

NEWS, VIEWS AND COMMENTS

Twin Studies in Brazil: Projects and Plans / Twin Research: Infant Twins' Viewing of Social Scenes; Religiosity and Substance Abuse; Down Syndrome Among Twins; Twin Case of Chronic Periodontitis / In the News: The Twin 'Property Brothers', Twins With Cerebral Palsy; Twins Affected With the Zika Virus; Twin Writers Derek and Roddy; Twins on Sports Teams; Local Quads

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Twin research in Brazil twin has expanded enormously in recent years, engaging the interests and efforts of many investigators, students and twins. Descriptions and brief summaries of this work and talks given by investigators at local conferences are presented, based on my four-city lecture tour. This is followed by summaries of twin research on infants' viewing of social scenes, religiosity and substance abuse, Down syndrome, and chronic periodontitis. This article concludes with twin-related news and information of general interest, including identical twin property designers, twins with cerebral palsy, twins affected with the Zika virus, a pair of twin writers, twins in sports, and a set of quadruplets from my childhood neighborhood in Riverdale, New York.

Twin Studies in Brazil: Projects and Plans

In July 2017, I presented a lecture at the Institute of Psychology at the Universidade de São Paulo (IPUSP), hosted by Dr Emma Otta, as part of a one-day conference on twin research. This was my second visit to IPUSP—the first took place in February 2016. This was the beginning of a 4-day lecture tour that took me from São Paulo to the cities of Diamantina (Universidade Federal dos Vales Jequitinhonha Mucuri or UFVJM), Salvador (Universidade Católica do Salvador) and Rio de Janeiro (Universidade Federal do Rio de Janeiro, Institute of Psychiatry). Highlights and photographs from the activities that were scheduled over that 2-week period are presented.

A twins' festival took place several days prior to the Universidade de São Paulo's 1-day conference, held at the sports complex. This event, targeted to twins of all ages, attracted monozygotic (MZ) and dizygotic (DZ) pairs from the local São Paulo area, the southern region of the country known as Rio Grande do Sul, and as far away as Montevideo, Uruguay.

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**FIGURE 1a–1d**

(Colour online) Figure 1a. Researchers and students from the Universidade de São Paulo; Dr Emma Otta is fourth from the left. Photo credit: Dr Craig K. Ihara; Figure 1b. Dr Vinícius C. Oliveiro (L) with students and guests. Photo credit: Dr Vinícius C. Oliveiro (selfie); Figure 1c. Professora Nara Cortes Andrade (R) and Dr Nancy L. Segal (L). Photo credit: Dr Craig K. Ihara; Figure 1d. Professor Antonio Egidio Nardi (L) and Dr Alexandre Ghelman (R). Photo credit: Dr. Nancy L. Segal.

Main activities included a general lecture about twin development (Dr Marco Antonio Varella), separate discussion groups for adult twins and parents of young twins (Drs Daniel Kuperman and Maria Livia Moretto) and twin participation in ongoing experimental research on facial expressivity following exposure to various stimuli such as the taste of bitter fruit. The experimental and clinical researchers and students from the conference are shown in Figure 1a. Young twins were entertained with magic tricks and juggling acts by Dr Otta's nephew, Café, and musical performances were held at the end of the day, most notably by MZ twins, Celia and Celma Mazzei, from the state of Minas Gerais. These twins' matched talents and coordinated styles exemplify findings from twin studies showing genetic influence on musical ability and interests.

Two especially intriguing MZ twin pairs were identified at the festival, one male and one female. The male twins, Adalton and Adaylton, were both married, but only Adalton's spouse attended the event. During our discussion of mate selection, it was clear that the twins' wives differed considerably in appearance and personality, and while the brothers-in-law and sisters-in-law liked each other a great

deal, neither twin believes he could have married his co-twin's spouse, and neither spouse believes she could have married her husband's twin. Interestingly, the spouse who was present had met both twins at the same time, but felt attracted to only one, an admission relevant to research on mate choice by Lykken and Tellegen (1993) that speaks to the randomness of human mate selection. Studying such twins and their families would be extremely informative regarding the subtle physical and behavioral features that affect partner choice.

The MZ female twins, Marjorie and Mayara, are remarkable for the fact that their family includes 24 sets of twins born across five generations, most of which are on the maternal family line. To my knowledge, this is the largest number of MZ twins ever reported in a single family. Most of the twin pairs in this family are MZ female. The twins come from a region in the south of Brazil, Rio Grande do Sul, known for its high rate of twinning. This area is separate from Cândido Godói, a high twinning town once thought to be linked to the infamous Auschwitz physician Josef Mengele who performed horrific experiments on twins and individuals with various genetic anomalies (Barrionuevo &

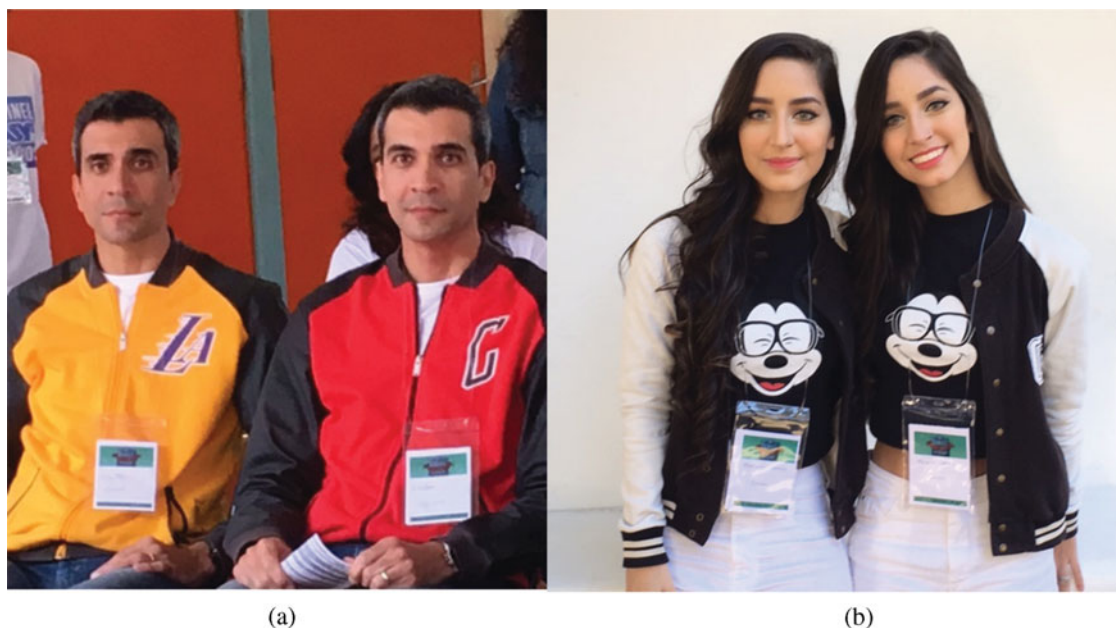


FIGURE 2a and 2b.

(Colour online) Identical twins, Adaylton (L) and Adalton (R) and identical twins Marjorie (L) and Mayara (R). Photo credit: Dr Nancy L. Segal.

Domit, 2011; Segal, 1985). Assisted by the twins, a biologist from the Universidade de São Paulo composed a genogram tracing the transmission of twinning in this family. To date, 18 sets have been accounted for, and other family relatives will be contacted for information about the remaining 6 pairs. Researchers at the Universidade de São Paulo will, hopefully, perform genetic analyses on the members of this extended family with the aim of identifying the gene(s) responsible for their high frequency of twinning. These female twins and the male pair described above are shown in Figure 2a and b.

Dr Otta also hosted a twin research conference that took place on July 31 at the Institute of Psychology at the Universidade de São Paulo. The program was introduced by the head of the Institute, Marilene Proenca Rebello de Souza, and was followed by remarks from Dr Otta and the main faculty participants. I delivered the first lecture, titled 'Twins: The Science Behind the Fascination', which covered twin methods and findings from past and present studies of twins raised apart. The next speaker was Dr Silvia Corte from the University of Uruguay, an ethological researcher new to twin research, who described efforts to obtain twinning rates in her country of 3 million people. Dr Corte additionally outlined potential collaborative projects, such as a study of emotional expressivity. Her lecture was followed by talks from Drs Kuperman and Moretta, clinical faculty interested in pursuing research with twins and providing counseling to twins and their families. Their students and post-doctoral fellow presented the results of literature searches for psychoanalytically based articles on twins. The final events were a review of posters on a range

of twin-related topics by students supervised by Drs Otta and Corte, and concluding comments by the faculty. The high interest generated by the conference and festival is evidence that these events will continue in the future. Twins interested in research participation can register for the São Paulo Twin Panel at https://docs.google.com/forms/d/e/1FAIpQLSdJ4B0cZ4JGzg77cLjkh2uFl0mBuSgoxoX_6pSvzn48__qeNA/viewform

Some future projects will include studies of twinning rates in Brazil as a follow-up to a paper on twinning rates in Sao Paulo (Otta et al., 2016), factors affecting wellbeing and olfactory sensitivity.

UFVJM, Diamantina, Brazil

My host in Diamantina was Dr Vinícius C. Oliveira, a professor in the Department of Physical Therapy. Dr Oliveira conducts research on the origins, symptoms, and treatment of lower back pain, but is closely involved in the development of the Brazilian Twin Registry (BTR) that now includes approximately 1,000 twin pairs from throughout the country. This work is ongoing in conjunction with Professor Paulo Ferreira and graduate student Lucas Calas Ferreira at the University of Sydney, in Australia, as well as a team of dedicated undergraduate and graduate students. A link to the registry allows interested twins and parents of twins to enroll: www.gemeosbrasil.org.

August 2 began with a tour of the university's physical therapy facilities, followed by a discussion of research projects with faculty and students at UFVJM. Dr Oliveira has published several papers describing the BTR (Ferreira

et al., 2016), as well as findings from twin research on lower back pain (Oliveira et al., 2015). His students are currently processing twin data for their own undergraduate projects and masters' theses on both lower back pain and obesity. In addition, two pairs of MZ reared-apart male twins have been identified and plans are in place to complete case studies of one or both pairs. On August 3, I delivered a department lecture on reared-apart twins, followed by a reception in the city. Dr Oliveira and some of his students and guests are shown in Figure 1b.

Looking through the university library listings, we discovered two books by Pedro M. Saldanha, *O Método dos Gêmeos para Médicos, Psicólogos e Biólogos* (The Twin Method for Physicians, Psychologists and Biologists, 1967) and *Gêmeos: Hereditariedade versus Ambiência* (Twins: Heredity versus Environment, 1980); the second may be an updated version of the first. This was a surprise finding, indicating that twin research actually began in Brazil a long time ago.

Universidade Católica do Salvador, Brazil

My next stop was Salvador, where I delivered a lecture for students and faculty on August 5. My host was Professora Nara Cortes Andrade, a faculty member in the Department of Psychology at the Universidade Católica de Salvador and a neuropsychologist, whose affiliation is Professor Edgard Santos, at the Hospital Universitario in the state of Bahia. Professora Andrade is also a doctoral candidate in the Department of Psychology at the Universidade de São Paulo.

Dr Andrade, who specializes in language development, social cognition and musical ability, was recently notified about a rare pair of twins concordant for William's syndrome who are presumably MZ. This condition is caused by a deletion in chromosome 7, resulting in an elfin-like facial appearance, cardiac difficulties, and impaired spatial skills, but also unusual friendliness, emotional sensitivity, and exquisite understanding of musical composition (Martens et al., 2008). This condition does not appear to run in families, although affected individuals have a 50% chance of passing the gene to each of their children (Williams Syndrome Association, 2014). Other MZ twins with Williams Syndrome have been identified (Murphy, Greenberg, Wilson, Hughes, & DiLiberti (1990), but this case is essential to report for determining if, and to what extent, the twins differ in their symptom severity and prognosis. Professora Andrade is shown in Figure 1c.

There is considerable interest in developing a twin research program in Bahia that would be comprehensive and interdisciplinary. The goals are to (a) obtain twinning frequencies in Bahia and possibly other states in northeastern Brazil, (b) develop a website for providing information to professionals representing different behavioral and medical specialties, and allow twins and their families to register for

research participation, (c) organize a one-day twins' festival to attract twins for research and to provide information to parents, and (d) report findings on twins that are variously affected with William's syndrome, toxic stress and attention deficit hyperactivity syndrome.

Universidade Federal do Rio de Janeiro, Institute of Psychiatry, Brazil

My final stop on the lecture tour was the Institute of Psychiatry in Rio de Janeiro, where I arrived on August 8. I was hosted by neurologist and MZ twin, Dr Alexandre Ghelman, and Professor Antonio Nardi, Director of the Section on Panic Disorders and Respiration. Currently, there is interest in using twins to examine various psychiatric conditions, as well as genetic and lifestyles influences on metabolic disorders that often precede cardiac difficulties. Dr Ghelman, his twin brother Ricardo, a pediatrician, and MZ twins and caricaturists, Paulo and Chico Caruso, have organized two gatherings of twins in São Paulo, known as Sindicato dos Gêmeos (Twins Union). Dr. Ghelman and Professor Nardi are shown in Figure 1d.

My lecture was followed by an important visit to the Museo Nacional de Belas Artes (MNBA). This visit was personally meaningful because the permanent collection includes a marvelous painting, titled 'Léa e Maura' (1940), depicting a beautiful pair of MZ female twins. The twins were the daughters of Senator Barros Carvalho, in whose home the well-known Brazilian artist, Alberto da Veiga Guignard, lived. Guignard's painting was included in my first book *Entwined Lives* (Segal, 2000), but the reprinting was in black and white, concealing the brilliant colors of the twins' clothing and the surrounding sights of what could be the historical city of Olinda, located in Brazil's northeastern state of Pernambuco. There is also some suggestion that the landscape is imaginary. Interestingly, Léa is the mother of another famous Brazilian artist, Tunga (Peneira Cultural, 2017).

I had never seen this painting, but I had come across a reproduction while writing *Entwined Lives*. Then, during my research visit to Brazil in February 2016, I scheduled a visit to this museum, but it was closed for repairs while Carnival was taking place. I was, however, able to visit the museum in August 2017 and to finally view the painting I longed to see. It was larger and more brilliant than I had imagined. I am grateful to Dr Ghelman and to Monica XeXeo, Director of MNBA/IBRAM (Imperial Museum/MinC (Ministry of Culture) for arranging this visit, and to Nelson Moreira and his museum staff members who personally guided my colleagues and me through the exhibits. Reproductions of 'Léa e Maura' and many other artistic works can be seen at the museum's website, <http://mnba.gov.br/portal/> and on their Facebook page, www.facebook.com/MNBARio.

Twin Research

Infant Twins' Viewing of Social Scenes

One of the most intriguing research studies to cross my desk in recent years compared 41 MZ pairs and 42 DZ pairs of infant twins as they viewed social scenes (Constantino et al., 2017). The variables of interest were preferential attention, timing, direction, and targeting of eye movements. The twins' responses were also contrasted with those of 88 non-twin infants with autism spectrum disorder (ASD) and 84 non-twin controls. The twin participants were identified through birth records compiled by the Missouri Family Register, maintained by Washington University's Department of Psychiatry. The non-twin children with ASD were recruited from the Marcus Autism Center in Atlanta, Georgia and the non-twin controls were recruited from the general population by advertising. Twin type was established by parental responses to the Goldsmith Child Zygosity Questionnaire that shows 94.8% agreement with results from blood group analyses and DNA testing, with DNA confirmation performed on a random sample of 24 twin pairs. A brief sampling of results is presented below.

MZ intraclass correlations for looking at eyes and mouth were .91 and .86, respectively, greatly exceeding the correlations of .35 and .44, respectively, found for DZ twins. The MZ twins maintained their greater concordance when reassessed 15 months after the initial testing, as evidenced by pairwise concordance values of .93 (MZ twin pairs) and .25 (DZ twin pairs). In contrast, the pairs of age- and sex-matched unrelated non-twins showed correlations close to zero. Infants with ASD showed substantially reduced scores for looking at eyes and mouth, found to be the most heritable measures based on the twin studies. Many other interesting findings are also reported, such as comparisons of twins' behavior when they viewed the same versus different videos and content categories.

This study highlights the broad applicability of twin studies. It also underlines the fact that genetic and environmental influences on some behaviors have never been examined using a twin-based approach.

Religiosity and Substance Abuse

Relationships between religiosity/spirituality (R/S) and substance abuse have been well established, but the causal nature is unclear. A study of MZ twins discordant for religiousness, spirituality and spiritual transformation, conducted by Nedelec et al. (2017), controlled for genetic and shared environmental factors in estimating the effects of

R/S on substance use and abuse. The twin sample was drawn from the National Longitudinal Study of Adolescent Health or ADD Health. The key findings were that R/S has little effect on substance use and abuse, while religiousness functioned to reduce general alcohol use, but not problematic alcohol use. Despite the interest of these findings, the authors correctly noted that replication using a larger sample including twins from clinical settings would be informative.

Down Syndrome Among Twins

The relative frequency of Down syndrome in twins and non-twins has not been well established. However, a recent review of California births between July 1995 and December 2012 has confirmed the greater frequency of this condition among non-twins (Sparks et al., 2016). Examination of 77,279 twin pregnancies found that 182 or 0.2% had at least one affected fetus. Additional analyses showed that the ratios of the expected-to-observed incidence of Down syndrome per pregnancy were 33.6% (MZ twins), 75.2% (DZ twins), and 70% (all twins). The incidence was lower than expected for women aged 25 to 45 years, especially those delivering MZ twins and women with increased maternal age. Fetal loss and consequent inability to record some cases of Down syndrome might partly explain the findings. A limitation of this study, as recognized by the investigators, is that the zygosity of the pairs under study was estimated rather than established conclusively.

Twin Case of Chronic Periodontitis

A case study involving a family of eight siblings, among them a set of MZ twins, is of interest given that periodontitis is a common gum disease (Grech, 2015). The affected individuals were the mother and four of her male sons, one of whom was part of the twin pair. The surprising conclusion was that strong genetic influence on periodontitis (a common gum disease) is *not* indicated because of the twins' discordance, although genetic susceptibility to the condition was acknowledged. The fact that smoking increases the risk and development of periodontitis and that both twins were heavy smokers probably contributed to this conclusion.

This case clearly shows that periodontitis is a complex condition affected by many factors. However, some significant studies based on participants from the Minnesota Study of Twins Reared Apart and Minnesota Twin Registry challenge this claim. The investigator cited a

review article on genetic risk factors for periodontal disease by Michalowicz (1994), a member of the University of Minnesota research team, but only with reference to definitions of periodontitis and the type of oral bacteria involved. In fact, the article indicated that the extent to which genetic factors affect chronic periodontitis is unclear, but noted that studies of the reared-apart and reared-

together twins from Minnesota showed genetic influence on adult probing depth and attachment loss. Furthermore, the method used to establish the zygosity of the twin pair in the case study was never explained—in the event that the pair proves to be DZ, the conclusion that periodontitis is not significantly affected by genetic factors would require revision.

In the News

The Twin 'Property Brothers'

The twin 'Property Brothers' Jonathan and Drew Scott are 39-year-old identical twins who have become famous for buying, renovating, and selling real estate. Their popular television program 'Brother vs. Brother', on HGTV, features Drew as a real estate agent who assists families in the purchase of a new home and Jonathan as a construction contractor who helps them fix things. As part of their livelihood, they have developed their own brand of refrigerators, electric furnaces, rugs, and patio furniture. They have also written a book, *It Takes Two*, to be released in September 2017, and perform songs and comedy routines. They hope to produce a movie for which they have written the screenplay.

The Scott twins, who come from Canada, displayed their shared talents early on. As children, they were involved in comedy and improvisation and worked occasionally as clowns. They became active in real estate as a way of financing possible acting careers. Their common career paths are not surprising, given that twin studies have shown genetic influence on many aspects of creativity, work values, and vocational interests. The fact they cooperate so well with each other additionally exemplifies the psychological closeness characteristic of identical twins, reported by a wide array of studies (Segal, 2012).

Twins With Cerebral Palsy

Seventeen-year-old high school seniors, Lizbeth and Elizabeth Gomez, are both affected with cerebral palsy (CP), but Lizbeth's symptoms are mild compared with those of her twin sister who is severely affected. Recent data from Norway found that the proband-wise concordance rate was 8.3% among same-sex twins but, unfortunately, zygosity information was unavailable (Tollånes et al., 2014). These twins appear to be identical based on inspection of a newspaper photograph.

Among Lizbeth's accomplishments are winning a first-place award at a racing car competition, becoming a varsity tennis player, speaking at her high school graduation, and earning a 4-year scholarship to Stanford University (Whiting, 2017). Her long-term goal is to become a bioengineer and conduct research into cerebral palsy.

Twins Affected With the Zika Virus

The Zika virus has affected hundreds of newborn infants in Brazil and other countries, and twins are among them. A recent article in the *New York Times* described the situations of infants in nine twin pairs, underlying their importance for understanding why some pairs are concordant and other pairs are discordant (Belluck & Franco, 2017). According to Universidade de São Paulo geneticist Mayana Zatz who was interviewed for the article, both twins were affected in two identical pairs, whereas only one twin was affected in six fraternal pairs, with the exception of one concordant fraternal (male-female) pair. The writer of the article stated that, 'Since identical twins share one placenta while fraternal twins almost always have separate placentas, Dr Zatz and other experts suggested that the Zika virus may have penetrated one placenta and not the other' (pp. D1, 6). Of course, this assertion is false as I indicated in an unpublished letter to the newspaper's editorial division and in my recent book, *Twin Mythconceptions* (Segal, 2017).

In my letter and book, I stated that fully one-third of identical twins have separate placentae, as well as fetal membranes (chorions and amnions), facts that challenge this theory. Instead, the twins' matched genetic make-up may have accounted for their matched susceptibility to the Zika infection. Fraternal twins typically have separate placentae and membranes, but fraternal twins' placentae can fuse and some relatively rare pairs share a chorion. Twins in just one of the seven fraternal pairs under study were both infected, yet they had separate placentae. It is possible that these particular twins shared a genetically-based predisposition for the Zika infection following exposure.

Twin Writers Derek and Roddy Walcott

Twins Derek and Roderick (Roddy) Walcott were born on January 23, 1930 in Castries, St Lucia in the Caribbean, to Alix and Warwick Walcott. Their father died in 1931, leaving their mother, a teacher, to raise them and their older sister. Their mother tried to cultivate a deep appreciation for art and literature in her three children (Poetry Foundation, 2017; Munro, 2010).

Photographs of the twins show a look-alike pair, but it is unclear whether they are identical or fraternal. Nevertheless, both brothers went on to distinguish themselves across a range of artistic fields. Derek published his first poem at the age of 14, the beginning of a career that would include several poetry collections, such as the *The Prodigal* (2004), *White Egrets* (2010) and *Morning, Paramin* (2016). He won an Obie award for his play *Dream on Monkey Mountain*, described as ‘a poem in dramatic form’. Together with his twin brother, he founded the Trinidad Theater Workshop (1950) and held teaching positions at Boston University, Columbia University, Yale University, Rutgers University in the United States, and Essex University in England. *The Capeman*, a musical based on the life of convicted murderer Salvador Agrón, created in conjunction with Paul Simon, did not have a long run on Broadway, but received Tony nominations for best score, best orchestrations, and best scenic design (Lefkowitz, 2017). Derek Walcott was awarded the Nobel Prize in Literature in 1992.

Roderick also has a long list of achievements as a playwright and theater director. He helped found the St Lucia Arts guild in the 1950s, for which he wrote, produced and directed plays, and is regarded as one of the founders of the modern Caribbean theater. His play, *The Harrowing of Benjy*, is produced more than any other theatrical work in the English-speaking Caribbean. In collaboration with Charles Cadet, he wrote a number of St Lucia’s most popular songs. He also studied theater arts at York University in Canada, and then returned to St Lucia temporarily as the First Director of Culture (1977–1980; see Wikipedia, 2017).

Derek Walcott passed away in 2016 at the age of 87, 17 years after his twin brother who died at age 70 from a long illness. Their childhood home in St Lucia operated as a museum for many years, but was closed recently.

These twins are of special interest given ongoing debates over whether twins are underrepresented among highly accomplished individuals. I have argued that this is probably *not* the case for several reasons (Segal, 2017). It is often unknown whether a highly talented fraternal twin individual is part of a pair. Some twins, like the Walcotts, are both very talented, yet only one might capture a rare prize, like the Nobel, that draws considerable attention to that twin. Furthermore, recent work shows that twins do not score below non-twins on tests of general intelligence as the older literature suggested. Finally, definitions of talent and creativity vary widely.

Twins on Sports Teams

I received a message from a father in the mid-western United States whose child plays soccer (Streiffer, 2017, personal communication). He was impressed that among the eight teams of 20 players were four identical twin pairs, or 1/20 individuals. ‘I have not found anyone who is as inter-

ested in this as I am,’ he noted, emphasizing how fascinated he was by this statistic. The Center for Disease Control most recently reported that the twinning rate in the United States is 1/33 (Martin et al., 2012), so this father was right to be fascinated.

Local Quads

I was recently contacted by a former friend from my old childhood neighborhood, in Riverdale, New York, who shared some surprising news. A celebrated set of quadruplets had lived in our neighborhood and had attended the same junior high school as I had, albeit several years earlier. I had never heard of the Collins quads, a naturally conceived set consisting of two males, Andrew and Edward, and two females, Barbara and Linda. I was unable to locate photographs of the four, but my friend believed that they consisted of two pairs of identical twins that did not look *exactly* alike.

An Internet search revealed that the quads were born on May 4, 1949 to 27-year-old Ethel and 29-year-old Charles Collins who had been told to expect triplets; the couple already had an older son, Stephen (Villani-York, 2009). The quads’ combined birth weight was 17 pounds, with the heaviest, Charles, at 5 pounds, 5 ounces and the lightest, Linda, at 3 pounds, 7 ounces — Linda was thought to be a ‘shadow’ on the x-ray, explaining why just three babies had been expected. Their home, donated by the organization *Quad Haven*, and designed and built by local architects and contractors, still stands today. The family also received food and supplies free of charge. The current widespread use of fertility treatments has increased the frequency of higher order multiple births so that quadruplets born today would not be celebrated in the ways that the Collins quads were.

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