



Domains of spirituality and their associations with positive mental health: a study of adolescents in Canada, England and Scotland



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ABSTRACT

Spirituality is a concept with ancient roots yet contemporary relevance to mental health. Its assessment in populations of young people, however, remains an immense challenge. Efforts to perform such assessments typically involve use of unidimensional scales incorporating items related to four domains (connections to “self”, “others”, “nature”, and the “transcendent”). For adolescents, it remains unclear whether these domains equally influence mental health, or if one domain is particularly important. Here we analyzed reports from adolescents who participated in the 2014 Health Behaviour in School-aged Children (HBSC) study conducted in Canada ($n = 21,173$), England ($n = 4339$) and Scotland ($n = 5603$). Reports of positive mental health were modelled as a function of ordinal scores describing each spiritual health domain, controlling for age, the other domains, and potential confounders. Subsequent analyses focused on the centrality of connections to “self” in these relationships. We identified strong and consistent associations between positive mental health and higher scores for each of the four spiritual health domains. In fully adjusted models, these effects were diminished or changed direction for connections to “others”, “nature”, and the “transcendent”, while the positive association with “connections to self” remained. While associations exist between each of the four domains of spiritual health and positive mental health, it appears that associations with connections to “others”, “nature”, and the “transcendent” are sometimes mediated by connections to “self”. Implications for assessment, models and related interventions and health promotion strategies, based on the idea that inner connections may be central to the protective effects of spiritual health, are considered.

1. Introduction

Adolescent health status has conventionally been modelled in terms of its physical, social, and mental components (World Health Organization, 1948). However, in a number of contexts, spirituality is emerging as a fourth dimension of health (Dhar et al., 2013; Hawks et al., 2007; Chirico, 2016; Vader, 2006). Indicators of positive child spirituality appear to share commonalities with adolescent well-being (Benson et al., 2012; Scales et al., 2014). Further, they correlate with higher levels of happiness (Holder et al., 2010), lower risks for depression and depressive symptoms (Cotton et al., 2005), and positive mental health status (Brooks et al., 2018).

Internationally, the *United Nations Convention on the Rights of the*

Child recognizes the importance of spirituality, protecting it in four of its articles (United Nations General Assembly, 1989). Notwithstanding, the spiritual dimension of health was not included in the original WHO definition (World Health Organization, 1948), and often continues to be ignored in the field of public health, perhaps because of its apparent (and often misconstrued) overlap with formal religion (Michaelson et al., 2016). Because of this, we may be “depriving ourselves of the leverage we need to help empower” young people to achieve optimal health status (Vader, 2006).

Spirituality in children has been described in terms of experiences of wonder and joy in life (Bone et al., 2007), the nurturing of moral sensitivities (Hay and Nye, 2006), early experiences of wisdom and compassion (Miller and Nakagawa, 2002), and expressions of the sacred

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qualities in life (Yust et al., 2006). Other constructs focus on connections in four relational domains: connections to self; others; nature; and some kind of transcendent, or larger meaning to life. In our own work, we have adapted a “working definition” based on these domains, and posited that *spiritual health is a way of being that involves some capacity for awareness of the sacred qualities of life experiences and is characterized by connections in these four domains* (Michaelson et al., 2016). These domains also contribute to composite scales that are internally consistent and reliable (Michaelson et al., 2016; Gomez and Fisher, 2003). However, more recent analyses challenge the field to consider more complex models and pathways in the assessment of adolescent spiritual health (Michaelson et al., 2016).

In a recent international analysis, we observed statistically significant positive correlations between each domain of spiritual health and measures of life satisfaction, psychosomatic health, and “excellent” self-rated health status (Brooks et al., 2018). These findings were consistent across gender, age, and country. Initially, we concluded that each of these domains of spiritual health was operating as part of the same factor structure, as per our past assumptions based on exploratory factor analysis and the assumptions of unidimensional scales (Gomez and Fisher, 2003). When applied to etiological study, such scales and models essentially treat all (correlated) domains as part of the same factor when predicting adolescent mental health status. As our analyses evolved, findings suggested that relationships between the four domains and mental health were more complex, and it was also unclear as to how far the domains uniformly affect adolescent mental health status, or if one or more of these domains is most influential.

The purpose of this study was therefore to explore the strength and consistency of associations between the four domains of spiritual health and low subjective health complaints (one indicator of positive mental health) across countries, and genders (Haugland and Wold, 2001). Further, we wished to confirm whether these domains contribute equally to positive mental health status, and to critically examine potential subtleties in these relationships that may provide novel direction for applied research and clinical and health promotion interventions. Our hope was that information that was generated through this study would eventually inform evidence-based interventions and practice.

2. Methods

2.1. Study population

Adolescent health surveys were conducted in Canada, England and Scotland during 2013–14. Young people were recruited using multi-stage sampling designs, with participants nested within schools. Sampling was stratified by type of school and regions on a replacement basis. After restriction to students with complete responses to all items used in the present analysis, the study sample included 28,178 students [weighted] aged 11 to 15 years ($n = 21,173$ Canada, overall 77% included; $n = 4339$ England, 92% included; and $n = 5603$ Scotland, 88% included).

2.2. Data collection

We followed the common research protocol of the Health Behaviour in School-aged Children Study, or HBSC (www.hbsc.org). Participating students completed an anonymous, general health questionnaire during a one-hour (40 min in Scotland) in-classroom session. Questionnaires were returned by school staff to central research centres in each country for data entry, cleaning, and analysis.

2.3. Compliance with ethical standards

All procedures were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments. All questionnaires were

anonymous. Approval was gained from the following ethics review boards: Queen's University (Canada), the University of Hertfordshire (England), and The University of St Andrews (Scotland). Student participation was voluntary, and consent (explicit or implicit) was sought from school administrators, parents, and participating students as per national human subject requirements.

2.4. Measures

As a general health survey, HBSC contains mandatory and optional questionnaire items. In the present analysis, we included an optional module describing adolescent spiritual health (Michaelson et al., 2016), a mandatory subjective health complaints scale from which we created an indicator of positive mental health (Haugland and Wold, 2001), and mandatory items describing socio-demographic factors and social supports that potentially confounded the focal relationships of interest.

2.5. Adolescent spiritual health

This module consisted of eight questions, adapted for brevity and literacy level (Michaelson et al., 2016), from Gomez and Fisher's Spiritual Well-being scale (Gomez and Fisher, 2003). Two items were asked for each of the four domains. Students responded to these questions with one of five response categories ranging from 0- “not at all important” to 4- “very important”. Students were requested to identify how important it is for them to: “feel that your life has meaning or purpose”; “experience joy (pleasure, happiness) in life” (connections to self); “be kind to other people”; “be forgiving of others” (connections to others); “feel connected to nature”; “care for the natural environment” (connections to nature); “feel a connection to a higher spiritual power”; “meditate or pray” (connections to the transcendent). Ordinal scores were estimated for each domain by summing the two corresponding items (range from 0 to 8).

Exploratory then confirmatory factor analyses were used to validate this spiritual health module using the larger Canadian dataset. Principal components analyses were applied involving an oblimin rotation (which assumes correlation between items). Findings best supported a four-factor structure (two items per factor) exactly consistent with the four domains of spiritual health (Michaelson et al., 2016). This was further supported by a maximum likelihood goodness of fit test ($p = 0.10$) and observed Cronbach's alpha values of > 0.80 for domain. Confirmatory analysis metrics also supported the four-factor solution (RMSEA 0.06, SRMR 0.02, AGFI 0.97).

2.6. Subjective health complaints

An eight-item HBSC symptoms checklist (Haugland and Wold, 2001) was used to assess the frequency of subjective health complaints (headache; stomach ache; backache; feeling low (depressed or low in Canada); irritability or bad temper; feeling nervous; difficulties in getting to sleep; and feeling dizzy). For each symptom, respondents indicated how often it occurred in the past six months, with possible responses being ‘about every day, 4; more than once a week, 3; about every week, 2; about every month, 1; and rarely or never, 0’. Responses were summed (range 0 to 32) to produce a composite scale with excellent psychometric properties, with subjective health complaints assumed to be an indicator of mental health status (Haugland and Wold, 2001). This composite scale has good internal consistency ($\alpha = 0.84$), (Currie et al., 2014) acceptable test-retest reliability as a whole ($r = 0.79$) and for its two subscales ($r = 0.61$ to 0.76) (Haugland and Wold, 2001). Low subjective health complaints (positive mental health) were operationally defined by being in the bottom quartile of the response distribution (Brooks et al., 2018). A continuous version of this scale ranging from 0 to 32 was also employed.

2.7. Socio-demographic covariates

Students reported their date of birth, gender (boy or girl) and immigration status (categorized as born vs. not born in the participating country). Family affluence was indicated by the question: “how well off do you think your family is?” (five response options: “very well off” through “not at all well off”) (Goodman et al., 2007).

2.8. Social support covariates

Community support was estimated using a five-item scale ($\alpha = 0.79$) describing neighbourhood social capital based on quality of social relations, neighbourhood safety, and trust (Elgar et al., 2011). Quality of family communication was estimated using a four-item scale ($\alpha = 0.88$) that combined responses to the following items: In my family... “I think the important things are talked about”, “when I speak someone listens”, “we ask questions when we don't understand each other”, and “when there is a misunderstanding we talk it over until it's clear” (five response options: “Strongly disagree” to “Strongly agree”) (Freeman et al. 2015). Perceived family support was assessed using a four-item scale ($\alpha = 0.90$) measuring student's agreement with statements relating to whether their family provides them with the help and support they need (Zimet et al., 1988). Perceived peer support was assessed using a four-item scale ($\alpha = 0.94$) that combined the following items: “my friends really try to help me”, “I can count on my friends when things go wrong”, “I have friends with whom I can share my joys and sorrows”, and “I can talk about my problems with my friends” (Freeman et al. 2015). For bivariate analyses social support variables were grouped into approximate tertiles based on the distribution in each country. For the multivariable regression analyses these variables were modelled as continuous.

2.9. Statistical analysis

Data analyses were conducted with SAS 9.4 (Cary, NC) and SPSS Amos 25.0.x. Descriptive analyses were used to characterize the samples in each country by age group and gender. We then explored the strength and consistency of bivariate associations between the above covariates and low subjective health complaints. This was done using a series of multivariable log-binomial models, stratified by country and gender. Generalized estimating equations were used to adjust for clustering effects by school. Using similar modelling strategies, we then examined associations between the ordinal scores for each of the four spiritual health domains and our outcome of low subjective health complaints. We developed multivariable models for each domain: first with adjustment for age; then with adjustment for age, the literature-based covariates, and the other three domains. The purpose of this modelling process was to estimate the relative importance of each individual domain in predicting low subjective health complaints, holding all other covariates and the other domains constant.

Using the Canadian data for illustration, we then proposed and tested a structural equation model (SEM), postulated based upon our initial descriptive findings. We used this model to simultaneously isolate the strength of direct associations between each domain and a linear version of the subjective health complaints score, as well as the indirect associations between each of three domains (connections to others, nature, and the transcendent) and the subjective health complaint score as mediated by connections to self. A path analysis approach to SEM was used with a maximum likelihood approach for effect estimation. These analyses were stratified by gender and also controlled for the same sets of covariates (each modelled continuously) as identified in the initial regression analyses.

Statistical power to detect socially meaningful effects varied within strata defined by country and domain. In earlier work (Michaelson et al., 2016; Brooks et al., 2018) we had observed that relationships between spiritual health and mental health differed between boys and

Table 1

Description of complete case series of young people ($n = 28,178$) who completed the 2013/14 Health Behaviour in School-aged Children Study Spiritual Health Module, by country (Canada, England, Scotland), gender, and age.

	Canada		England		Scotland	
	n	(%)	n	(%)	n	(%)
Boys, total	10127		2339		2712	
≤11	880	(8.7)	575	(24.6)	–	–
12	1700	(16.8)	239	(10.2)	–	–
13	1958	(19.3)	487	(20.8)	1514	(55.8)
14	2165	(21.4)	168	(7.2)	–	–
≥15	3423	(33.8)	871	(37.2)	1198	(44.2)
Girls, total	11046		2000		2891	
≤11	945	(8.6)	478	(23.9)	–	–
12	1836	(16.6)	206	(10.3)	–	–
13	2069	(18.7)	504	(25.2)	1584	(54.8)
14	2564	(23.2)	164	(8.2)	–	–
≥15	3632	(32.9)	647	(32.4)	1307	(45.2)

Note: All values are weighted.

girls. Based on this precedent, we therefore also stratified our results by gender in the present analysis. Among boys, in Canada after accounting for a conservative design effect of 1.2 to account for the nested and hence clustered sampling, we had 80% power to detect relative risks for low subjective health complaints varying from 1.42 to 1.64 for the highest (7–8) vs. lowest (0) reported levels of domain-specific spiritual health ($\alpha = 0.05$, 2-sided); power would be higher for ordinal versions of these scores. Equivalent minimal detectable effects were RR of 1.45 to 1.56 (England), and 1.68 to 2.11 (Scotland). Among girls, these minimal detectable effects were 1.64 to 2.40 (Canada), 2.06 to 2.80 (England), and 2.35 to 3.66 (Scotland).

3. Results

The samples available for study are described by age and gender within each of the three countries in Table 1. These distributions include participants that provided complete data for the key study variables.

Among boys, there were consistent relationships observed (3/3 countries) between low subjective health complaints and: younger age, higher relative levels of community support, family support, quality of family communication, and peer support (Table 2). Associations between higher levels of family affluence and low subjective health complaints were observed in Canada and Scotland only. There was no statistically significant relationship evident between immigration status and low subjective health complaints in any country. Among girls, with the exception of the immigration status variable for which no consistent relationship was identified, there were strong and consistent (3/3 countries) relationships observed between low subjective health complaints and all other variables: younger age, higher family affluence, higher relative levels of community support, family support, quality of family communication, and peer support.

Table 3 presents the results for the age-adjusted then fully adjusted regression models that examined ordinal scores for each of the four spiritual health domains (independent variables) and their associations with low subjective health complaints (dependent variable). Among boys, in all three countries the age-adjusted models suggested that higher scores for each of the four domains were associated with more frequent reports of low subjective health complaints, with 12/12 separate regressions showing this pattern. In the fully adjusted models, these effects became much smaller in magnitude, and non-significant, or even changed direction for connections to “others” and the “transcendent”, while “connections to nature” remained for Canada, and “connections to self” remained in England and Scotland, with skewed 95% confidence intervals also suggestive of a positive effect in Canada.

Table 2
Associations between socio-demographic factors; community, family and peer supports; and low subjective health complaints (% Low): 2013/14 Health Behaviour in School-aged Children Study by country (Canada, England, Scotland) and gender.

	Canada				England				Scotland			
	n	% low	RR	(95% CI)	n	% low	RR	(95% CI)	n	% low	RR	(95% CI)
Boys												
Age			0.94	(0.91–0.97)			0.90	(0.85–0.96)				
≤ 11	880	29.7	1.00	Ref.	575	28.4	1.00	Ref.				
12	1700	35.8	1.10	(0.93–1.31)	239	34.6	1.22	(0.90–1.65)				
13	1958	28.1	0.95	(0.79–1.14)	487	39.8	1.05	(0.82–1.33)	1514	32.0	1.00	Ref.
14	2165	24.9	0.84	(0.70–1.00)	168	31.2	1.10	(0.81–1.49)				
≥ 15	3423	24.6	0.83	(0.69–1.00)	871	19.4	0.68	(0.50–0.94)	1198	24.3	0.76	(0.64–0.90)
Family affluence												
Not well-off	825	19.2	1.00	Ref.	185	29.5	1.00	Ref.	155	13.7	1.00	Ref.
Average	3317	21.1	1.10	(0.91–1.33)	817	19.8	0.67	(0.47–0.96)	924	24.2	1.77	(1.08–2.91)
Well-off	5985	31.6	1.65	(1.36–2.00)	1337	29.6	1.00	(0.70–1.43)	1634	32.5	2.38	(1.46–3.89)
Immigration status												
Non-immigrant	7928	26.5	1.00	Ref.	2103	26.4	1.00	Ref.	2352	27.9	1.00	Ref.
Immigrant	2199	29.4	1.11	(0.98–1.25)	236	24.2	0.92	(0.63–1.35)	360	33.2	1.18	(0.94–1.49)
Community support												
Low	2906	21.2	1.00	Ref.	795	17.7	1.00	Ref.	828	21.4	1.00	Ref.
Medium	3479	27.0	1.28	(1.14–1.43)	763	27.6	1.56	(1.29–1.87)	905	28.3	1.32	(1.05–1.66)
High	3742	31.9	1.51	(1.32–1.73)	781	33.3	1.88	(1.44–2.46)	980	35.1	1.64	(1.33–2.03)
Family support												
Low	3093	17.5	1.00	Ref.	782	16.8	1.00	Ref.	858	21.5	1.00	Ref.
Medium	3644	27.6	1.58	(1.35–1.84)	700	26.8	1.60	(1.16–2.20)	962	25.9	1.20	(0.96–1.51)
High	3389	35.5	2.03	(1.77–2.32)	857	34.2	2.04	(1.53–2.72)	893	38.3	1.78	(1.45–2.18)
Quality of family communication												
Low	2738	16.2	1.00	Ref.	606	14.2	1.00	Ref.	730	17.9	1.00	Ref.
Medium	3251	26.3	1.63	(1.37–1.93)	874	26.1	1.84	(1.38–2.45)	1167	28.9	1.62	(1.27–2.06)
High	4137	35.0	2.17	(1.89–2.48)	860	34.7	2.45	(1.78–3.36)	815	37.8	2.12	(1.65–2.72)
Peer support												
Low	4166	23.2	1.00	Ref.	967	20.5	1.00	Ref.	1109	25.4	1.00	Ref.
Medium	3582	27.5	1.18	(1.05–1.33)	796	26.4	1.29	(1.00–1.66)	879	27.8	1.09	(0.89–1.35)
High	2379	33.4	1.44	(1.30–1.59)	576	35.4	1.73	(1.43–2.10)	724	34.6	1.36	(1.11–1.67)
Girls												
Age			0.75	(0.71–0.79)			0.73	(0.70–0.77)				
≤ 11	945	27.3	1.00	Ref.	478	28.6	1.00	Ref.				
12	1836	20.7	0.76	(0.62–0.92)	206	28.9	1.01	(0.73–1.40)				
13	2069	15.6	0.58	(0.47–0.73)	504	17.3	0.61	(0.45–0.81)	1584	19.1	1.00	Ref.
14	2564	10.5	0.39	(0.30–0.49)	164	12.9	0.45	(0.26–0.78)				
≥ 15	3632	8.2	0.30	(0.24–0.38)	647	7.8	0.27	(0.21–0.35)	1307	7.8	0.41	(0.30–0.56)
Family affluence												
Not well-off	1112	8.1	1.00	Ref.	177	7.1	1.00	Ref.	202	1.7	1.00	Ref.
Average	4044	9.9	1.22	(0.83–1.79)	810	16.6	2.34	(1.13–4.86)	1202	13.3	7.70	(2.70–21.9)
Well-off	5891	17.7	2.17	(1.48–3.19)	1014	20.5	2.90	(1.45–5.79)	1487	16.2	9.38	(3.17–27.8)
Immigration status												
Non-immigrant	9229	13.4	1.00	Ref.	1824	18.1	1.00	Ref.	2598	14.2	1.00	Ref.
Immigrant	1817	16.5	1.23	(1.04–1.45)	176	14.1	0.79	(0.46–1.33)	294	12.2	0.86	(0.58–1.27)
Community support												
Low	3558	8.4	1.00	Ref.	705	9.8	1.00	Ref.	909	7.0	1.00	Ref.
Medium	4036	13.8	1.63	(1.35–1.97)	695	19.5	1.99	(1.42–2.80)	932	13.2	1.89	(1.28–2.79)
High	3452	19.6	2.33	(1.95–2.79)	600	25.1	2.57	(1.80–3.66)	1051	20.6	2.94	(2.11–4.09)
Family support												
Low	4150	5.1	1.00	Ref.	761	12.3	1.00	Ref.	1085	6.1	1.00	Ref.
Medium	3474	15.2	3.00	(2.35–3.84)	580	17.2	1.40	(0.99–1.99)	889	11.1	1.82	(1.21–2.74)
High	3422	23.3	4.61	(3.67–5.80)	660	24.5	1.99	(1.44–2.75)	917	26.0	4.28	(3.01–6.09)
Quality of family communication												
Low	3808	4.7	1.00	Ref.	604	7.0	1.00	Ref.	989	4.3	1.00	Ref.
Medium	3008	13.2	2.78	(2.19–3.53)	686	19.0	2.70	(1.99–3.67)	1059	14.1	3.30	(2.22–4.90)
High	4229	22.6	4.77	(3.85–5.91)	710	25.7	3.67	(2.57–5.23)	843	25.1	5.87	(4.04–8.53)
Peer support												
Low	2969	9.6	1.00	Ref.	608	14.6	1.00	Ref.	802	8.1	1.00	Ref.
Medium	3812	14.0	1.46	(1.20–1.77)	636	14.7	1.01	(0.71–1.44)	821	12.0	1.48	(1.02–2.15)
High	4266	16.8	1.72	(1.45–2.12)	757	22.9	1.57	(1.10–2.25)	1269	19.0	2.35	(1.65–3.35)

Note: All values are weighted.

Among girls, in all three countries the age-adjusted models suggested that higher ordinal scores for each of the four domains were associated with more frequent reports of low subjective health complaints (12/12 models). In the fully adjusted models, positive associations remained and were strongest for connections to “self” (all three countries), and these effects were much stronger than those reported for boys. Effects were weaker but present for connections to “nature” (all

three countries) and “others” (Scotland only), and were not present for the connections to the “transcendent” domain.

In our path SEM models, among both girls and boys we identified strong direct effects between connections to self and low subjective health complaints, and much weaker and mainly statistically non-significant (Table 4) direct effects for each of the other three domains. Model findings also suggested consistent indirect effects between

Table 3
Results of log binomial regression examining the associations between domain-specific ordinal scores of spiritual health and low subjective health complaints: 2013/14 Health Behaviour in School-aged Children Study by country and gender.

	Canada				England				Scotland			
	Adjusted for age		Fully adjusted*		Adjusted for age		Fully adjusted*		Adjusted for age		Fully adjusted*	
	RR	(95% CI)	RR	(95% CI)	RR	(95% CI)	RR	(95% CI)	RR	(95% CI)	RR	(95% CI)
Boys												
Self	1.26	(1.16–1.37)	1.05	(0.96–1.16)	1.32	(1.15–1.52)	1.15	(0.99–1.33)	1.27	(1.14–1.42)	1.13	(1.00–1.28)
Others	1.16	(1.08–1.24)	0.91	(0.84–0.98)	1.23	(1.07–1.41)	0.96	(0.81–1.14)	1.16	(1.05–1.28)	0.94	(0.83–1.06)
Nature	1.21	(1.15–1.27)	1.10	(1.03–1.19)	1.17	(1.08–1.27)	1.03	(0.97–1.09)	1.16	(1.08–1.24)	1.06	(0.98–1.15)
Transcendent	1.10	(1.05–1.15)	1.02	(0.98–1.06)	1.06	(1.01–1.13)	1.01	(0.96–1.07)	1.07	(1.01–1.14)	1.02	(0.95–1.08)
Girls												
Self	1.86	(1.62–2.12)	1.58	(1.38–1.81)	1.51	(1.26–1.80)	1.30	(1.09–1.56)	1.76	(1.51–2.04)	1.39	(1.18–1.62)
Others	1.51	(1.32–1.73)	1.05	(0.91–1.21)	1.43	(1.17–1.73)	1.09	(0.89–1.33)	1.81	(1.50–2.18)	1.32	(1.06–1.65)
Nature	1.33	(1.24–1.43)	1.10	(1.01–1.20)	1.31	(1.17–1.46)	1.16	(1.02–1.31)	1.42	(1.28–1.58)	1.19	(1.04–1.36)
Transcendent	1.17	(1.11–1.24)	1.03	(0.97–1.10)	1.08	(0.99–1.18)	0.99	(0.89–1.09)	1.17	(1.06–1.29)	0.98	(0.89–1.09)

Spiritual health domain scores varied from 0 to 4.

* Adjusted for age, spiritual health domains, family affluence, immigration status, community support, family support, family communication, and peer support.

connections to others, nature, and the transcendent and reports of low subjective health complaints, as mediated through connections to self. Again, these findings were essentially equivalent in England and Scotland.

Finally, in order to address the possibility that specific variables (community support, family support, peer support and family communication) that were considered as confounders in our binomial regressions (Table 3) and the path analysis (Fig. 1) may be acting as mediators, we conducted a sensitivity analyses where they were removed from these models. Findings were essentially equivalent between the unadjusted and adjusted versions of the models and path analyses.

4. Discussion

This cross-national analysis identified strong and consistent associations between self-reports of the importance of the four domains of spiritual health and low subjective health complaints, one indicator of positive mental health. Subjective health complaints include psychological and somatic symptoms that are manifestations of psychological processes. (Piccininni et al., 2018; Currie et al., 2014; Haugland et al., 2001). Psychological symptoms act as the initial expression of perceived stress, and have the potential to develop into somatic symptoms in later stages of perceived stress (Haugland et al., 2001).

In all three countries, associations between our indicators of

spiritual health and subjective health complaints were strongest for girls. The domain that was most strongly and consistently associated with low subjective health complaints in girls and boys was “connections to self”. This was borne out all of our modelling. For the other domains differences by gender were reported. Among boys, there was a modest association between “connections to nature” and low subjective health complaints after adjustment for covariates, while effects with the other two domains were weaker and lost strength and statistical significance in the fully adjusted models. This loss of effect with adjustment for covariates too was observed for the other domains among girls, although statistically significant effects remained with connections with “others” and “nature” in Scotland, and for the transcendent domain in Canada only. There may, therefore, be some cross-national and gender differences in the extent to which these domains impact on young people’s mental health, potentially explained by socio-cultural or educational factors. Further research is required to better understand the nature and relevance of these differences. However, our primary finding was that “connections to self” remain central to these relationships and patterns.

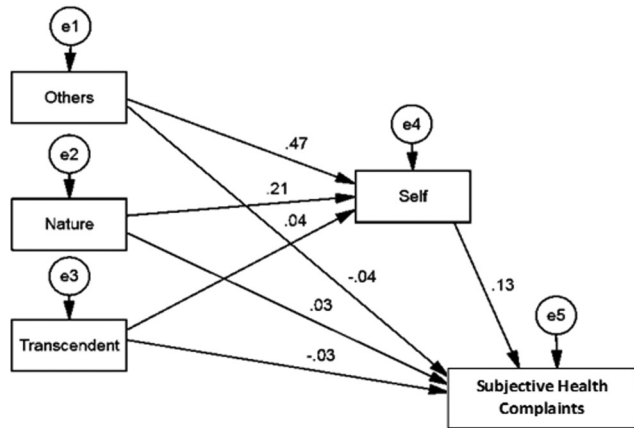
Building on seminal conceptual work in this field, both qualitative and quantitative (Michaelson et al., 2016; Hay and Nye, 2006; Gomez and Fisher, 2003), our analysis provides correlational evidence of the potential importance of adolescent spiritual health in fostering one composite indicator of positive mental health. An important addition to

Table 4
Standardized effect estimates taken from the fully adjusted path analysis (presented in Fig. 1) for boys and girls, Canada, 2013/14 Health Behaviour in School-aged Children Study.

Boys	Total effects			Direct effects			Indirect effects		
	beta	(95% CI)	P	beta	(95% CI)	P	beta	(95% CI)	P
Connections to...									
Self	0.13	(0.11–0.16)	0.01	0.13	(0.11–0.16)	0.01	–	–	–
Others	0.02	(–0.002–0.04)	0.15	–0.04	(–0.07 – –0.02)	0.01	0.06	(0.05–0.07)	0.01
Nature	0.06	(0.04–0.08)	0.01	0.03	(0.01–0.05)	0.02	0.03	(0.02–0.03)	0.01
Transcendent	–0.03	(–0.05 – –0.01)	0.02	–0.03	(–0.05 – –0.02)	0.01	0.01	(0.003–0.007)	0.01
Girls									
Connections to...									
Self	0.19	(0.17–0.21)	0.01	0.19	(0.17–0.21)	0.01	–	–	–
Others	0.03	(0.02–0.05)	0.02	–0.04	(–0.06 – –0.02)	0.01	0.07	(0.06–0.08)	0.01
Nature	0.03	(0.01–0.05)	0.01	–0.02	(–0.04 – –0.002)	0.06	0.05	(0.04–0.05)	0.01
Transcendent	–0.002	(–0.02–0.01)	0.84	–0.02	(–0.03 – –0.002)	0.08	0.01	(0.01–0.02)	0.01

Notes: Standardized betas have been adjusted for age, socioeconomic status, and peer, family, and community support (findings for England and Scotland available upon request).

Boys



Girls

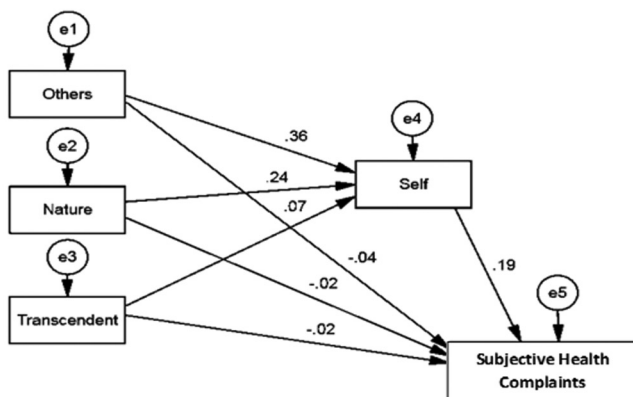


Fig. 1. Structural equation model (path analysis) examining the hypothetical pathways through which the spiritual health domains may be operating on subjective health complaints for boys and girls, Canada, 2013/14 Health Behaviour in School-aged Children Study. Standardized beta coefficients have been adjusted for age, socioeconomic status, and peer, family, and community support. Note that e1 through e5 refer to the model-generated error terms, and betas were generated from maximum likelihood estimation.

the existing evidence base, however, is the hypothesis that each of the domains that are inherent to the holistic concept of spirituality, while highly correlated, may not be operating as part of a single factor or construct that has an overall influence on mental health status. Rather, it appears that each domain may have direct and also indirect influences, with associations between connections to “others”, “nature” and the “transcendent” possibly being mediated, at least partially, through connections to “self”, at least in our countries. This idea was borne out in the structural equation models that quantified the relative strength of the connections to self-domain, as well as the consistency of the indirect effects with the other domains in both genders.

If the hypothetical pathways described in our findings are true, they would have implications for etiological research. First, a focus on these more internal connections to self may conceptually provide the most direct route(s) to positive mental health status. Second, study of the other domains, whether they focus on the quality and depth of relationships with others, fostering connections to nature and the land, or even focus on God (or whatever one believes to be ultimate) and the transcendent, are important yet may be incomplete without considering internalized connections with “self” that seem fundamental to positive mental health status. As implied by our path structural equation analysis, these models may wish to consider connections with “self” as important intermediate outcomes in causal pathways. Third, model findings that depict the important of connections to “self” suggest that

this domain requires more in-depth focus and emphasis as part of etiological mechanisms.

The “connection to self” domain includes two items, one of which relates to the importance of young people experiencing meaning in life. This relates to Antonovsky’s “sense of coherence” theory: the extent to which one sees one’s world as comprehensible, manageable, and meaningful (Antonovsky, 1993; Antonovsky and Sourani, 1988). Such coherence has been shown to strongly relate to positive mental health status in that it enables people to reflect on and mobilize external and internal resources in order to resolve tension in a health promoting manner” (Eriksson and Lindström, 2006).

The second item related to the domain “connection to self” is about the importance of experiencing joy (pleasure, happiness) in life. This item may relate to the attainment of a fulfilling life as it has been endorsed, for example, in the field of positive psychology (Seligman and Csikszentmihalyi, 2014). Accordingly, positive mental health is fostered by helping people to develop strengths, or buffers, against psychopathologies and such buffers clearly include the intentional pursuit of positive emotions and experiences, such as joy or happiness (Shoshani and Steinmetz, 2014).

The items about connections to “self” contained in our adapted spiritual health scale therefore relate to other well-known theories that have been used to explain the conditions and practices required to achieve positive mental health status. In past research, such constructs have been independently associated with decreases in anxiety and depression, and increases in self-esteem, self-efficacy, and optimism (Shoshani and Steinmetz, 2014). In addition, both Antonovsky’s and Seligman’s theories recognize that spirituality can be an important asset to health and well-being (Delgado, 2007). What our analyses have added, however, is that these two qualities (a sense of meaning or meaningfulness along with positive experiences of “joy”) may actually be working synergistically. Moreover, when this sense of meaning in life and experiences of joy are reported in combination, reports of subjective health complaints are five to seven-fold lower than when compared to young people with neither of these qualities. The sum of these two items therefore makes this a particularly powerful correlate, and potentially determinant, of positive mental health status.

One possible concern about the emergent central focus on “connections to self” in our models is that it affirms the potentially negative culture of “extreme individualism”, which some have argued is culturally or socially constructed (Hay, 2000). Research is clear that the development of a sense of self can be vital to positive mental health in adolescents. Our only caution, which stems from thinking in the discipline of spirituality, is that the development of a sense of self at the expense of other connections could potentially come at a cost, and result in what Hay describes as “destructive of human community” (Hay, 2000).

Strengths of our analysis include its robust and cross-national nature. It contributes to a strong literature base by adding theoretical depth and advanced modelling that we hope will inform causal thinking and possible interventional approaches (Scales et al., 2014; Hay and Nye, 2006; Yust et al., 2006; Gomez and Fisher, 2003). One potential limitation is that the positive connections measured in our spiritual health scale may be viewed as simply another expression of the positive mental health outcome being modelled and hence, the strong association between connections to self and low subjective health complaints is spurious. However, we would argue that the subjective health complaints that constitute our outcome (e.g., somatic symptoms, psychological complaints) are conceptually different than the constructs that make up the “connections to self” domain, and our interpretations have some validity. Additional limitations include challenges associated with use of cross-sectional data, which limits temporal and causal inference. Our analysis suffered from modest sample sizes and hence limits on power within some strata, particularly in England and Scotland. Our use of an adapted and abbreviated version of a previously validated instrument to assess spiritual health has also been subject to criticism

(Fisher, 2016). However, we see our efforts to refine and further develop the scale and adapt it for a large population health survey as strengths, as is our effort to apply it to etiological questions of interest. Our work makes an important contribution to the way that the concept of spiritual health can be explored in like quantitative studies.

Our findings have implications for future research on adolescent health and possible interventions to address youth mental health and emotional well-being. The analysis of the domains of spirituality offer insights into possible protective assets that enable young people to thrive and develop strong emotional health. Our study findings respectfully challenge the field to consider more complex models and pathways linking spiritual and other aspects of adolescent health. There is a need for more sophisticated analysis of the proposed pathways represented in Fig. 1 to determine whether our hypothesized causal model can be observed consistently across countries and confirmed in longitudinal approaches to analysis. If this simple model is found to be robust, there is also a need to evaluate interventions that focus on direct and indirect components of this pathway, to see if it can be useful in optimizing positive mental health in efficient and evidence-based manners. Our findings provide important direction to interventional approaches as well, in that they necessitate a focus on the centrality of connections to “self,” and stress the need for a (re)focus of interventions that prioritise the other domains to include consideration of self as part of their content and as a potential indirect mechanism linking them to mental health outcomes. This is important both theoretically and practically. To illustrate, our findings offer a theoretical challenge to the discipline of spirituality to reconsider any assumptions that the four domains work together in an equally balanced way. More practically, the findings stress the importance of being attentive to creating interventions that nurture a sense of meaning or coherence and also that foster a sense of joy in life as a way of fostering connections within the other three domains.

Conflicts of interest

The authors have no conflicts of interest to declare.

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References

- Antonovsky, A., 1993. The structure and properties of the sense of coherence scale. *Soc. Sci. Med.* 36, 725–733.
- Antonovsky, A., Sourani, T., 1988. Family sense of coherence and family adaptation. *J. Marriage Fam* 50, 79–92.
- Benson, P.L., Scales, P.C., Syvertsen, A.K., Roehlkepartain, E.C., 2012. Is youth spiritual development a universal developmental process? An international exploration. *J. Posit. Psychol.* 7, 453–470.
- Bone, J., Cullen, J., Loveridge, J., 2007. Everyday spirituality: an aspect of the holistic curriculum in action. *Contemp. Issues Early Child.* 8, 344–354.
- Brooks, F., Michaelson, V., King, N., Inchley, J., Pickett, W., 2018. Spirituality as a protective health asset for young people: an international comparative analysis from three countries. *Int. J. Public Health* 63 (3), 387–395.
- Chirico, F., 2016. Spiritual well-being in the 21st century: it's time to review the current WHO's health definition. *J. Health Soc Sci* 1, 11–16.
- Cotton, S., Larkin, E., Hoopes, A., Cromer, B.A., Rosenthal, S.L., 2005. The impact of adolescent spirituality on depressive symptoms and health risk behaviors. *J. Adolesc. Health* (6), 529.
- Currie, C., Inchley, J., Molcho, M., Lenzi, M., Weselska, Z., Wild, F., 2014. Health Behaviour in School-Aged Children (HBSC) Study Protocol: Background, Methodology, and Mandatory Items for the 2013/2014 Survey. St Andrews University, Scotland. <http://www.hbsc.org>.
- Delgado, C., 2007. Sense of coherence, spirituality, stress and quality of life in chronic illness. *J. Nurs. Scholarsh.* 39, 229–234.
- Dhar, N., Chaturvedi, S.K., Nandan, D., 2013. Spiritual health, the fourth dimension: a public health perspective. *WHO South-East Asia J Public Health* 2, 3–5.
- Elgar, F.J., Davis, C.G., Wohl, M.J., Trites, S.J., Zelenski, J.M., Martin, M.S., 2011. Social capital, health and life satisfaction in 50 countries. *Health Place* 17, 1044–1053.
- Eriksson, M., Lindström, B., 2006. Antonovsky's sense of coherence scale and the relation with health: a systematic review. *J. Epidemiol. Community Health* 60, 376–381.
- Fisher, J.W., 2016. Assessing adolescent spiritual health and well-being (commentary related to social science & medicine–population health, ref: SSMPH-D-15-00089). *SSM Popul Health* 2, 304–305.
- Gomez, R., Fisher, J.W., 2003. Domains of spiritual well-being and development and validation of the spiritual well-being questionnaire. *Pers Individ Dif* 35, 1975–1991.
- Goodman, E., Huang, B., Schafer-Kalkhoff, T., Adler, N.E., 2007. Perceived socioeconomic status: a new type of identity that influences adolescents' self-rated health. *J. Adolesc. Health* 41, 479–487. <https://doi.org/10.1016/j.jadohealth.2007.05.020>.
- Haugland, S., Wold, B., 2001. Subjective health complaints in adolescence—reliability and validity of survey methods. *J. Adolesc. Health* 24, 611–624.
- Hawks, S.R., Smith, T., Thomas, H.G., Christley, H.S., Meinzer, N., Pyne, A., 2007. The forgotten dimensions in health education research. *Health Educ. Res.* 23, 319–324.
- Hay D (2000) “Spirituality versus individualism: why we should nurture relational consciousness.” *Int J of Children's Spirituality* 5(1):37–48, p 47.
- Hay, D., Nye, R., 2006. *The Spirit of the Child*. Rev ed.. Jessica Kingsley Publishers, London.
- Holder, M.D., Coleman, B., Wallace, J.M., 2010. Spirituality, religiousness, and happiness in children aged 8–12 years. *J. Happiness Stud.* 11, 31–50.
- Michaelson, V., Brooks, F., Jirásek, I., Inchley, J., Whitehead, R., King, N., Walsh, S., Davison, C.M., Mazur, J., Pickett, W., 2016. Developmental patterns of adolescent spiritual health in six countries. *SSM-Population Health* 2, 294–303.
- Miller, J.P., Nakagawa, Y. (Eds.), 2002. *Nurturing our Wholeness: Perspectives on Spirituality in Education*. Foundation for Educational Renewal, Brandon.
- Piccininni, C., Michaelson, V., Janssen, I., Pickett, W., 2018. Outdoor play and nature connectedness as potential correlates of internalized mental health symptoms among Canadian adolescents. *Prev. Med.* 112, 168–175.
- Scales PC, Syvertsen AK, Benson PL, Roehlkepartain EC, Sesma A Jr (2014) Relation of spiritual development to youth health and well-being: evidence from a global study. In: Ben-Arieh A, Casas F, Frønes I, Korbin JE. *Handbook of Child Well-Being: Theories, Methods and Policies in Global Perspective*. vol. 2 Houten: Springer Netherlands, 1101–35.
- Seligman, M.E.P., Csikszentmihalyi, M., 2014. Positive psychology: an introduction. In: Csikszentmihalyi, Mihaly (Ed.), *Flow and the Foundations of Positive Psychology: The Collected Works of Mihaly Csikszentmihalyi*. Springer, New York, pp. 279–298.
- Shoshani, A., Steinmetz, S., 2014. Positive psychology at school: a school-based intervention to promote adolescents' mental health and well-being. *J. Happiness Stud.* 15, 1289–1311.
- United Nations General Assembly, 1989. *Convention on the Rights of the Child*. UN General Assembly, New York [cited 2018 July 12]. Available from: <http://www.refworld.org/docid/3ae6b38f0.html>.
- Vader, J.P., 2006. Spiritual health: the next frontier. *Eur. J. Pub. Health* 16, 457.
- World Health Organization, 1948. *Constitution of the World Health Organization*. In: grad FP (2002) the preamble of the constitution of the World Health Organization. *Bull. World Health Organ.* 80, 982.
- Yust, K.M., Johnson, A.N., Sasso, S.E., Roehlkepartain, E.C., 2006. Traditional wisdom: creating space for religious reflection on child and adolescent spirituality. In: Yust, K.M., Johnson, A.N., Sasso, S.E., Roehlkepartain, E.C. (Eds.), *Nurturing Child and Adolescent Spirituality: Perspectives From the World's Religious Traditions*. Rowman & Littlefield Publishers, Inc., New York, pp. 1–14.
- Zimet, G.D., Dahlem, N.W., Zimet, S.G., Farley, G.K., 1988. The multidimensional scale of perceived social support. *J. Pers. Assess.* 52, 30–41.