



Self-transcendence as a measure of spirituality in a sample of older Australian twins

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Measures of self-transcendence, physical health and psychological well-being were included in a self-report Health and Lifestyle questionnaire administered to Australian twins aged over 50 between 1993 and 1995. Self-transcendence appears to be higher among older Australian women than men, and was significantly associated with religious affiliation, marital status (in women) and age (in men). No strong correlations were observed between self-transcendence and any measure of psychological or physical health. Additive genetic effects were found to be important in influencing self-transcendence, with heritability estimates of 0.37 and 0.41 for men and women respectively, whilst shared environment effects were not found to be significant. Multivariate modelling of self-transcendence scores and self-reported church attendance behavior indicated substantially different etiologies for these variables, with implications for methods of investigation of religiosity and spirituality.

Keywords: self-transcendence, church attendance, spirituality, twins, temperament, character inventory

Introduction

Self-transcendence has been defined as the capacity to reach out beyond oneself and discover or make meaning of experience through broadened perspectives and behavior.¹ As an indicator of spirituality, it has been described as a developmental process involving aspects of self-forgetful experience, transpersonal identification (identification with nature) and spiritual acceptance,² and a characteristic of developmental maturity.³

Some studies have found significant correlations between religious beliefs, attitudes or behavior and physical health or psychological well-being among older individuals,^{1,4–6} whilst others have not.⁷ Lack of agreement between studies has been attributed to the inadequacy of instruments used to measure religious attitudes and behavior,⁵ and the situation is complicated by concerns regarding causation.^{4,8} In particular, church attendance has been criticised as a measure of religiosity, with the observation that as people age and become restricted by financial considerations and physical disabilities, their ability to participate in organised religious activity decreases.⁹ Ainlay and Smith¹⁰ identified three separate aspects of religious participation (public participation, attitude toward participation, and private participation)

with these dimensions becoming more distinct with advancing age, whilst Koenig et al¹¹ found various aspects of physical and mental health were associated with different forms of religious activity among older persons.

Inherited sources of influence on some aspects of an individual's religious behavior have previously been considered,^{12–14} with both church attendance and religious affiliation found to have substantial shared environment effects and at least some indication of additive genetic influences. Cloninger et al² hypothesised that genetic factors were likely to be important in character development (of which self-transcendence was proposed to be part), with the alternative possibility of strong shared environmental influences indicating importance of cultural perspectives and social learning in the epigenesis of self-concepts. Investigation of the possible biological and nonbiological influences on self-transcendence is therefore important for understanding self-transcendence and character as a whole.

This study considers self-transcendence as a measure of spirituality in a sample of Australian twins over 50 years of age, and its relationship with a range of demographic and psychological variables. As a measure of character, rather than behavior, it is suggested that this construct may provide information about the relationship between intrinsic spiritual or religious tendencies and health in this age group. Sources of individual variation in self-transcendence (measuring spirituality) and church attendance (measuring active organised religious participation) among older people are also explored using

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univariate and multivariate structural modelling techniques.

Method

Sample

Data for this study were collected as part of a Health and Lifestyle Questionnaire of twins over 50 years of age who were enrolled on the Australian National Health and Medical Research Council Twin Registry (ATR). The ATR is a volunteer register begun in 1978 and has about 25 000 twin pairs of all zygosity types and all ages enrolled and in various stages of active contact. Twins are recorded on the register regardless of their state of health. Questionnaires were mailed to 2281 pairs of eligible twins during 1993–1995, with responses received from 1279 complete pairs and 558 singles. Excluding deaths and non-contacts, the individual and complete pairs' questionnaire response rates were 71% and 61%, respectively. As commonly observed in volunteer twin studies, there was a higher response rate from women (73%) than from men (59%) and from monozygotic twins than from dizygotic twins (73% and 65%, respectively). The mean age of respondents was 61.5 ± 8.7 years, with an age range for men of 50–89 years, and for women of 50–94 years.

Although no significant difference in mean age was observed between those who responded to the questionnaire and those who did not, the age distribution of non-responders was more positively skewed (has a longer right tail) ($P < 0.02$). That is, the non-responder group contains more very old people than the responder group. Previous studies of a related data set¹⁵ have indicated that there is likely to be a disproportionate number of people with higher than average levels of education in the sample.

Measures

Fifteen items from the original Self-transcendence scale of the Temperament and Character Inventory² were included in the questionnaire, along with a range of items requesting information on marital status, religious affiliation, and frequency of church attendance. Measurement of subjective health status was achieved via a single item 'How would you describe your health at present?' with a five-point response set (very good / good / fair / poor / very poor). Level of physical incapacitation was assessed using items asking about ability for self-care, work and housekeeping, walking outdoors on flat ground, and recreation and leisure. These four items used a three-point response set of 'completely able', 'some limitations' and 'very limited'. Also included in the

16-page questionnaire were several psychological scales, including the anxiety and depression scales of the Delusion Symptoms States Inventory (DSSI/sAD),¹⁶ the 12-item General Health Questionnaire (GHQ-12),¹⁷ used extensively in epidemiological and clinical studies to detect cases of psychological distress, and an 8-item community version of the Schedule of Fatigue and Anergia (SOFA)¹⁸ which is a screening test for chronic fatigue/neurasthenia. General optimism was measured by the Life Orientation Test¹⁹ which used a three-point response set instead of the original five-point Likert scale. The Extraversion, Neuroticism, Psychoticism and Lie scales of the revised short version of the Eysenck Personality Questionnaire (EPQ-RS)²⁰ were also included, along with Short Interpersonal Reactions Inventory²¹ items from Type 1 ('cancer-prone' with emotional response suppression), Type 2 ('coronary heart disease-prone' with stress responses of chronic irritation and anger), Type 4 ('healthy' with autonomous behavior) and Type 5 (rational/anti-emotional behavior). The original Type 4 scale has positively scored and negatively scored components, which were treated here as separate scales (4a and 4b respectively) as several studies have noted the low correlation between these subscales.^{22–24}

Statistical techniques

Although 3116 questionnaire responses were received, not all responses were free of missing values for the items of interest. The imputation option of PRELIS2.12²⁵ was used to impute the missing item responses for the self-transcendence scale, within individuals by sex. This approach obtains the substitute value from other cases with similar response patterns but no missing values, provided the variance of the value for these other cases is acceptable. After imputation, 1911 female and 827 male respondents (87% and 90% of the original sample, respectively) had complete responses for self-transcendence items, an increase of 178 individuals (0.4% of data points imputed).

Structural equation modelling²⁶ is used to distinguish between possible mechanisms of familial resemblance for traits of interest. Three broad causes of variation can be considered, two of which (additive genetic influences 'A' and common environment 'C') make family members more alike than random pairs of individuals. The third source of variance (unique environment 'E') acts to make monozygotic (MZ) and dizygotic (DZ) twins different from one another. Significant correlations between twins indicate the presence of familial aggregation for the measures of interest, and modelling is then used to determine which combination of these three parameters provides the most parsimonious explanation for

Table 1 Response frequencies of Temperament and Character Inventory Self-transcendence items in a study of Australian twins aged over 50

Questionnaire items	% Yes		Z	Factor structure	
	Females (n=1911)	Males (n=827)		Females (λ=7.31)	Males (λ=6.33)
1 Often I have unexpected flashes of insight or understanding while relaxing	43.9	52.1	-3.96 ^a	0.46	0.31
2 I often feel a strong spiritual or emotional connection with all the people around me	37.7	33.5	2.11 ^b	0.57	0.50
3 I often feel that I am a part of the spiritual force on which all life depends	26.4	25.3	0.60	0.67	0.65
4 I love the blooming of flowers in the spring as much as seeing an old friend again	90.2	80.3	7.14 ^a	0.03	0.13
5 I sometimes feel so connected to nature that everything seems to be part of one living organism	23.8	18.0	3.33 ^a	0.53	0.48
6 I seem to have a 'sixth sense' that sometimes allows me to know what is going to happen	44.3	35.0	4.55 ^a	0.39	0.28
7 Sometimes I have felt as if I was part of something with no limits or boundaries in time or space	16.6	18.0	-0.88	0.57	0.56
8 I sometimes feel a spiritual connection to other people that I cannot explain in words	37.9	28.2	4.92 ^a	0.72	0.68
9 Sometimes I have felt my life was being directed by a spiritual force greater than any human being	32.4	30.5	0.99	0.72	0.73
10 I often become so fascinated with what I'm doing that I get lost in the moment – as if I'm detached from time and place	31.8	33.5	-0.86	0.40	0.38
11 I have made real personal sacrifice in order to make the world a better place – like trying to prevent war, poverty and injustice	18.2	26.7	-5.07 ^a	0.33	0.33
12 I have had personal experiences in which I felt in contact with a divine and wonderful spiritual power	29.1	25.9	1.72	0.68	0.70
13 I have had moments of great joy in which I suddenly had a clear, deep feeling of oneness with all that exists	39.4	35.4	1.96 ^b	0.65	0.57
14 I believe that all life depends on some spiritual order or power that cannot be completely explained	62.1	56.6	2.71 ^c	0.46	0.50
15 Often when I look at an ordinary thing, something wonderful happens – I get the feeling that I am seeing it fresh for the first time	41.8	29.6	6.03 ^a	0.51	0.48

^ap<0.001; ^bp<0.01; ^cp<0.05.

the observed pattern of MZ and DZ twin correlations. The inclusion of another source of variance, 'M', allows for the inclusion in the model of additive genetic effects not shared by males and females. Extension to multivariate analysis allows the determination not only of the sources of covariation but the pattern or structure in which these differentially influence the covarying measures. The same principles of parsimony apply in arriving at the preferred model.²⁶ Implementation of structural equation modelling here was via Mx,²⁷ whilst other statistical analyses were performed using SAS6.11.²⁸

Results

Response frequencies and factor analysis

Tables 1 and 2 list self-transcendence item response frequencies and frequency of church attendance for male and female respondents. Endorsement frequencies differed significantly between men and women on two-thirds of the items, and mean self-transcendence scores were generally higher for women (5.76 ± 3.83) than for men (5.28 ± 3.62) (P = 0.006). By contrast, no overall difference was observed between sexes in self-reported church attendance frequency ($\chi^2_4 = 4.02$). The distribution of self-transcendence is not normal (P < 0.001), with

Table 2 Frequency (percentage) of church attendance in Australian twins aged over 50, by sex

	Rarely	Once or twice a year	Every month or so	Once a week	More than once a week
Females (n = 2063)	897 (43.5%)	285 (13.8%)	161 (7.8%)	451 (21.9%)	269 (13.0%)
Males (n = 872)	398 (45.6%)	123 (14.1%)	64 (7.3%)	195 (22.4%)	92 (10.6%)

No significant difference in church attendance between males and females

positive skewness (0.60 for female scores and 0.74 for male scores). Exploratory factor analysis using maximum likelihood factor analysis of the 15 self-transcendence items indicated a single common factor for men and women, accounting for 42% and 49% of total variance respectively. Item 4 ('I love the blooming of flowers in the spring as much as seeing an old friend again') was the only item with a poor fit to this factor, with very small loadings obtained in each case (0.03 for women and 0.13 for men).

Correlations with other variables

The relationships between self-transcendence and the demographic, health and psychological variables above are outlined in Tables 3 and 4. Self-transcendence scores are not homogenous across religious

Table 3 Relationship between self-transcendence and marital status, and religious affiliation. Mean values \pm standards deviation are shown, with number of cases in brackets and Kruskal-Wallis homogeneity test P-values

Marital status	K-W Test	Married	De facto	Widowed	Separated	Divorced	Single
Females	P=0.003	5.58 \pm 3.79 (1339)	5.23 \pm 3.81 (31)	5.84 \pm 5.90 (275)	6.55 \pm 3.60 (42)	6.89 \pm 3.92 (117)	6.22 \pm 3.93 (103)
Males	P=0.426	5.32 \pm 3.70 (710)	5.00 \pm 2.16 (10)	4.96 \pm 2.92 (25)	3.95 \pm 3.22 (22)	5.45 \pm 2.94 (33)	5.80 \pm 3.62 (25)

Religious Affiliation		None	Evangelical	Fundamentalist	Anglican	Other Protestant	Roman Catholic	Other
Females	P<0.0001	4.79 \pm 3.67 (127)	7.85 \pm 3.25 (52)	6.18 \pm 3.34 (11)	5.31 \pm 3.74 (628)	6.13 \pm 3.85 (598)	5.61 \pm 3.73 (365)	7.14 \pm 4.20 (91)
Males	P<0.0001	3.64 \pm 2.94 (88)	9.00 \pm 3.20 (16)	7.70 \pm 3.50 (10)	4.95 \pm 3.66 (268)	5.39 \pm 3.43 (244)	5.62 \pm 3.64 (152)	6.95 \pm 3.98 (39)

Table 4 Polychoric correlations between self-transcendence and age, church attendance, health self-rating and various psychological scale variables

Variable	Females		Males	
	r \pm ASE	n	r \pm ASE	n
Age	-0.01 \pm 0.02	1911	0.15 \pm 0.04	827
Church attendance	0.30 \pm 0.02	1827	0.41 \pm 0.03	801
Health self-rating	-0.03 \pm 0.03	1779	-0.01 \pm 0.04	783
Incapacitation	0.08 \pm 0.03	1874	0.03 \pm 0.05	815
Optimism	0.16 \pm 0.02	1762	0.17 \pm 0.04	789
EPQ-RS Extraversion	0.21 \pm 0.02	1691	0.11 \pm 0.04	741
EPQ-RS Neuroticism	0.04 \pm 0.02	1778	0.15 \pm 0.04	782
EPQ-RS Psychoticism	0.17 \pm 0.02	1787	0.06 \pm 0.04	765
EPQ-RS Lie	-0.10 \pm 0.02	1747	0.00 \pm 0.04	777
SOFA Fatigue	0.12 \pm 0.03	1688	0.09 \pm 0.04	769
GHQ-12 Distress	0.10 \pm 0.03	1889	0.00 \pm 0.04	818
DSSI Anxiety	0.14 \pm 0.02	1898	0.14 \pm 0.04	823
DSSI Depression	0.13 \pm 0.03	1902	0.14 \pm 0.04	823
SIRI Type 1	-0.02 \pm 0.02	1812	0.17 \pm 0.04	792
SIRI Type 2	0.03 \pm 0.03	1815	0.09 \pm 0.04	793
SIRI Type 4a	0.20 \pm 0.02	1795	0.13 \pm 0.04	782
SIRI Type 4b	0.00 \pm 0.02	1757	-0.08 \pm 0.04	777
SIRI Type 5	-0.08 \pm 0.03	1749	-0.09 \pm 0.04	787

affiliation groups for men or women (Table 3), with those belonging to fundamentalist and evangelical denominations tending to have the highest self-transcendence, and those with no affiliation the lowest. This significant difference in self-transcendence with affiliation persists even when those with no affiliation are removed from the analysis. By contrast, marital status is only significantly associated with self-transcendence in women, with married women, widows and those in de facto relationships tending to have lower self-transcendence than those who are single, separated or divorced.

From Table 4 it can be seen that self-transcendence is substantially correlated with church attendance behavior in both men and women (0.41 and 0.29 respectively), whilst age is only correlated with self-transcendence scores for men. Small but statistically significant correlations are observed with optimism, extraversion, fatigue, anxiety, depression and SIRI Types 4a and 5 in both sexes, with the addition of EPQ-RS Neuroticism and SIRI Type 1 in men and

psychological distress, incapacitation and EPQ-RS Psychoticism and Lie scales in women. Self-rating of current health status is uncorrelated with self-transcendence in either men or women.

Univariate analysis

Correlations between MZ and DZ twins for self-transcendence scores and church attendance behavior appear in Table 5. Self-transcendence scores are more highly correlated for MZ male and female twins than for DZ twins, indicating some genetic influence on this measure. Dizygotic female twins only have slightly lower correlations for church attendance than their MZ counterparts, and the corresponding observed correlation for DZ male twins is somewhat higher than for monozygotic male twins, indicating that shared environment effects are likely to be important in determining familial resemblance in church attendance behavior.

Results of univariate structural modelling of self-transcendence and church attendance data are shown in Tables 6 and 7, with Table 8 summarising estimates of variance components and their 95% confidence intervals for the most parsimonious model for each variable. Self-transcendence is best described by a model including additive genetic effects which are the same in men and women, a small age effect in men only and unique environment. Age effects in men and women could not be equated (Model 3) and the additive genetic effect could not be dropped from the model without significantly worsening model fit (Model 7). It should be noted that the eight degrees of freedom in the initial model arise from data concerning age effects in the various zygosity groups, and do not provide information about additive genetic, shared environment and unique environment. In this respect, Model 1 is a saturated model and the poor fit of the overall models are indicators of heterogeneity in the age regression. Church attendance behavior in this sample has a different etiology, with a substantial shared environment component of the same

Table 5 Cross-twin cross-trait polychoric correlations for monozygotic and dizygotic twins for self-transcendence (ST) and church attendance (CA). Bold type indicates twin correlations for the relevant trait

	MZ Females (369 pairs)				MZ Male (122 pairs)				ST1	CA1	ST2	CA2
	ST1	CA1	ST2	CA2	ST1	CA1	ST2	CA2				
ST1	1.00	0.35	0.49	0.24	1.00	0.45	0.40	0.03	1.00			
CA1	0.33	1.00	0.18	0.65	0.47	1.00	0.15	0.36	0.31	1.00		
ST2	0.26	0.28	1.00	0.28	0.18	0.16	1.00	0.51	0.25	0.31	1.00	
CA2	0.21	0.56	0.40	1.00	-0.06	0.43	0.30	1.00	0.19	0.43	0.38	1.00
	DZ Females (209 pairs)				DZ Males (64 pairs)				DZ Opposite sex (191 pairs)			

Table 6 Univariate models for TCI Self-transcendence scale, indicating variance components attributable to additive genetic, shared environment and unique environment effects. Preferred model is highlighted in bold

Model	Females						Males				Model χ^2	df	Comparison	
	A _f	C _f	E _f	age _f	A _m	C _m	E _m	M	age _m	Compare with model			P	
1	0.427	0.066	0.507	<0.001	0.310	0.079	0.571	0.000	0.040	17.422	8	–	–	
2	0.427	0.066	0.507	<0.001	0.310	0.079	0.571	–	0.040	17.422	9	1	1.000	
3	0.379	0.113	0.505	0.003 ^a	0.258	0.156	0.583	–	0.003 ^a	33.473	10	2	0.000	
4	0.420	0.074	0.506	–	0.298	0.092	0.569	–	0.041	17.867	10	2	0.505	
5	0.415	0.079 ^b	0.506	–	0.312	0.079 ^b	0.568	–	0.041	17.879	11	4	0.913	
6	0.394 ^c	0.072 ^b	0.534	–	0.394 ^c	0.072 ^b	0.496	–	0.037	19.449	12	5	0.210	
7	–	0.379 ^b	0.621	–	–	0.379 ^b	0.587	–	0.033	31.073	13	6	0.001	
8	0.478 ^c	–	0.522	–	0.478 ^c	–	0.483	–	0.039	20.033	13	6	0.445	

^{a,b,c}parameters that have been fixed equal in the model

Table 7 Univariate models for church attendance, indicating variance components attributable to additive genetic, shared environment and unique environment effects. Preferred model is highlighted in bold

Model	Females						Males				Model χ^2	df	Comparison	
	A _f	C _f	E _f	age _f	A _m	C _m	E _m	M	age _m	Compare with model			P	
1	0.187	0.459	0.343	0.011	0.005	0.385	0.609	0.000	0.001	9.422	8	–	–	
2	0.187	0.459	0.343	0.011	0.005	0.385	0.609	–	0.001	9.422	9	1	1.000	
3	0.179	0.469	0.346	0.007 ^a	0.011	0.382	0.600	–	0.007 ^a	10.743	10	2	0.250	
4	0.170	0.478	0.351	–	0.010	0.382	0.609	–	–	17.467	11	3	0.008	
5	0.234	0.419 ^b	0.340	0.007 ^a	0.006	0.419	0.569	–	0.007 ^a	11.013	11	3	0.603	
6	0.215 ^c	0.394 ^b	0.383 ^d	0.007 ^a	0.215 ^c	0.394 ^b	0.383 ^d	–	0.007 ^a	16.929	12	5	0.015	
7	0.222	0.430 ^b	0.341	0.007 ^a	–	0.430 ^b	0.563	–	0.007 ^a	11.078	13	5	0.799	
8	–	0.562 ^b	0.431 ^d	0.007 ^a	–	0.562 ^b	0.431 ^d	–	0.007 ^a	19.668	14	7	0.003	

^{a,b,c,d}parameters that have been fixed equal in the model

Table 8 Variance components (95% confidence intervals) for univariate analysis of self-transcendence and church attendance

	A	C	E	age
Self-transcendence				
Females	0.478 (0.409–0.548)	–	0.522 (0.419–0.625)	–
Males	0.478 (0.409–0.548)	–	0.483 (0.345–0.622)	0.039 (0.012–0.082)
Church Attendance				
Females	0.222 (0.073–0.371)	0.430 (0.321–0.539)	0.342 (0.226–0.457)	0.007 (<0.001–0.021)
Males	–	0.430 (0.321–0.539)	0.563 (0.403–0.724)	0.007 (<0.001–0.021)

magnitude in men and women, a small age effect, and an additive genetic effect evident in women only. Additive genetic effects in men and women could not be equated in the model ($\Delta\chi^2_1 = 5.92$), but the size of the age effect was the same.

Multivariate analysis

Figure 1 illustrates the results of multivariate analysis of the church attendance and self-transcendence data. As indicated by the univariate analysis, age effects are significant for church attendance behavior in both sexes, and self-transcendence only in men. The genetic factor for self-transcendence contributes

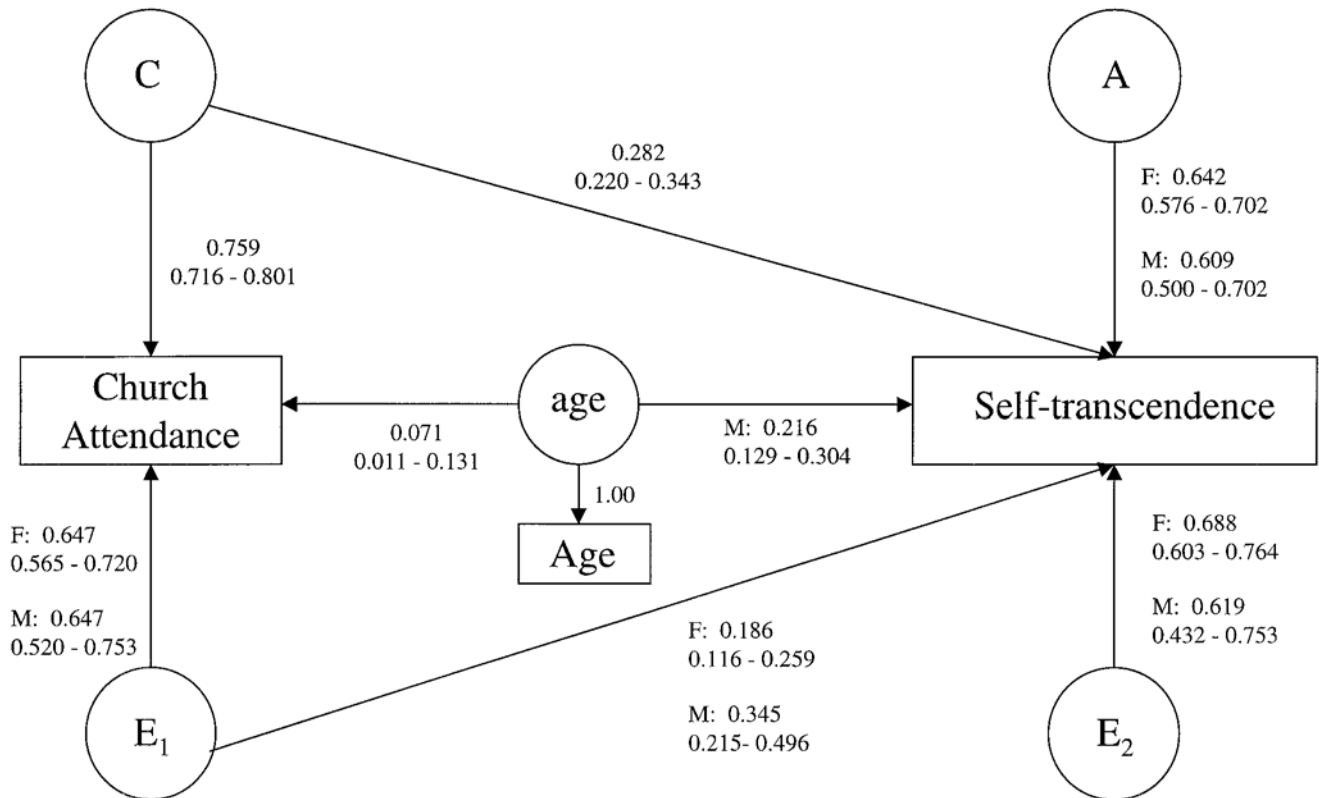


Figure 1 Bivariate structural modelling analysis of church attendance and self-transcendence in a sample of Australian twins aged over 50. Path estimates specific to males and females are indicated by M and F respectively. A and C indicate latent additive genetic and shared environment variables acting on observed phenotypes self-transcendence and church attendance, whilst E₁ and E₂ represent unique environment latent variables. A fourth latent variable, age, also affects self-transcendence and church attendance, and is perfectly correlated with its corresponding observed variable.

approximately 37% and 41% of variance in men and women, respectively, with no significant additive genetic effect found for church attendance in either sex using multivariate techniques. Shared environment effects are of the same magnitude for both sexes, with only a very small contribution (approximately 8% of variance) to self-transcendence and a much larger effect on church attendance (58% of variance). Unique environment plays an important part in determining an individual's church attendance behavior and self-transcendence (42–50%), with a small proportion of unique environment influences affecting both variables.

Discussion

Self-transcendence was found to be higher in Australian women aged over 50 than for their male counterparts, to be significantly associated with religious affiliation and to be moderately correlated with church attendance behavior. Marital status was found to be significantly associated with self-transcendence in women only, and age effects were

found to be important only for men. No strong correlations were found between self-transcendence and any of the personality or health rating scales considered here, with only weak associations observed with measures ranging from optimism to depression and fatigue. However, the assessment of health outcomes in the present study is poor, being limited to measures of physical incapacitation and subjective self-rating of current health. We hope to investigate the possibility that self-transcendence is more important in improving prognosis (cf Koenig et al⁵ for religious behaviors) than disease prevention using follow-up data.

The heritability of self-transcendence was estimated to be approximately 41% in women and 37% in men. As hypothesised by Cloninger et al,² genetic factors are important in character development as for temperament, with little contribution from shared environmental factors which would have indicated some importance of cultural perspectives or social learning.

The etiologies for church attendance and self-transcendence for this age group differ substantially, with shared environment, as expected from previous research,^{13,14,29} playing a substantial role in church

attendance behavior. This tends to support criticisms that church attendance alone is not necessarily an adequate measure of religiosity or spirituality,^{5,9,10} as it is evidently subject to different influences from those affecting a person's more intrinsic characteristics, at least in persons of more advanced age.

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