

# Adolescents' Spirituality and Cystic Fibrosis Airway Clearance Treatment Adherence: Examining Mediators

Daniel H. Grossoehme,<sup>1</sup> DMin, Rhonda D. Szczesniak,<sup>1,2</sup> PhD, Sylvie Mrug,<sup>3</sup> PhD, Sophia M. Dimitriou,<sup>1</sup> BA, Alec Marshall,<sup>1</sup> and Gary L. McPhail,<sup>1</sup> MD

<sup>1</sup>Division of Pulmonary Medicine, <sup>2</sup>Division Biostatistics and Epidemiology, Cincinnati Children's Hospital Medical Center, and <sup>3</sup>Department of Psychology, University of Alabama – Birmingham

All correspondence concerning this article should be addressed to Daniel H. Grossoehme, DMin, Division of Pulmonary Medicine MLC2021, Cincinnati Children's Hospital Medical Center, 3333 Burnet Avenue, Cincinnati, OH 45229, USA. E-mail: daniel.grossoehmc@cchmc.org

Received September 21, 2015; revisions received March 4, 2016; accepted March 5, 2016

## Abstract

**Objective** Adolescent cystic fibrosis (CF) treatment adherence is a significant multidimensional issue. Using the Theory of Reasoned Action (TRA), this study examined the role of spiritual factors in adherence. **Methods** Forty-five 11–19-year-olds diagnosed with CF completed questionnaires concerning psychosocial, spiritual, and adherence-related constructs and Daily Phone Diaries to calculate treatment adherence. Exploratory Factor Analysis identified two spiritual factors used in subsequent analyses. The mediating roles of attitude toward the treatment's value (utility), subjective behavioral norms (the product of perceived behavioral norms and one's motivation to comply with them), self-efficacy for completing the treatments and treatment intentions in the relationship between spiritual factors and treatment adherence were tested with path analysis. **Results** Lower 'spiritual struggle' and greater 'engaged spirituality' predicted treatment attitude (utility) and subjective behavioral norms, which, together with self-efficacy, predicted treatment intentions. Finally, treatment intentions predicted airway clearance adherence. **Conclusions** Findings were consistent with the TRA. Engaged spirituality supports pro-adherence determinants and behavior. Spiritual struggle's negative associations with outcomes warrant screening and intervention.

**Key words:** adherence; adolescent; cystic fibrosis; Theory of Reasoned Action.

Cystic fibrosis (CF) is a genetic, life-shortening disease requiring a significant daily treatment routine (Modi et al., 2006). Adherence to prescribed evidence-based therapies slows disease progression, and yet, adherence remains low and variable (36–90%), depending on modality and data collection methods (Ball et al., 2013; Modi et al., 2006). These rates are consistent with the poorest treatment adherence among adolescents with chronic diseases and point to the need to better understand factors that contribute to treatment adherence in this population of youth. Numerous barriers to treatment adherence have been identified

(Modi & Quittner, 2006), some of which occur across disease populations (e.g., forgetting) and some of which are disease specific (e.g., time management in CF).

Overcoming barriers to treatment completion, and the stressor of a chronic disease, requires coping. An important coping method for adolescents with chronic illness is spirituality (Benore, Pargament, & Pendleton, 2008). The role of spirituality in treatment adherence among youth has been addressed by only one study, which found an association between positive spiritual coping and better adherence to

antiretroviral medication among pediatric patients with HIV (Park & Nachman, 2010). Two spiritual factors may be related to treatment adherence in youth with CF—spiritual coping and sanctification of the body (Grossoehme, Opipari-Arrigan, VanDyke, Thurmond, & Seid, 2012; Mahoney et al., 2005). Spiritual coping is defined as “a search for significance, in ways related to the sacred, in times of stress” (Pendleton, Cavalli, Pargament, & Nasr, 2002), and represents a unique way of coping distinct from nonreligious coping (Burker, Evon, Sedway, & Egan, 2005). Spiritual coping has several components, including positive and negative spiritual coping (Pargament, 1997). Positive coping styles refer to relying on a secure attachment to God, finding meaning in life, and being spiritually connected to others. Negative coping style refers to a lack of secure attachment to God, spiritual struggles, and difficulties finding meaning in life. The terms “positive” and “negative” reflect the association of these styles of spiritual coping with positive or negative health outcomes, rather than the nature of coping styles themselves (Pargament, 1997).

In addition to negative and positive spiritual coping, Pargament (1997) has identified spiritual coping styles used for problem-solving to gain control of a stressor. These include Collaboration, in which one believes himself/herself to be solving the problem in partnership with the Divine; Passive Deferral, in which resolution of the problem is left to the Divine; Pleading, in which Divine assistance is sought through prayer or other means of communication; Self-Directed Coping, in which responsibility for problem-solving remains with the individual rather than with the Divine; and Active Surrender, in which a person, having reached the limit of those aspects of the stressor he/she can control, leaves its resolution up to the Divine. Collaborative spiritual coping is included as one of the positive coping styles based on prior research (Pargament, Smith, Koenig, & Perez, 1998); the remaining styles of problem-solving coping are typically not included in the positive or negative spiritual coping constructs or scales (Pargament, 1997). In prior research, positive spiritual coping was associated with more stable trajectories of pulmonary function, nutrition status, and fewer hospitalizations among adolescents with CF (Reynolds et al., 2014), possibly reflecting better adherence behaviors. In addition, parents of children with CF who endorsed using negative spiritual coping were among the least adherent to their child's prescribed therapies (Grossoehme et al., 2015). The odds of an adolescent with CF using a form of negative spiritual coping were found to decrease by 24% for every 1% increase in their pulmonary function (FEV<sub>1</sub>: forced expiratory volume in 1 s, expressed as a percentage of what is predicted for their age and

gender) (Grossoehme, Szczesniak, McPhail, & Seid, 2013).

Sanctification of the body is defined as imbuing one's body with divine significance and has been associated with pro-healthy behaviors among college students (Mahoney et al., 2005). Sanctification of the body is measured with two dimensions, one using concepts common to monotheistic faiths and one more broadly spiritual. Body sanctification has been measured in adolescents with CF, with values similar to those reported by parents of children with CF (Grossoehme, VanDyke, & Seid, 2008). However, no studies have examined the relationship between body sanctification and treatment adherence among adolescents with chronic disease, suggesting it is an underused and underappreciated construct. However, parents of children with CF who sanctified their child's body were among the most adherent to their child's prescribed treatments (Grossoehme et al., 2015). It is possible that adolescents who viewing their body as having divine significance may also engage in better self-care.

Although spiritual coping and body sanctification have been linked with better health outcomes, and with variables related to treatment adherence, no study has examined a comprehensive theoretical model that would explain how spiritual factors augment treatment adherence. We formulate and test such a model, drawing on a widely used model of health behaviors, the Theory of Reasoned Action (TRA) (Fishbein & Ajzen, 2010). This behavioral model suggests that a health behavior reasonably follows from beliefs a person has about the behavior. According to the TRA, the best predictor of a behavior (in this case, treatment adherence) is one's intention to perform that behavior. In turn, intentions are shaped by three “determinants”: one's attitudes toward the value or utility of the behavior; subjective norms (the product between the perceived norms regarding the behavior by influential others and one's motivation to do what those others expect); and by the degree to which one perceives having control over performing the behavior (self-efficacy). These determinants arise from what Fishbein and Ajzen termed “background factors,” which may include (but are not limited to) age, gender, ethnicity, education, socioeconomic status, and religious/spiritual factors. The background factors that are important may differ for different behaviors. Based on prior work using the TRA with parents of children with CF (Grossoehme et al., 2012), we proposed that spiritual coping and body sanctification contribute positively to beliefs about treatment utility, subjective norms, and self-efficacy, which lead to intentions to perform treatments and, in turn, treatment adherence. In addition, gender and depression were chosen as additional background factors to be

included in the analyses as covariates. Fishbein and Ajzen name these as potentially important influences on behavioral beliefs (Fishbein & Ajzen, 2010); their inclusion in the present study is further supported by research showing that gender differences in the way CF is experienced account for differences in adherence and disease progression among adolescents. The importance of depression for adolescent treatment adherence has also been clearly demonstrated for adolescents with CF (Quittner et al., 2014a, 2014b). The specific aims for this study were (1) to examine how adolescents' spiritual beliefs and coping relate to adherence to their daily CF airway clearance (AC) treatments and (2) to apply the TRA to study factors that mediate the effects of spiritual beliefs and coping on treatment adherence in adolescents with CF. We hypothesized that greater positive and pleading spiritual coping and body sanctification, as well as lower negative and deferring spiritual coping would predict greater utility, subjective norms, and self-efficacy for CF treatments, which in turn would relate to greater treatment intentions and treatment adherence.

## Methods

### Participants

This study was approved by the institutional review board and was carried out at an accredited CF center within a 525-bed academic pediatric medical center in the Midwest. The Center followed approximately 265 children and youth, of which 90 were aged 11–19 years and 81 of whom met the eligibility criteria for this study: English literacy, confirmed CF diagnosis, prescribed AC, not participating in a treatment adherence study, and, following the age range used by Britto and colleagues, aged 11–19 years (Britto et al., 2004). An eligibility letter and study information sheet were mailed to legal guardians of eligible patients ( $N = 81$ ) <18 years of age and eligible patients aged 18 or 19 years containing contact information for questions about the study or to indicate interest in the study. Eligible patients and legal guardians were also approached by study staff in the outpatient CF clinic. An *a priori* recruitment goal, based on a power analysis, was that 45 participants would be required for 80% power to detect changes in association of adherence determinants and adherence behavior of magnitude  $\geq 0.40$ . Eligible participants were approached until the recruitment goal of  $N = 45$  was achieved (54 approached with 9 declined for an 83% participation rate). Participants were aware that they were enrolling in a study of treatment adherence. Informed consent was obtained from the legal guardians of participants <18 years of age and participants aged 18 or 19 years; assent was obtained from all participants.

### Procedure

Participants completed a set of questionnaires at the conclusion of the same clinic appointment when possible. In all cases, questionnaire completion was procured by study staff. In addition to a demographic questionnaire, the scales described below were completed. The scales measuring TRA constructs were worded to be specific to the behavior of interest, which in this case was adherence to prescribed AC treatments. AC was chosen as the focus because it was a part of the treatment regimen for all youth in the study and is one of the most difficult parts of the treatment regimen to keep. Others have also shown (Modi et al., 2006) that only AC and enzymes were prescribed to all children with CF in their sample (e.g., vs. nebulized medications, which were not), and that AC frequency was more variable than enzymes or vitamins. Two Daily Phone Diary (DPD) calls were scheduled with participants during the 3 weeks following questionnaire completion to obtain adherence information. The DPD uses cued recall, in which participants recounted all activities lasting >5 min that they had engaged in during the previous 24 hr. In addition to naming the activity, they also reported duration, companions, mood, and whether the activity was recreational or instrumental. An initial prompt is given to report certain activities that may take <5 min (e.g., taking enzymes). By asking about all activities, the participants are “blinded” to the behaviors of interest, decreasing the likelihood of giving socially desirable responses. Each activity was coded across three increasingly detailed levels of behavioral specificity by a study staff member; the coding was subsequently verified by a second study staff member and discrepancies were resolved by consensus. Activity frequency was averaged over the two DPDs. Therapies prescribed at the clinic visit before questionnaire completion were collected by chart review using a query of the electronic medical record. Adherence was then calculated as the ratio of DPD-reported treatment frequency divided by the prescribed treatment frequency.

### Spiritual Coping

Spiritual coping was measured with the 14-item Brief R-COPE scale (Pargament, Koenig, & Perez, 2000) to which five additional items from the complete R-COPE were added to measure spiritual coping for control by problem-solving (Pargament, 1999). These five additional items were *Collaborative* (“Tried to put my plans into action together with God”), *Deferring* (“Didn’t do much, just assumed God would handle it”), *Active surrender* (“Did what I could and put the rest in God’s hands”), *Pleading* (“Pleaded with God to make things turn out okay”), and *Self-directed* (“Tried to deal with the situation on my own without God’s help”). These problem-solving and control

items were added based on prior research (Burker, Evon, Sedway, & Egan, 2004) that concluded that persons with and without CF use religious or spiritual coping for problem-solving and that they differ in their sense of control and agency in coping with their disease stressors. Their study suggested that the use of self-directed religious coping in particular, rather than Deferring, may be attributable to the self-management skills being taught to persons with CF even in their early years. The Brief R-COPE instructions typically include a cue that makes them situation specific; in this study the cue was, "The following items deal with ways you have coped with your CF." Participants indicated how frequently they used each coping style using a four-item Likert-style response format, coded 0–3 ("not at all" to "a great deal"). The measure includes two seven-item subscales, one for positive and one for negative religious coping styles, derived as sums of the items. Positive religious coping items include statements such as, "Looked for a stronger connection with God." Negative religious coping items include statements such as, "Wondered whether God had abandoned me." The Brief R-COPE (or items from it) has been used with 8–19-year-olds and has acceptable psychometric properties with Cronbach alphas ranging from .59 to .95 (Benore et al., 2008; Cotton et al., 2009; Dew et al., 2010; Molock, Puri, Matlin, & Barksdale, 2006; Reynolds et al., 2014; Reynolds, Mrug, Hensler, Guion, & Madan-Swain, 2014; Terreri & Glenwick, 2013; Westers, Rehuss, Olson, & Wiemann, 2014). Cronbach's alphas in this sample were .80 for the negative subscale and .89 for the positive subscale.

### Sanctification of the Body

This construct, described as imbuing one's body with divine significance, has two dimensions, which are measured using two subscales of the body sanctification scale presented by Mahoney and colleagues (2005). These subscales measured religious (12 items) and spiritual (10 items) aspects of body sanctification. The monotheistic religious subscale, *Manifestation of God in the body*, contained items such as, "My body is created in God's image." The spiritual subscale, *Sacred qualities of the body*, included descriptive attributes such as, "miraculous" and "spirit-filled." Participants rated items on a seven-point scale (0–6) from "strongly disagree" to "strongly agree" for the Manifestation of God subscale and "doesn't apply" to "applies strongly" for the Sacred qualities subscale. This scale was previously used with 12–20-year-olds with Cronbach alphas reported from .97 to .98 (Grossoehme et al., 2008; Mahoney et al., 2005). Cronbach's alphas for this sample were .98 for the Manifestation of God subscale and .96 for the Sacred Qualities subscale.

### Treatment Attitude (Utility)

Four items comprising the *Perceived utility* (benefits/costs) subscale of the Adherence Determinants Questionnaire (DiMatteo et al., 1993) were used to measure participants' attitudes toward the utility of completing their treatments. The scale is composed of items such as, "The benefits of my treatment plan outweigh any difficulty I might have in following it." Respondents indicated their level of agreement with each statement using a five-item Likert-style response format ("strongly disagree" to "strongly agree"). AC treatment-specific wording was used for these items. This scale has been used with 12–17-year-olds with a reported Cronbach alpha of .76 (Fotheringham, 1998). In the present study, Cronbach's alpha was .57.

### Subjective Norms

The TRA conceptualizes subjective norms as composed of normative beliefs about a behavior (the extent to which the participant believes that completing AC as prescribed would be approved of by an important other kind of person), and the participant's motivation to do what that important other person expects of the participant (here, to complete their AC as prescribed) (Ajzen & Fishbein, 1980). Following Fishbein and Ajzen's point that no single TRA questionnaire exists and that investigators must construct their own measure based on their theoretical model and the example items provided (Fishbein & Ajzen, 2010), pairs of questions were developed to measure subjective norms for each of two important reference groups ("my immediate family" and "my close friends"). Each question pair consisted of an item for perceived behavioral normative beliefs (e.g., "My family makes sure I get my airway clearance done the number of times recommended each day") and one for motivation to comply with that norm for those important other persons (e.g., "I want to do what my family thinks I should do about my daily recommended airway clearance"). These items were developed based on Fishbein and Ajzen's example using behavior-specific wording for AC, and, to verify understandability by the target sample, were used in a cognitive interview discussion with young adult with CF from this CF Center who was ineligible for the study. Participants indicated their level of agreement with each statement using a five-item Likert-style response format ("strongly disagree" to "strongly agree", coded 1–5). As outlined by Fishbein and Ajzen (p. 137), perceived behavioral normative beliefs alone do not adequately predict behavioral intentions. Rather, it is the product of these norms and the person's motivation to comply with them which is salient. Therefore, the magnitude of the subjective norm is defined by calculating the product of the normative

belief item by the motivation item for each identified important other group (family and close friends, respectively) (Ajzen & Madden, 1986; Fishbein & Ajzen, 2010).

### Self-Efficacy

Bandura's guide for constructing self-efficacy scales was used to build an AC treatment-specific, 10-item scale to measure self-efficacy for completing AC treatments (Bandura, 2006). This method has been used with CF samples in prior work (Grossoehme et al., 2012). Using a range of 0–100 respondents indicated their confidence for completing their AC treatment for each of 10 given conditions (e.g., “On a typical weekend,” “When I'm running late in the morning,” “When our family is feeling stressed”). Cronbach's alpha for this scale was .91.

### Treatment Intentions

The four-item intentions subscale of the Adherence Determinants Questionnaire (DiMatteo et al., 1993) was used with AC treatment-specific wording. An example item is, “I have made a commitment to follow my AC treatment plan.” Respondents indicated their level of agreement with each statement using a five-item Likert-style response format (“strongly disagree” to “strongly agree”). Two items are reverse scored, and the sum of the four items gives the score for intentions. This scale has been used with 12–17-year-olds with a reported Cronbach alpha of .84; in the present study, Cronbach's alpha was .89.

### Adherence to Treatments

The Daily Phone Diary (DPD) was used with all participants to collect data for actual AC treatment adherence. DPD is widely used in CF adherence research and has acceptable psychometric properties (Quittner, Modi, Lemanek, Ievers-Landis, & Rapoff, 2007; Quittner & Opiari, 1994). Strong convergent validity of the DPD has been documented (Quittner et al., 1998; Quittner & Opiari, 1994). Reliable stability coefficients over a 3-week period ( $r_s = .61-.71$ ,  $p < .01$ ) and high levels of interrater reliability (>90%) in a CF population have been reported (Quittner, et al., 1998). Use of the DPD with adolescents who have CF have shown adherence rates ranging from 36% to nearly 100% (Modi et al., 2010). Compared with self-report data obtained by direct inquiry of parents about their treatment completion, which may well include overreporting of adherence, adherence measured by DPD, while still considered by some to be a form of self-report, was significantly lower (Modi et al., 2006).

### Clinical Characteristics

Values for the most-recent pulmonary function test and the number of pulmonary exacerbations in the prior year were obtained by chart review.

### Statistical Analyses

Descriptive statistics and bivariate associations among variables were examined. Given the relatively large number of interrelated spiritual variables that were measured, the variables were first reduced to a smaller number of underlying dimensions using Exploratory Factor Analysis. Before the factor analysis, two spiritual variables (Pleading and Deferring) were excluded, which were not significantly associated with any treatment-related variables (treatment utility, perceived behavioral norms, self-efficacy, and intentions). The remaining seven spiritual variables were then subjected to Exploratory Factor Analysis using principal components extraction and varimax rotation, yielding two factor scores (computed from factor score coefficients) that were used in subsequent analyses. As expected by the factor analysis constraints, the two unrotated factors had virtually no correlation (Pearson's  $r = .006$ ). Varimax rotation was used because the correlation of the two factors under oblique rotation was negligible ( $r = -.16$ ). The hypothesized model was then tested with path analysis in Mplus version 7.3 (Muthen & Muthen, 2010). In this model, the two spiritual TRA background factors were modeled as predictors of treatment utility, subjective norms (immediate family and close friends), and self-efficacy, which in turn, following the TRA, predicted intentions. Finally, intentions predicted AC treatment adherence. Treatment utility, subjective norms, and self-efficacy were allowed to correlate. Missing data (1.4% of all values) were handled with Full-Information Maximum Likelihood, which preserves the overall sample size and minimizes bias (Wothke, 2000). The significance of all indirect effects was tested simultaneously with bootstrapping using 10,000 bootstrap samples (Preacher & Hayes, 2008). Results corresponding to  $p < .05$  were considered statistically significant.

## Results

### Preliminary Analyses

Descriptive characteristics of the sample are presented in Table I. No associations were found between the study variables and the clinical measures of pulmonary exacerbations and pulmonary function ( $FEV_1$ ), with correlations ranging from  $-0.15$  to  $0.17$  ( $p > .29$ ). Mean adherence rates for AC were relatively high as a percentage of prescribed treatments completed. However, only 20% of youth had perfect (100%) adherence for AC over the 3-week period in which

**Table I.** Descriptive Summary of Demographic and Clinical Characteristics of Study Participants

Characteristics	N (%)	M (SD)
Female, <i>n</i> (%)	27 (60)	
Age, years		13.8 ± 2.2
Religious affiliation, <i>n</i> (%)		
Nondenominational Christian	19 (42)	
Protestant	10 (22)	
Roman Catholic	6 (13)	
None	6 (13)	
Other	3 (7)	
Did not disclose	1 (2)	
FEV <sub>1</sub> % predicted		85.7 ± 20.8
PEX in prior year		1.38 ± 1.79
Adherence to AC treatment frequency, % of prescribed treatment	83 <sup>a</sup> (67–100)	
Complete adherence to AC treatment frequency, <i>n</i> (%)	20 (44)	

Note. *N* = 45; FEV<sub>1</sub> = forced expiratory volume in 1 s, as a measure of lung function; PEX = pulmonary exacerbation; AC = airway clearance.

<sup>a</sup>Values are median (interquartile range).

adherence data were collected by DPD. The sample overall was relatively healthy, with mild pulmonary disease based on pulmonary function testing, and relatively few pulmonary exacerbations. Compared with eligible patients who were not enrolled, participants did not differ significantly from nonparticipants in terms of gender, number of pulmonary exacerbations, or pulmonary function (FEV<sub>1</sub>) (all  $p > .30$ ). There was a significant difference in mean age between the groups ( $t = -2.64$ ;  $df = 87.8$ ;  $p = .010$ ) with participants being younger, on average ( $M = 13.9$  years,  $SD = 2.3$ ) than nonparticipants ( $M = 15.3$ ,  $SD = 2.6$ ).

Examination of correlations among variables indicated that pleading and deferring spiritual coping were not associated with any variables related to treatment adherence (Pearson correlation coefficient  $r$ 's ranged from  $-.19$  to  $.18$ ,  $p > .232$ ). Principal component analysis of the seven remaining spiritual variables indicated the presence of two factors based on parallel analysis and Velicer's test, and Kaiser criterion (two eigenvalues were  $>1$ ). A summary of the individual measures and results from the factor analysis are provided in Table II. The first factor was termed 'engaged spirituality'; it included high positive loadings from positive spiritual coping, collaboration with God, active surrender, and both body sanctification subscales (manifestation of God in the body and sacred qualities of the body). The second factor was termed 'spiritual struggle', and included high loadings from negative religious coping and self-directed coping (see Table II).

Descriptive statistics and correlations of all variables used in the path model are presented in Table III. Engaged spirituality was related to more supportive friend norms, whereas spiritual struggle was

associated with lower perceptions of treatment utility. Utility was related to more supportive norms from both friends and family, as well as stronger intentions to perform treatment. Family and friend norms were positively correlated and related to stronger intentions. Self-efficacy was related to stronger intentions and intentions were related to adherence. Gender and age were not related to any variables and were not included in the main model. The zero correlation of the two spiritual variables reflects the forced independence of the factor scores derived from the factor score coefficients after using an orthogonal rotation (Henson & Roberts, 2006).

### Main Analyses

Good model fit for path analytic models is indicated by Comparative Fit Index (CFI)  $> 0.95$ , Root Mean Square Error of Approximation (RMSEA)  $< 0.06$ , and Standardized Root Mean Square Residual (SRMR)  $< 0.08$  (Hu & Bentler, 1998). Using these guidelines, the path model had excellent fit to the data ( $\chi^2_{(10)} = 6.91$ ,  $p = .734$ ; CFI = 1.00; RMSEA = 0.00; SRMR = 0.08). Engaged spirituality predicted greater perceived utility of treatment and treatment-supporting norms from close friends (see Figure 1). Spiritual struggle predicted lower perceptions of treatment utility. Neither spiritual variable predicted self-efficacy to perform AC. In turn, greater perceived utility of treatment, treatment-supportive norms from close friends (but not family), and greater self-efficacy predicted greater intentions to perform AC. Intentions, in turn, predicted greater adherence with AC. In addition, perceived utility of treatment was correlated with more supportive norms from family ( $r = .38$ ,  $p < .01$ ) and friends ( $r = .47$ ,  $p < .001$ ), and norms from family and friends were correlated ( $r = .53$ ,  $p < .001$ ). Testing of indirect effects with bootstrapping yielded significant effects from engaged spirituality through friend norms and intentions to adherence (indirect effect  $b = 0.012$ ,  $p < .05$ ; 95% CI = 0.002 to 0.050), as well as from spiritual struggle through utility and intentions to adherence ( $b = -0.017$ ,  $p < .05$ ; 95% CI =  $-0.064$  to  $-0.001$ ). The indirect effects from engaged spirituality through utility and intentions and from self-efficacy through intentions to adherence did not reach statistical significance ( $p > .05$ ).

### Discussion

This study applied a theoretical model, the TRA, to better understand how spiritual factors may relate to treatment adherence among youth with CF. As hypothesized, engaged spirituality (involving positive spiritual coping, collaborative and active surrender coping, and body sanctification) was related to greater perceived utility of AC and more supportive norms for

**Table II.** Loadings of Spiritual Variables

	<i>M (SD)</i>	Range	Engaged spirituality	Spiritual struggle
Spiritual Variables Positive spiritual coping	11.11 (6.01)	0–21	<b>.94</b>	.04
Collaborative coping	1.41 (1.21)	0–3	<b>.83</b>	.17
Active surrender coping	1.62 (1.07)	0–3	<b>.70</b>	–.35
Manifestation of God in the body	66.93 (17.22)	12–84	<b>.89</b>	–.27
Sacred qualities of the body	53.40 (14.10)	13–70	<b>.89</b>	–.25
Negative spiritual coping	2.55 (3.27)	0–16	.13	<b>.91</b>
Self-directed coping	1.09 (1.02)	0–3	–.38	<b>.60</b>
Eigenvalue			3.95	1.31
% variance			54%	21%

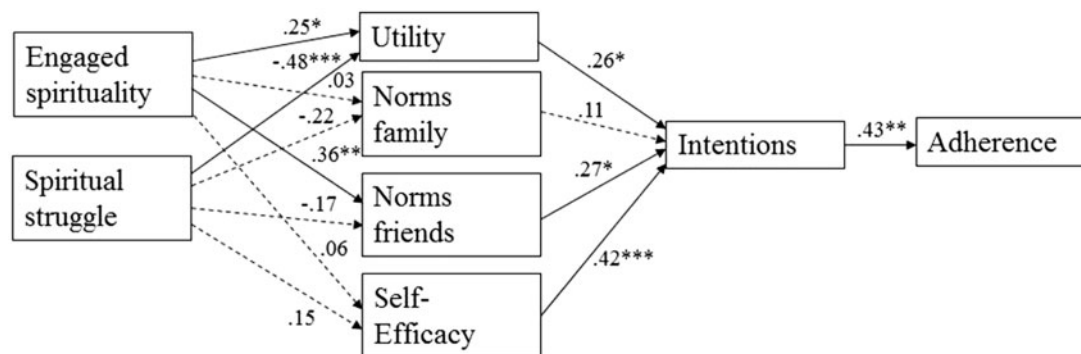
Note. Bold font indicates which factor each spiritual variable loaded on.

**Table III.** Correlation Matrix of Path Model Variables

	<i>M (SD)</i>	1	2	3	4	5	6	7
1. Engaged spirituality	0.00 (1.00)	–						
2. Spiritual struggle	0.00 (1.00)	.00 <sup>a</sup>	–					
3. Utility	34.36 (3.56)	.25	–.48**	–				
4. Family norms	2.93 (2.02)	.03	–.22	.45**	–			
5. Friend norms	5.29 (4.27)	.36*	–.17	.56***	.53***	–		
6. Self-efficacy	75.11 (20.22)	.06	.15	.18	–.05	–.05	–	
7. Intentions	17.36 (2.60)	.08	–.02	.51***	–.33*	–.34*	.51***	–
8. Adherence	0.86 (0.30)	.07	–.10	.15	–.20	–.08	.22	.34*

\* $p < .05$ ; \*\* $p < .01$ , \*\*\* $p < .001$ .

<sup>a</sup>Estimated Pearson correlation coefficient between factor scores after rotation; before rotation, Pearson's  $r = .006$ .



**Figure 1.** Path analysis model linking spiritual factors with adherence through utility, norms, self-efficacy, and intentions. Note: Path coefficients are standardized. Dashed paths are not significant. \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$ .

doing the treatment from close friends, both of which were associated with stronger intentions to perform the treatment, and in turn greater treatment adherence. Additionally, spiritual struggle (involving negative spiritual coping and self-directed coping) was related to lower perceived utility of AC, which in turn related to weaker intentions to perform AC and lower treatment adherence. Finally, self-efficacy was related to treatment intentions, although it was not associated with the spiritual factors.

Certain forms of spiritual coping are termed “negative” because they are associated with poorer health outcomes. These include not only the styles of constructed meaning of disease as divine punishment or diabolical act, but also spiritual coping for control that is self-

directed. It was therefore not surprising that self-directed spiritual coping loaded on the same factor (termed spiritual struggle) as negative spiritual coping in the principal components analysis. Spiritual struggle’s association with poorer outcomes is consistent with substantial prior research (Fitchett et al., 2004; Ramirez et al., 2012; Thune-Bolye, Stygall, Keshtgar, Davidson, & Newman, 2011, 2013). Spiritual struggle has been associated with depression (Thune-Bolye et al., 2013), which in turn has been related to poorer adherence (DiMatteo, Lepper, & Croghan, 2000; Smith et al., 2006). It may be that poor treatment adherence among youth who struggle spiritually may be owing to their less positive attitudes toward the value of their treatments (e.g., beliefs that treatments are not useful), and subsequently diminished intentions

to complete these treatments. The relationship of spiritual struggles to low perceived utility, intentions, and adherence to AC is consistent with previously reported associations between negative spiritual coping and decline in adolescents' pulmonary function. However, it is also possible that attitudes about treatment utility and treatment intentions may affect spiritual factors, and these alternatives should be evaluated in future longitudinal studies.

The engaged spirituality factor reflected multiple facets of helpful spiritual engagement, including positive spiritual coping (e.g., turning to God for strength), collaboration with God to solve problems, turning problems to God after doing one's best (Active Surrender), and viewing one's body as sacred and a reflection of God. The daily treatments to slow CF disease progression require time and effort—engagement—to provide maximum benefit, and persons with CF are taught disease self-management skills from an early age. It may be that greater positive spiritual engagement promotes greater engagement with one's disease and its treatment.

Engaged spirituality was also associated with perceived behavioral norms by one's friends, but not the perceived norms by one's family. This may be explained by homophily (associating with peers with similar values, beliefs, and behaviors) (Valente, 2010) and peer influence during adolescence. The influence of spirituality and friendship on each other has been described (Schwartz, Bukowski, & Aoki, 2006). Not only may spirituality and its practices influence one's choice of friends and activities with them, so friends can also modify one's spirituality. The greater role of close friends' norms compared with family norms may reflect increasingly greater importance of peer influence compared with that of parents during adolescence (Levenson, Aldwin, & D'Mello, 2006). The role of peer influence, in addition to family influence, may be an important construct to integrate into the design, prototype, and development of interventions aimed at adolescents with CF.

Self-efficacy for completing AC was unrelated to spiritual factors. This may be because it was related to other factors, such as the extent to which the youth have assumed responsibility for completing their AC treatments, or the existence of, and ability to create, routines which include AC (Fiese & Wamboldt, 2000) and family emotional dynamics (Fiese, Wamboldt, & Anbar, 2005). This finding is also consistent with findings from parents of children with CF, for whom self-efficacy was associated with treatment intentions but not spiritual, demographic, or psychosocial factors (Grossoehme et al., 2013).

The present findings suggest the following practice implications. First, screening youth with CF for spiritual struggle may be helpful to identify patients who may be less adherent with their therapies. Methods to

screen for spiritual struggle for use by nonchaplain clinicians have been published (Fitchett & Risk, 2009). Interventions exist with demonstrated efficacy in helping adolescents (Oemig Dworsky et al., 2013) and adults decrease spiritual struggles and improve psychological outcomes (Cole, 2005). For instance, spiritually focused cognitive therapy may be used to help youth develop more positive and engaged spirituality and reduce spiritual struggle, while strengthening their perceptions of treatment utility and peer norms for conducting treatments. This would focus attention on the more proximal determinants of treatment adherence rather than interventions aimed at the more distal outcomes such as intentions or adherence behaviors. Second, youth who are spiritually engaged may benefit from an approach that draws parallels between their engagement with faith and engagement with disease self-management.

This study has the following limitations. The relatively small sample size had limited statistical power to detect smaller-sized effects. Specifically, the sample size provided sufficient power ( $\geq 0.80$ ) to detect only indirect effects consisting of large effects ( $\beta = .59$ ) (Fritz & MacKinnon, 2007); thus the power was limited for the obtained effects  $\beta$ 's  $\leq .048$ . In addition, the small sample size relative to the number of free parameters in the model may have resulted in unstable estimates (Bentler & Chou, 1987); replication with a larger sample size would be important. All participants were from a single center, with potential selection bias. Participants had a lower mean age than eligible nonparticipants, so the results may not generalize to older youth with CF. The limited sample size also did not permit comparison of the model across age-groups, which means that possible developmental differences in the results could not be addressed. However, one study found no age differences in the relationship between spiritual coping and internalizing and externalizing problems (Reynolds, Mrug, & Guion, 2013). Adherence rates, as a percentage of prescribed treatments, were relatively high compared with other studies (Ball et al., 2013; Zindani, Streetman, Streetman, & Nasr, 2006). This study was primarily carried out during the school year, when adherence rates tend to be highest (Ball et al., 2013). There also may have been a treatment effect of participation in the study itself; Modi and colleagues have shown that treatment adherence rates are higher when participants are enrolled in trials (Modi et al., 2010). The number of prescribed therapies was based on chart review; it may be that some youth were told orally by their pulmonologist how many treatments to do without that having been reflected in their chart note, which was used to calculate adherence. These factors may explain the relatively higher adherence rates in this study than in some previously published studies.



Most of the data obtained in this study came from self-report. This opens the possibility for common method bias, although there is limited consensus on the extent to which it may inflate observed relationships between variables (Siemsen, Roth, & Oliveira, 2010). The utility subscale had a low reliability as measured by Cronbach's alpha. Finally, the cross-sectional design of the study does not allow causal interpretations, although adherence was assessed after the other variables. Future research should replicate the results using longitudinal designs, as cross-sectional studies often yield biased estimates of prospective mediation effects (Maxwell & Cole, 2007).

In conclusion, this study offers novel insights into psychological processes through which spiritual factors may contribute to treatment adherence. It suggests that spiritual factors may promote or hinder perceptions of treatment utility and social norms for completing treatments, which in turn contribute to treatment intentions and adherence. Future research implications include the inclusion of spiritual, together with other psychosocial constructs, to gain a broader understanding of adherence and self-management in adolescence. The role of peers and their influence on treatment adherence, especially during preadolescence and early adolescence (11–13 years old), should be explored. The results also show that TRA is a useful theoretical model for understanding treatment adherence among youth with CF.

### Acknowledgments

The authors acknowledge with appreciation the contributions of Elizabeth Lind, Colin Lozier, Sarah Lohbeck, Alaina McCracken, Michael Price, Emily Smith, Matthew Veerkamp, Yu Wang, and Vasilios Zois who conducted DPDs and performed data entry and preliminary analyses for this study. The authors are grateful to medical writer Denise Wetzel for critical review of the manuscript.

### Funding

This work was supported by a Places Outcomes Research Awards from the James M. Anderson Center for Health Service Excellence.

*Conflicts of interest:* Coauthor Gary McPhail served on the national advisory board during 2014 for Vertex Pharmaceuticals, and for Gilead Pharmaceuticals. No other coauthors have any potential or real conflicts of interest.

### References

- Ajzen, I., & Fishbein, M. (1980). *Understanding attitudes and predicting social behavior*. Englewood Cliffs, NJ: Prentice-Hall.
- Ajzen, I., & Madden, T. J. (1986). Prediction of goal-directed behavior: Attitudes, intentions, and perceived behavioral control. *Journal of Experimental Social Psychology*, 22, 453–474.
- Ball, R., Southern, K. W., McCormack, P., Duff, A. J. A., Brownlee, K. G., & McNamara, P. S. (2013). Adherence to nebulised therapies in adolescents with cystic fibrosis is best on week-days during school term-time. *Journal of Cystic Fibrosis*, 12, 440–444. doi: 10.1016/j.jcf.2012/12/012
- Bandura, A. (2006). Guide for creating self-efficacy scales. In F. Pajares & T. Urdan (Eds.), *Self-efficacy beliefs of adolescents* (p. 367). Greenwich, CT: Information Age Publishing.
- Benore, E., Pargament, K. I., & Pendleton, S. M. (2008). An initial examination of religious coping in children with asthma. *International Journal for the Psychology of Religion*, 18, 267–290. doi: 10.1080/10508610802229197
- Bentler, P. M., & Chou, C.-P. (1987). Practical issues in structural modeling. *Sociological Methods and Research*, 16, 78–117.
- Britto, M. T., DeVellis, R. F., Hornung, R. W., DeFries, G. H., Atherton, H. D., & Slap, G. B. (2004). Health care preferences and priorities of adolescents with chronic illnesses. *Pediatrics*, 114, 1272–1280.
- Burker, E. J., Evon, D. M., Sedway, J. A., & Egan, T. (2004). Religious coping, psychological distress and disability among patients with end-stage pulmonary disease. *Journal of Clinical Psychology in Medical Settings*, 11, 179–193.
- Burker, E. J., Evon, D. M., Sedway, J. A., & Egan, T. (2005). Religious and non-religious coping in lung transplant candidates: Does adding God to the picture tell us more? *Journal of Behavioral Medicine*, 28, 513–526.
- Cole, B. (2005). Spiritually-focused psychotherapy for people diagnosed with cancer: A pilot outcomes study. *Mental Health, Religion and Culture*, 8, 217–226.
- Cotton, S., Grossoehme, D. H., Rosenthal, S. L., McGrady, M. E., Roberts, Y. H., Hines, J., ... Tsevat, J. (2009). Religious/spiritual coping in adolescents with sickle cell disease: A pilot study. *Journal of Pediatric Hematology Oncology*, 31, 313–318. doi: 10.1097/MPH.0b013e31819e40e3
- Dew, R. E., Daniel, S. S., Goldston, D. B., McCall, W. V., Kuchibhatla, M., Schleifer, C., ... Koenig, H. G. (2010). A prospective study of religion/spirituality and depressive symptoms among adolescent psychiatric patients. *Journal of Affective Disorders*, 120, 149–157.
- DiMatteo, M. R., Hays, R. D., Gritz, E. R., Bastani, R., Crane, L., Elashoff, R., ... Marcus, A. (1993). Patient adherence to cancer control regimens: Scale development and initial validation. *Psychological Assessment*, 5, 102–112.
- DiMatteo, M. R., Lepper, H. S., & Croghan, T. W. (2000). Depression is a risk factor for noncompliance with medical treatment. *Archives of Internal Medicine* 160, 2101–2107.
- Fiese, B. H., & Wamboldt, F. S. (2000). Family routines, rituals and asthma management: A proposal for family-based strategies to increase treatment adherence. *Families, Systems and Health*, 18, 405.
- Fiese, B. H., Wamboldt, F. S., & Anbar, R. D. (2005). Family asthma management routines: Connections to medical adherence and quality of life. *Journal of Pediatrics*, 146, 171–176. doi: 10.1016/j.jpeds.2004.08.083

- Fishbein, M., & Ajzen, I. (2010). *Predicting and changing behavior*. New York, NY: Taylor & Francis.
- Fitchett, G., Murphy, P. E., Kim, J., Gibbons, J. L., Cameron, J. R., & Davis, J. A. (2004). Religious struggle: Prevalence, correlates and mental health risks in diabetic, congestive heart failure, and oncology patients. *International Journal of Psychiatry in Medicine, 34*, 179–196. doi: 10.2190/UCJ9-DP4M-9C0X-835M
- Fitchett, G., & Risk, J. L. (2009). Screening for spiritual struggle. *Journal of Pastoral Care and Counseling, 63*, 1–12.
- Fotheringham, M. J. (1998). Adolescents' adherence to chronic medical regimens: Parent-adolescent conflict and adolescent autonomy in relation to adherence to insulin dependent diabetes treatment regimens (doctoral dissertation). Department of Psychiatry, University of Adelaide, Adelaide, Australia.
- Fritz, M. S., & MacKinnon, D. P. (2007). Required sample size to detect the mediated effect. *Psychological Science, 18*, 233–239.
- Grossoehme, D. H., Opiari-Arrigan, L., VanDyke, R., Thurmond, S., & Seid, M. (2012). Relationship of adherence determinants and parental spirituality in cystic fibrosis. *Pediatric Pulmonology, 47*, 558–566. doi: 10.1002/ppul.21614
- Grossoehme, D. H., Szczesniak, R., Dimitriou, S., Dodd, C., Britton, L., Chini, B., & Seid, M. (2013). Parental adherence: Spiritual, religious and psychosocial influences. *Pediatric Pulmonology, 53*(6), 429.
- Grossoehme, D. H., Szczesniak, R., McPhail, G., & Seid, M. (2013). Is adolescents' religious coping with cystic fibrosis associated with the rate of decline in pulmonary function—a preliminary study. *Journal of Health Care Chaplaincy, 19*, 33–42. doi: 10.1080/08854726.2013/767083
- Grossoehme, D. H., Szczesniak, R. D., Britton, L. L., Siracusa, C. M., Quittner, A. L., Chini, B. A., ... Seid, M. (2015). Adherence determinants in CF: Cluster analysis of parental psychosocial and religious/spiritual factors. *Annals of the American Thoracic Society, 12*, 838–846. doi: 10.1513/AnnalsATS.201408-379OC
- Grossoehme, D. H., VanDyke, R., & Seid, M. (2008). Spirituality's role in chronic disease self-management: Sanctification of the body in families dealing with cystic fibrosis. *Journal of Healthcare Chaplaincy, 15*, 149–158. doi: 10.1080/08854720903163312
- Henson, R. K., & Roberts, J. K. (2006). Use of exploratory factor analysis in published research common errors and some comment on improved practice. *Educational and Psychological Measurement, 66*, 393–416.
- Hu, L.-t., & Bentler, P. M. (1998). Fit indices in covariance structure modeling: Sensitivity to underparameterized model misspecification. *Psychological Methods, 3*, 424.
- Levenson, M. R., Aldwin, C. M., & D'Mello, M. (2006). Religious development from adolescence to middle adulthood. In R. F. Paloutzian & C. L. Park (Eds.), *Handbook of the psychology of religion and spirituality* (pp. 144–161). New York, NY: Guilford Press.
- Mahoney, A., Carels, R. A., Pargament, K. I., Wachholtz, A., Leeper, L. E., Kaplar, M., & Frutchey, R. (2005). The sanctification of the body and behavioral health patterns of college students. *International Journal for the Psychology of Religion, 15*, 221–238.
- Maxwell, S. E., & Cole, D. A. (2007). Bias in cross-sectional analyses of longitudinal mediation. *Psychological Methods, 12*, 23.
- Modi, A. C., Cassedy, A. E., Quittner, A. L., Accurso, F., Sontag, M., Koenig, J. M., & Ittenbach, R. F. (2010). Trajectories of adherence to airway clearance therapy for patients with cystic fibrosis. *Journal of Pediatric Psychology, 35*, 1028–1037. doi: 10.1093/jpepsy/jsq015
- Modi, A. C., Lim, C. S., Yu, N., Geller, D., Wagner, M. H., & Quittner, A. L. (2006). A multi-method assessment of treatment adherence for children with cystic fibrosis. *Journal of Cystic Fibrosis, 5*, 177–185. doi: 10.1016/j.jcf.2006.03.002
- Modi, A. C., & Quittner, A. L. (2006). Barriers to treatment adherence for children with cystic fibrosis and asthma: What gets in the way? *Journal of Pediatric Psychology, 31*, 846–858. doi: 10.1093/jpepsy/ksj096
- Molock, S. D., Puri, R., Matlin, S., & Barksdale, C. (2006). Relationship between religious coping and suicidal behaviors among African-American adolescents. *Journal of Black Psychology, 32*, 366–389.
- Muthen, L. K., & Muthen, B. O. (2010). *Mplus user's guide* (7th ed.). Los Angeles, CA: Muthen & Muthen.
- Oemig Dworsky, C. K., Pargament, K. I., Reist Gibbel, M., Krumrei, E. J., Faigin, C. A., Haugen, M. R. G., ... Warner, H. L. (2013). Winding road: Preliminary support for a spiritually integrated intervention addressing college students' spiritual struggles. *Research in the Social Scientific Study of Religion, 24*, 309–339.
- Pargament, K. I. (1997). *Psychology of religious coping*. New York, NY: Guilford Press.
- Pargament, K. I. (1999). *Religious/spiritual coping* (pp. 43–56). Kalamazoo, MI: Fetzer Institute, National Institute on Aging Working Group.
- Pargament, K. I., Koenig, H. G., & Perez, L. M. (2000). The many methods of religious coping: Development and initial validation of the RCOPE. *Journal of Clinical Psychology, 56*, 519–543. doi: 10.1002/(SICI)1097-4679
- Pargament, K. I., Smith, B. W., Koenig, H. G., & Perez, L. (1998). Patterns of positive and negative religious coping with major life stressors. *Journal for the Scientific Study of Religion, 37*, 710–724.
- Park, J., & Nachman, S. (2010). The link between religion and HAART adherence in pediatric HIV patients. *AIDS Care, 22*, 556–561. doi: 10.1080/09540120903254013
- Pendleton, S. M., Cavalli, K. S., Pargament, K. I., & Nasr, S. Z. (2002). Religious/spiritual coping in childhood cystic fibrosis: A qualitative study. *Pediatrics, 109*, E8.
- Preacher, K. J., & Hayes, A. F. (2008). Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. *Behavior Research Methods, 40*, 879–891.
- Quittner, A. L., Abbott, J., Georgiopoulos, A. M., Goldbeck, L., Smith, B., Hempstead, S.E., ... Elborn, S., (2014a). the International Committee on Mental Health (2016). International Committee on Mental Health in cystic fibrosis: Cystic Fibrosis Foundation and European cystic Fibrosis Society consensus statements for screening and treating depression and anxiety. Thorax, online

- publication ( October, 2015, doi:10.1136/thoraxjnl-2015-207488.International%20Guidelines.pdf. Retrieved 14 May 2015.
- Quittner, A. L., Espelage, D. L., Opiari, L. C., Carter, B., Eid, N., & Eigen, H. (1998). Role strain in couples with and without a child with a chronic illness: Associations with marital satisfaction, intimacy, and daily mood. *Health Psychology, 17*, 112.
- Quittner, A. L., Goldbeck, L., Abbott, J., Duff, A. J., Lambrecht, P., Sole, A., ... Barker, D. (2014b). Prevalence of depression and anxiety in patients with cystic fibrosis and parent caregivers: Results of The International Depression Epidemiological Study across nine countries. *Thorax, 69*, 1090–1097. doi: 10.1136/thoraxjnl-2014-205983
- Quittner, A. L., Modi, A. C., Lemanek, K. L., Ievers-Landis, C. E., & Rapoff, M. A. (2007). Evidence-based assessment of adherence to medical treatments in pediatric psychology. *Journal of Pediatric Psychology, 33*, 916–936. doi: 10.1093/jpepsy/jsm064
- Quittner, A. L., & Opiari, L. C. (1994). Differential treatment of siblings: Interview and diary analyses comparing two family contexts. *Child Development, 65*, 800–814. doi: 10.1111/1467-8624.ep9408220881
- Ramirez, S. P., Macedo, D. S., Sales, P. M. G., Figueiredo, S. M., Daher, E. F., Araujo, S. M., ... Carvalho, A. F. (2012). The relationship between religious coping, psychological distress and quality of life in hemodialysis patients. *Journal of Psychosomatic Research, 72*, 129–135. doi: 10.1016/j.jpsychores.2011.11.012
- Reynolds, N., Mrug, S., Britton, L., Guion, K., Wolfe, K., & Gutierrez, H. (2014). Spiritual coping predicts 5-year health outcomes in adolescents with cystic fibrosis. *Journal of Cystic Fibrosis, 13*, 593–600. doi: 10.1016/j.jcf.2014.01.013
- Reynolds, N., Mrug, S., & Guion, K. (2013). Spiritual coping and psychosocial adjustment of adolescents with chronic illness: The role of cognitive attributions, age, and disease group. *Journal of Adolescent Health, 52*, 559–565. doi: 10.1016/j.jadohealth.2012.09.007
- Reynolds, N., Mrug, S., Hensler, M., Guion, K., & Madan-Swain, A. (2014). Spiritual coping and adjustment in adolescents with chronic illness: A 2-year prospective study. *Journal of Pediatric Psychology, 39*, 542–551. doi: 10.1093/jpepsy/jsu011
- Schwartz, K. D., Bukowski, W. M., & Aoki, W. T. (2006). Mentors, friends, and gurus: Peer and nonparent influences on spiritual development. In E. C. Roehlkepartain, P. E. King, L. Wagener, & P. L. Benson (Eds.), *Handbook of spiritual development in childhood and adolescence* (pp. 310–323). Thousand Oaks, CA: Sage Publications.
- Siemens, E., Roth, A., & Oliveira, P. (2010). Common method bias in regression models with linear, quadratic, and interaction effects. *Organizational Research Methods, 13*, 456–476.
- Smith, A., Krishnan, J. A., Bilderback, A., Riekert, K. A., Rand, C. S., & Bartlett, S. J. (2006). Depressive symptoms and adherence to asthma therapy after hospital discharge. *CHEST Journal, 130*, 1034–1038.
- Terreri, C. J., & Glenwick, D. S. (2013). The relationship of religious and general coping to psychological adjustment and distress in urban adolescents. *Journal of Religion and Health, 52*, 1188–1202. doi: 10.1007/s10943-011-9555-8
- Thune-Bolye, I. C., Stygall, J., Keshtgar, M. R. S., Davidson, T. I., & Newman, S. P. (2011). Religious coping strategies in patients diagnosed with breast cancer in the UK. *Psycho-Oncology, 20*, 771–782. doi: 10.1002/pon.1784
- Thune-Bolye, I. C., Stygall, J., Keshtgar, M. R. S., Davidson, T. I., & Newman, S. P. (2013). Religious/spiritual coping resources and their relationship with adjustment in patients newly diagnosed with breast cancer in the UK. *Psycho-Oncology*. doi: 10.1002/pon.3048
- Valente, T. W. (2010). *Social networks and health*. New York, NY: Oxford University Press.
- Westers, N. J., Rehffuss, M., Olson, L., & Wiemann, C. M. (2014). An exploration of adolescent nonsuicidal self-injury and religious coping. *International Journal of Adolescent Medicine and Health, 26*, 345–349. doi: 10.1515/ijamh-2013-0314
- Wothke, W. (2000). Longitudinal and multigroup modeling with missing data Little T.D., Schnable K. U. and Baumert J. (Eds.). pp.219–240, 269–281) Mahwah, NJ: Lawrence Erlbaum Associates Publishers.
- Zindani, G. N., Streetman, D. D., Streetman, D. S., & Nasr, S. Z. (2006). Adherence to treatment in children and adolescent patients with cystic fibrosis. *Journal of Adolescent Health, 38*, 13–17. doi: 10.1016/j.jadohealth.2004.09/013