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Stability and Change in Religiousness During Emerging Adulthood

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Understanding the development of religiousness is an important endeavor because religiousness has been shown to be related to positive outcomes. The current study examined mean-level, rank-order, and individual-level change in females' religiousness during emerging adulthood. Genetic and environmental influences on religiousness and its change and stability were also investigated. Analyses were completed with an epidemiological study of 2 cohorts of twins: 1 assessed at ages 14 and 18 and a 2nd at 20 and 25. Mean levels of religiousness decreased significantly with age, while rank-order stability was high. Individual-level change was also evident. Analyses also supported the hypotheses that more change would occur in the younger cohort compared with the older cohort and that more change would occur in religious service attendance than the general index of religiousness. Twin analyses suggested that the heritability of religiousness increased with age, while the shared environmental influences decreased. For the younger cohort, change was genetic in origin, while stability was environmental. In the older cohort, change was influenced by nonshared environment and stability by both genes and family environment.

Keywords: religiousness, stability, change, twins, behavior genetics

Emerging adulthood refers to the ages of about 18 to 25, when youth are no longer adolescents but are not yet considered fully mature adults (Arnett, 2000). Emerging adulthood is a period of great change and formation, occurring without many of the parental or societal constraints that characterize other developmental periods either prior or subsequent to this life stage (Arnett, 2000). For many, this is also a period when religious attitudes, behaviors, and preferences, first established in childhood and early adolescence, are reexamined. Individuals begin to make choices that reflect their own interests and values rather than those of their parents. Understanding the development of religiousness during this time period is an important endeavor because religiousness has been found to be associated with positive outcomes: For example, religiousness is negatively correlated with antisocial behavior and positively correlated with prosocial behavior (e.g., Koenig, McGue, Krueger, & Bouchard, 2007). Studies on stability and change in religiousness during this time period have included investigations of mean-level, rank-order, and individual-level change.

Stability and Change in Religiousness During Emerging Adulthood

Stability and Change in Mean Levels

Most studies have found that mean religiousness decreases during the transition from adolescence to adulthood. Funk and Willits (1987) reported reductions in religious attitudes (e.g., "God controls everything that happens everywhere") in a sample of high school sophomores reassessed at age 26–27, and Madsen and Vernon (1983) found that students were on average less traditional in religious views at the end of college than they were before college. Other studies, however, found different results. Argue, Johnson, and White (1999) reported an overall increase in religiousness starting at age 18, and several studies reported no or very little mean-level change during the college years (Pilkington, Poppleton, Gould, & McCourt, 1976; Pogue-Geile & Rose, 1985).

The inconsistencies that appear in the literature on religious change may stem from study differences in the assessment of religiousness and in the developmental period investigated. A study of individuals followed from sophomore year in high school to age 27 found decreases in church attendance, but no mean-level change for a measure of traditional beliefs in God (Willits & Crider, 1989). Several other studies have found similar decreases in religious service attendance but not other measures of religiousness for large age spans (O'Connor, Hoge, & Alexander, 2002), adolescents (King, Elder, & Whitbeck, 1997), and college students (Hunsberger, 1978). Cross-sectional research suggests more change happens during high school than after. Hastings and Hoge (1976), for example, found that college men from a selective liberal arts college reported they first started doubting their religious beliefs at a median age of around 15, prior to the age when most individuals start attending college. Studies on apostasy and discontinuation of religious service attendance also support this conclusion. For example, Ozorak (1989) found that more individuals changed or dropped their church affiliation between 9th and 11th–12th grades than between the latter and a couple years post-high school graduation. Thus, an investigation of the development of religiousness during the transition to early adulthood should ideally consider multiple facets of religiousness (and spirituality, which is thought to be a different aspect of behavior; see, e.g., MacDonald, 2000) and multiple developmental periods.

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Stability and Change in Rank Order

Studies using retrospective reports or prospective data over short time intervals (1–5 years) have found test–retest correlations between .50–.80 for overall measures of religiousness (Koenig, McGue, Krueger, & Bouchard, 2005; Mumford, Snell, & Hein, 1993; Pogue-Geile & Rose, 1985; Woodrome, Aalsma, Zimet, Orr, & Fortenberry, 2004). Over longer retest intervals (approximately age 16 to age 27), the test–retest correlation has been reported to be only around .2–.3 for church attendance and .3–.4 for traditional beliefs about God (Willits & Crider, 1989). There is moderate to high rank-order stability in religiousness.

Stability and Change of Individual Differences

Change at the individual level, which is a function of both mean-level change and rank-order stability, can provide a somewhat different perspective than either aspect of change alone. Individual-level change assesses the extent to which there are individuals that decrease and increase in religiousness. Willits and Crider (1989) reported that a large majority of the over 300 individuals studied changed in church attendance (about 70%–80% of both males and females changed) and traditional beliefs (about 90% changed) between high school and age 27. Interestingly, more individuals changed in beliefs than attendance, but for beliefs approximately equal numbers of individuals increased and decreased, while for church attendance more individuals decreased than increased. Significant individual-level change in religiousness has also been reported by other researchers using different time intervals and different methods (Hunsberger, 1978; King et al., 1997; Lee, 2002; Madsen & Vernon, 1983; Ozorak, 1989) showing, not surprisingly, that some individuals decrease while others increase in religiousness.

Genetic and Environmental Influences on Stability and Change

Though studies of change and stability are essential to describing the development of a trait, it is also important to understand why change and stability occurs. Truly understanding a behavior means identifying its causes as well as how it develops. Two different research traditions have investigated the causes of change in religiousness.

From a socialization perspective, which emphasizes environmental effects like modeling and reinforcement (Hoge, Johnson, & Luidens, 1993; Willits & Crider, 1989), as children age they are exposed to new ideas and experiences outside of the home, and these environmental influences become important in their development, as emphasized by cultural broadening theory (which stresses the cognitive broadening and exposure to cross-cultural learning that adolescents experience in high school and/or college; see Hoge et al., 1993; O'Connor et al., 2002). The idea that environmental effects have an impact on one's religious beliefs has motivated research that examines the effects of specific environmental changes. Studies have reported that individuals become less religious because they reside with an unmarried romantic partner (a behavior not condoned by the church; Stolzenberg, Blair-Loy, & Waite, 1995) or because they attend college (Funk & Willits, 1987; Madsen & Vernon, 1983). In both cases the presumed mechanism is that exposure to influences and environments outside of their parents and rearing home cause individuals to rethink their religious values.

Another research tradition, however, emphasizes the importance of genetic influences on behavior, including religiousness. These studies estimate heritability, or the proportion of observed variance in a population that is due to genetic variance. A multitude of studies have examined the genetic influence on different beliefs and behaviors (see Bouchard et al., 2004, or Koenig & Bouchard, 2006, for an overview of the heritability of social attitudes), including Traditionalism (e.g., Finkel & McGue, 1997), Authoritarianism (e.g., McCourt, Bouchard, Lykken, Tellegen, & Keyes, 1999), Conservatism (e.g., Eaves et al., 1999), political attitudes (e.g., Alford, Funk, & Hibbing, 2005), and religiousness (e.g., D'Onofrio, Eaves, Murrelle, Maes, & Spilka, 1999). There is no gene for being religious, however. Rather, genetic influences on behavior are likely to reflect the cumulative effect of many genes, which interact with the environment (Rutter, Moffitt, & Caspi, 2006; Scarr & McCartney, 1983). Molecular genetic studies can identify specific genes that impact behavior, but quantitative behavior genetic studies can estimate the proportion of variance in a trait due to genetic (heritability), shared environmental, and nonshared environmental factors. *Shared environment* is defined as those environmental influences that make children in the same family similar to one another (typically thought to be home and parental influences), while *nonshared environment* is defined as those environments that make children in the same family different from one another. One way to investigate these effects is to study identical (monozygotic [MZ]) and fraternal (dizygotic [DZ]) twins. This method compares the similarity of DZ twins, who share on average only half of their genes, with MZ twins, who share all of their genes. If MZ twin pairs are more similar than DZ twin pairs, there is evidence for genetic influence on a trait. Studies using this method find that the shared environmental influence on religiousness in adolescence is large (around .50), while heritability is small (.00–.15; Abrahamson, Baker, & Caspi, 2002; Koenig et al., 2005). In adulthood, however, about 40% of the variance in religiousness is attributable to differences in genes, while very little is attributable to shared environmental influences (e.g., Bouchard, McGue, Lykken, & Tellegen, 1999; D'Onofrio et al., 1999). These data suggest that while parents may have an influence on religiousness during childhood and adolescence, their impact diminishes when children leave their rearing homes. The pattern of decreasing shared environmental influence is also consistent with the idea that other environmental and cultural influences may begin to play a role, as would be hypothesized by the socialization perspective.

Behavior genetic studies can also examine the causes of change and stability in religiousness, if the samples include data from more than one time point. One longitudinal twin study found that DZ twins were more similar than MZ twins in change in religious fundamentalism from age 20 to 25, implicating the importance of environmental influences at this life stage (Pogue-Geile & Rose, 1985). Longitudinal twin studies of change in Traditionalism (which has been shown to be correlated .37 with intrinsic religiousness, or belief motivated by religion as the end goal; Bouchard et al., 1999) conclude that nonshared environmental factors are the primary determinant of change from age 17 to 25 (Blonigen, Carlson, Hicks, Krueger, & Iacono, in press) and from age 20 to 30 (McGue, Bacon, & Lykken, 1993), and that genetic factors are the primary contributor to stability of Traditionalism over these age ranges. Thus, although there are few behavioral genetic studies investigating religiousness over time, the available behavioral genetic literature also appears to implicate environmental mechanisms of change. This conclusion stands in contrast to the cross-sectional research reviewed earlier suggesting overall increases in the heritability of religiousness with age.

Both developmental and behavioral genetic perspectives acknowledge the environmentally mediated impact of parents on children's religiousness while they are still living in the home. The importance of parenting and the home environment once children enter emerging adulthood is also hypothesized to decrease in both theories. However, from a traditional developmental perspective, the decreasing influence of the home environment on religiousness is replaced with other environmental influences (e.g., peers), while in behavior genetic theory it is replaced with genetic influences. The reasons for change and stability of religiousness in emerging adulthood are not clear, and knowing how religiousness develops would have implications for parents and for churches as to how to effectively influence adolescents and young adults.

The Current Study

Our review of the existing literature led us to conclude that there is a need for longitudinal research that involves assessment of multiple aspects of religiousness over multiple developmental periods within a genetically informative design. In the current study we sought to fill this need. Specifically, the first part of the study focused on describing stability and change in religiousness in two cohorts, the first assessed at ages 14 and 18 and the second assessed at ages 20 and 25. In both cohorts, assessment included a multiple-item measure of religiousness as well as a single-item measure of religious service attendance. We hypothesized that (a) mean levels of religiousness would decrease during adolescence and early adulthood, (b) rank-order stability (correlations over time) would be high but that (c) there would also be reliable individual-level change in religiousness over time, and (d) there would be greater change in late adolescence than in early adulthood. Another research question of interest that we investigated, though did not test statistically, was whether there was greater change in religious service attendance than in overall religiousness. The second part of this study included an investigation into the genetic and environmental etiology of change and stability in religiousness[1] through behavior genetic methodology and the use of twins. The first prediction of this biometric analysis was that the genetic influence on religiousness would increase over time, while the shared environmental effect would decrease. This hypothesis was supported by previous research, as discussed previously. The limited behavioral genetic literature investigating genetic and environmental influences on change and stability of religiousness led us to two more hypotheses: Both genes and environment will influence change in religiousness, and stability in religiousness will be due primarily to genetic influences.

Method

Participants

The participants were female twins from the Minnesota Twin Family Study (MTFS), an epidemiological study of Minnesota-born twins and their parents. Birth records were used to identify all twins born in the state of Minnesota between 1979 and 1984, 90% of whom were located. Most of the families that were eligible to participate in the study agreed to do so, with only about 17% refusing. The sample was over 95% Caucasian, and about 60% of the participants resided in the Minneapolis–Saint Paul metropolitan area. The sample as a whole broadly represents the Minnesota population, based on United States Census statistics, in terms of race, urbanicity, socioeconomic status, and other demographic variables (see Holdcraft & Iacono, 2004; Iacono, Carlson, Taylor, Elkins, & McGue, 1999). For the parents of the younger cohort, mothers and fathers had an average of 13.7 and 14.0 years of education, respectively. The women in the older cohort, who are old enough to have finished college themselves, had an average education level of 14.8 years, with over 78% having had some college education (at either a community college or 4-year college). The MTFS includes ongoing assessment of two birth cohorts of female and male twins. The religiousness measure used here was not given to the male sample until their second follow-up assessment (age 17 for the younger cohort and age 23 for the older cohort), however, so we necessarily focus here on the female sample, which had completed its intake, first follow-up, and second follow-up assessments at the time the current study was undertaken. The younger cohort first visited at age 11, with follow-up assessments at the targeted ages of 14 and 17, though the actual mean age of the second follow-up was 18. The older cohort first visited at age 17, with follow-up assessments at age 20 and 25. At each visit, the twins were given a wide variety of questionnaires, interviews, and self-report assessments, though only the religiousness self-report questionnaire was used for the current study. For more information about the study, recruitment method, and the participants, see Iacono et al. (1999) and Iacono and McGue (2002).

For the first set of analyses, the twins were treated as individuals. For the younger cohort, 770 individuals completed an intake assessment of a variety of measures (but not religiousness). Of these intake individuals, 692 (89.9%) completed an assessment of religiousness at age 14 (mean age of 14.8, $SD = 0.55$), and 641 (83.2%) completed an assessment of religiousness at age 18 (mean age of 18.2, $SD = 0.69$). For the older cohort, 674 individuals completed an intake assessment. Of these, 618 (91.6%) were assessed for religiousness at the age 20 assessment (mean age of 20.7, $SD = 0.60$), and 573 (85.0%) were assessed for religiousness at the age 25 follow-up (mean age of 25.0, $SD = 0.70$). As reported below, not all individuals participating in the follow-ups had valid religiousness scores because of missing data.

For the biometric modeling analyses, the twins were used as pairs. Zygosity was assessed by a questionnaire report of the parent, as well as information given by a MTFS staff member about the physical resemblance of the twins, in combination with other indices (e.g., fingerprint ridge count). Total sample sizes were the same as those specified above as raw data was analyzed, with 344 MZ individuals (138 complete twin pairs) and 220 DZ

[1] For length and simplicity, and because higher reliability and discrimination is possible with a multiple-item index, we report the behavior genetic analyses only for the religiousness score, not for the religious service attendance item. See Footnote 4, however, for a brief description of the results for this item.

individuals (93 complete pairs) at age 14, 347 MZ individuals (143 complete pairs) and 223 DZ individuals (92 complete pairs) at age 18, 371 MZ individuals (164 complete pairs) and 194 DZ individuals (85 complete pairs) at age 20, and 343 MZ individuals (146 complete pairs) and 188 DZ individuals (80 complete pairs) at age 25. The slight differences between total sample sizes in the younger cohort here and above (1 individual at age 14 and 2 individuals at age 18) are from two sets of DZ triplets where the third-born triplet was deleted for the twin analyses (as is study policy). More MZ than DZ twins participated at intake, as is common for volunteer-based samples. Nonetheless, previous analyses has shown that the population base from which these twins were drawn consists of more MZ than DZ twins (Hur, McGue, & Iacono, 1995).

Religious affiliation of the sample was mostly Christian, with around 85% of each age group labeling themselves as belonging to a Protestant, Catholic, or other Christian church (over 50% of individuals at each age chose a Protestant denomination). Another 1%–2% of individuals chose Jewish or "other" as their affiliation. The percentage of individuals marking the "none" option (choosing to claim no affiliation) increased with age (2.6% at age 14, 4.7% at age 18, 6.8% at age 20, and 8.6% at age 25), while those marking "don't know" or leaving the item blank decreased with age (10.7% at age 14, 7.3% at age 18, 5.9% at age 20, and 5.4% at age 25). The affiliation item was not used for any other analyses, though it is interesting to note that the percentage of individuals who report having no church affiliation increased with age.

Table 1
Means, Standard Deviations, Alphas, and Rank-Order Stability Correlations for Religiousness Measures

Cohort and age	Religiousness scale *M* (*SD*)	Religiousness scale α (*N*)	Religiousness scale Correlation (95% CI)	Religious service attendance *M* (*SD*)	Religious service attendance Correlation (95% CI)
Younger cohort			.70 (.65–.75)		.50 (.43–.56)
Age 14	15.99_a (6.98)	.84 (565)		2.33_c (1.19)	
Age 18	14.38_b (7.71)	.88 (572)		1.80_d (1.16)	
Older cohort			.81 (.77–.84)		.65 (.60–.70)
Age 20	13.87_b (7.35)	.87 (565)		1.60_c (1.09)	
Age 25	13.90_b (7.59)	.88 (531)		1.59_e (1.09)	

Note. The religiousness scale included nine items and had a range of 0 to 32. The possible range of the religious service attendance item was 0 to 4, with 4 reflecting *more than once a week.* The letter subscripts denote significant differences between means. Within a column, means with the same subscript letter are not significantly different from one another (at $p < .01$; though for the religious service attendance item, the difference between age 18 and 25 was $p < .05$, and the difference between age 18 and age 20 only tended toward significance at the .05 level). Test–retest correlations were estimated in Mx using raw data, collapsing across zygosity. CI = confidence interval.

Materials

The scale used to assess religiousness included nine items that we summed to create one total score for each individual at each assessment age. The nine items were as follows (response ranges in parentheses): frequency of attending religious services (0–4), frequency of prayer (0–3), frequency of reading scripture (0–4), frequency of discussing religious teachings (0–4), frequency of deciding moral actions for religious reasons (0–3), frequency of observing religious holidays (0–3), membership in religious youth groups (0–1), having friends with similar beliefs (0–4), and the overall importance of religion in daily life (0–4). We also used the frequency of religious service attendance item as a single index in order to compare results from the single item with the full scale. This item was used as is, with no substitutions for missing data. This item could be rated from 0 to 4, with 0 = *never*, 1 = *seldom, e.g. on religious holidays*, 2 = *monthly*, 3 = *weekly*, or 4 = *more than once a week*.

Each item also had a "don't know" option. At each assessment, an individual was allowed one missing or "don't know" response out of nine. Individuals missing two or more items were not given a religiousness score.[2] To calculate the score for individuals missing one item, we used the mean score for that item for that age assessment in place of the missing data and then we summed the values of all nine items. The full range of the scale was 0 to 32. The nine religiousness items loaded highly onto one factor at each assessment, and for each assessment this factor accounted for over 40% of the variance. Alphas for the scale were high and can be found in Table 1.

We also used the single religious service attendance item for the descriptive analyses. The total number of individuals with a score for the religious service attendance item were for ages 14, 18, 20, and 25, respectively, 668, 626, 610, and 567. The mean ages for these individuals did not differ from the overall mean ages for the entire cohorts.

Statistical Analyses

Stability and change in religiousness. To investigate the first four descriptive hypotheses, we analyzed three aspects of stability and change: mean-level, rank-order, and individual-level. We assessed mean-level stability by examining mean differences in religiousness scores across time. We completed statistical analyses in SAS using Proc-Mixed (Littell, Milliken, Stroup, & Wolfinger, 1996) to account for the correlated nature of the data (i.e., the twins). Mean-level changes were also assessed separately for each twin type. Change in the mean level of religiousness within and across cohorts reflects either maturational or historical processes that are shared by the population under study. Mean changes across cohorts should be interpreted with caution since these differences may reflect cohort effects rather than true age effects. We examined the rank-order stability of religiousness over time by

[2] At the age 14 assessment, 565 individuals had religiousness scores, while 127 individuals (18.4%) had too much missing data to be given a score. For the age 18 assessment, 572 individuals were missing one or no items, while 69 individuals (10.9%) were missing two or more religiousness items. For the older cohort, 565 individuals had religiousness scores at age 20, while 53 individuals (8.6%) had too much missing data. At the age 25 assessment, 531 individuals had religiousness scores and 42 individuals (7.3%) were lost because of missing items.

finding correlations for scores from age 14 to age 18 and from age 20 to age 25. Rank-order stability was also assessed separately for each twin type. We assessed individual-level stability with the Reliable Change Index (RCI; Christensen & Mendoza, 1986; Jacobson & Truax, 1991), which unlike difference scores, accounts for regression to the mean over time. We calculated the RCI by dividing the difference between the two scores by the standard error of the difference score estimated using the standard error of measurement (SEM): RCI = Score 1 – Score 2 / $\{[2(\text{SEM Score } 1 \times \text{SEM Score } 2)]^{1/2}\}$, where the SEM for each assessment is found by multiplying the standard deviation of scores times the square root of one minus the reliability of the scores. The standard error of the difference is an index of the expected spread of the change scores given that no actual change has occurred. The significance of change is tested by chi-square (χ^2) analyses on RCI scores against the null hypothesis that only 5% of RCI scores would exceed 1.96 in absolute value.

Biometric modeling of stability and change in religiousness. To investigate the last three hypotheses about genetic and environmental influences on religiousness, its change, and its stability, we calculated twin correlations and completed biometric modeling analyses. We estimated twin correlations using maximum-likelihood techniques in Mx, a statistical modeling program (Neale, Boker, Xie, & Maes, 1999). Raw data was used in all Mx analyses, so that twins with missing data could still contribute to the derived estimates. Estimation of the heritability of religiousness at each age assessment was based on the differential resemblance of MZ and DZ twins. Since MZ twins share all of their genes, while DZ twins share, on average, only half of their (segregating) genes, there is evidence for genetic influence on a trait when MZ twins are more similar than DZ twins. Essentially, doubling the difference between the MZ and DZ correlations provides an estimate of heritability. Twin similarity not due to genetic factors is due to shared environmental influences, and the remainder of the variance (i.e., that not contributing to twin similarity) is due to nonshared environmental influences. Cholesky models (Neale & Cardon, 1992) are one type of biometric model (see Figure 1) that partitions the phenotypic variances as well as the phenotypic covariances between traits into genetic and environmental components. When examining two (or more) traits, as in a Cholesky model, the portion of variance in one trait that is explained by the other trait, as well the portion that is unique, can be decomposed into genetic and environmental influences. When examining the same trait over time, Traits 1 and 2 become Time 1 and Time 2 assessments, and modeling analyses can estimate the genetic and environmental influences on change and on stability. The model, as seen in Figure 1, included genetic influences (A), shared environmental effects (C), and nonshared environmental effects (E), as defined earlier. Genetic and environmental influences on stability are estimated by the paths a_{21}, c_{21}, and e_{21} linking Time 1 to Time 2 (shared variance), while contributions to change are estimated by the paths a_2, c_2, and e_2 that are unique to Time 2 (residual variance). Data was analyzed with one Cholesky model that allowed for independent estimates between the two cohorts.

To assess the fit of the biometric model to the data, we compared the fit of the full model estimating all parameters with the fit of models equating standardized variance estimates to be equal across age groups. The fit of the models was compared by a chi-square test on the difference in –2 log likelihoods (–2LL) for the full model compared with the reduced models. If the difference was significant, the constrained model fit the data poorly compared with the full model. A nonsignificant difference shows that the constrained model fit as well as the full model, and would then be chosen as the better fitting model because it is more parsimonious.

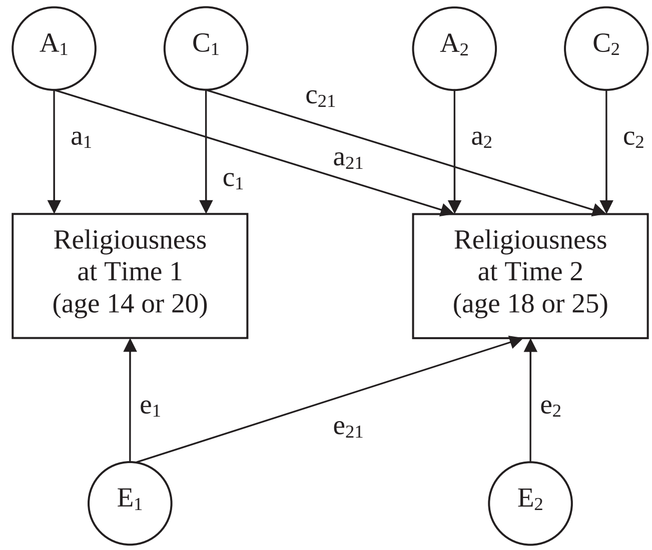

Figure 1. The Cholesky model depicting decomposition of variance in religiousness over time. The model was fit twice, once for the younger cohort (age 14 and 18) and once for the older cohort (age 20 and 25). A = genetic influence; C = shared environmental influence; E = nonshared environmental influence.

Results

Given that the study was in part longitudinal, it was important to test for attrition effects, as individuals who are less religious or who change the most in religiousness may be less likely to return for later follow-ups. Though we cannot test the second of these effects, analyses showed that the mean religiousness score for individuals assessed only at the first follow-up did not differ from those assessed at both follow-ups. The mean religiousness score at age 14 was 16.3 ($SD = 6.9$, $n = 459$) for those assessed at age 25 and was 14.6 ($SD = 7.2$, $n = 106$) for those not assessed at the second follow-up. The latter mean was not significantly different from the former, $t(51) = .62$, $p > .05$. For the older cohort, the mean at age 20 was 14.1 ($SD = 7.5$, $n = 465$) for those assessed again at age 25 and was 13.0 ($SD = 6.7$, $n = 100$) for those not assessed at the second follow-up. Again, this was not a significant difference, $t(50) = .91$, $p > .05$. These analyses show that the attrition seen in the study was independent of religiousness at the first follow-up.

Stability and Change in Religiousness

Means and mean-level stability and change. Means for religiousness are reported in Table 1. The effect of age (Time 1 vs. Time 2) was assessed for each cohort in SAS. Mean religiousness decreased significantly from age 14 to age 18, $t(307) = -6.17$, $p <$

.01, but did not change significantly from age 20 to age 25, $t(291) = 0.46$, $p > .05$. Comparisons across cohorts revealed a significant mean difference between ages 14 and 20, $t(647) = -3.87$, $p < .01$, but not between ages 18 and 25, $t(638) = -0.41$, $p > .05$. Also, means at age 18 and age 20 did not differ significantly, $t(649) = -0.63$, $p > .05$, but means at ages 14 and 25 were significantly different, $t(636) = -3.57$, $p < .01$. Since age varied among the individuals at each assessment time (e.g., not all individuals at the age 14 assessment were exactly 14), the effect of age as a continuous variable was also assessed in SAS. The effect of age was studied with all four religiousness assessments at once, and a significant negative linear slope for age was found (–.20, $SE = .04$), $t(1538) = -5.09$, $p < .01$, with a trend for a significant interaction between cohort and age (estimate = –.05, $SE = .03$), $t(1538) = -.165$, $p = .10$. Examining mean-level religiousness and mean-level change by zygosity yielded comparable results, as mean levels of religiousness did not differ by zygosity in each age assessment or by zygosity across cohorts at each assessment time point (data available on request).

The pattern of mean-level change and stability seen in religious service attendance was very similar to that found for the religiousness index, though two mean comparisons were significant or tended toward significance that were not significant for the total scale (see Table 1). Comparing within cohort, the age 14 mean was significantly higher than the age 18 mean, $t(330) = -14.7$, $p < .01$. The difference between ages 20 and 25, however, was not significant, $t(298) = -1.1$, $p > .05$. Comparing across cohorts, the age 14 mean was significantly higher than the age 20 mean, $t(670) = -8.5$, $p < .01$. The differences from age 18 to age 20 tended toward significance, $t(657) = -1.9$, $p = .06$, while the comparison of age 18 to age 25 was significant, $t(468) = -2.0$, $p < .05$. The difference between age 14 and age 25 was also significant, $t(661) = -8.53$, $p < .01$. When examining age effects instead of cohort effects, there was a significant linear trend for age (estimate = –.08, $SE = .01$), $t(1772) = -11.29$, $p < .01$, with a significant interaction between age and cohort, such that the slope of decline differed in each cohort with the younger cohort having a steeper slope (estimate = –.02, $SE = .004$), $t(1772) = -3.82$, $p < .01$.

Rank-order stability. Test–retest correlations were estimated in Mx within each cohort and are given in Table 1. All were significant and large, above .60. The correlations were also significantly different from one another across cohorts, as can been seen by the confidence intervals. Test–retest correlations for both zygosities within each cohort were also significant (data available on request).

Individual-level stability and change. RCI scores were computed as described above for each individual, with RCI scores more extreme than 1.96 in absolute value indicating reliable individual-level change. For the younger cohort, the chi-square for observed versus expected cell frequencies was significant, $\chi^2(2, N = 459) = 250.4$, $p < .001$. RCI scores showed a similar, albeit weaker, pattern for the older cohort, $\chi^2(2, N = 465) = 11.4$, $p < .01$. No direct statistical comparison was made between the two cohorts, but there were more individuals with significant individual-level change, in both the positive and especially the negative direction, for the younger cohort.

Because single-item scales do not have an alpha reliability, RCI scores could not be calculated for the religious service attendance item.[3] Instead, the difference scores for religious service attendance were calculated. For the younger cohort, the mean difference score for the 584 people with difference scores was –0.56 ($SD = 1.03$). The largest proportion of individuals (45.2%) did not change in religious service attendance. Only 10.3% increased, while 44.5% decreased attendance levels. For the older cohort, the mean change score was –0.06 ($SD = 0.86$) for the 529 individuals without any missing data (145 individuals, 21.5%, had no difference score). Again, most individuals (59.5%) remained at the same level of religious service attendance, while 16.6% increased and 23.8% decreased in attendance. Of those who changed, the largest number of individuals changed only by one point on the scale, though there were individuals with change scores of 3 and 4. To test the significance of these difference scores, we transformed them into z scores, on the basis of the mean and standard deviation for each cohort, and we examined the distribution of z scores. These scores were analyzed by chi-square analysis in the same way RCI scores were analyzed above. For both cohorts, the distribution of scores was significantly different from expected: younger cohort, $\chi^2(2, N = 584) = 13.7$, $p < .01$; older cohort, $\chi^2(2, N = 529) = 6.7$, $p < .05$.

Genetic and Environmental Influences on Stability and Change in Religiousness

Twin correlations. Twin correlations were estimated in Mx from raw data for the religiousness index.[4] A comparison of correlations indicates the extent to which variability in religiousness is explained by genetic variance. These correlations are reported in Table 2. The MZ correlations were around .75 for all four ages, while the DZ correlation was .76 for the age 14 assessment but dropped almost linearly for each assessment after that. Since the heritability of a trait is a function of the difference between the MZ and DZ correlations (see explanation above), this pattern of correlations suggests that the heritability for religiousness increased over time, such that there was little heritability for religiousness at age 14 but substantial heritability by age 25.

To assess the covariance or correlation between religiousness assessed at the two time points within each cohort, we calculated cross-twin–cross-time correlations in Mx, which are given in Table 2. These correlations take Twin 1's score at Time 1 and correlate it with Twin 2's score at Time 2 and vice versa. A pattern of higher MZ than DZ correlations suggests the correlation be-

[3] The same results as reported here were found for the older cohort when we calculated RCI scores using the test–retest correlation rather than internal consistency for the reliability coefficient. Results differed for the older cohort though, as 25 people still showed a decrease in religious service attendance, but no one showed an increase in religious service attendance (the 5 individuals who had z scores above 1.96 had RCI scores of 1.92, just below the cutoff for positive change).

[4] The results for religious service attendance are available on request from Laura B. Koenig. Twin correlations were generally lower but showed the same pattern over time. The basic pattern of heritability and shared environmental influence (analogous to Table 3 for religiousness) was the same except that the shared environmental influences dropped to zero by age 20. The results for stability and change (analogous to Table 4 for religiousness) for the older cohort were also different then because shared environmental influences were not associated with either change or stability in religious service attendance.

Table 2
Monozygotic (MZ) and Dizygotic (DZ) Twin Correlations (With 95% Confidence Intervals in Parentheses) for Religiousness at Each Age Assessment as Estimated in Mx

Cohort and age(s) assessed	MZ twins	DZ twins
Younger cohort		
Age 14	.75 (.67–.81)	.76 (.67–.83)
Age 18	.78 (.71–.83)	.69 (.57–.78)
Cross twin–cross time	.61 (.53–.68)	.68 (.58–.68)
Older cohort		
Age 20	.76 (.69–.81)	.59 (.45–.71)
Age 25	.75 (.68–.81)	.39 (.20–.54)
Cross twin–cross time	.75 (.69–.80)	.46 (.32–.58)

Table 3
Standardized Genetic (A), Shared Environmental (C), and Nonshared Environmental (E) Parameters (With 95% Confidence Intervals in Parentheses) as Estimated in the Cholesky Bivariate Model

Cohort and age	A	C	E
Younger cohort			
Age 14	.02 (.00–.16)	.74 (.59–.79)	.24 (.21–.28)
Age 18	.21 (.04–.31)	.55 (.44–.71)	.24 (.21–.28)
Older cohort			
Age 20	.27 (.11–.51)	.49 (.24–.64)	.24 (.21–.28)
Age 25	.46 (.27–.66)	.30 (.09–.49)	.24 (.21–.28)

Note. Parameter estimates based on best fitting model in which standardized A and C estimates varied across age groups but standardized E estimates could be constrained to be equal.

tween time points is due in part to shared genetic variance. For the younger cohort, the cross-twin–cross-time correlations were around .65 for both MZ and DZ twins, suggesting little genetic correlation over time. The MZ cross-twin–cross-time correlation was higher than the DZ correlation for the older cohort, however, suggesting a genetic correlation for religiousness across the two ages.

Cholesky modeling. A Cholesky model (Neale & Cardon, 1992) was fit to the data. The full model estimated the heritability of religiousness at age 14 to be .0003, or essentially zero, so in all subsequent models the genetic correlation for the younger cohort was fixed to zero: fit statistics, –2LL(2197) = 13,834.3, compared with the full model: change in –2LL(1) = .02, $p > .05$. This was done because with essentially no genetic effect on religiousness at age 14, there cannot be a genetic correlation between religiousness at age 14 and age 18, but Mx could estimate a very large correlation if the small portion of genetic variance at age 14 is the same as that at age 18. This large correlation would, however, make little sense conceptually. That the heritability at age 14 was estimated to be zero was not surprising, since the MZ and DZ twin correlations were almost identical with completely overlapping confidence intervals (see Table 2). For all other ages, however, the MZ twins were more similar than the DZ twins, showing heritability for religiousness.

The full model was compared in fit with a model in which the heritability, shared environmental effects, and nonshared environmental effects were equated across all four ages. This provided an omnibus test of the change in variance decomposition over time. The constrained model fit the data worse than the full model: change in –2LL(9) = 16.9, $p < .05$. Three other models were then compared with the full model: one equating the heritabilities across time (change in –2LL[3] = 10.7, $p < .05$), one equating the shared environmental effects across time (change in –2LL[3] = 15.0, $p < .01$), and one equating the nonshared environmental effects across time (change in –2LL[3] = 2.4, $p > .05$). The best fitting model, then, was that which equated the nonshared environmental parameters only to be equal across all four ages. Results from this model are shown in Tables 3 and 4. Table 3 reports the genetic and environmental estimates for religiousness at each age (related to the first biometric hypothesis), while Table 4 reports estimates of genetic and environmental contributions to change and stability across ages (related to the second and third biometric hypotheses) from the best fitting model.

As seen in Table 3, there was very little heritability for the age 14 religiousness data (.02). All of the similarity between twins within a pair was due to shared environmental influences. At age 18, the heritability of religiousness was 21%. At ages 20 and 25, the heritabilities were 27% and 46%, respectively. The heritabili-

Table 4
Standardized Genetic (A), Shared Environmental (C), and Nonshared Environmental (E) Contributions (With 95% Confidence Intervals in Parentheses) to Stability and Change in Religiousness as Estimated in the Cholesky Bivariate Model

Cohort and age(s) assessed	A	C	E
Younger cohort			
Age 18: From age 14 (stability)	.00	.53 (.44–.66)	.02 (.00–.05)
Age 18: Residual (change)	.21 (.04–.31)	.01 (.00–.19)	.22 (.19–.26)
Correlations	.00	.99 (.85–1.0)	.29 (.14–.43)
Older cohort			
Age 25: From age 20 (stability)	.46 (.25–.67)	.30 (.09–.49)	.03 (.01–.05)
Age 25: Residual (change)	.00 (.00–.07)	.00 (.00–.05)	.22 (.19–.25)
Correlations	1.0 (.91–1.0)	1.0 (.91–1.0)	.33 (.20–.44)

Note. For both age 18 and age 25, total standardized variance (i.e., 1.0) is decomposed into portions attributable to age effects from the earlier age (i.e., stability given in first row) and portions attributable to change (second row). For the younger cohort, the genetic effect at age 14 was very small and so could not contribute to the stability of the trait at age 18. The genetic correlation was also fixed to zero. Confidence intervals were not applicable for these estimates.

ties were significant at ages 18, 20, and 25, since the confidence intervals for these estimates did not include zero, but not at age 14. Modeling analyses showed that the change in heritability over time was significant. Shared environmental influences accounted for a significant portion of the variance in religiousness at all ages. The shared environmental effect did decrease with age and was still moderately large at age 25, with estimates of .74, .55, .49, .30, respectively, at ages 14, 18, 20, and 25. Nonshared environmental effects accounted for the remaining variance at each age (.24) and were equated across all four ages.

In Table 4, the genetic, shared environmental, and nonshared environmental effects on religiousness at the older ages (18 and 25) were taken and parsed into that which was shared with the younger age (ages 14 and 20, respectively) and that which was residual, or unique, to religiousness at the older age. The shared portion of variance indexes stability, while the unique portion indexes change in religiousness. The significance of these parameters was not tested directly in the model fitting but can be seen by examining their confidence intervals. As seen in the table, the stability of religiousness from age 14 to age 18 was due almost completely to shared environmental effects. No genetic effect on stability was shown, since there was no genetic effect on religiousness at age 14. The change in religiousness (the residual variance not shared with the time one assessment) was due to genetic and nonshared environmental influences. From age 20 to age 25, stability was due to both genetic and shared environmental factors, while change was due entirely to nonshared environmental influences. Table 4 also gives the genetic and environmental correlations over time. These are estimates of the extent to which the same genes and environmental factors influence religiousness at both ages. For the younger cohort, the genetic correlation was fixed to zero, as there was little genetic effect at the younger age that could correlate with any genetic effect seen at age 18. The shared environmental correlation was estimated at .99, and the nonshared environmental correlation was estimated at .29. For the older cohort, both the genetic and shared environmental correlations were estimated at 1.0, while the nonshared environmental correlation was estimated to be .33.

Discussion

Longitudinal analyses of religiousness support the conclusion of high mean-level, rank-order, and individual-level stability, with significant change also apparent in group- and individual- level analyses. Our hypothesis that means would decrease over time was supported. The mean level of religiousness decreased slightly, but significantly, with age, and it decreased more from age 14 to 18 than from age 20 to 25, supporting the hypothesis of more change in the younger cohort. Also, since means did not differ much from the age 18 assessment in the younger cohort to the age 20 and 25 assessments in the older cohort, the decrease in religiousness that was seen with age was more likely to be maturational and not a cohort effect. Decreases were also seen for religious service attendance, though the decreases were more consistently seen over all four time points. These results provide evidence for the research question that religious service attendance would decrease more than other measures of religiousness, since the decrease in religious service attendance seemed to be more continuous across time, whereas the total religiousness score decreased from age 14 to 18 but then stabilized in early adulthood.

Our hypothesis of high rank-order stability was also supported. Test–retest correlations were high for both cohorts, though the stability was stronger for the older cohort, supporting the hypothesis of more change in the younger cohort. The stronger correlation for the older cohort could, however, be due to an increase in consistency with age or a cohort effect. Rank-order stability was seen for both religiousness and religious service attendance, but the lower correlations for religious service attendance support the idea that more change occurs for attendance than for general religiousness. The different scales of the two measures make it hard to compare correlations across measures, however, as a ceiling effect on the single-item religious service attendance scale may attenuate correlations.

Individual-level change analyses revealed significant reliable change for both cohorts, which supported our third hypothesis. Further examination of the RCI scores showed that more individuals from the younger cohort decreased than increased in both religiousness and religious service attendance, which matched the pattern of decreasing mean scores. There were, however, a number of individuals who increased in religiousness over time, and the reasons for these changes deserve further exploration. These analyses again indicated that change was greatest for religious service attendance and in the younger cohort.

The current study helped to address the question about when the most change occurred. As stated earlier, some studies have found that late adolescence is a more important time for change than college. Since the current sample was community based, it includes both individuals who are attending college and those who are not. The change in the older cohort may be somewhat diluted if more change occurs in college students than in individuals who do not attend college. Unfortunately, we do not yet have the ideal data for investigating this question as the younger cohort has not yet started college and individuals in the older cohort at age 20 have already been in college for a year or two. Other studies have found that college attendance is related to more liberal attitudes (Funk & Willits, 1987). The idea of increasing stability in religiousness, whether mean-level, rank-order, or individual-level, needs further study with a longitudinal sample followed over many years.

Our results also provide important data on the question of how religiousness changes in adolescence and early adulthood. Individuals in the current sample seem to reduce their frequency of attending religious services without changing their religious beliefs. One explanation for decreasing religious service attendance for young adults is an increasing influence of peers on religious behavior, a possible nonshared environmental effect. De Vaus (1983) found support for the idea that the increase in peer pressure and the importance of friends in adolescence may account, in part, for decreases in religious service attendance and other religious practices, while parents continue to influence religious beliefs. Religious service attendance is also something that is easily changed, and perhaps stopping attendance is an easy way to react against parental control. Religious service attendance could also be eliminated from the repertoire of an individual's behavior because other things, like sleeping in, become more important. King et al. (1997) posited that the decreases in church attendance in adolescents may stem from an increase in attendance at other church-related events. Once a child is involved in a youth group, attending events during the week may be a substitute for attending church on Sundays. These ideas about why religious service attendance may decrease more than other religiousness variables need further examination.

The hypotheses for the biometric analyses were also supported. The first hypothesis that the proportion of phenotypic variance accounted for by genotypic variance would increase with age was supported by both the twin correlations and the Mx modeling results. The increase in heritability especially seemed to occur after age 14. The 40% heritability estimate for the age 25 data is very similar to the value reported in many studies of adult samples including females (e.g., Beer, Arnold, & Loehlin, 1998; Bouchard et al., 1999; Truett et al., 1994). The results also support the conclusions made by Koenig et al. (2005) and Eaves et al. (1997) that the heritability of religiousness and conservatism increases with age. There could be many reasons for this change, stemming from either a decrease in family environmental effects or an increase in genetic effects. In behavior genetic designs, the estimates for the three influences (genetic, shared, and nonshared environment) must add to one: If the variance accounted for by one of these effects decreases, there must be an increase in another effect. It is possible for genes to turn on and off in expression at different points in development and to influence the magnitude of the genetic effect on a trait. The heritability for religiousness could also increase because of the decrease in variance accounted for by family environmental influences. Parents play a limited role in their children's life once they leave the home, and this may allow genetic predispositions to be expressed. It is likely that environments are still impacting one's religiousness, but with age these environments become highly correlated with one's genotype (often called *niche picking*).

In examining genetic and environmental influences on change and stability in religiousness, we found slightly different results for each cohort. As hypothesized, estimates seemed to be affected by the small genetic effects on religiousness in the younger cohort. The low heritability at age 14 necessarily limits the genetic contributions to stability to zero as well. Therefore, in the younger cohort, stability was due predominantly to shared environmental factors, while change was affected by genetic and unique environmental effects. The results for the older cohort turned out as hypothesized: Stability in religiousness was influenced by genetic effects, and change was influenced by unique environmental effects. However, stability was also influenced by the shared environment, and change was not influenced by genetic effects as hypothesized. The correlations across time show that the same genetic (when possible) and shared environmental effects were influencing religiousness across time. Nonshared environmental effects, however, though equal in magnitude across all four ages, were not stable across age, such that different events were influencing religiousness at different ages.

These results suggest that both genes and the shared environment (often thought to include the home environment) have enduring effects on religiousness. Nonshared environmental factors, however, influenced change in religiousness for both cohorts and were not highly correlated over time. Nonshared environmental effects can include random events and occurrences, which may affect twins in a pair differently from one another, and influence their religiousness in different ways. Events like marriage and child bearing, the death of a friend, or a life-threatening accident or illness are likely to change one's outlook on life, possibly including one's religious views and beliefs. Marriage and child rearing, however, have been shown to increase religiousness (Hoge, 1981; O'Connor et al., 2002; Sandomirsky & Wilson, 1990; Stolzenberg et al., 1995; Wilson & Sherkat, 1994), so while these environmental effects may be influencing certain individuals, they cannot account for the overall decrease seen in religiousness during this time period. Also, research has shown that these types of life events, though seemingly random, may also be influenced by one's genes (e.g., Bolinskey, Neale, Jacobson, Prescott, & Kendler, 2004).

Limitations

There are limitations to this research, which include the homogeneity of the sample under study with respect to gender and state of residence. All individuals examined were females born in the state of Minnesota. Results could be different for males, who are reported to have lower mean scores for religiousness in general (King et al., 1997; Stolzenberg et al., 1995). The rates of change, and the genetic and environmental influences on change and stability, may also be different for males than for females. Also, as reported above, the sample was almost entirely Christian in background, as is typical in the state of Minnesota. Studies of individuals from different regions of the United States or from different countries may yield different results. The sample is also representative of Minnesota with respect to race, urbanicity, and socioeconomic status, which means the sample is relatively homogeneous. Though the sample size of the study was not small, twin studies require large samples in order to have adequate power to detect differences in estimates for genetic and environmental effects. The large confidence intervals seen in the tables indicate that more twin pairs would be ideal in order to more confidently compare changes in these estimates over time.

Another limitation is that the sample was not continuously longitudinal. When comparing means across cohorts, one must interpret results with caution as both age and cohort effects may have been operating to produce changes. However, because the two cohorts were very close in age (the younger cohort was born between 1981 and 1984, and the older cohort was born between 1975 and 1979), they most likely did not differ in their broad cultural environments. The similarity in the age 18 to age 20 mean religiousness score supports the interpretation of the results from a developmental perspective, as there seemed to be little cohort differences in mean levels across this break. Also, studying the two consecutive cohorts allows for a more in-depth analysis of change and stability of religiousness during emerging adulthood than the analysis of a single cohort alone. Data collection for the current samples is still ongoing and will eventually include overlapping assessments, such that the younger cohort will be assessed at the same ages as the older cohort.

One limitation evident in the longitudinal nature of the study is that of attrition. Not all individuals who were assessed at the first follow-up were also assessed at the second follow-up, and this could have affected the results. While analyses showed that there was little difference between the initial means for those who came back for the second assessment and those who did not, it could still be the case that those individuals who were not included at the second follow-up were those who had changed the most on religiousness. If this were the case, however, the change we report in the current study would be underestimated.

Although we feel one strength of the current study is the ability to examine religiousness with a multiple-item index, there are also many other scales that measure religiousness and spirituality. The use of one single index means that examining different facets of religiousness (except for looking at specific items) is not possible. Also, the concept of spirituality is thought to be much broader than what usually encompasses religiousness. Investigations into changes in spirituality would be an important contribution to the current literature, as it is possible that young adults may become less religious and less tied to a specific church but more spiritual and more likely to seek other forms of religious expression. This may also help to explain the decrease in religious service attendance in individuals who still label themselves as religious and participate in other behaviors tied to religion. Another explanation, however, could be that there have been changes in patterns of religious participation during this time period. More individuals could be listening to radio programs of religious services or viewing televangelists as technology becomes a popular mode of information gathering.

Finally, there are limitations to the methods used for analysis, especially for the biometric analyses. First, the genetic analyses do not account for any assortative mating effects (the tendency for similar individuals to marry). Past studies have reported high levels of assortative mating for religiousness, with correlations around .60–.80 (Kirk et al., 1999; Koenig et al., 2005; Waller, Kojetin, Bouchard, Lykken, & Tellegen, 1990). High levels of assortative mating would act to reduce the genetic estimate and increase the shared environmental estimate for a trait. The mating of like parents would increase DZ twin genetic similarity, while having no impact on MZ twin genetic similarity, thereby decreasing the difference between the MZ and DZ correlations. To the extent there are any assortative mating effects, they must not be overpowering, as we see the expected increase in heritability over time. The general conclusions would probably not change if assortative mating could be taken into account, though the specific estimates might.

Also, as in any study with twins, the assumption is made that the environments of the MZ and DZ twin pairs are equally similar (the Equal Environments Assumption). MZ twins may, however, actually experience environments that are more similar: Parents may treat MZ twins more similarly, MZ twins may rely more on one another for support, and so forth. This increased environmental similarity would then account for the increased MZ similarity relative to DZ similarity. The Equal Environments Assumption has been tested in several ways and is found to be an adequate assumption to make (e.g., Borkenau, Riemann, Angleitner, & Spinath, 2002; Plomin, Willerman, & Loehlin, 1976).

Another limitation of the method used in the second part of the study is that the effects of gene–environment correlations and gene–environment interactions cannot be taken into account. Other variables may moderate the heritability of religiousness, such that some environments may be more or less influential for adolescents. A study completed in Finland (Winter, Kaprio, Viken, Karvonen, & Rose, 1999) reported different genetic and environmental effects on religiousness in urban versus rural areas of the country, though the moderating effects were different for males and females. Further investigation is needed in this area to try to understand how genes and environment can work together to produce behavior. Finally, another limitation of the behavior genetic analyses is that specific environmental variables were not measured. The effect of the environment is only inferred from the patterns of similarity seen between MZ and DZ twins. Given the previous work on specific variables that influence religiousness, it is important to undertake studies that examine specific environmental influences in genetically informative designs.

Conclusions

This article provides information about both the nature and origin of change and stability in religiousness during emerging adulthood. The findings of the current study support the interpretation that the genetic effect on religiousness increases once individuals leave their rearing homes and increasingly make their own life decisions. The same trend is seen for other psychological traits, including intelligence (McCartney, Harris, & Bernieri, 1990; McGue, Bouchard, Iacono, & Lykken, 1993), antisocial behavior (Lyons et al., 1995), and conservatism (Eaves et al., 1997). Possibly, the lack of parental control and the ability of older children and adults to make their own decisions allows genetic predispositions to more fully express themselves. Also, other unique influences may become important, including peers and work environments. Stability in religiousness in the younger cohort was due to shared environmental influences. It seems the socialization studies examining the effects of parenting on a child's religious development may be most important when one looks at the stability of religiousness in younger children. In early adulthood, however, already expressed genetic predispositions, along with shared environmental influences, create stability in religiousness. It is likely that these effects are interacting with one another as well. An interesting next step for future researchers in this area involves combining the research on environmental triggers for change in religiousness with the possibility of genetic effects on religiousness. Family studies examining environmental influences on religious development may provide interesting results, but the findings will always be confounded with the influence of genetic effects that this investigation shows to be important.

This study, as well as previous work in the area, supports the idea that the transition to adulthood is an important period in one's life. Emerging adulthood is a time when religious beliefs and attitudes are examined and possibly changed. Though genetic influences have been shown to be important in the current study, this does not mean that family influences should be ignored. Large familial influence on religiousness exists when children live at home, and the extent to which these early influences interact with genetic predispositions and later environmental influences is unknown. Differences in religiousness in young adults are shown here to be partly due to differences in individuals' genes, but where these genetic effects stem from is also unknown. They may stem from genes that influence other aspects of behavior, like personality or behaviors (like antisocial behavior), that are not condoned by the church. It is also clear that genes and environment act in concert with one another. One example for religiousness is the finding that children who were more agreeable were more likely to be influenced by their parents' religious values and socialization efforts (McCullough, Tsang, & Brion, 2003). Further investigation into the causes and consequences of change and stability of religiousness is certainly called for, though as the current study shows, this research should take place in both the environmental and genetic arenas.

The implications of this investigation are important for researchers, parents, and those involved in religious groups. Religiousness, often thought to be part of a larger domain of social attitudes and values (Koenig & Bouchard, 2006), is not strictly an environmental variable. These other variables have been shown to be under some genetic influence, much like religiousness, as stated above. Parents should realize that peers and other people may have more of an influence on their child's religiousness than they have once the child grows up, though the genes they have passed on to their child will have an influence on the child's behavior. Researchers who examine specific environmental influence should not be surprised to find small effects of these variables, as this study shows that genetic influences are also accounting for some of the change in religiousness over time.

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