THE HERITABILITY OF RELIGIOUSNESS: AN INTERNATIONAL TWIN STUDY

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Background

Emerging adulthood is a time of religious change for many people.[1,2] A potential explanation is that leaving the environmental influences of the home, which generally occurs during emerging adulthood, allows for the expression of one's own inherent dispositions.[1] Heritability is the proportion of variance in a measured trait that is due to genetic variation; environmentability is the proportion of variance in a population that is due to environmental variation. Nearly always, there is some degree of both environmentability and heritability accounting for the observed phenotypic variation.[3] Identical twins (monozygotic twins) share 100% of their genetic makeup. Fraternal twins (dizygotic twins) share 50% of their genetic makeup. If monozygotic twins (MZ) resemble each other in religiousness more than dizygotic twins (DZ) resemble each other, we can infer that genetics are a factor in one's religiousness. In one study, religious affiliation was found to be cultural, but religiousness in terms of practice and attitude was found to be heritable.[4] Further, the heritability of religiousness been seen to increase with age.[1,5] However, the two studies that found the heritability of religiousness increased with age dealt with limited samples.[1,5] The purpose of the current study is to utilize a more diverse sample in replicating and extending the finding that religiousness is a heritable trait.

Hypotheses

1. Participants will report more religious involvement as children than as adults.
2. In childhood, MZ twins will be about as similar as DZ twins in religiousness, but in adulthood, MZ twins will be more similar than DZ twins in religiousness.
3. Among those who have stayed near their home environment (home town) in adulthood, there will not be an increase in heritability of religiousness with age comparable to a group of those who have moved away from their home environment.

Method

Administrators of twin-related groups on the internet social utility, Facebook, sent link to the questionnaire to twin members of these groups upon my request. Participants' ages ranged from age 18 to 54 with an average age of 22.4. A total of 102 individuals responded about themselves and their MZ twin, and 156 individuals responded about themselves and their opposite-sex or same-sex DZ twin. Of the 156 DZ twins, 87 were same-sex twins. When accounting for the respondents and their co-twins, there are data on 518 individuals total. Participants and their twins reside mainly in the United States (321 of 518 individuals), with 197 individuals residing in 20 other countries. Although this study contains data on individuals from many parts of the world, the majority of participants who responded about self and twin's religious affiliation responded as a Christian denomination (349 of 441 responses). Participants reported on their own and their co-twin's religious involvement and affiliation during their childhood and adulthood.

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Results and Figures

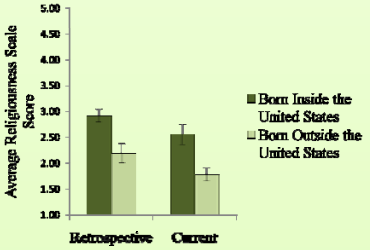
Scale Creation

The 5-item self-reported childhood and adulthood Religiousness Scales had internal consistencies (alpha) of .89 (N = 258) and .93 (N = 258), respectively. The Internal Subscale consisted of three items, Importance of Faith in Daily Life, Frequency of Prayer, and Frequency of Reading Religious Text; it had an internal consistency in childhood and adulthood of .84 (N = 258) and .90 (N = 258), respectively. The External Subscale consisted of two items, Frequency of Attending Religious Services and Frequency of Discussing Religious Teachings; it had an internal consistency in childhood and adulthood of .72 (N = 258) and .83 (N = 258), respectively.

Decrease in Religiousness

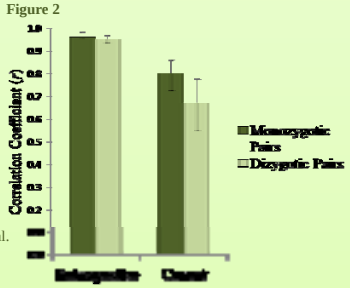
Supporting Hypothesis 1, religiousness in the current sample measured by the Religiousness Scale decreased from childhood to adulthood $t(257) = 7.3$, $p < .001$. Scores decreased from childhood to adulthood in both the Internal $t(257) = 3.82$, $p < .001$ and External Subscales $t(257) = 10.6$, $p < .001$. Although all scales showed lower scores in adulthood than in childhood, the effect size was much higher for the External Scale $d = .66$ (a medium to large effect) than for the Internal Scale $d = .24$ (a small effect). The effect size for the Religiousness Scale fell in between the two subscales at $d = .46$. Further, the correlation of scores from childhood to adulthood on the External Subscale r (258) = .59 was lower than on the Internal Subscale r (258) = .72, $p = .006$. These results indicate that the External Subscale is more susceptible to change than the Internal Subscale.

Figure 1



As shown in Figure 1, the decrease in religiousness was seen regardless of country of origin. However, respondents born in the United States scored significantly higher on the Religiousness Scale for retrospective (M = 2.91, SD = 0.94) and current (M = 2.55, SD = 1.23) ratings than did respondents born outside the United States (M = 2.18, SD = 0.93) and (M = 1.77, SD = 1.77), t(256) = 6.12, p < .001 and t(232.6) = 6.07, p < .001. Error bars represent a 95% Confidence Interval of the standard error of the mean.

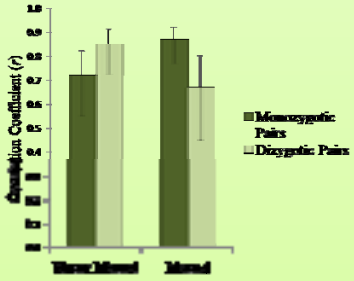
Figure 2



Heritability

Heritability was calculated as two times the difference between MZ and DZ correlation coefficients. Heritability estimates (h^2) for retrospective and current ratings on the Religiousness Scale were .02 and .26, respectively. Supporting Hypothesis 2, MZ and DZ twins were about as similar in childhood but MZ twins were more similar than DZ twins in adulthood. Figure 2 shows the correlation coefficients for MZ and DZ twins in retrospective and current ratings. Error bars represent a 95% Confidence Interval.

Figure 3



Although the heritability estimate (h^2) for current ratings on the Religiousness Scale was .26 (as shown above in Figure 2), in adulthood, correlation coefficients of MZ twins did not differ from that of DZ twins in the group who never moved from home, as shown in Figure 3. In the group who moved from home, the heritability estimate was much higher than when examining the groups together, hitting .40 for current ratings, supporting Hypothesis 3. Figure 3 depicts the difference between correlation coefficients for MZ twins and correlation coefficients for DZ twins when grouped by whether the respondent had moved at least 150 miles from home for at least four months. Error bars represent a 95% Confidence Interval.

Discussion

The current study replicated and extended patterns found in previous research.[1,4,5] Although participants born outside the United States are less religious in childhood and adulthood, the patterns of religiousness remain the same. The first pattern was the decrease in religiousness from childhood to adulthood. Second, MZ twins were generally not more similar than DZ twins were in childhood, but MZ twins tended to be more similar than DZ twins were in adulthood. In twin pairs with the responding twin never having lived more than 150 miles from home for at least four months, MZ twins were no more similar than DZ twins in current responses on the religiousness scale. However, when the responding twin had lived more than 150 miles from home for four months or more, MZ twins were significantly more similar than DZ twins. The active gene-environment correlation could explain this phenomenon; the individuals who have moved from their home environments have created their own environments to fit with their genetic predispositions. Both MZ and DZ twins change, but because DZ twins only share half the amount of genes MZ twins share, DZ twins become less similar to each other than MZ twins do as their genetic predispositions are realized.

The External Subscale correlation from childhood to adulthood was significantly smaller than the Internal Subscale correlation from childhood to adulthood. In childhood, Internal and External Subscales do not correlate or match as highly as in adulthood. This all points to the External Subscale as more susceptible to change and the Internal Subscale remaining more stable.[5] External religiousness is easily manipulated by the environment, parents making children to go church for example.[5] Therefore, we should see external religiousness become more heritable over time, but internal religiousness remain more stable.

Because it would have been impossible ensure both individuals in a twin pair participated, or to identify a participant's co-twin in the dataset in the first place without compromising anonymity, participants provided all ratings for themselves and their co-twins. Although past research found twins were reliably able to rate their co-twins, correlation coefficients were between .67 and .86 depending on zygosity and whether the rating was retrospective or current.[5] While these correlation coefficients are acceptable, they are not perfect. To be conservative, whenever analyses were run for groups of individuals (as opposed to groups of twins), only the respondents' data were used.

The current study made a case for niche seeking (active gene-environment correlation) as a cause of phenotype similarity among genetically similar individuals. However, much is still unknown about religiousness and its heritability in differing religions, heritability over extended periods of time, and usefulness as a factor in personality. These are topics for future research.

References

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