

# Unrelated ART Twins / Tribute: Dr Robert Derom / Twin Research Reviews: Transfusion Syndrome; Discordant MZ-Twin Method / Matched Talents: Tennis Twins: (Mike and Bob Bryan; Sonchai and Sonchat Ratiwatana); Television Twins: (Ellen and Lynda Kahn)

Nancy L. Segal

*Department of Psychology, California State University, Fullerton, United States of America*

A unique case of artificially conceived twins is described. The infants involved are unrelated to one another, as well as to the mother who carried them. The question of whether these individuals meet scientific criteria for being twins is considered, as is the issue of whether their parents are really parents of twins. Next, the International Society for Twin Studies acknowledges the life and work of its late esteemed colleague, Dr Robert Derom. His professional accomplishments on behalf of twins and twin research will be remembered, as will his helpfulness and generosity to fellow investigators. This tribute to Dr Derom is followed by reviews of new research on the pathophysiology of the twin transfusion syndrome and the use of discordant MZ twins (co-twin control) in behavioral research. The final section provides a review of the athletic talents of two sets of MZ twin tennis players, and the creative skills of a set of MZ twin designers.

## Unrelated ART Twins

Investigators at the National Embryo Center in Knoxville, Tennessee, have reported the first case of twins unrelated to their mother and to each other (Keenan et al., 2009). The pair resulted from the transfer of three embryos from two different donors (both aged 33 years old) to a 42-year-old woman with a history of infertility. She had delivered a son two and a half years earlier, conceived via donor insemination; however, subsequent pregnancy attempts were unsuccessful.

The three embryos had been cryopreserved, thawed simultaneously and implanted during the same procedure. The only pregnancy complications were the twins' discordant weights and the mother's mild hypertension. Delivery of a healthy boy and girl occurred at week 36.50.

The authors noted a key advantage to this procedure, namely the opportunity to use the best, high quality embryos available at a given time. This case also shows that successful pregnancies are possible even when mothers do not share immune systems with fetuses. However, the importance of establishing the genetic identity of each twin's natural parents, for knowledge of medical history information and biological origin, was noted. A potential drawback could be difficulties for parents trying to explain their children's life histories to them. The clinic advocates full disclosure of background information during early childhood. This is an issue that will require attention and documentation during the children's development.

The investigators refer to the children as 'twins', but the appropriateness

of this term can be debated. Elsewhere, I have argued that twins are defined by certain scientific attributes that uniquely distinguish them from non-twins (Segal, 2006). These attributes include (1) simultaneous conception, (2) shared biological parents, (3) common prenatal environment and (4) simultaneous delivery. In the present case, the embryos were conceived 10 and 8 years apart, violating the first criterion. Of course, it is possible that unrelated donors could conceive their embryos at the same time — but then criterion 2 (shared biological parents) would not be fulfilled. It is theoretically possible (but

*Address for correspondence: Nancy L. Segal, Department of Psychology, California State University, Fullerton, CA 92834, USA. E-mail: nsegal@Exchange.FULLERTON.EDU*

practically impossible) for the same parents to conceive DZ twins who share no genes in common (like the twins in the present case), but such twins would still share their biological parents.

Given the foregoing, I would argue that a different label would be more appropriate for the infants in question. In fact, they appear to be a special case of virtual twins (i.e., same age-unrelated siblings adopted together; see Segal, 2000). What distinguishes them from ordinary VTs is that they shared an intrauterine environment. The difficulty with calling the children twins without qualification is that the term implies similarity and common origins, and it is likely that the two separately conceived children will be quite different in appearance and in behavior.

Similar reasoning extends to the parents of these children. If the children cannot be considered twins, then

their mother and father cannot be considered parents of twins. However, the parents will confront some of the same issues faced by parents of twins. Examples include whether or not to enroll the children in the same or separate classrooms, and the advisability of encouraging them to have the same or different friends. Some mothers of ordinary virtual twins have benefited from membership in mothers' of twins clubs. The mother in question might benefit, as well.

The case reported by Keenan et al. (2009) is the first of its kind. There have, however, been similar cases that have informed thinking about the relationship status of the two infants. One previous case, summarized in Segal (2000), concerned a Dutch mother who, in 1994, delivered one of her own artificially conceived sons and another son who was the product of

her egg and the sperm from a man of a different ethnicity. I concluded that these children could be considered twins since they replayed natural events occurring in superfecundated twinships; that is, double ovulation, followed by conception in separate coital acts by different fathers.

In 1998, a pair of male infants (one white and one black) was delivered by a New Jersey woman. One child was hers, but the other one belonged to a different couple; an error had been made during embryo implantation (Liebler, 2008). The family voluntarily relinquished custody of the child after extended legal struggles. In my view, this pair did not meet criteria for twinship status, given the lack of biological relatedness between the parents and one child. Instead, these children can also be considered to be a special case of virtual twins.

## Tribute: Dr Robert Derom

Dr Fernand Leroy contributed a moving tribute to the memory of Dr Robert Derom. I would like to add some additional thoughts.

It is with great sadness that the ISTS membership acknowledges the passing of a friend and colleague, Dr Robert Derom. Dr Derom was 87 years old when he was killed in a car accident near his home in Destelbergen, Belgium on July 29, 2009. This news was made available to the International Society for Twin Studies by his daughter and collaborator, Dr Catherine Derom. Robert leaves behind a professional legacy of research on twins and twin development, and a personal legacy of friendship and dedication.

It is informative and insightful to review the resumes of our colleagues. These documents often tell us things that we never knew about the people with whom we have worked. It is no surprise that Robert Derom did residencies in gynecology and obstetrics, but he also spent one and a half years in microbiology training. He was a Lieutenant-Colonel in the Army Medical Corps (1946–1947). He was also the recipient of several awards, including the Jaspard Prize from the Agency for the Care of Mother and Child (1987) and Honorary Membership in the Belgian Society for Reproductive Medicine (2002).

Dr Leroy has noted the accomplishments of Dr Derom that most ISTS members know and appreciate:

creator of the East Flanders Prospective Twin Survey, founding member of the ISTS, ISTS President (1996–1999) and founder and editor of the journal *Twin Research* (now *Twin Research and Human Genetics*). These achievements are worth repeating and remembering because of their profound effects on our professional activities in twin research.

Dr Derom would have been a significant presence at the 2010 ISTS meeting in Seoul, South Korea. He will be missed.

Dr Catherine Derom is gratefully acknowledged for providing information used in this article. On behalf of the ISTS membership, I wish to extend condolences to the Derom family.

## Research Reviews

### Transfusion Syndrome

A new and informative overview of the detection and management of twin-to-twin transfusion syndrome (TTS) is available (Bebbington, 2009). Predicting which monochorionic pairs are likely to suffer from TTS is not possible; however, pairs affected with this condi-

tion before 26 weeks gestation are likely to suffer most in terms of morbidity and mortality. Clues to eventual outcomes and optimal treatment may be derived from the cardiovascular response of the recipient twin. The responses of the fetuses to one another may have implications for their long-term health.

### Discordant MZ-Twin Method

The co-twin control design is a well-known method for disentangling genetic and environmental effects on medical and behavioral traits. Experimental approaches involve providing one MZ co-twin with a drug, learning program or other interven-

tion; the co-twin is either untreated or is administered a different regimen for the same interval. Similar outcomes indicate genetic effects on the trait of interest, while different outcomes indicate nongenetic effects. Natural co-twin control studies occur when investigators compare the life histories of twins discordant for selected medical, behavioral and/or physical traits.

Vitaro et al. (2009) offer a comprehensive overview of the benefits, limitations and ways for improving co-twin control studies, especially in the behavioral sciences. The primary benefits include control over genetic factors, as indicate above. This allows pheno-

typic differences between genetically identical co-twins to be reliably tied to observed nongenetic differences between them. The authors cite the example of how differences in friends' aggression during kindergarten increased MZ co-twin differences in aggression from kindergarten to grade one. Of course, the direction of causation remains uncertain — did the more aggressive twin seek out more aggressive friends, or did the company of more aggressive friends lead to increased aggression? This is seen as a limitation. Another difficulty (not mentioned in this article) is that the trained twin may impart information

to the co-twin, a process termed vertical diffusion. This possibility places the internal validity of the study at risk.

The authors propose the use of (1) longitudinal designs, (2) designs that control for correlated non-shared experiences and (3) designs that include theoretically relevant mediators and moderators. A timely suggestion concerns attempts at linking differential environmental experiences with different patterns of DNA methylation. The authors conclude by noting that medical studies have benefitted considerably by co-twin control studies, and that the behavioral sciences are now poised to do so.

## Matched Talents

Twins' matched athletic skills have been the focus of considerable research. The majority of studies indicate that athletic skills, the physical features that underlie them, and athletic interests are partly influenced by genetic factors (see Segal, 2007). Two sets of twins who excel in tennis exemplify these findings.

### Tennis Twins (1): Mike and Bob Bryan

Mike and Bob Bryan are probably the most famous twins in tennis (Bilger, 2009; Bishop, 2009; Konigsberg, 2009). They are ranked first in the world in doubles and hold 54 titles. (The largest number of wins by a doubles team is 61, a number that the Bryan twins hope to surpass.) These twins have beaten the Ratiwatana twins (see below), claiming that they did not want to be the second-ranked twin pair in their sport. Bob, the older twin, is one inch taller and 15 pounds heavier than Mike. A particular advantage for the pair is that Bob is left-handed and Mike is right-handed, allowing them considerable command over the court.

The twins' parents played tennis professionally, so the twins were exposed to the game from an early age. This experience, plus their natural ability and close social relationship, most likely explain their continued success. The twins have identified three essential ingredients that keep

them winning: loving the game, playing at the highest level and creating a common identity. The twins share many things, including a home, a music band and a twitter account. They want to pass this wisdom on to other tennis-playing twins who hope to follow in their footsteps.

Note: the Federer twins referenced in the title of the article by Bishop are the newborn twin girls of tennis champion Roger Federer. There was a joke circulating that, given their father's talent, the twins would be the Wimbledon doubles winners in 2029-2040.

### Tennis Twins (2): Sanchai and Sonchat Ratiwatana

The identical Ratiwatana twins were born in Bangkok, Thailand on January 23, 1982 ([http://en.wikipedia.org/wiki/Sanchai\\_Ratowatana](http://en.wikipedia.org/wiki/Sanchai_Ratowatana); [http://en.wikipedia.org/wiki/Sonchat\\_Ratowatana](http://en.wikipedia.org/wiki/Sonchat_Ratowatana)). They are exactly the same height (1.75 m or 5 feet, 9 in) and weight (70 kg or 150 lb), and both are right-handed. The brothers won their first ATP doubles tournament in Bangkok in 2007. In 2008, the twins participated for the first time in the Grand Slam during the Australian Open, but lost. The twins came in second in Wimbledon, in both 2006 and 2009. Their prize money is nearly identical, although Sonchat (\$148,522) has

earned somewhat more than Sanchai (\$141,283).

### Television Twins (Ellen and Lynda Kahn)

The Kahn sisters are 53-year-old identical twins, both of whom have won Emmy awards for television design (Verrier, 2006). Their work includes preparing logos, graphics and titles for television programs that are part of a network series. Together they founded TwinArt, a company with offices in New York (Ellen) and Los Angeles (Lynda). Each twin wears a gold necklace with her respective area code as the charm (212 for New York and 213 for Los Angeles). They have used their twinship to gain recognition in a field that is highly competitive.

The twins' artistic interests emerged during their early childhood. They created puppet shows and other productions to entertain family and friends in the Long Island, NY area where they lived. They were fond of television shows such as 'The Mickey Mouse Club' and 'Bewitched', but took a special interest in the opening credits.

The twins claim to have wanted to be individuals, leading Ellen to earn a BA degree in fine arts at Temple University's Tyler School of Art in Philadelphia, and Lynda to earn an MA degree in fine arts from Chicago's Art Institute, in Illinois. Ellen majored in painting, while Lynda majored in

sculpture. Ellen has been married twice, while Lynda has never been married. Give their differences, the twins are amused that they are now pursuing shared careers. I suspect that twin researchers would be less surprised.

## References

- Bebbington, M. (2009). Twin-to-twin transfusion syndrome: current understanding of pathophysiology, in-utero therapy and impact for future development. *Seminars in Fetal and Neonatal Medicine*, doi: 10.1016/j.siny.2009.05.001.
- Bilger, B. (2009, August 31). Perfect match. *The New Yorker*, pp. 44–55.
- Bishop, G. (2009, August 12). The Bryans have advice for the Federer Twins. *New York Times*, pp. B–9, 14.
- Keenan, J. A., Sommerfelt, C., & Finger, R. (2009). *Reproductive Biomedicine Online*, 1(Suppl. 1), 27–28.
- Konigsberg, E. (2009, August 30). Unseparated at birth. *New York Times Magazine*, MM22.
- Liebler, R. (2008). Race and advanced reproductive technology mistakes. Available at <http://academic.udayton.edu/health/05bioethics/reproduce09.htm>
- Segal, N. L. (2006). Psychological features of human reproductive cloning: A twin-based perspective (invited paper). *Psychiatric Times*, XXIII, 20, 22.
- Segal, N. L. (2000). *Entwined lives: Twine and what they tell us about human behavior*. New York: Plume.
- Segal, N. L. (2007). Sports pairs: Insights on athletic talent. *Twin Research and Human Genetics*, 10, 528–533.
- Verrier, R. (2006, January 9). They get double takes creating looks for TV. *Los Angeles Times*, pp. C–1, 5.
- Vitaro, F., Brendgen, M., & Arseneault, L. (2009). The discordant MZ-twin method: One step closer to the holy grail of causality. *International Journal of Behavioral Development*, 33, 376–382.