illustrative purposes, we calculated predictions of P-WB associations for participants with the lowest and highest possible ProRel scores as well as one and two standard deviations from the mean (see S5). The prayer coefficients for individuals with a ProRel score at zero were predicted to be 0.25 (95% CI = [0.09; 0.41]), whereas individuals with a maximum ProRel score were predicted to have negative coefficients at −0.08 (95% CI = [−0.24; 0.08]). The ProRel coefficient itself remained constant across Model 4 and 5. Note that the estimated interaction effect was weak. Whether this effect has any practical significance for the average participant is a valid question (see Discussion).

<table>
<thead>
<tr>
<th>Table 2. Average individual-level associations for fixed effects (multilevel regression).</th>
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<tr>
<td><strong>Model 3</strong> (N = 282; n = 4254)</td>
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<tr>
<td>Wellbeing (95% CI)</td>
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<td>-------------------</td>
</tr>
<tr>
<td>Intercept</td>
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<tr>
<td>Prayer</td>
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<tr>
<td>ProRel</td>
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<tr>
<td>Prayer*ProRel</td>
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</tbody>
</table>

N is the number of included participants; n is the number of observations.
To compare the models, we used likelihood ratio test. This requires the same participants to be included in all three models, and thus we had to repeat model 3, including only participants with available ProRel scores. Following this procedure we found Model 4 to be a significantly better fit to the data than model 3 ($p = .001$) and model 5 was a significantly better fit to the data than model 4 ($p = .02$).

**Model control**

Histograms of individual intercepts and slopes did not reveal any major deviance from the normal distribution as judged by qq-plots and histograms. We found a very small statistically significant effect of time on prayer ($0.01, p = .03, 95\% CI [0.001; 0.03]$), meaning that on average, each additional response from a participant was associated with a 0.01 increase in prayer frequency (remember 1 unit is 1–5 prayers). However, we think it fair to say there was no practical significance in time.

**Discussion**

In this study, we probed the religion-wellbeing link on both group and individual levels by analyzing cross-sectional data and longitudinal data on prayer frequency and wellbeing. We find evidence to suggest that positive prayer-wellbeing ($P$-$WB$) associations commonly observed at the group level may be artifacts of a social desirability response bias: Controlling for social desirability (ProRel) a weak positive association becomes insignificant. At the individual level, however, we do find an average positive but weak $P$-$WB$ association, which hardly seems to be affected by social desirability and maintains its significance after controlling for indiscriminate proreligiousness. Generally, if participants pray more than usual (above their own average) we find a small positive change in wellbeing, irrespective of their average prayer frequency. Thus, it may not matter as much whether a person normally prays 5 or 50 times a week, as cross-sectional (C-S) studies would suggest. Note, that prayer frequency is a simplistic measure, which ignores important dimensions of prayer including content, behavior, intention, which have all been associated with wellbeing (Spilka & Ladd, 2013). Note also, however, that a fourth of the participants appear to demonstrate negative associations. In other words, for a substantial number of participants praying more than usual is associated with reduced wellbeing. This insight is theoretically interesting because prayer frequency so often has been associated with wellbeing in C-S studies. Yet, the direction is far from straightforward at the individual level.

Why some people report positive associations while other people report negative associations is an important question. In religion-wellbeing research, there is a general tendency to view religion as beneficial. Positive $P$-$WB$ associations are often interpreted as evidence that prayer promotes wellbeing. Negative associations, on the other hand, are interpreted as a healthy response to distress. We find both positive and negative associations, which suggest that both of these explanations may be true. It is also possible, however, that prayer is not beneficial. For some people praying may reduce wellbeing, and it is also perfectly plausible that reduced wellbeing may reduce prayer activity. Theoretically, an individual could go through several causal $P$-$WB$ relationships within short time, e.g., by distress leading to prayer, then prayer decreasing distress, then thanking God for the decreased distress. Prayer psychology is a complex phenomenon with multiple factors likely to influence the relationship between wellbeing and prayer, including individual trait profiles (e.g., personality traits and attachment styles).

We find evidence to suggest that negative $P$-$WB$ slopes are associated with a tendency to exaggerate one’s own religiosity, as measured on the indiscriminate proreligiousness scale (ProRel) (Figure 1Id and Table 2, model 5). Participants with more realistic self-reported accounts of their own religiosity show more positive $P$-$WB$ associations, even though they report lower average levels of wellbeing (corresponding to the kind of data used in cross-sectional data analyses). For participants with a tendency to exaggerate their own religiosity, we see the opposite pattern: As social
desirability scores increase, P-WB associations level off and tip to the negative side, despite the apparent desire in those participants to report a high prayer frequency and a high level of wellbeing. We see two possible explanations for this perplexing image. First, participants who refuse to admit any failings in the religious domain may have trouble honestly reporting decreases in prayer frequency in response to mood changes and as a consequence display weaker or negative P-WB associations. On the other hand, participants, who are willing to admit they fall short of their religious ideals at times, may also be more willing to admit that they pray less when they feel bad. Second, people who refuse to take a critical look at their own religiosity may, in fact, benefit less from prayer. Pargament argues (Pargament, 1997) that social desirability, as measured by the indiscriminate proreligiousness scale (ProRel), may hamper the individual’s ability to cope in situations that calls for religious change, because they ignore the negative side of religion. Again, it should be stressed that the interaction effect is weak and that we did not anticipate the observed interaction before the study. Clearly more studies will be needed to confirm its existence.

Limitations

There are several limitations to consider for the present study. First, we find an overall weak, positive prayer-wellbeing association (group level = 0.11 and individual level = 0.07 without social desirability control). In both cases, a one-unit increase on the prayer scale corresponds to an increase of approximately 1% on the 10-point wellbeing scale. Although previous group-level studies have reported similar effect sizes as evidence of a positive association (Bradshaw & Ellison, 2010; Ellison et al., 2009), whether these associations have any practical significance is open to debate.

Second, compared with cross-sectional datasets, longitudinal data are difficult to come by because they often require dedicated groups of participants who are willing to invest considerable time and energy and likewise for the researcher. Recruiting our participants not only required extensive sampling efforts, but it also required continuous enrollment and extensive administration that followed. Several issues of validity follow from our longitudinal design; (1) Our requirements for participation, e.g., time and energy, may have resulted in a subgroup of our population, which could have affected our results and thus the generalizability of the study; (2) Participation in longitudinal studies may change the behavior of respondents. Several participants remarked they were happy to participate because the weekly questionnaire reminded them to pray. We did find a slight increase of prayer frequency over the course of participation, but the effect size seemed to be of no practical significance (S3 Text); (3) Since we collected responses at a set time interval every week, as opposed to random sampling throughout the week, participants’ weekly routines might have put them in a particular mood every time they responded to the questionnaire (Podsakoff et al., 2003). A temporally random sampling could abate such a recall bias, but this would introduce other problems related to the assessment of prayer frequency and wellbeing. Relatedly, whether weekly measurements are the ideal temporal resolution to capture P-WB associations over time is another question. Daily measurements might reveal other patterns of associations; (4) The amount of effort required of the participants to complete the study may have resulted in an attrition bias. For example, those who dropped out may have had different prayer-wellbeing associations (S2 Text).

Third, we customized our questions to a specific sample of Christian practitioners, which denies us the possibility of generalizing broadly to larger populations. Indeed, we will let other scholars of prayer decide, whether our sample, data, and results can be extended to their population of interest. Our study, however, illustrate the problem of social desirability in religion-wellbeing research, and our analysis suggests that this problem may be abated by obtaining and analyzing longitudinal data.

Conclusion

The present study provides two important contributions to prayer-wellbeing research. First, the results challenge the idea that positive associations between prayer frequency and wellbeing are well
established by showing that the typical weak, positive prayer frequency-wellbeing association disappears when controlling for social desirability. Second, we analyze, for the first time, the coefficients of the individual P-WB slopes based on longitudinal data. Unlike previous research, which draws conclusions at the individual level despite reporting associations at the group level, we report associations at the individual level, to avoid this ecological fallacy. We find a weak, average, positive P-WB association persisting control for social desirability, but this overall association conceals both positive and negative individual associations. This diversity calls for in-depth analyses of the many factors that may contribute to these individual associations. For example, we found an unexpected effect of social desirability to suggest that people’s tendency to exaggerate their own religiosity may explain part of the variation. Investigating the individual P-WB slopes seems to be a considerable improvement over analyses that focus on group means, if the aim is to study the intricate relationship between prayer activity and wellbeing in individuals.

Acknowledgments

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Disclosure statement

No potential conflict of interest was reported by the authors.

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