

News, Views and Comments

Terminating Twins: Survival of One/Twin Research Reviews: Twin Discordance for Primordial Dwarfism; Twin Study of Public Service Motivation; Four-Parameter Model for Twin Research; Global Twinning at a Peak; Germline Differences of Monozygotic Twins/In the News: Twins and Dyngus Day; Triplets Born in Austrian Displaced Persons' Camp; *Superior*, Film About Estranged Identical Twin Sisters; Adopting Own Twins After Surrogacy; Twins and Primordial Dwarfism Revisited

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Abstract

Selective termination is the term used for the elimination of an abnormal fetus. In contrast, *multifetal pregnancy reduction* refers to the termination of one or more members of a twin or higher-order multiple birth set, respectively, to reduce the high risks associated with these pregnancies. The procedure can also be used when a serious physical condition is detected prenatally in a member of a multiple birth set. In a minority of cases, selective termination has reduced two healthy fetuses to one when parents wanted just one additional child in the family. In the present article, the perspectives of a surviving twin whose family wished to terminate both healthy fetuses are examined. Next, past and present twin studies of primordial dwarfism, public service motivation, an analytical model, the global twinning rate and germline differences are summarized. The article concludes with a synopsis of twin-related news that covers twins and Dyngus Day, triplets born in an Austrian displaced persons' camp, the film *Superior* — about estranged identical twin sisters, a couple adopting their own twins after surrogacy and a new case of twins and primordial dwarfism, a condition introduced in the research reviews.

Terminating Twins: Survival of One

The current consensus is that *selective termination* is the appropriate term for the elimination of an abnormal fetus. In contrast, *multifetal pregnancy reduction* refers to the termination of one or more members of a twin or higher-order multiple birth set, respectively, to reduce the high risks associated with these pregnancies (Beriwal et al., 2020). The procedure has also been used when a serious physical condition is detected prenatally in a member of a multiple birth set. In a minority of cases, selective termination has reduced two healthy fetuses to one when parents wanted to add just one additional child to their family. I have always felt that surviving twins whose healthy co-twin was selectively terminated for this reasons (and perhaps others) might feel anger, resentment and/or sadness at being deprived of this special sibling relationship;

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however, I have never identified relevant studies or case reports. The present article is unique in that it explores the perspectives of a surviving adult co-twin whose family wished to terminate both healthy twin fetuses.

In January 2021, I was contacted by a 54-year-old woman who wondered if I would be interested in the 'experience of a twin who survived an attempted (or at least partially successful) termination'. I will call her TS for 'twin survivor' to preserve her privacy.

Over a series of interviews and email exchanges, I learned that TS had been born in England to a couple who had three older sons. One of her brothers had been part of a twin pair, but the early loss of his co-twin was never clearly explained or understood. However, the fact of her brother's twinship was discussed openly in the family, while TS's twinship was unknown to her because it was never mentioned. She believes that discussion of her brother's twinship was possible because of his brilliance and eccentricity — family members decided he was different from everyone else because he had been born a twin.

In 1966, TS's mother discovered that she was pregnant for the fourth time, at the age of 32. The couple knew they could not afford to raise another child and refused to accept financial support from anyone. It is unlikely that TS's mother knew that she was carrying twins. Regardless, the couple had a friend who was a chemist who

provided her mother with a ‘medical concoction’ intended to end the pregnancy. At that time, pregnancy termination was illegal in the UK. However, only one baby was aborted, and the pregnancy continued. There were never any indications that the pregnancy was not progressing well.

At the time of her birth, TS’s mother had been a night shift nurse while holding various other jobs, one being gas station cashier. Her father had just accumulated a huge debt from a failed business venture — a local haberdashery shop that went into receivership — in which her parents had invested, using her mother’s inheritance from her own father’s estate. Her father eventually went into the retail business and park service — her parents’ ‘moral compass’ made them reluctant to seek financial assistance. TS’s father was a ‘frustrated intellectual’ who had wished to become a lawyer, but unfortunate personal circumstances did not allow that — he was sent to forced labor in Siberia and later lived life as an ‘eternal immigrant’ in England.

From an early age, TS experienced ‘an innate and overwhelming sense of distress and utter longing’. A neighbor recalled that she cried constantly as a young baby. TS mostly played alone and currently prefers interacting closely with one individual at a time. She wonders if her inability to find the ideal life partner is because she is searching for someone similar to herself. It is easy to explain these feelings with reference to TS’s lost twinship, a claim that some twins, parents and professionals promote. However, scientific evidence does not favor such interpretations, which would require prenatal knowledge of twinship. Research shows that low oxygen tension in fetal blood, as well as pregnanolone and prostaglandin D2 provided by the placenta, keep fetuses sedated (Lagercrantz & Changeux, 2009).

TS did not learn she had been part of a twin pair until she was told by a cousin at the age of 13 years. Her mother was present at the time and looked embarrassed. Her cousin assumed that TS knew this fact of her birth, perhaps because her brother’s twinship was known. TS recalls feeling shocked and in a state of disbelief at hearing this news — ‘there is so much that goes along with that,’ she said. After learning the truth about herself, TS became increasingly empathic when it came to her brother. She feels that she also gained understanding of why she felt different from others, and why she experienced a ‘flood of understanding and acknowledgment’ of her childhood thoughts and experiences. Interestingly, when TS was just 3 years old, she cried while insisting that she ‘wanted a baby’, then later formed plans to steal one and keep the baby in the garden shed.

However, as I indicated above, connections between prenatal twin loss and later behaviors cannot be definitively drawn. I have noted that some parents of young surviving twins have observed strong desires for physical closeness in their children, observations that are possibly suggestive of twins’ prenatal contact — which has been demonstrated — and are worth investigating (Segal, 2017). Scientists must remain open to the possibility that young surviving twins miss something for which they lack words, comprehension and knowledge.

TS did not hear additional details about her early history until later in life when her mother finally spoke of it — at the time her mother was dying. That is when TS learned that a form of medication provided by a pharmacist had been used to end the pregnancy. Today, TS is not bitter, angry or resentful, explaining that she tries to justify her mother’s decision. Moreover, TS felt ‘utterly loved’ as a child and beyond, recalling that her mother ‘nourished her with life and with love. She was all heart.’ Her mother was very concerned that her daughter spent so much time playing alone. TS has no sense of whether her mother regretted her decision to end the pregnancy.

Over the years, TS earned a Bachelor of Education degree and obtained certification as a postpartum doula. She is married, has two children and lives in a northeastern part of the USA. She has worked as a photojournalist with an emphasis on travel. Reflecting on her past and present, she noted that as a surviving twin, she is innately sad and melancholy, but feels privileged to live life. And while people generally disappoint her, she is sure that if she had a twin, this person would not be disappointing — this may explain why seeing twin children today ‘digs at her heartstrings’. Interestingly, TS had thought about contacting me 20 years ago, then decided against it, perhaps because memories forgotten or denied would come to the fore.

Selective Termination: Controversies

The elimination of one or more multiple birth fetuses is not without controversy. A 1981 termination of a twin fetus with trisomy 21 (Down syndrome infant) at 17 weeks into the pregnancy ignited intense discussion of ethical and moral issues among physicians. There was the risk of damaging or killing the healthy fetus because the mother did not wish to raise it. One physician who learned of the case felt that the adoption of Down syndrome infant would have been a more prudent choice than termination (Hoffman & Slade, 1981; ‘Physicians deplore the aborting of one twin’, 1981).

Beriwal et al.’s (2020) article reviewed the different forms of multifetal reduction best suited to variations in gestational age and chorionicity. It was also pointed out that these decisions are not easy for families, especially when two healthy fetuses are present, and reduction is chosen only in the event that a preterm birth might pose difficulty. There is also a group of mothers who conceived twins by assisted reproductive technologies (ART), then decide to reduce two fetuses to one because of parenting concerns and/or financial considerations (Padawer, 2011). This action seems hard to understand because couples seeking ART are eager to have children, are told that ART often yields more than one fetus, and most who seek such intervention are able to cover its cost.

It is striking that the emotional consequences of multifetal reduction for surviving co-twins were not considered in the studies I reviewed. There is professional literature on early twin loss from natural causes (e.g. see Woodward, 2010, and a special issue of *Twin Research and Human Genetics*, volume 5, issue 3, pp. 145–244, edited by Elizabeth Bryan and Ronald Higgins, 2002), but less on the surviving twins than on their parents. I am grateful to TS for sharing her story, but we cannot know how representative her perspectives might be. Understanding the impact of twin loss via multifetal reduction will only be possible if other individuals from such pregnancies come forward.

Research Reviews

Twin Discordance for Primordial Dwarfism

I came across a fascinating article from the early 1960s that is relevant to a media entry in the section below. The article describes primordial dwarfism (PM) in one member of a dizygotic (DZ) opposite-sex twin and in one member of two age-matched sibling sets (Black, 1961). Black noted that PM was one of several terms used to describe ‘a disorder of growth by implication present at or before birth, in which the individual is of extremely small stature, but otherwise exhibits no representative causative disease’. Consistent with his view is that five types of PM are currently recognized (Healthline, 2018).

All the affected children discussed in the article were female and very low in birth weight: 3 pounds, 1 ounce (DZ female twin), 4 pound, 4 ounces (female singleton-1) and 3 pounds, 2 ounces (female singleton-2). The twins were delivered four and a half weeks early; the male co-twin weighed 5 pounds, 13.5 ounces, clearly below the average weight of 7 pounds, .32 ounces for male twins born at about 40 weeks. The height and weight differences between the twins, shown in a photograph taken when they were 18 months of age, are striking even allowing for the sex difference. The children in the discordant sibling pairs, pictured with a sister taken when they were the same age (8.75 years and 7.00 years, respectively), also convey the extreme physical differences between the children. The affected child in the first sibling set was born after a 40-week pregnancy, while the affected child in the second sibling set was full term. Unfortunately, the childhood heights and weights of the unaffected male co-twin and age-matched same-sex siblings were not provided.

Twin Study of Public Service Motivation

Twin studies examining factors affecting a wide range of behavioral phenotypes have shown that genetic effects are pervasive. Another recent example of this finding comes from a twin study of public service motivation (PSM; Christensen et al., 2020). The investigators explained that individuals seeking jobs characterized by PSM fulfill a motivation that is nurtured more often by private than public institutions and settings. They also noted that most colleagues in business and related fields embrace an environmental origin of PSM.

The twin data, collected in 1995–1996, were drawn from the National Survey of Midlife Development in the United States (MIDUS). The final sample included 715 MZ twin pairs and 671 same-sex DZ twin pairs. It was determined that 89.7% of MZ twins and 84.4% of DZ twins worked in the same sector. MZ–DZ mean differences in life satisfaction, optimism and perceived contribution to others were not indicated, an analysis conducted to rule out zygosity-related differences in attitudinal socialization. Logistic regression revealed a significant genetic component to PSM, leading the investigators to encourage further genetic research into public service attraction, selection and retention.

Four-Parameter Model for Twin Research

A recent article suggests that twin data be evaluated with a four-parameter model (ACDE), rather than three-parameter models; the addition of the D parameter considers dominance genetic variations (Jöreskog, 2021). The heritabilities of body mass index (BMI) were compared using three models (ACE, ADE and ACDE) applied to MZ and DZ twins from two populations (UK and Australia). It was shown that the heritabilities of BMI were more precisely estimated using the four-parameter model (UK, .27 and Australia, .28), in contrast with both three-parameter models that yielded negative or nonsignificant estimates of one or more parameters.

Global Twinning at a Peak

New research by Monden et al. (2021) finds that the worldwide twinning rate has increased by one-third since the 1980s (9.1/1000 deliveries), compared with 2010–2015 (12.0/1000 deliveries). It is now estimated that 1.6 million twins are born each year. Africa remains the continent with the highest twinning rate, but rates in

Europe, North America and Asia have also climbed. The country with the highest (presumably natural) twinning rate is no longer Benin, now at 24.2 deliveries/1000, but the Ivory Coast at 24.9/1000. In fact, several countries, such as Ghana, surpassed Benin in this latest analysis. The global increase in twinning was attributed to the greater frequency of assisted reproduction, known to be associated with DZ twinning. However, the authors acknowledged that accurate statistics are difficult to obtain from some nations, especially given the variety of data sources used (e.g. hospitals, population registries). Furthermore, some women travel outside their borders to obtain reproductive assistance, most likely compromising the confidence that can be placed in some national reports.

Germline Differences of Monozygotic Twins

Groundbreaking research by Jonsson et al. (2021) from Iceland has revealed intriguing genetic differences between MZ co-twins. Specifically, it was determined that monozygotic (MZ) twins differ by 5.2 developmental mutations, on average, and that 15% of MZ twins are discordant for such genetic changes. The authors asserted that the early distribution of cells between MZ co-twins underlies these differences. Their paper provides illustrations of the processes giving rise to either prezygotic or postzygotic mutations.

Despite the foregoing, it remains remarkable that MZ co-twins are as alike as they are in virtually all measured physical, medical and behavioral traits. It is also compelling that selected MZ co-twins may mirror one another so much in some characteristics, but not in others.

In the News

Twins and Dyngus Day

Dyngus Day is a holiday celebrated on the Monday following Easter Sunday. It takes place across Eastern Europe and in the USA where Polish populations reside (Suarez, 2017). There are several versions of the origins of this event, one involving twins (poloniamusic.com, 2021). Specifically, the twin pagan gods, Dyngus and Śmigus, represented water and moist earth, respectively. According to this theory, the water tradition is the transformation of the pagan water god into the Christian baptism. The custom of pouring water was an ancient spring rite of cleansing, purification and fertility. At one time, the holiday focused on courting, such that young girls were drenched with buckets of water by young males who sneaked into their bedrooms. Girls who were not subjected to such treatment were considered unmarried. Currently, girls also ‘attack’ the boys and/or station themselves on balconies from which they join others in dousing passersby with water.

Triplets Born in Austrian Displaced Persons’ Camp

The Center for Jewish History (CJH) recently posted compelling photographs of the first triplet set born in a displaced persons camp (Center for Jewish History, 2021). The triplets — Gisella, Henia-ETTA and Sabina — are female and appear to be either fraternal or identical-fraternal, based on inspection of photographs. The three babies were born to parents Josef and Rachela on April 28, 1948. Two weeks prior to their delivery, their doctor speculated that their mother would be having twins. He then believed that after the first baby appeared another rather large baby would be born. However, baby 1 was followed by baby 2 five and a half hours later, and baby 3 emerged sometime after that. The infant triplets were surprisingly healthy given the poor conditions under which they were born. The

family left Europe in July 1950 to join an aunt who resided in Brooklyn, New York ('Triplets headed for Brooklyn', 1950).

Superior — Film About Estranged Identical Twin Sisters

Fascinated by twin relationships, Erin Vassilopoulos directed the film *Superior* as a way of exploring these social connections more deeply (Gao, 2021). The film was shown at the Sundance Film Festival, 2021, an official selection of the U.S. Dramatic Competition. Starring twins Alessandra and Ani Mesa, the work began as a short film in 2015, but its success led to the production of a 99-min sequel with the same name and cast. Set in the 1980s, the film explores the themes of twin estrangement, spousal abuse, reconnection and reconciliation.

Adopting Own Twins After Surrogacy

Michigan state law does not recognize babies born to surrogates as the legal children of the biological parents who created and donated the embryos (Cramer, 2021). Furthermore, in that state, a woman accepting payment for surrogacy is subject to a fine and imprisonment. This ruling resulted from the 1988 Surrogate Parenting Act that followed the 1985 'Baby M' case in which a New Jersey surrogate refused to relinquish the baby to the biological family. In this case, the baby was the product of the surrogate's egg and the biological father's sperm. Ultimately, custody of the child was granted to the biological father. Michigan hoped to avoid such a situation by passing the 1988 law.

In June 2020, a Michigan couple, Tammy and Jordan Myers, found a surrogate via Facebook who volunteered to serve for them without a fee. The Myers had a young daughter, but wished to enlarge their family quickly, due to Tammy's cancer diagnosis. They were aware of the law standing in their way, but they felt that seeking reproductive assistance in another state would have been difficult, due to their desire to be involved with the pregnancy. The surrogate gave birth to opposite-sex twins, Eames and Ellison.

The Myers needed reference letters and 'temporary permission' from the surrogate to bring their twins home. In order to become their legal parents, the couple must adopt them. Despite successfully raising a daughter, they are receiving visits from a social worker who is checking their parenting practices and past behaviors. Despite the frustrating nature of these visits, they believe that going through the courts would be far more tedious and trying.

Twins and Primordial Dwarfism Revisited

Even seasoned twin researchers will be stunned by the photographs of identical female twins, Sienna and Sierra Bernal, who are discordant for primordial dwarfism ('Primordial dwarf with identical twin sister', 2021). The text accompanying the photos identifies the twins as the first such pair. However, there are many varieties of primordial dwarfism (Kugler, 2020), making it difficult to know if they are the first identical set to differ in the condition or to differ in a specific form of the condition; the latter seems likely. It is also possible that they are the only identical twins who are currently discordant for primordial dwarfism. The ABC's news magazine, 20/20, aired a program about the twins on February 7, 2021. The twins are now age 20, differ by over a foot in height and by nearly 50 pounds in weight (Bailey-Milado & Frishberg, 2019).

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