



# Pairs of Genetically Unrelated Look-Alikes

## Further Tests of Personality Similarity and Social Affiliation

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### Abstract

Relationships of physical resemblance to personality similarity and social affiliation have generated considerable discussion among behavioral science researchers. A “twin-like” experimental design (involving genetically unrelated look-alikes, U-LAs) explores associations among resemblance in appearance, the Big Five personality traits, self-esteem, and social attraction within an evolutionary framework. The Personality for Professionals Inventory (PfPI), NEO/NEO-FFI-3, Rosenberg Self-Esteem Scale, and a Social Relationship Survey were variously completed by 45 U-LA pairs, identified from the “I’m Not a Look-Alike” project, Mentorm Media, and personal referrals. The mean U-LA intraclass correlations were negligible for all Big Five personality traits on the PfPI and NEO/NEO-FFI-3 ( $r_1 = -.02$  and  $-.04$ , respectively). In contrast, mean  $r_1$  values of .53 and .15 for monozygotic (MZA) and dizygotic (DZA) reared-apart twins, respectively, have been reported for these personality measures. The U-LA self-esteem correlation ( $r_1 = -.18$ ) was also below the correlations reported for MZ and DZ reared-together twins ( $r_1 = .31$  and  $.13$ , respectively). Finally, far fewer U-LAs expressed close social relationships (20%) than MZA (80%) and DZA (65%) twins. The present study extends earlier findings indicating that appearance is not meaningfully related to personality similarity and social relatedness. The criticism that MZ twins are alike in personality because their matched looks invite similar treatment by others is refuted. A more judicious interpretation is reactive genotype-environment correlation, namely that MZ twins’ similar personalities evoke similar reactions from others. MZ twins’ close social relations most likely derive from their perceptions of genetically based within-pair similarities that are lacking in U-LAs.

**Keywords** Twins · Look-alikes · Monozygotic · Dizygotic · Personality · Self-esteem

Relationships among physical resemblance, personality similarity, and social affiliation have generated considerable discussion among behavioral science researchers

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representing diverse domains and specializations. Research in this area has yielded interesting, but inconsistent, results. Anderson and colleagues (Anderson et al. 2001) reported that extraversion predicts group social status, but does so independently of physical attractiveness. In contrast, Naumann et al. (2009) noted that the accuracy of observers' personality judgments varied as a function of whether target subjects assumed a constrained or spontaneous posture.

An element largely missing from this field is reference to genetic and evolutionary perspectives that would bear upon the basis of personality similarity between individuals who look alike, and the implications of these similarities for subsequent social relations. Such questions are best addressed using genetically and environmentally informative kinships, a key feature of the present study.

Behavioral genetics, social-psychological theory, and evolutionary psychology have significant, and to some extent overlapping, concerns with reference to associations between appearance and personality. A review of the main themes raised in these three areas of psychological investigation is presented by way of introducing a methodological approach that combines several novel kinships—namely, pairs of unrelated look-alike individuals (U-LA) and pairs of reared-apart and reared-together monozygotic (MZA, MZT) and dizygotic (DZA, DZT) twins—that can uniquely highlight associations between physical resemblance and behavior. The present study is part of a series of analyses from an ongoing project that now includes nearly twice as many U-LA pairs as in previous reports (Segal 2013; Segal et al. 2013).

## Behavioral Genetics: Twin and Adoption Studies

Behavioral genetics is the study of individual differences in behavior, specifically the extent to which genetic and environmental influences underlie observed variability in traits of interest. Twin and adoption studies have been primary methodological approaches in these efforts. The classic twin method is simple and elegant. It rests on the availability of two types of twins: monozygotic (MZ or identical) twins, who share 100% of their genes, and dizygotic (DZ or fraternal) twins, who share 50% of their segregating genes, on average, by descent. A rare variant of the classic twin design is that of twins reared apart from birth; MZ reared-apart twins (MZA) provide a direct estimate of genetic influence on individual differences, and DZ reared-apart twins (DZA) offer an informative control. Greater MZ than DZ twin resemblance demonstrates genetic influence on traits under study. A recent meta-analysis showed that the degree of genetic influence (heritability) across 17,804 traits is 49%, on average (Polderman et al. 2015).

The two principal adoption designs include genetically related individuals who grow up apart and genetically unrelated individuals who grow up together. Examples of the first type are parents who place children with adoptive or foster families, and biological siblings raised apart. Examples of the second are adoptive parents raising genetically unrelated children, and virtual twins—namely, same-age unrelated siblings raised together from birth (Segal 2017; Segal and Montoya 2018).

Another largely unrecognized, but powerful, kinship consists of genetically unrelated individuals who look remarkably alike (U-LAs). The research attraction of U-LAs is their value in resolving a recurrent criticism of twin studies—namely, that MZ co-twins

are alike in personality because they are treated alike by others, owing to their matched physical appearance (Segal 2013). Some critics of twin research have used this argument to challenge, or even refute, genetic interpretations of personality resemblance demonstrated by MZ-DZ twin comparisons (Palmer 2011; also see Segal 2012). However, it is reasoned that if MZ twins' matched looks are truly responsible for their similar treatment by others, then U-LAs should show the same degree of personality similarity as MZ twins reared apart. Alternatively, if MZ twins' genetically based personality traits evoke similar treatment from others, a concept known as reactive genotype-environment correlation, then U-LAs should show negligible personality similarity.

Assortative mating, the non-random pairing of significant others with respect to behavioral and physical features, also bears on possible meaningful links between appearance and personality. Aside from ethnicity ( $r = .60$ ) and age ( $r = .97$ ), partner resemblance is generally higher for behavioral traits such as educational level ( $r = .67$ ), attitudes ( $r = .61$ ), and values ( $r = .50$ ) than for physical traits such as height ( $r = .04-.21$ ) and weight ( $r = .05-.25$ ) (Hur 2003; Rushton and Bons 2005; Zietsch et al. 2011). Interestingly, these same studies also find that partners show negligible resemblance in personality traits such as neuroticism and novelty-seeking. Regardless, some key points are that partner resemblance is higher for behavioral than physical traits; instances of matching on selected behavioral similarities are likely correlates of successful pair-bonding; and physical similarities alone appear to be an unlikely basis for mate attraction.

## Social Psychological Perspectives: Appearance and Behavior

Similarity-attraction theory (Byrne 1971) helps to explain how phenotypic similarities are linked with social attraction, as well as with the social context in which individuals conduct their interpersonal relations. In regard to sociodemographic attributes (e.g., education, income, gender, and age), behavioral measures (e.g., recreational activities and interaction styles), and intrapersonal factors (e.g., beliefs and attitudes), social network members such as spouses, friends, and roommates tend to be more similar than randomly selected members of the same population (Bahns et al. 2017; Kossinet and Watts 2009; McPherson et al. 2001). Likewise, recent findings based on self-report questionnaires, digital records of behaviors and preferences, and language use provide evidence for strong similarity in personality between romantic partners and friends (Youyou et al. 2017). Ansell et al. (2008) also demonstrated that similarity in interpersonal styles during dyadic interactions, such as expressions of warmth, predict cohesion among same-sex college roommates.

Numerous studies have also shown that similarity in certain characteristics plays a central role in relationship formation early in life (Kandel 1978). Giordano (2003) found that adolescents tend to choose friends who share gender, race, and social class. Additionally, recent data have found that children are more likely to form friendships based on similar levels of personality traits and cognitive ability (Ilmarinen et al. 2017). The behaviors and attitudes of adolescents are also remarkably similar to the behaviors and attitudes of their friends (Cicchetti 2006; Kandel 1978). For instance, adolescents tend to befriend others who engage in aggressive and substance use behaviors similar to their own (Brechwald and Prinstein 2011; Prinstein and Dodge 2008).

Physical resemblance has also been conceptualized to explain social attraction or closeness. Indeed, people tend to affiliate with others who are similar to themselves in physical attractiveness (Berscheid et al. 1971). For example, it has long been recognized that romantic couples are more similar than chance on a variety of physical features (Alvarez 2004; Voracek et al. 2007). However, as indicated above, recent research reveals that when compared with physical resemblance, behavioral resemblance among couples and friends appears to be stronger.

## Evolutionary Psychology: Genetic Relatedness and Social Affiliation

Evolutionary psychology aims to uncover the psychological mechanisms that developed to meet the challenges that the environment posed for our ancestors (Buss 2015). Over the course of human history, survival has depended largely on access to assistance, protection, and resources, as set forth in the family benefits model (Buss 2015). These various advantages are available to the members of a family—a living situation that remains universal, albeit with considerable variation in composition, such as number of children and presence of grandparents.

Hamilton's (1964) theories of kinship and inclusive fitness explain the generally increased cooperation between close genetic relatives, compared with more distant relatives and non-relatives. At the ultimate level, Hamilton asserted that closely related kin, such as immediate family members, should be more frequent recipients of cooperative and altruistic acts than less closely related kin as a way of transmitting one's own genes to subsequent generations. Inclusive fitness is calculated as the reproductive success of an individual, augmented by effects on relatives other than offspring, in which each effect is multiplied by the actor's relatedness to the recipient. At the proximal level, factors that impact the expression of advantageous interactions between relatives (e.g., age and resources of the potential recipient; perceived social closeness) have also been highlighted (Burnstein 2005; Hackman et al. 2017). Most recently, reciprocity has been shown to be a more salient factor than group conformity in fostering cooperation (Romano and Balliet 2017). It has also been suggested that internal estimates of welfare evaluation influence cooperative behavior, and that gratitude may function as an indicator of intent to engage in cooperative exchange (Smith et al. 2017).

Cues to genetic relatedness between siblings include perinatal association with the biological mother and length of co-residence (Lieberman et al. 2007). These cues *do not* apply to reared-apart twins or biological siblings, yet close social relationships have, nevertheless, been reported between reunited MZA and DZA twins and separated biological siblings. Segal et al. (2003) found that MZA twins were more likely to anticipate and experience high levels of social closeness and familiarity than DZA twins, consistent with the nature of twin relationships observed among reared-together twins. Most telling, few MZA and DZA twins who had grown up with adoptive siblings expressed the same high levels of closeness and familiarity toward these individuals as they did toward their newly found co-twin. It is likely that their perceptions of similarity in intelligence, personality, and interests, all of which are partly genetically based and more alike in MZ than DZ twins, as well as between biological than non-biological siblings, contribute to this difference (see Segal 2012).

Despite lacking the cues to genetic relatedness mentioned above, most biological siblings who reunite as adults regard their relationship positively and maintain subsequent social contact (O'Neill et al. 2016). Factors associated with favorable outcomes are perceptions of resemblance in personality, interests, and mannerisms. Similar looks and appearance have also been mentioned, but, although these features would characterize U-LAs even more strongly than separated siblings, previous work indicated that they do not lead to, or sustain, close social relations between U-LAs (Segal et al. 2013). Physical and behavioral resemblance is confounded in first-degree relatives but can be potentially disentangled in U-LAs, who share no common genes by descent.

## Personality Similarity and Self-Esteem: Prior Findings

An initial study of U-LAs reported a mean intraclass correlation of  $r_1 = -.05$  across the Big Five personality traits of openness, conscientiousness, extraversion, agreeableness, and stability, as assessed among 23 U-LA pairs by the Personality for Professionals Inventory (PfPI). (Stability, the reverse of neuroticism, is used in the PfPI.) This mean correlation is considerably below those reported for MZA ( $r_1 = .53$ ) and DZA ( $r_1 = .15$ ) twins on a comparable personality questionnaire. The U-LA self-esteem correlation of  $r_1 = -.18$ , is also well below the correlations of .31 and .13 reported for MZ and DZ reared-together twins, respectively.

A second analysis presented a constructive replication of the first—in other words, the revisiting of an original study, but with new methods or conditions. It did so by examining personality resemblance using the same participants in the U-LA sample with several additional pairs, but with a different personality protocol, the NEO. The NEO also generates scores for the Big Five personality traits. The mean intraclass U-LA correlation was  $-.03$ , very closely replicating the earlier findings from the PfPI (Segal et al. 2013). It was, therefore, of interest to determine if prior findings would be replicated using a larger, more diverse U-LA sample.

The second analysis also examined the nature and quality of the social relationships that evolved between the U-LAs and compared them with those characterizing MZA and DZA twins (Segal et al. 2013). This phase of the study was set in an evolutionary framework. The hypotheses and predictions assessed in that phase of the study were generated by Hamilton's (1964) theories of kinship and inclusive fitness. It was anticipated that (1) substantially fewer U-LAs would express high levels of closeness and familiarity, relative to MZA and DZA twins, and (2) U-LAs would show reduced closeness over time, whereas closeness would increase within MZA and DZA twin pairs.

## Measures

### Personality

Personality scores on the Big Five personality traits were obtained by having U-LAs complete the Personality for Professional Inventory (PfPI) and either the NEO or NEO-FFI-3. The PfPI includes 200 self-report items that yield 21 personality dimensions

(e.g., sensitivity and assertiveness) and the Big Five personality scales (Stability [reverse of neuroticism], Extraversion, Openness, Agreeableness, and Conscientiousness) (Rolland and de Fruyt 2009). This inventory, originally developed in France, was chosen because the participant group in the initial study came from the French-speaking area of Québécois in Canada. An English version of the inventory was subsequently developed, and both can now be administered by computer. In the present study, participants completed a paper-and-pencil version of the PfPI that was later entered into the computerized system by research staff. Self-ratings on the PfPI have shown strong rank-order convergence with self- and peer ratings on descriptive text blocks, demonstrating the validity of computerized personality reports (de Fruyt and Willie 2013).

The French version of the 60-item NEO was used in the constructive replication (McCrae and Costa 2004). The NEO, the short form of the 240-item NEO Personality Inventory-Revised (NEO-PI-R), also assesses the Big Five personality traits. The NEO Five-Factor Inventory-3 (NEO-FFI-3) is a recently updated version of the short form that was completed in English by later participants (Costa and McCrae 2010). Correlations between the PfPI's five factor model scores and the corresponding NEO-PI-R domains are stability:  $r = .82$ , extraversion:  $r = .88$ , openness:  $r = .83$ , agreeableness:  $r = .84$ , and conscientiousness:  $r = .92$ , based on a sample of 348 respondents.

### **Self-Esteem**

Self-esteem was assessed by the Rosenberg Self-Esteem Scale (RSES), a widely used ten-item form developed at the University of Maryland (Rosenberg 1989) that has been translated into many languages. Five positively worded items and five negatively worded items are rated by respondents on a 0 (strongly agree) to 3 (strongly disagree) scale. The ten items on the RSES were coded so as to yield scores ranging from 0 to 30, with scores falling between 15 and 25 reflecting good self-esteem.

### **Social Relatedness**

The Social Relationship Inventory was adapted from the Twin Relationship Survey completed by twins in the Minnesota Study of Twins Reared Apart (MISTRA) (Segal 2012; Segal et al. 2003). Feelings of social closeness and familiarity upon first meeting are rated on a 1 (greater than best friends) to 6 (less than for most people I meet for the first time) scale, a format repeated with reference to current feelings of social closeness and familiarity. These six categories were later reorganized into three as described below.

### **Participants and Procedures**

Participants were identified via multiple sources. The first twenty-six pairs were referred by the French-Canadian photographer François Brunelle, whose “I’m Not a Look-Alike Project” (see [http://www.francoisbrunelle.com/web/projet\\_en.html](http://www.francoisbrunelle.com/web/projet_en.html)) generated the idea for this study. Brunelle has been photographing pairs of unrelated

look-alikes for many years, work that has attracted considerable scientific and public attention (Levine 2014; CBS News 2015). Two U-LA pairs are displayed in Fig. 1. Eight pairs were identified by the British-based Mentorn Television Production Company, which produced the 2016 program “Finding My Twin Stranger,” and the remaining pairs were identified through personal referrals. The mean age of the sample was 42.42 years ( $SD = 16.28$ ) and participants ranged between 16 and 84 years old. Additional participant characteristics are summarized in Table 1.

MZ and DZ reared-apart and reared-together twins from the MISTRA and Minnesota Twin Registry, respectively, had completed the Multidimensional Personality Questionnaire and California Psychological Inventory forms, which yield scores on the Big Five personality dimensions (Bouchard 1993). These data (weighted means) were used in a comparative analysis of twin and U-LA personality resemblance.

All U-LAs received the study packet by regular mail or by email and returned it to the investigator. The packet included an informed consent letter approved by California State University, Fullerton’s Institutional Review Board that was signed by the participant and returned to the principal investigator with the completed materials.

## Results

### Correlations: Personality and Self-Esteem with Age and Sex

Correlations between the Big Five personality factors from the PffPI and age and sex were generally small and not statistically significant, with several exceptions, as shown in Table 2. Conscientiousness was positively, but modestly, associated with age ( $r = .23$ ,  $p < .05$ ) and sex ( $r = .23$ ,  $p < .05$ ), whereas emotional stability correlated negatively with sex ( $r = -.34$ ,  $p < .01$ ). Within-pair differences in personality scores were unrelated to the within-pair difference in age. The five factors from the NEO/NEO-FFI-3 showed mostly similar, but also some different, associations with age and sex, most notably the significant correlations between both neuroticism and openness



Fig. 1 Two sets of U-LA pairs. Photo credit: François Brunelle, Canada

**Table 1** Participant sample ( $N=45$  pairs; 55.6% female)

	Age (years)	Age difference
Mean	42.42	6.00
<i>SD</i>	(16.28)	(5.87)
Range	16–84	0–25

with age ( $r = -.32, p < .01$ , and  $r = .22, p < .05$ , respectively). The within-pair difference in openness correlated positively with the within-pair difference in age ( $r = .34, p < .05$ ), whereas the within-pair difference in agreeableness correlated negatively ( $r = -.41, p < .01$ ). The differently signed correlations between emotional stability (PfPI) and neuroticism (NEO/NEO-FFI-3) with age reflect the complementary nature of these constructs.

All correlations between the personality factors from the two inventories were highly statistically significant, ranging from  $r = .45, p < .001$  for openness to  $r = -.75, p < .001$  for emotional stability/neuroticism. The somewhat variable pattern of these factors with age and sex may be partly due to the smaller number of items (12) comprising the scales of the NEO/NEO-FFI-3, compared with the PfPI (approximately 30), and their consequently reduced stability.

The self-esteem score yielded by the RSES correlated significantly with both age ( $r = .41, p < .001$ ) and sex ( $r = -.24, p < .05$ ). The within-pair difference in self-esteem also showed a significant correlation with the within-pair difference in age ( $r = .44, p < .01$ ).

**Table 2** Correlations between age, age difference, and sex and the PfPI, RSES (2017), and NEO/NEO-FFI-3 personality inventory (2017)

Trait	Age	Age difference	Sex
PfPI <sup>a, b</sup>			
Emotional Stability	.17	.17	-.34**
Extraversion	.11	-.11	-.12
Openness	.15	.20	-.03
Agreeableness	.16	-.18	.16
Conscientiousness	.23*	-.02	.23*
RSES <sup>a, b</sup>			
Self-Esteem	.41***	.44**	-.24*
NEO/NEO-FFI-3 <sup>c</sup>			
Neuroticism	-.32**	.28	.28**
Extraversion	-.02	.05	-.14
Openness	.22*	.34*	-.04
Agreeableness	.17	-.41**	.06
Conscientiousness	.26*	.16	-.11

<sup>a</sup>  $n$  (individuals: age, sex) PfPI = 77, RSES = 86

<sup>b</sup>  $n$  (pairs: age difference) PfPI = 37, RSES = 42

<sup>c</sup>  $n$  (individuals: age, sex) = 84;  $n$  (pairs: age difference) = 42

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



## Personality Similarity, or Difference? Constructive Replication

Prior to analysis, scores from the P&PI and NEO/NEO-FFI-3 were age- and sex-corrected according to the methods of McGue and Bouchard (1984). All intraclass correlations for the Big Five personality factors of the P&PI were negligible in magnitude, yielding a mean correlation of  $r_i = -.02$  ( $n = 37$  pairs). This result is consistent with that ( $r_i = -.05$ ) based on the earlier study of 23 U-LA pairs (Segal et al. 2013). Results from the present constructive replication using the NEO/NEO-FFI-3 also yielded a negligible mean intraclass correlation of  $r_i = -.04$ , consistent with findings from the earlier study ( $r_i = -.03$ ) and with the present results from the P&PI. The single exception is the significant intraclass correlation for openness ( $r_i = .41$ ,  $p < .01$ ), comparable to the correlation for MZ twins reared together. This was an unanticipated finding that will be addressed in the discussion. These data are summarized in Table 3.

### Comparative Analysis: U-LAs and Twins Reared Apart and Together

The lack of personality similarity among the U-LAs is less informative than their lack of similarity relative to MZ and DZ twins reared apart and together. The mean MZA twin intraclass correlation of  $r_i = -.53$  across the Big Five personality traits is significantly higher than the U-LA correlation of  $r_i = -.02$  ( $z = 3.166$ ,  $p = .002$ ). The MZA individual correlations for the five personality factors are also significantly above those of the U-LAs. These MZA data are of particular interest given that this twin group most closely parallels the U-LAs with regard to physical resemblance and rearing circumstances. It appears that despite their highly similar appearance, the U-LAs fail to show the same degree of personality resemblance as the MZA twin pairs.

Comparing the U-LA findings with the other three twin groups yields similar results. The mean MZT correlation of  $r_i = .48$  is significantly above that of the U-LA pairs ( $z = 3.086$ ,  $p = .002$ ), and the five individual MZT correlations also significantly exceed those of the U-LAs. The DZA and DZT correlations generally exceed the U-LA correlation, as expected, although the differences are not statistically significant. These findings are summarized in Table 4.

**Table 3** U-LA intraclass correlations and 95% confidence intervals for the Big Five personality factors: P&PI and 60-item NEO/NEO-FFI-3 constructive replication (present study)

Personality factors	U-LA-1: P&PI		U-LA-2: NEO/NEO-FFI-3	
	$n = 37$ pairs		$n = 42$ pairs	
Stability	-.07	(-.38, .25)	-.09	(-.38, .21)
Extraversion	-.01	(-.33, .31)	-.32	(-.56, -.02)
Openness	-.08	(-.39, .24)	.41**	(-.38, .21)
Agreeableness	-.09	(-.40, .23)	-.21	(-.48, .09)
Conscientiousness	.13	(-.20, .43)	.02	(-.32, .28)
Mean	-.02		-.04	

\*\* $p < .01$

**Table 4** U-LA intraclass correlations ( $r_i$ ) for the PfPI's Big Five personality factors and comparison with twins reared apart and reared together. Twin data are from Bouchard 1993

Big five personality factors	U-LA	MZA	MZT	DZA	DZT
	$n = 37$ pairs	$n = 113$ pairs	$n = 652$ pairs	$n = 75$ pairs	$n = 558$ pairs
Stability	-.07	.54	.47	.27	.15
Extraversion	-.01	.51	.53	-.03	.17
Openness	-.08	.60	.43	.31	.18
Agreeableness	-.09	.51	.42	.10	.18
Conscientiousness	.13	.50	.57	.09	.35
Mean	-.02 <sup>a,b</sup>	.53 <sup>a</sup>	.48 <sup>b</sup>	.15	.20

<sup>a</sup>  $p < .01$ : MZA  $r_i >$  U-LA  $r_i$

<sup>b</sup>  $p < .01$ : MZT  $r_i >$  U-LA  $r_i$

The present results for self-esteem replicate those found earlier in that the U-LAs show substantially less resemblance than the MZ and DZ twins reared together. The present U-LA intraclass correlation of  $r_i = -.18$  ( $n = 42$  pairs) is comparable to the previous U-LA correlation of  $r_i = -.03$  ( $n = 23$  pairs). Both values are significantly less than the values for MZ twins ( $r_i$  values = .30–.35) and lower, albeit not significantly, for DZ same-sex twins ( $r_i$  values = .11–.16). These findings are summarized in Table 5.

### Social Closeness and Familiarity

The six possible ratings on the Social Relationship Survey were reorganized into three categories that combined the ratings 1 and 2 (very close/familiar), 3 and 4 (somewhat close/familiar), and 5 and 6 (not close/familiar) in order to be comparable with an earlier analysis (Segal et al. 2003). Two findings are important to consider. The first is that only slightly more than 20% of the U-LAs indicated the highest levels of initial or current social closeness, less than 20% indicated the highest level of initial familiarity, and only slightly more than 20% indicated the highest level of current familiarity. These findings contrast with those of the MZA twins for whom 72% and 80% chose the highest initial and current social closeness ratings, respectively. Furthermore, 62% and 78% of MZA twins expressed the highest levels of initial and current familiarity. The U-LAs percentages were also well below those of the DZA twins.

**Table 5** U-LA intraclass correlations and 95% confidence intervals for the Rosenberg Self-Esteem Scale (RSES) and comparison with twins who were reared together. Twin data from Kendler et al. 1998; RSES data were unavailable for twins reared apart

Sample	Self-Esteem		$n$ (pairs)
	$r_i$	(95% CI)	
U-LA	-.18	(-.45, .13)	42
MZ male	.30	(.24, .36)	859
MZ female	.35	(.27, .42)	500
DZ male	.11	(.03, .18)	658
DZ female	.16	(.06, .26)	356
DZ male-female	.13	(.08, .18)	1420

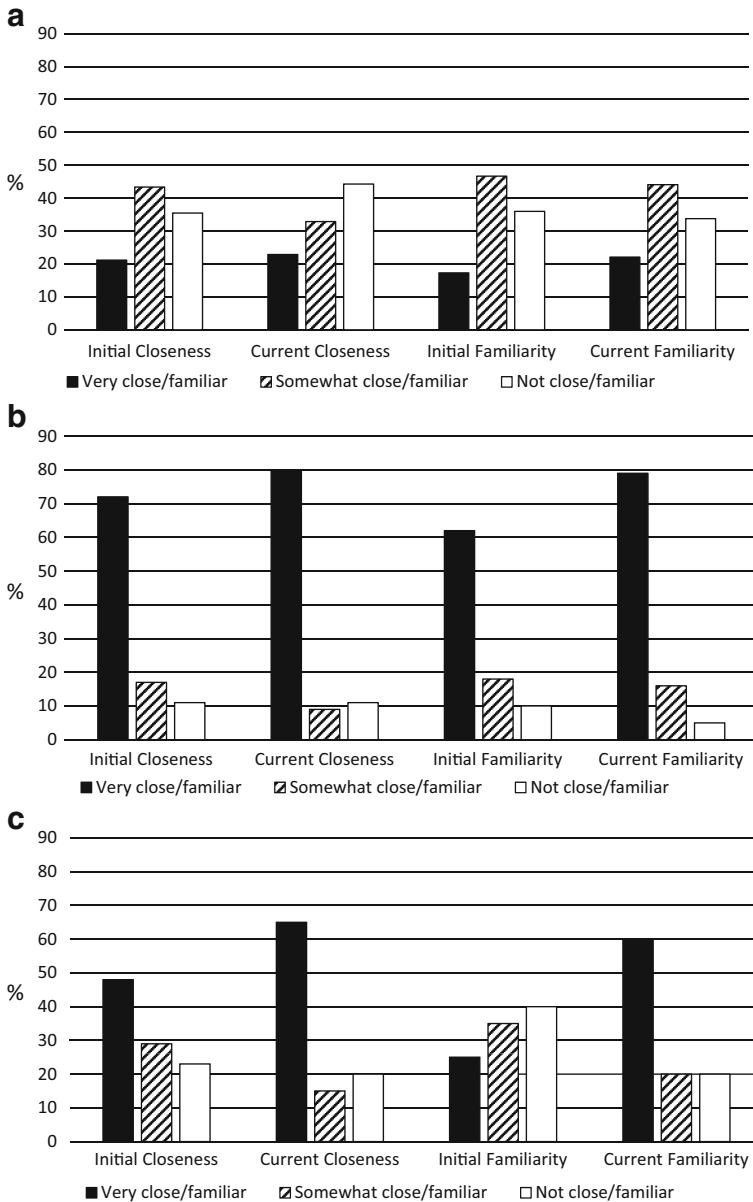
The second finding worth noting is that the greatest change in the U-LA closeness ratings over time (from first meeting to current time) was in a negative direction, from “somewhat close” to “not close,” indicating that social relations were not developed or sustained. In contrast, the greatest change for the MZA twins was an increase in the percentage of twins indicating “very close,” with a corresponding reduction in the percentage indicating “somewhat close.” A similar pattern was observed among the DZA twins. Only a slight increase in the highest level of U-LA familiarity was noted over time, whereas a substantial increase in the highest levels was noted for both the MZA and DZA twins. These data are summarized in Fig. 2a-c.

## Discussion

The present study confirmed and extended previous findings concerning associations of physical resemblance with personality similarity and social relatedness, using a substantially enlarged U-LA participant sample. Despite their near physical identity, the members of the U-LA pairs showed negligible resemblance in the Big Five personality traits, measured across two different inventories, as well as negligible resemblance in self-esteem. In contrast, their counterparts—namely, MZA twins—showed significant similarity in both personality and self-esteem despite not meeting one another until adulthood. MZT twins also showed substantial personality resemblance. Both the DZA and DZT twins, who share half their genes on average, were less alike than both MZ twin groups, but *more* alike than the U-LAs; importantly, these twins do not share the same degree of physical resemblance as the U-LAs. Collectively, these findings demonstrate genetic influence on personality and self-esteem, rebutting the notion that personality resides in the face, consistent with arguments expressed by Rowe (1995).

The U-LA intraclass correlation of  $r_i = .41$  ( $n = 42$  pairs) for openness as assessed by the NEO/NEO-FFI-3 deserves comment. The magnitude of this correlation increased considerably from the previous finding of  $.14$  ( $n = 26$  pairs). It is worth noting that eight of the recently added U-LA pairs had volunteered through Mentorm Media to take part in a program on look-alikes; as such, these individuals may have been self-selected for openness to experience, a trait likely to predispose individuals toward liking attention and, consequently, media participation. The correlation ( $r_i$ ) appears to be an exception given that it was  $-.08$  ( $n = 37$  pairs) on the PfPI and all other correlations were negligible for the other traits measured by both personality inventories.

As expected, the percentage of U-LAs expressing the highest social closeness ratings was very low and did not change over time. The majority of these respondents (43.4%) chose initial ratings at the second level (somewhat close), but they dropped to 32.9% at the time of participation, with a corresponding change at the lowest level (not close), from 35.5% initially to 44.3% at the time of participation. Few respondents (17.3%) chose the highest level of familiarity at the initial meeting, a value that increased only slightly over time. In addition, the majority of U-LAs indicated that the other seemed somewhat familiar or not familiar. These results are in striking contrast to those from the MZA and DZA twin pairs. Both twin groups showed increasing closeness over time and familiarity at the highest level. Interestingly, the DZA twins showed larger increases than the MZA twins, most likely because their initial levels were lower so they had more opportunity to change. Collectively, these



**Fig. 2** Closeness and familiarity ratings for (a) U-LAs ( $n = 68\text{--}76$  individuals); (b) MZA twins ( $n = 89$  individuals; data from Segal et al. 2003); (c) DZA twins ( $n = 65$  individuals; data from Segal et al. 2003)

findings, based on pairs of individuals who vary in genetic relatedness, support the evolutionary-based predictions that (1) fewer U-LAs would express high levels of closeness and familiarity, relative to MZA and DZA twins, and (2) U-LAs would experience reduced closeness over time, whereas closeness would increase between MZA and DZA co-twins.

Several ideas to consider emerge from the social relatedness analysis. It is likely that perceptions of behavioral resemblance are vital in order to sustain meaningful social relations, whereas physical resemblance is far less effective. DZA twins looks less alike than U-LAs, some considerably so, yet their closeness and familiarity ratings were higher. It might also be objected that knowledge of twinship is a factor in the development of close social relationships; however, a number of examples show that half-siblings, full siblings, and even MZA twins are attracted to one another without any awareness of their true biological connectedness (Segal et al. 2013).

## **Caveats and Limitations**

Several caveats to this study warrant attention. The sample size was small, such that the present results should be viewed cautiously. Nevertheless, the constructive replications offer confidence that the findings remain valid. It is also possible that the members of some look-alike pairs, perhaps those from French-speaking Canada, share common genes, an issue that has not been investigated. However, their personality and self-esteem scores were quite different, a finding that would not be expected in the event of biological relatedness; of course, biological relatives do vary in their extent of shared behavioral traits.

Meetings between U-LA partners were variable in length and frequency, such that current ratings of closeness and familiarity (as with the pairs provided by the television program) reflected experiences following only a day or two of contact, whereas the members of several sets met several times each week or each month. In addition, 50% of the U-LA participants who had met at least once did not meet subsequently, but factors such as the distance between them sometimes precluded such meetings; for example, the members of some pairs lived in different countries and on different continents.

Lastly, it would be of interest to obtain personality and social relationship ratings of the look-alikes by individuals who know them well, to improve the validity of the self-report data. This procedure might be incorporated into the study as we identify future participants.

## **Future Directions**

Future research directions include the recruitment of additional look-alike pairs, a procedure that may be facilitated via Internet sites for look-alike individuals; see, for example, <http://www.ilooklikeyou.com>. In addition, it would, be of interest to recruit pairs of individuals who resemble one another in “type” of appearance—for example, tall, overweight, and blonde—to compare them with the look-alikes in the present study, many of whom resemble one another at the level of identical twins. People hold certain beliefs about treatment of such types, and finding the same lack of personality and self-esteem similarity between them would help confirm findings from the present study.

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