



# Born in Korea-adopted apart: Behavioral development of monozygotic twins raised in the United States and France



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## ABSTRACT

Monozygotic (MZ) twins raised in different countries and cultures are rare. This report examines behavioral and physical similarities and differences of MZ female twins from South Korea, but raised separately in the United States and France. Analyses of the twins' intelligence, special cognitive abilities, personality traits, self-esteem, job satisfaction and health histories are considered with reference to their genetic relatedness and rearing conditions. Both striking similarities and intriguing differences were noted.

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## 1. Introduction

Monozygotic twins raised apart (MZA) in different countries are rare. Three reared-apart twin studies in the United States (Newman, Freeman, & Holzinger, 1937), England (Shields, 1962) and Denmark (Juel-Nielsen, 1965) included only 2/75 pairs in which co-twins had been raised in different countries. The more recent Minnesota Study of Twins Reared Apart (MISTRA; 1979–1999) included 12/137 sets raised in different countries (Segal, 2012). The only prospective study of adopted apart Chinese twin children includes only 2/15 sets raised in different countries and continents (Segal, Stohs, & Evans, 2011). The higher proportion of such pairs in the latter two studies probably reflects their more varied recruitment methods, including the Internet.

Unfortunately, data gathered from MZA co-twins reared in different countries have been “hidden” within larger samples. Such presentation forfeits opportunities to explore ways that cultural/experiential features of the twins' rearing environments may be linked to current behavioral and physical differences between them.

Critics have objected to genetic interpretations of MZA twins' similarities, asserting that twins' similar circumstances largely explain their observed similarities (Palmer, 2011). Such criticisms persist even though genetic contributions to individual differences in behavior have been well-established (Plomin, DeFries, Knopik, & Neiderhiser, 2012). Nevertheless, the challenge to study MZA twins from different countries lingers, not just among critics, but also twin researchers.

### 1.1. Present study

To meet the foregoing challenge, two case reports of MZA twins raised in South Korea and the United States have been completed (Segal & Hur, 2008; Segal, Hur, & Graham, under review). Here, a third case of MZA female twins from South Korea, but raised in the United States and France, is presented. A unique feature of this pair is that both twins were raised outside their birth nation and held minority status in their rearing environments.

## 2. Methods

### 2.1. Twin participants

The twenty-five-year-old twins came to attention in 2013 via a colleague. The twins were trying to raise money for a life history

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documentary (Futerman, 2013). One twin (US), an actress in Los Angeles, had posted a video on YouTube that was viewed by her twin's (FR) friends in France; their striking physical resemblance was noted. FR discovered that they were born on November 19, 1987 and adopted through different agencies. Suspecting they were twins, FR contacted US via Facebook on February 21, 2013 and received a response three days later. After exchanging information, the possibility of twinship appeared likely. DNA analysis showed concordance across fifteen short tandem repeat markers, indicating monozygosity with greater than 99% probability.

## 2.2. Protocols

The twins completed a life history interview, IQ test, special cognitive ability tests, personality inventories, self-esteem scale, job satisfaction questionnaire, medical life history and videotaped interview. Various components of the battery were completed when the twins were together (CSUF, June 2013) and apart (Internet; fall 2013). Their mean scores and profile concordance on some measures were compared in several ways (see Furr (2010)). FR was also fluent in English, but completed inventories translated into French whenever possible.

### 2.2.1. Life history

A modified version of the Life History Interview completed by MISTRA participants was administered to each twin (Segal, 2012). Items concerned age at adoption, rearing family circumstances and educational background.

### 2.2.2. Cognitive measures

The Wechsler Adult Intelligence Scale-IV (WAIS-IV) was administered to each twin, approximately one week apart, in September 2013 (US in Los Angeles and FR in France) by separate examiners. The WAIS-IV yields scores across ten core subtests and five supplemental subtests, organized into verbal comprehension, perceptual reasoning, working memory and processing speed scales, and an IQ score (Pearson, 2008). FR's scores were calculated using French norms; converting FR's raw scores to United States norms yielded negligible differences.

A special mental ability (SMA) battery was administered at CSUF in June 2013. They completed these tests at the same time in separate areas of the laboratory. The SMA included selections from the Cognitive Ability Battery (Hakstian & Cattell, 1975–77), and Hawaii Ability Battery (DeFries et al., 1974). Test selection was limited to spatial, visual, perceptual and memory skills because of the twins' language difference.

### 2.2.3. Personality and self-esteem

The first personality questionnaire was the *PfPI Questionnaire de Personnalite au Travail (Personality for Professionals Inventory)* (Rolland & de Fruyt, 2009). It includes 200 items organized into 21 personality dimensions and the Big Five personality traits of Openness, Conscientiousness, Extraversion, Agreeableness and Stability (reverse of Neuroticism). Correlations between the PfPI's five factor model scores and the corresponding NEO-PI-R domains range between .82 and .92. Both English and French versions are available.<sup>1</sup>

The second personality inventory was the *Adjective Checklist (ACL)* (Gough & Heilbrun, 1983). It includes 300 adjectives respondents endorse if the term is self-descriptive. ACL items are organized into four task approach scales, fifteen needs scales, nine topical scales, five transactional scales, four orience–intellectence

scales and five other scales. Consistency in sex difference desirability is high across the American, French and Italian versions of the ACL (.89 to .98), although specific items may differ in translational comparisons (Fioravanti, Gough, & Frere, 1981).

The third personality questionnaire was the 60-item NEO-PI-R (McCrae & Costa, 2004). This inventory also yields scores on the Big Five personality traits. Factor analyses have demonstrated the universality of the American derived five-factor model across fifty cultures, including France (McCrae & Terracciano, 2005; Rolland, Parker, & Stumpf, 1998). Different versions of the NEO were completed by US (NEO-FFI-3) and FR (NEO-FFI), because the latter was available in French. Over 75% of the items overlap and different items are equally distributed among the five scales. Reliabilities for the five personality factors, based on the NEO-PI, NEO-PI-R and NEO-FFI, range between .75 and .88 (Caruso, 2000). Comparable personality data from three sources enabled constructive replication within the study.

The Rosenberg Self-Esteem Scale (RSES; Rosenberg, 1989) includes five positively and five negatively worded items rated on a 0 (strongly agree) to 3 (strongly disagree) scale. This form is available in French. Cross-cultural comparison of the RSES, translated into twenty-eight languages and administered in fifty-three countries, supports an invariant factor structure (Schmitt & Allik, 2005).

### 2.2.4. Job satisfaction

The short form of the Minnesota Job Satisfaction Questionnaire (Weiss, Dawis, England, & Lofquist, 1967) was administered. It yields Extrinsic, Intrinsic and Overall Job Satisfaction scales. Respondents use a 1 (very dissatisfied) to 5 (very satisfied) scale to indicate their satisfaction with twenty job-related items. A single overall job satisfaction item was included.

*Medical Life History.* The twins completed a medical life history covering illnesses, injuries and hospitalizations. Handedness was assessed by self-report and observation by IQ examiners. The twins' heights and weights were recorded by research staff at CSUF.

*Videotaped Interview.* A joint videotaped interview at CSUF recorded reunion events, self-reported behavioral similarities and differences and twins' expectations for their relationship.

## 3. Results

### 3.1. Life history

The twins were born in Busan, South Korea. US's records show that their biological mother was twenty-four years old at their birth and had delivered a non-twin daughter two years earlier. The twins' single mother was financially unable to care for three children so relinquished the twins to insure a better future for them. Their mother had been binding her stomach to hide the pregnancy to continue working. It is suspected that the binding explains why FR was "tiny" at birth, weighing 4.85 lb; US was also small at birth. FR's records do not mention an older child and the maternal age differs by several years. Inaccuracy in adoptees' records is not uncommon (Adoptiontalk, 2011).

US was placed in foster care when two weeks old by the Spence-Chapin Adoption Services. Four months later, she was adopted by a New Jersey couple. US's adoptive father, a certified public accountant, was forty-three. Her adoptive mother, a preschool teacher with an M.A., was thirty-six. The couple had two older biological sons. US's community had few Koreans, but she never felt out of place. This may be explained by the fact that her adoptive parents had wanted a female child and were warm and supportive. The family was upper middle class, residing in a home that was "average" in the neighborhood.

<sup>1</sup> The English version included seven fewer items so appropriate adjustments were made in scoring.

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