1 BEGINNINGS

Great Myths of Child Development, First Edition. Stephen Hupp and Jeremy Jewell.

Myth #1 Identical twins have a telepathic connection that originates in the womb

Perhaps you've heard a story like that of Silvia and Marta Landa; these 4-year-old twins made news when Marta burned her hand on an iron, and Silvia, who was miles away, felt a sharp pain and developed an identical blister [1]. During subsequent investigation, even when separated in different rooms, when Marta's knee was tapped, Silvia's leg started swinging; when Marta smelled perfume, Silvia covered her nose; when light was shined in Marta's eye, Silvia's eyes blinked. They seemed to have a special telepathic connection.

In 2011, the television news program *Nightline* began a spinoff called *Primetime Nightline: Beyond Belief*. The first episode in the series, "Twin-Tuition: A Telepathic Connection?," examined special relationships between identical twins. The show's reporter, Juju Chang, claimed "There are certain unexplained phenomena that occur between twins that even modern science simply can't explain" [2]. Chang went on to explain the potential cause of the telepathic connection, suggesting that "In the womb identical twins actually start out as one physical being, one embryo that splits in two during gestation, but perhaps their souls are still entangled, even when their bodies are separate." Jensen and Parker [3] referred to this connection that begins in the womb as "quantum entanglement" and suggested that the longer it takes the fertilized egg to split in two, the greater the special connection.

The *Primetime Nightline* episode includes the story of newborn twins, in which one twin frequently awakened from a deep sleep in another room at the exact same moment his identical twin brother was undergoing a medical procedure [2]. In another example, a 5-year-old started developing a black eye after her identical twin sister sustained an injury to the same eye in a playground. Chang asks, "Did one sister telepathically transfer her injury to her twin, or was it just a coincidence?"

The book *Twin Telepathy, 3rd Edition* [4] reports many similar anecdotal stories:

> A 3-day-old twin "screams in terror for no obvious reason," helping his mother realize that his brother is "suffocating silently on the couch" (p. 2).
>
> A 5-month-old twin "yells his head off" while his brother calmly receives a vaccination (p. 2).
>
> A 6-year-old twin breaks his collar bone "within half an hour" of his brother breaking the same bone in a different manner (p. 59).

> A 7-year-old twin tells her mother about a dream, and her sister (who had not heard about the dream) later describes having "exactly the same dream" (p. 42).
>
> An 8-year-old twin starts searching for her sister upon inexplicably feeling "panic stricken," and she discovers her sister has broken a tooth (p. 46).

These examples all focus on children, and Playfair [4] uses an unpublished doctoral dissertation (Spinelli [5] as cited in Playfair) to suggest that telepathy peaks at 3 years old and by 8 years old the connection is lost. Similarly, others have suggested that it's best to study telepathy in twins before they reach adulthood because they will gradually become increasingly different due to life circumstances [6, 7]. Well-known and self-professed psychic Sylvia Browne suggests that psychic children are a window into "the spirit world of the Other Side …" [8].

Other anecdotes from Playfair [4], however, involve adult twins choosing the same gifts for each other (as in the case of Gloria Vanderbilt and her twin), simultaneous deaths (on the same day and in the same manner), and corresponding murders (in which the second twin didn't know why he suddenly felt compelled to murder someone). Moreover, Elvis Presley was reported in the book to miss the companionship of his stillborn twin brother.

A telepathic twin connection is commonly represented in pop culture as well, and Playfair [1] indicated that *The Corsican Brothers*, a novel by Alexandre Dumas [9], is the first literary reference to this special connection. In this novel two identical twins could feel each other's pain. The first example presented in the novel occurs when one twin says "I have experienced terrible pains in the region of the heart, and palpitations, so it's evident to me that my brother is suffering some great grief" (p. 32).

Although there have been many stage and screen adaptations, perhaps the most notable is *Cheech and Chong's The Corsican Brothers* [10] in which, as stated in the official movie trailer, "when one brother was being hurt, the other felt the pain." Interestingly, the characters played by Cheech and Chong are not identical twins as in the novel by Dumas, but are in fact fraternal twins with different fathers (see the "Truth is More Surprising than Fiction" section in the Postscript of our book for more on this topic). In this movie adaptation, each twin intentionally and humorously hurts himself in order to cause pain to the other twin.

In the movie *Twins* [11], Arnold Schwarzenegger and Danny DeVito play genetically engineered "identical" twins that unevenly split from the same fertilized egg, and Schwarzenegger's character reveals, "We're twins:

I can feel your pain." A more recent movie, *Seconds Apart* [12], tells the story of a police detective (played by Orlando Jones) investigating deaths perpetrated by adolescent twins with a sinister telepathic connection. The telepathic twin connection is also depicted in recent literary fiction. For example, in Stephen King's *The Dark Tower* [13] series a villain attempts to take from the brains of children an "enzyme or secretion not produced by singleton children … that created the supposed phenomenon of 'twin telepathy'" (p. 580).

Sir Francis Galton, who helped popularize the nature-versus-nurture debate, has been described as the first scientist to give twin telepathy serious attention [1]. Galton [14] indicates that about one third of twins have a "similarity in the association of their ideas" (p. 231), adding that they say the same thing at the same time, finish each other's sentences, and surprisingly buy each other the same gifts. Although Playfair [1] calls this similarity telepathy, it's probably unfair to Galton to suggest that he meant anything beyond the likelihood that it's the identical genes shared between the twins that influence similar behaviors.

In the book *Twins and Super-Twins* [15], Dr. Horatio Newman describes twin telepathy as a commonly held belief, and this myth continues to be believed today. According to a Gallop poll, 31% of Americans believe in telepathy and another 27% report being uncertain [16]. In our own research, 56% of college students and 76% of parents agreed that "Some identical twins can feel each other's physical pain" [17]. In another study published in *Behavior Genetics*, 40% of identical twins themselves (and 12% of fraternal twins) reported believing they had a telepathic connection [18]. In short, the belief in twin telepathy is widely held.

Because this belief is so popular, researchers have attempted to examine the possibility of a special connection between twins. For example, Nash and Buzby [19] investigated differences between identical twins and fraternal twins (who ranged in age from 5 to 13 years) using a test of extrasensory perception (ESP) to see if clairvoyance had a genetic basis. Over several trials the participants were asked to guess which of five symbols was on a card. Although the scores of the identical twins were positively correlated (meaning they were making similar guesses to each other) and reported to be significant, the fraternal twins' scores were non-significant, spurring the researchers to conclude that ESP does have a genetic basis. However, in a following commentary, Thiessen [20] highlighted the fact that the scores for the identical twins were actually lower than chance. That is, each participant was tested across 150 trials and with only 5 possible symbol options they would be expected to get 30 of the 150 trials correct by chance alone. Nevertheless, their performance

was, in fact, worse than chance, averaging less than 30 correct, providing no support for the hypothesis that the twins possessed ESP. Still, Nash and Buzby, unable to accept the conclusion that twins do not possess ESP, attributed their poor performance to a competition in which the twins telepathically tried to lower the score of each other.

Over decades of investigation, other researchers have failed to find a telepathic connection between twins. For example, one study published in the *Journal of the American Society for Psychical Research* [6] included nine pairs of adolescent-aged identical twins in which one twin viewed an exciting movie, while the other twin (in a different room) was monitored for signs of physiological arousal. This study failed to show any meaningful telepathic connection between the twins, although the researchers devoted substantial speculation to why "the experimental situation itself would be unfavorable to extrasensory communication" (p. 78). As can be seen across many studies, failure to find significant results is rarely accepted as meaning that twins are not telepathic after all. Rather, some investigators go to great lengths to find morsels of evidence supporting the telepathy hypothesis in their research with non-significant findings.

Researchers have continued to develop laboratory procedures for identifying a unique twin connection. Jensen and Parker [3] studied three pairs of identical twins, ranging in age from 9 to 21 years old. Like the previous study, the twins were separated in different rooms, and while one twin was exposed to exciting stimuli (e.g., a balloon popping behind their head) the other twin's physiological arousal was monitored. Overall, the researchers failed to find a significant connection between the twins' responses. A follow-up study yielded similar unimpressive results [21].

We would like to share one final piece of information to help debunk the notion that twins possess telepathy or that anyone possesses telepathic talents of any kind. In 1964, the famous skeptic James "The Amazing" Randi introduced an open challenge to the public for any person to come forward to provide evidence of any paranormal talent. That challenge continues today but is now called "The Million Dollar Challenge" and is offered by the James Randi Educational Foundation (www.randi.org). Despite hundreds of attempts to provide scientifically credible evidence of paranormal abilities, including several specifically related to telepathy, no individual has succeeded in passing even the preliminary round of tests.

Despite evidence to the contrary, many people, including twins themselves, believe that identical twins have a special telepathic connection, as our surveys indicated. Why is this? First, there is a long history across

many cultures of giving special powers to twins. Newman [15] describes some cultural beliefs that twins are a good omen and a positive sign from fertility gods. Furthermore, twins have been thought to be endowed with supernatural powers, such as immunity from serpent poison, the talent of stopping water from boiling, and even the ability to predict a baby's sex (see Myth 3 for other misperceptions related to predicting a baby's sex). Thus, modern beliefs about twins may have evolved from earlier beliefs about twins and their supernatural powers.

Also contributing to the twin telepathy myth is the fact that identical twins do share important connections. They're very similar genetically, and because genes have a considerable impact on behavior, twins are more likely to respond similarly in a given situation. Furthermore, identical twins typically spend a lot of time together and are usually exposed to very similar environments. Thus, it's not at all surprising that they act in similar ways and are adept at anticipating and forecasting each other's reactions to events.

Some of the "Sources of Psychological Myths" also help explain the popularity of belief in twin telepathy. Specifically, the bias of selective perception and memory can cloud a person's judgment. Sometimes two people feel the same pain, think the same thought, wear the same clothes, buy the same gift, or call each other simultaneously. For people who are not twins, it's easy to assume that these situations are coincidences, but with twins these coincidences are more memorable. People, including the twins themselves, remember and tell stories about the coincidences, but they quickly forget (and don't tell stories about) all of the other times they don't feel the same pain, don't think the same thought, don't wear the same clothes, don't buy the same gift, or don't call each other at the same time.

A belief in twin telepathy has been particularly harmful in cultures in which twins (with their purported supernatural powers) are a sign of evil. Newman [15] reports that in the Benin territory in West Africa, twins were once "regarded as visitations of a devil" (p. 15), leading to human sacrifice. Another reason that belief in twin telepathy can be harmful is because it feeds into the broader belief that some humans have special psychic abilities. Many so-called "psychics" swindle people out of large sums of money and mislead police officers and parents when it comes to child abductions. Psychic Sylvia Browne, for example, appeared on *The Montel Williams Show* [22] and told the mother of Amanda Berry (kidnapped in 2002) that Amanda was dead. But a decade later, in 2013, Amanda shocked the world when she escaped from her abductor and heroically helped others escape. Despite Browne's terrible record of

making psychic predictions, one chapter of her book serves as an "instruction manual" for raising children with psychic abilities such as telepathy [8]. Unfortunately, a manual such as Browne's serves only to promote uncritical thinking in parents and their children.

What you need to know

Raising two children of the same age can be more difficult at times than raising two children of different ages. Furthermore, parents of twins try to strike the balance between keeping a strong bond between the twins while also encouraging each twin to be independent. The book *Raising Twins: From Pregnancy to Preschool* [23], published by the American Academy of Pediatrics, includes tips related to pregnancy, premature births, breastfeeding, sleeping, sharing toys, socialization, fairness, one-on-one time, and preschool issues. However, it doesn't include tips for promoting telepathy between twins – and we think that is a good thing.

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Myth #2 Couples dealing with infertility are more likely to get pregnant if they adopt

Humans have long worried about their fertility, as evidenced by the hundreds of fertility gods people have created across many cultures. In Roman mythology, for example, Venus (mother of Cupid) inspired many superstitious behaviors related to fertility. In fact, many superstitions around fertility persist to this day, with perhaps the most prominent being the act of throwing rice, a symbol of fertility, at newly married couples.

Unlike people in ancient Rome, however, we now know a lot more about how to help couples deal with infertility. Even so, many couples still continue to have a difficult time getting pregnant in the 21st century. Estimates

of prevalence rates vary widely depending on the definition of "infertility." Studies use "time of trying" cutoffs for infertility that range from one to seven years [1]. These studies reveal that many people who struggle with fertility for some time do eventually conceive a baby. Thus, most definitions of infertility capture the notion that a couple is having difficulty conceiving but not that it's impossible for them to ever conceive. About 10% of couples worldwide have to deal with either primary infertility, in which they have never been able to conceive a child, or secondary infertility, in which they haven't been able to conceive another child [2].

Because fertility has continued to be a challenge for many couples in the modern era, new superstitions have developed long after belief in Venus's power over fertility was viewed as mythical. For example, parenting experts Ilg and Ames [3] describe what often seems to happen when couples become discouraged with infertility and make the decision to adopt a child: "Before the adoption has even waited out its legal year's waiting period … along comes a baby of their own" (p. 342). In these situations it's common for people to make a connection between the adoption and the subsequent pregnancy. In fact, the connection between these two events was also made earlier in a 1936 article published in *Eugenical News*. Perkins [4] declared that "there does appear to be a basis in fact for the popular belief that the adoption of a child by a childless couple does sometimes, and not infrequently, help to overcome infertility" (p. 95), leading Perkins to recommend adoption to couples to increase their odds of natural conception.

The quote from Perkins [4] indicates that the belief that adoption increases fertility has a long history, and it's still commonly believed today. In our research, 30% of students and 36% of parents agreed with the statement that "Couples that are struggling with fertility have an increased chance of getting pregnant after they adopt a child" [5]. This belief is also commonly represented in modern media. Surprise pregnancies also make for great television. In the show *King of Queens*, Carrie and Doug Heffernan struggle with fertility, and in the series finale they fly to China to adopt a daughter [6]. While Doug is holding this new baby in the hotel room, Carrie tells him she is pregnant and that "It happens all the time: when couples don't think they can get pregnant, they stop trying, and then they adopt a baby …" and then they get pregnant. The television show *Sex and the City* [7] uses a similar storyline. In the fourth season, Charlotte's marriage ends partly due to the couple's struggle with fertility, and in the final season she gets remarried and unsuccessfully tries fertility treatments. By the last episode, they decide to adopt a child from China. The first *Sex and the City* movie [8] picks up on the couple after they have adopted a daughter. Then, upon visiting her

doctor, Charlotte says, "people always say that when you stop trying it can happen, and my doctor says that she knows other couples who've adopted and then they get pregnant … Carrie, I'm pregnant!"

Many writers have attempted to provide an explanation for why adoption might increase fertility. Some suggest that the adoption itself represents "giving up" and thus purges the couple of the stress associated with their unsuccessful attempts to conceive [9]. Thus, for some couples, psychological problems are thought to cause infertility. Psychoanalytic psychologists in particular have postulated numerous psychological mechanisms that cause infertility, such as the woman's unconscious opposition to motherhood or her unconscious choice of a man who is infertile [10]. In a description of three cases, Christie [11] indicated that infertility could be overcome following the "woman's increasing capacity to retrieve her negative feelings and achieve a more balanced awareness of having strong feelings both for and against allowing the baby to arrive" (p. 232) and goes on to link infertility to "the legendary Oedipus himself, whose parents tried to kill him in infancy" (p. 234).

Other suggested causes of infertility include: (i) hostility toward the couple's own mothers; (ii) fear of hostility from their future child; (iii) the unconscious wish to avoid having children; and (iv) failure to cope with a previous trauma [11]. Christie argues that psychoanalysis is the key to treating "psychologically-caused" infertility, whereas other psychodynamic therapists suggest that adopting a child may help one cope with this intra-psychic conflict [12]. These arguments all include the psychodynamic paradox of "If I want a child I must stop wanting a child" (as summarized by Wischmann [13]). It's the adoption of a child that signifies the couple has given up on conceiving a child, and this opens the door for a successful pregnancy, or so the theory goes.

Recent research on the potential connection between adoption and pregnancy is scarce; however, over two decades ago Thomas Gilovich was already able to debunk the adoption-causes-pregnancy myth in his book, *How We Know What Isn't So* [14]. There was a time when researchers were quite interested in the relation between adoption and conception. A 1965 study [15] examined 362 couples contending with infertility and showed that 23% of adopting couples became pregnant after the adoption. That might seem like a high percentage until you learn that the control group (couples dealing with infertility who didn't adopt) became pregnant *more* often (i.e., 35% of the time). A similar study followed 533 couples, and 20% of the couples who adopted later became

pregnant, whereas 66% of couples of non-adopting couples later became pregnant [16]. An even larger study [17] with 895 couples found a 32% pregnancy rate in the adoption group and a 42% pregnancy rate in the no-adoption group. Taken together, it seems clear that adoption does not increase fertility.

Looking at these results, in fact, might lead you to the opposite hypothesis: that the adoption actually makes pregnancy less likely. Nevertheless, we would caution against this interpretation. The shortcoming of all of these studies is that the research cannot control which couples adopt or not. That is, the researchers weren't able to use random assignment in these studies, so it's problematic to make an interpretation regarding the cause of the differences between the groups. Very possibly, there is some difference in the type of couples who choose to adopt versus those who choose not to adopt. For example, some couples that choose to adopt might decrease their time spent trying to get pregnant, thus lowering their likelihood of conception.

This belief might be popular due to several of the "Sources of Psychological Myths," such as word-of-mouth, selective perception, misleading media, and post hoc, ergo propter hoc reasoning. Most of us have heard a story about someone who became pregnant after adopting a child. Indeed, research shows that some couples do get pregnant after having considered themselves to be infertile. The problem is that many couples also never get pregnant no matter how many babies they adopt. We're also less likely to hear stories about couples that never get pregnant than we are about couples that do get pregnant because surprise pregnancies are a lot more fun to talk about. Regarding the media examples provided earlier, the problem with these shows is not that couples get pregnant after they have adopted a child, because that really does happen. The problem is that these shows suggest that a direct connection exists between the adoption and the pregnancy when research clearly shows that adoption does not increase the likelihood of natural conception.

Adoption itself can also be a wonderful solution for helping families grow. Nevertheless, believing that the adoption will somehow cause the couple to naturally conceive a child can be problematic. It's possible that a couple might adopt a child due to this mistaken notion, which could ultimately result in rushing this important decision or even create resentment if the couple does not subsequently become pregnant as they had hoped. Adoption should be an option for all couples to consider, but there are many better reasons to adopt a child than a myth about fertility.

Pregnancy is a complicated, some might say miraculous, process in which many potential obstacles can get in the way. The American Society for Reproductive Medicine (ASRM) published a free resource called *Infertility: An Overview* [18] which outlines the complications that can occur and many options for facing the challenges of infertility. As described in this resource, one of the first steps is to get an infertility evaluation. For the male partner, a semen analysis provides information about sperm quality. For the female partner, the evaluation includes consideration of factors such as ovulation (e.g., are mature eggs being released?), tubal function (e.g., are the fallopian tubes open?), and peritoneal conditions (e.g., is scar tissue affecting internal organs?). Furthermore, age also influences the interpretation of the evaluation, because fertility tends to decline around the mid-30s. Finally, about 10% of the time the cause of the infertility is unknown [18]. Once a complicating factor has been identified, or even when the cause is unknown, there are many possible solutions. Specifically, medications and surgical procedures are available for both men and women. Also, assisted reproductive technologies offer other possibilities such as in vitro fertilization (i.e., combining egg and sperm in a laboratory dish), donations (i.e., eggs, sperm, or embryos can be donated), or surrogacy (i.e., when the pregnancy is carried out by another woman).

Several helpful books also describe the best ways to emotionally cope with the challenge of infertility. The book *When You're Not Expecting: An Infertility Survival Guide* [19] provides a woman's perspective, and *How to Make Love to a Plastic Cup: A Guy's Guide to the World of Infertility* [20] offers one male's perspective. To be clear, these emotional coping strategies by themselves are not designed to make natural conception more likely, as some psychodynamic psychologists would suggest. Also, because some cases of infertility have been caused by preventable sexually transmitted infections (STIs), many forms of STI prevention can help prevent fertility problems.

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Myth #3 Parents can predict the sex of a fetus by examining the shape of the mother's body

Pregnancy is an exciting time for prospective parents, regardless of whether they're anticipating their first child or adding to an already established family. During this special time, numerous decisions often become a priority, one of which is this: What color should the nursery be painted? This decision, however, requires some thought as many parents decorate the nursery according to the anticipated sex of the baby. Friends and family often join in the fun, using a variety of methods to try to predict the baby's sex.

Research by Goldfarb [1] uncovered 32 different methods believed to determine the sex of the fetus. For example, some of the methods suggest that the shape of the mother's face and body is useful in predicting sex. Specifically, "If a pregnant woman's face becomes prettier or more radiant, the child will be a boy; the same or uglier and swollen, a girl; if the mother is carrying high or to the front, it's a boy; low or to the back, a girl" (p. 896). The book *Boy or Girl: 50 Fun Ways to Find Out* [2] also suggests that the baby is more likely to be a girl if the pregnant mother has a more ample face, a bulging waistline, or more weight gain on her rear end (a good friend might be wise to say "it looks to me like you're having a boy"). Furthermore, a belly shaped like a watermelon is said to predict a girl, whereas a basketball shape predicts a boy; and carrying high predicts a girl, whereas carrying low predicts a boy. Both of the above sources also include the "pendulum test" in which an object (often a wedding ring) is tied to a thread (or the mother's hair) and held over the pregnant belly with the direction of its movement indicating a girl (i.e., in a circle) or a boy (i.e., side to side).

These prediction methods can be amusing, but do people really believe they accurately predict the sex of the child? One study surveyed 104 pregnant women who didn't know the sex of their unborn child and found that 30% used the shape of their belly to predict the baby's sex [3]. Of these women, 79% were at least "somewhat sure" about their prediction. Interestingly, 14% of the participants used a dream to make a prediction about gender, and their confidence in their prediction was fairly high with about half being at least "somewhat sure." In our research, 31% of students and 20% of parents agreed with the statement that "The shape of the mother's belly is one factor that can help doctors predict the sex of a fetus" [4].

There are many examples of this belief in modern media. For example, in the show *Cake Boss* [5], Buddy Valastro's sisters employ two of the above-mentioned methods for predicting his baby's sex. When chatting with Buddy's wife, one sister mentions she can predict the baby's sex

"from your face – because they say the girls take away the mom's beauty – you're still pretty Lisa, so I think you're having a boy." Another sister then applies the pendulum test that also predicts she will have a girl. Similarly, in a recent interview with Matt Lauer from the *Today Show* [6], actress Kate Hudson described several ways that she had ascertained that her baby-on-the-way was to be a girl. These methods included the way she was carrying the baby and the pendulum test. More recently, in the summer of 2013, the fate of the British monarchy was about to be shaped for the first time in decades. Would Prince William and Kate Middleton have a little prince or a princess? Would their baby be the future King of England? In a CNN news report [7], Dr. Fiona Mathews, a reproductive biologist, predicted that the royal couple was more likely to have a girl, partly based on the shape of Kate's waist.

In all three of the above media examples, the prediction was a baby *girl*, and in all three examples the parents welcomed baby *boys* into the world. Specifically, Lisa Valastro gave birth to Carlo (named after the original owner of the bakery) on Valentine's Day; Kate Hudson gave birth to Bingham; and Kate Middleton gave birth to George Alexander Lewis, the future King of England!

We don't have to rely on these anecdotal case examples, though, because researchers have examined the effectiveness of popular methods for predicting a baby's sex. For example, Perry and colleagues [3] found that pregnant women using these types of methods were no more accurate in their prediction of the baby's sex than a flip of a coin. Furthermore, the ability to place belly shapes into different categories was fairly unreliable, with considerable disagreements between the mothers and another belly shape judge. Most interesting, however, was that participants' understanding of the meaning of the belly shape was often contradictory. That is, many participants believed that carrying the child high was a sign of a boy, whereas several other participants believed this was a sign of a girl. Finally, there was no relation between the mother's confidence in her sex prediction and the actual sex of the baby. Indeed, using belly shape turned out to be one of the worst predictors of all. Regarding general weight gain, another study followed 304 pregnant women and found that mothers put on the same amount of weight whether they carried a boy or a girl [8]. Other sex prediction folklore has similarly been no more accurate than chance considering the fact that every method statistically has about a 50% chance of being correct [9, 10].

The sex prediction myth proliferates due to many of the "Sources of Psychological Myths." As evidenced by the pop culture examples, word-of-mouth and misleading media are two ways this myth is spread. Additionally, people remember the times the prediction was right and forget about

the times it was wrong (i.e., selective perception and memory). Finally, some of these myths seem plausible due to reasoning by representativeness in which people seek meaning when two things are similar in some way. For example, a watermelon is sweet, so a watermelon shape represents a girl; whereas, the basketball shape may make some people think of a bouncing baby boy [2]. Please don't blame us if this seems sexist, as we are just reporting about this mistaken connection that has been around for quite some time.

Is there really any harm in people believing the myths about sex prediction? It depends. If family members use these methods for fun at a baby shower, and everyone realizes that no important decisions should be made based on the belly shape (or based on which direction a pendulum swings), then these myths are not really harmful. On the other hand, throughout history, and even in some cultures today, sex prediction in general has been associated with serious issues such as sex-selective abortion.

Folklore methods predate modern technology by several hundred years, and they were widely used at a time when couples were even more desperate to know the sex of their baby. Many cultures throughout history have held preferences for boys for both economic and religious reasons. For example, in many agrarian societies, sons were believed to be more able to engage in the physical work required in the home, and sons have been relied on to care for their parents as they become elderly [11]. Both China and India also have cultural and/or religious beliefs regarding the sacred place of the son, which daughters are not allowed to fulfill [11, 12].

Even in today's Western societies some people tend to prefer sons, especially firstborn sons. For example, Goldfarb [1] asked American college students about their preference for the sex of their hypothetical first- and secondborn child. In this study, 64% preferred their firstborn to be a boy, although this preference was significantly stronger for men. Goldfarb also reviewed research showing that Americans' preference for a firstborn son has been relatively stable for several decades. A 2011 Gallup poll of Americans found similar results. When asked whether they would prefer to have a boy or a girl if they could have only one child, 40% preferred a boy, 28% a girl, and 26% expressed no preference [13]. Nevertheless, similar to the results of Goldfarb [1], men's preference for a son was strong (49% preferring a boy compared with 22% a girl), whereas women were equally split between wanting a boy or a girl. An examination of previous Gallup polls indicates that these recent results are virtually identical to those obtained some 70 years ago [13].

The preference for a boy is particularly troublesome as it relates to abortion due to sex selection. In *Contraception and Abortion from the Ancient World to the Renaissance* [14], John Riddle provides detailed evidence that effective practices to cause an abortion were known and used at least as early as the time of the ancient Egyptians and throughout history. Further evidence of sex-selective abortions comes from the better documented cases of killing female infants after they're born, which has also been practiced in several cultures. In their exhaustive analysis, Coale and Bannister [15] present research findings from several Chinese demographic databases that they contend help explain tens of millions of "missing" Chinese females from the 1930s through the 1980s. From the earliest available data, they believe that 15% of females born in the late 1930s were likely victims of infanticide. In fact, the practice of infanticide with unwanted female infants was likely commonplace [15].

Although infanticide declined during the 1960s, the 1970s and 1980s brought a new trend in China, as parents opted to use birth control after they had achieved their first son during a time when their government was employing sanctions against families with more than one or two children [11, 15]. But it seems that the advent of ultrasound technology, which was available in the 1980s in China, only exacerbated the problem of sex-selective abortions, as the ratio of males to females has become even more lopsided in that country [15]. To further illustrate this problem, researchers estimate that by the year 2020 there will be about 30 million males in China who are not able to find women to marry as a result of the sex-selective abortion and contraception practices that occurred between 1985 and 1995 [16].

China is not the only country to struggle with this issue. Similar problems with higher rates of male births have been found in both South Korea [15] as well as India [12]. The problem in India has become so widespread that in 1994 the Indian government passed the Prenatal Diagnostic Techniques Act, which prevents the use of modern technology, such as ultrasounds, for the mere purpose of sex identification of the fetus due to the fear that this will lead to sex-selective abortion [17].

Clearly, even accurate modern technologies, like the inaccurate sex prediction myths, can be misapplied. Still, more often than not, when sex prediction myths are used in most modern societies, they probably don't cause great harm. The sex of Prince William's baby has less meaning today than it would have had in the past history of England; however, even the sex of that baby was not insignificant to the future of the royal throne.

If the low-tech folklore about predicting the child's sex is not accurate, what is? With regard to this question research is much more certain. That is, ultrasound technology performed in the second or third trimester is very accurate in determining the sex of the fetus. Ultrasound is able to provide conclusive predictions in about 90% of cases, and these predictions were accurate 97% of the time [18]. Another very accurate high-tech method of fetal sex determination is DNA analysis of the mother's plasma [19]. Nevertheless, it should be clear from the statistics that even the high-tech methods get it wrong sometimes; in fact, sex prediction is made even more complicated by the next myth.

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Myth #4 All boys have one Y chromosome (and all girls don't)

"Are you having a boy or a girl?" is one of the first questions we ask someone upon finding out they're pregnant. Although some parents choose to learn the baby's sex about mid-way into the pregnancy, other parents would rather be surprised on the actual day of birth. When people wonder about the baby's sex, they're assuming that the baby is either clearly a boy or clearly a girl. Doctors and nurses are usually quick to let the parents see the evidence of the baby's sex for themselves. A quick declaration of sex is then indicated on the birth certificate and used for choosing the correct celebratory cigars, helium balloons, and lawn signs.

New parents are not too concerned about the genes behind the gender, but any child development book informs students that girls have two X chromosomes (i.e., girls are XX), and boys have one Y chromosome and one X chromosome (i.e., boys are XY). One X is provided by the mother's egg, and the father's sperm provides either an X or a Y. These two chromosomes are called the sex chromosomes, and together they're one

pair, out of the total 23 pairs, of chromosomes that make humans what we are (the other 22 pairs are called the autosomes).

The sex chromosomes influence several of a person's traits (including many traits unrelated to sex), but one of their primary responsibilities is to help determine if the baby is a boy or a girl. Gonads start off as undifferentiated sex glands, and the sex-determining region of the Y chromosome (SRY) causes the gonads to turn into testes during the embryonic stage. Without the SRY, the gonads become ovaries. Then, during the fetal stage (around the third month) the testes secrete hormones that cause a penis to grow. A vagina forms without these hormones from the testes.

This process is described in every child development textbook, but even before a college student takes a course in human development they already have a sense of the chromosomes behind a baby's sex. In our research, 82% of students and 79% of parents agreed with the statement that "The sex chromosomes of all girls are XX and all boys are XY" [1]. If things were that simple, however, this topic would not be a myth in this book.

The true story is considerably more complicated. Sometimes doctors are not quite sure at first if the baby is a boy or a girl. At first glance, there is only one good place on a baby's body to look for an answer, and sometimes that place does not yield a clear verdict. Other times doctors may think they know the child's sex but are wrong. And yet still other times, after all the genetic tests are conducted, the answer still does not easily fit into the two choices of "boy" or "girl," at least not the way that most people understand these two categories. These are all examples of sexual ambiguity, and some research suggests that sexual ambiguity occurs in about up to 1% (or more) of live births [2]. Although this may seem like a small percentage, 1% of the current world population is about 70 million people.

In the book *Between XX and XY: Intersexuality and the Myth of the Two Sexes* [3], the author, Gerald N. Callahan, thoroughly debunks the notion that girls never have a Y chromosome and boys always have one Y chromosome. While it's true that all humans have at least one X chromosome, there are a wide range of possibilities when it comes to their other sex chromosome(s). Some of these possibilities were once referred to as "hermaphroditism," coming from Greek mythology when Hermaphroditus (the male son of Hermes and Aphrodite) became entangled with a female water nymph. This term, however, is now outdated and considered by some to be offensive.

In the 1990s, the term "intersex" was advocated over hermaphroditism, though many people find the term intersex to be misleading because it

suggests that there is a third group of people that fall directly between male and female. More recently, a consensus statement emerged from a gathering of international experts which offered the term *Disorders of Sexual Development* (DSDs), and this term has since been widely used by the medical community [4]. The consensus statement also provides a classification system with three categories: (i) sex chromosome DSDs; (ii) 46,XX DSDs; and (iii) 46,XY DSDs.

To their credit, most child development textbooks provide a few examples of the first of these categories (i.e., sex chromosome DSDs). To understand sex chromosome DSDs, it's valuable to know that a typical female's two X chromosomes are depicted as "46,XX," with the "46" representing the fact that most humans have 23 pairs of chromosomes and the "XX" representing the two sex chromosomes specifically. Females with Turner syndrome, however, have one sex chromosome instead of the typical two X chromosomes; thus they're depicted as 45,XO, with the "O" and the "45" both representing the fact that these girls do not have a second sex chromosome. Young girls with Turner syndrome develop much in the same way as any other girl; however, instead of ovaries they have "streak gonads" that do not produce hormones in the way that ovaries would. This becomes most noticeable during puberty when secondary sexual characteristics do not emerge as expected. In a literary depiction of this chromosome DSD, the main character in the novel *The Condition* [5] has Turner syndrome.

In Turner syndrome there is one sex chromosome missing, and by contrast, in Klinefelter's syndrome there is at least one *extra* sex chromosome. When first discovered, Klinefelter's syndrome described males with an extra X chromosome and was depicted as 47,XXY. Since the initial discovery, other variations have been discovered including 48,XXXY and 48,XXYY. In all of these variations, the person has at least one Y chromosome and at least two X chromosomes. Commonly, Klinefelter's syndrome is not noticed until the adult man goes in for fertility testing after failing to have children. Men with Klinefelter's tend to be taller and infertile. In fact, characteristics such as these have led some to speculate that President George Washington may have had Klinefelter's syndrome (see Amory [6] for the debate).

Up to this point, we've started to chip away at beliefs related to sex chromosomes, and you've now seen one condition in which boys can have more than one Y chromosome. But if we left things here you would end your day believing that girls *never* have a Y chromosome. In fact, child development textbooks rarely depict this part of the myth. One way to debunk this myth requires some understanding of the possibility of double fertilization.

Astonishingly, sometimes one egg can have two nuclei. This one egg can then be fertilized by two different sperm. This scenario creates one zygote that has two different sets of genetic material. Thus, some cells in the body (those that make the left eye, for example) have one set of genes, while other cells in the body (those that make the right eye, for example) have a different set of genes. These people have two sets of genetic material in their body. Now here's what you really need to know: in double fertilization, it's possible for one sperm to carry an X chromosome while the other sperm carries a Y chromosome. Thus, some of the person's cells are XX while some of their other cells are XY, and this one person would be depicted as 46,XX/46,XY (with the slash representing the fact that some of their body's cells differ in regards to the sex chromosomes). Other variations of this "mosaicism" might include one person that is 45,XO/46,XX or another person that is 45,XO/47,XXY, to name just a few (rare) possibilities.

A person with this mixed genetic makeup might be a typical looking male or a typical looking female, but there is also a good chance that they could have both male and female characteristics such as one testis and one ovary. Or perhaps they might have two *ovotestes*, which contain both types of tissue. Similarly, they might have a penis in addition to a vagina and breasts. There are many different possible outcomes.

A similar type of sex chromosome DSD can also be created when two fertilized eggs become one. That is, typically when two different eggs are fertilized by two different sperm, the result is fraternal twins (also known as non-identical twins), but sometimes those two fertilized eggs merge together and develop into one person with two different sets of genetic material. Similar to the mosaicism described earlier, it's possible for one of the fertilized eggs to be 46,XX while the other is 46,XY; thus this one person would be depicted as 46,XX/46XY. There are a lot of other possibilities, too. This type of mosaicism is sometimes referred to as chimerism, although the term chimerism (from chimera) has the same drawbacks as the term hermaphroditism in that they both conjure up images of strange mythical creatures.

So far we have only uncovered *one* of the *three* broad categories of DSDs. The second category includes the 46,XX DSDs. In this category, the person has two X chromosomes, and you might expect the individual to appear female. However, sometimes during sperm development one of the X chromosomes can actually have the SRY (sex-determining region of the Y chromosome) even though the person does not have a Y chromosome. If this sperm fertilizes an egg, the result will be a person with a DSD who has two X chromosomes, and

one of the X chromosomes will include the SRY. The SRY begins the process of turning this fertilized egg into an XX male (without the Y chromosome).

At this point, you might think that it's just the SRY that determines the sex characteristics of a person. However, in the case of congenital adrenal hyperplasia, the person does not have the SRY as part of the genetic makeup. Congenital adrenal hyperplasia, a type of 46,XX DSD, is the result of a mutation in one gene that, during early fetal development, causes masculinization of the genitalia which can range from an enlarged clitoris to an actual penis, making sex assignment on the birth certificate challenging.

The third category in the classification system includes the 46,XY DSDs. A person in this category has a Y chromosome, so you might expect them to be male; however, sometimes they're clearly female. If during sperm development a sperm carrying the Y chromosome somehow drops the SRY, the person would typically develop as an XY female with underdeveloped ovaries.

In another example of a 46,XY DSD, a person with complete androgen insensitivity syndrome has a gene on the X chromosome that blocks the body's ability to use androgens, and the person develops as a female. In fact, due to the inability to use androgens, as well as the conversion of testosterone into estrogen, such individuals are often very feminine. On the other hand, someone with partial androgen insensitivity syndrome would be a female with a more masculine body (e.g., more muscular). The documentary *Orchids: My Intersex Adventure* [7] describes Phoebe Hart's experience in discovering she has androgen insensitivity syndrome.

The last 46,XY DSD to be discussed here is called 5-alpha reductase deficiency. It's similar to androgen insensitivity syndrome in that the baby is born with the same external appearance of any baby girl. While the girl would have testes, the testes do not descend so they stay in the position where the ovaries would typically be. Also, what looks like a vagina is actually a nonfunctional pouch. Typically, people with this DSD live their entire childhood as girls. Then comes puberty when a new wave of hormones causes (what was once thought to be) the clitoris to grow into a penis. Other changes at puberty include muscle growth and a deeper voice. Put simply, this previously apparent girl becomes a man. The main character in the novel *Middlesex* [8] has 5-alpha reductase deficiency, and this novel won the Pulitzer Prize.

It's worth noting that many aspects of sex development are actually influenced by genes on the autosomes (these are the other 22 pairs of

chromosomes). That is to say, the sex chromosomes are not the only chromosome to influence sex development. Thus, there are a lot of other ways sex development can vary in addition to what we could describe in this chapter. We also didn't have the space to discuss how brain development is influenced by hormones. Accordingly, while there is a lot of variation in the genitalia of a person, there is also a lot of variation that occurs in the sex characteristics of the brain.

Believing the Y chromosome myth is a common error in thinking that can be described as an overreliance on representative heuristics (see Lilienfeld, Ammirati, and David [9] for a description of representative heuristics). Heuristics are rules of thumb that usually hold true and help us make sense of the complex world by putting things in categories. Oftentimes this categorization is quite helpful, but we become so accustomed to thinking about things in distinct categories that it's easy to forget that not everything in the world fits into the categories.

Physicians and parents have to make some difficult decisions if the sex of the child is not clear. For example, assigning a sex to the baby (i.e., announcing if the baby is a boy or girl) can be very challenging in some of the cases described. Also, decisions need to be made about performing surgery on the baby's genitalia to look more like a typical male or female. This decision can be difficult, partly because many adults with DSDs indicates that physicians are too quick to recommend irreversible surgeries that have the potential to inhibit sexual function and satisfaction later in life.

One final issue regarding categories of sex involves rules, regulations, and laws. Most sports are divided by sex, but this can cause complications when the person has a DSD. For example, Caster Semenya, South African runner and silver medal winner in the 2012 Olympics, has been surrounded in controversy leading to sex testing. Although the results have not been publicly released, some writers have suggested that she has a DSD complicating her ability to compete as a female, and others have even speculated that she purposefully avoided the gold medal in 2012 in order to escape more controversy [10]. Similarly, governments often require their citizens to be categorized as male or female for record-keeping purposes. In 2013, Germany became the first European country to allow parents to legally choose "undetermined" or "unspecified" on their baby's birth certificate [11]. Thus, while there are still many challenges associated with traditional notions of sex, increased knowledge about this myth can lead to real-world changes in the available choices for parents, their children, and adults with DSDs.

What you need to know

In response to concerns about problems associated with early gender assignment, the *Consensus Statement on Management of Intersex Disorders* [4] provides the follow guidelines:

> (1) gender assignment must be avoided before expert evaluation in newborns; (2) evaluation and long-term management must be performed at a center with an experienced multidisciplinary team; (3) all individuals should receive a gender assignment; (4) open communication with patients and families is essential, and participation in decision-making is encouraged; and (5) patient and family concerns should be respected and addressed in strict confidence (p.490).

These guidelines were written with open communication as a central goal. Previously, many physicians didn't explain the DSD to parents, and they even conducted surgery without fully explaining the decision. Similarly, parents often do not explain the DSD to their child or otherwise provide an inadequate explanation. Although some adults may never discover they have a DSD, often DSDs do not get identified until adulthood. Nevertheless, the average age that a doctor is able to identify a DSD is about 6.5 years old, and over 60% of DSDs are identified by a doctor before the child reaches puberty [12]. Parents and their children often report distress about being kept in the dark about the DSD, making open communication a priority.

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Myth #5 The attachment parenting approach strengthens the mother–infant bond

You may not have heard of "attachment parenting" per se, but most parents have been exposed to it in some way. For example, *The Baby Book* [1] written by Dr. William Sears and his co-authors (who happen to be family members) introduces attachment parenting, and in the foreword *The Baby Book* proclaims that it "has been dubbed the 'baby bible' by millions of parents" (p. xiii). This seems to be a fair description, as it's one of the best-selling books for parents of all time, with considerably over one million copies sold. Attachment parenting has also been championed by celebrities such as actress Mayim Bialik (known for sitcoms like *Blossom* and *The Big Bang Theory*) who wrote a book about her experience with attachment parenting [2]. In the book's introduction, Dr. Jay Gordan indicates that Bialik's attachment parenting style "will show you how to excel at parenting" (p. ix).

Dr. Sears and his co-authors claim that attachment parenting is "the best way to achieve the proper fit between parents and child" (p. 3). Attachment parenting is a broad approach with several notable components that make it stand out. In particular, a few of the major ideas promoted by attachment parenting include the importance of immediate birth-bonding, extended breastfeeding, and bed-sharing. Because this is such a big topic, we're going to break the discussion of each of these

components into subsections, meaning that you're going to get three myths here for the price of only one (that's two free myths!).

Importance of immediately bonding within the first two hours after birth

The attachment parenting emphasis on immediate birth-bonding [1] has origins in the work of zoologist Konrad Lorenz, who is well-known for his research on imprinting in geese. During imprinting, newborn chicks begin to follow the first moving object they see, and this is usually their mother. However, Lorenz was the first moving object that some chicks saw, and they followed him around instead. Lorenz also studied the time period within which imprinting could occur and discovered that chicks only imprinted within the first day or so of hatching. That is, they failed to imprint if they didn't see a "mother" within that critical period. Given this discovery, other researchers began looking for similar critical periods in humans.

Klaus and Kennell [3] believed that they found something like a critical period in human newborns, although they favored the term "sensitive period." Klaus and Kennell suggested "there is strong evidence that at least 30 to 60 minutes of early contact in privacy should be provided for every parent and infant to enhance the bonding experience" (p. 56). Kennell [4] even went so far as to suggest failure to bond immediately after birth would ultimately lead to child abuse or other "mothering disorders"(p. 294). The authors based their theory on preliminary research they conducted, although their study had serious methodological flaws, including a very small sample size [5, 6].

Soon after Klaus and Kennell published their original research, other research failed to find any benefit to attachment following from immediate birth-bonding [7, 8]. For example, Svejda et al. [8] compared mothers that received extra early contact with a control group of mothers without extra early contact and found no differences in any of 28 attachment behaviors between groups. Despite weak evidence, the idea contained in this myth appears to be widely held. We found that 83% of students and 82% of parents agreed with the statement that "Within about one hour after birth, babies need to bond with their mothers so that attachment is stronger over time" [9].

Goldberg [10] penned an excellent summary and critique of the impact of Klaus and Kennell's work by suggesting that many hospitals changed their practices as a result of their findings, and we do agree that this was a good change. Previously, childbirth was viewed as the end of an illness, and due partly to Klaus and Kennell's work childbirth came to be

recognized as a healthy, rewarding experience. However, Goldberg adds that "the popularization of the ideas and work behind these changes has often led to the distorted view that the first hours after birth are critical for the establishment of parent-infant bonding …" (p. 1379) and that bonding is impaired if parents are not able to have immediate contact with their newborns.

While Sears et al. [1] acknowledge that "Catch-up bonding is certainly possible" (p. 44), they also "believe that bonding during this biologically sensitive period does give the parent-infant relationship a head start" (p. 44). Furthermore, Sears et al. also suggest that "The way baby and parents get started with one another often sets the tone of how this early attachment unfolds" (p. 5). Although early contact seems like a reasonable goal, parents should not be made to feel distraught about the future of their relationship with their child if they need to be separated from their babies in the hours after birth, which may be necessary for medical and other reasons.

Value of extended breastfeeding for up to seven years

Evidence suggests that breastfeeding is good for babies and should be encouraged whenever possible. The American Academy of Pediatrics [11] recommends exclusive breastfeeding for the first six months of life and continued breastfeeding for at least a year because of several associated benefits. The World Health Organization [12], which also considers babies in third world countries, recommends breastfeeding for two years or more. Nevertheless, attachment parenting often goes well beyond that time period with the notion of child-led weaning.

Child-led weaning can result in weaning that lasts many years. For example, Sears et al. [1] suggest that some children have the need to suckle for up to three-and-a-half years. In another book about attachment parenting, Granju and Kennedy [13] suggest that breastfeeding should continue for a minimum of two-and-a-half years, but they also suggest that it would be natural to let it go on up to *seven* years based on the weaning practices of children in other cultures as well as the weaning practices of other primates [14]. Recently, the May 2012 *Time* magazine cover stirred up controversy with a picture of a mom breastfeeding her 3-year-old son.

Actress Mayim Bialik breastfed her son for about four years, and she reportedly used breastfeeding as a way to calm down tantrums [15]. Another attachment parenting celebrity advocate, singer-songwriter Alanis Morissette, told ABC News that she was prepared to breastfeed

for up to six years [16]. These celebrity examples may represent attachment parenting taken to the extreme; however, it's easy to see how mothers are afraid of ending breastfeeding too early when Sears et al. [1] suggest that "securely attached babies (those who are not weaned before their time) eventually grow to be more independent, separate more easily from their mothers, move into new relationships with more security, and are, in fact, easier to discipline" (p. 203). Moreover, they warn that ending breastfeeding too early can increase "the risks of what we call *diseases of premature weaning*: anger, aggression, habitual tantrumlike behavior, anxious attachment to caregivers, and less ability to form deeper and more intimate relationships" (p. 206).

The advice of William Sears has apparently been quite influential. We found that 39% of students and 52% of parents agree with the statement that "Breastfeeding a baby for more than two years helps strengthen the attachment between the mother and child" [9].

It's worth noting that there are no documented harms in breastfeeding for several years, and Dr. Sears has likely done some good in the world by promoting breastfeeding in general. Nevertheless, he has also possibly done some harm by making exaggerated statements that go well beyond research findings and beyond timelines developed by professional organizations [11]. Research supports the notion that breastfeeding for a year or so is good for the baby [17]; however, there is no research to suggest there is any harm in ending the breastfeeding when the child is around 1 year old. In fact, most babies that are never breastfed likely still have a healthy attachment style.

Encouragement of nightly bed-sharing between babies and parents

Attachment parenting encourages bed-sharing with the baby sleeping between the mother and an added guardrail. One attachment parenting expert [13] discourages crib use altogether by referring to a crib as an "expensive, space-wasting 'babycage'"(p. 36). On her video blog, Reality TV star Kourtney Kardashian [18] posted her tips for how to bed-share safely. Bed-sharing is actually fairly common, with about 45% of infants sleeping at least part of the night in the adult bed. But the rate of parents who have their infants routinely sleep in their bed is quite a bit lower at about 13% [19]. In our research, 63% of students and 62% of parents agreed with the statement that "Having a baby sleep in the mother's bed promotes the baby's secure attachment" [9].

Bed-sharing, however, contradicts recommendations of the American Academy of Pediatrics [20]. In addition to there being no research that

bed-sharing is important for parent–child attachment, there is also evidence that bed-sharing is a risk factor for sudden unexpected infant deaths such as Sudden Infant Death Syndrome (SIDS) [21, 22]. The American Academy of Pediatrics, report has several recommendations to prevent sudden unexpected infant deaths, with the most prominent being to have infants sleep on their back. Another important recommendation, however, is to have infants sleep in a crib (including a safe portable crib) in the same room as parents but not the same bed (i.e., room-sharing but not bed-sharing). The report cites research indicative of the suffocation dangers associated with bed-sharing, and it specifically warns against bed railings (as suggested by Sears et al. [1]) and devices on the market that purport to make bed-sharing safe (as suggested by Kardashian [18]).

The report acknowledges there is no research on additional sleepers (i.e., cribs) that attach to the side of the adult bed but suggests that even these side sleepers pose potential risks if improperly secured to the bed. Overall, the greatest risks associated with bed-sharing include entrapment, suffocation from bedding, and suffocation from an adult's body. Furthermore, alcohol or other drug use substantially increases the risk for accidental suffocation during bed-sharing because parents become less sensitive to their surroundings.

Although attachment parenting leaves room for parents to choose other sleep strategies, the promotion of bed-sharing is risky. It's unfortunate that Sudden Infant Death Syndrome has the nickname "crib death" because that nickname may give parents the false sense that cribs are more dangerous than the parental bed. Proponents of attachment parenting often suggest that bed-sharing has been around as long as the human species [1], and that cribs are a relatively new development. In fact, this is all true; however, it's also true that infant mortality rates (i.e., rates of infants that die in the first year of life) have been on a steady decline, partially due to safer sleeping practices.

It's worth mentioning that the report for the American Academy of Pediatrics [20] also cites research suggesting that bed-sharing can be supportive of breastfeeding; however, the risks outweigh this potential benefit. A safer option for mothers is to bring the infant into the bed for feeding and then put the baby back in the crib for sleep.

Attachment parenting in general

Despite the problems associated with these major components of attachment parenting, we found that 88% of students and 83% of parents agreed with the statement that "The Attachment Parenting approach strengthens

the mother–infant bond" [9]. Sears et al. [1] give attachment parenting the hard sell by saying "In our experience of caring for families over the past forty years in pediatric practice and in our review of scientific studies, we have found that attachment-parented children are likely to be: smarter, healthier, more sensitive, more empathetic, easier to discipline, more bonded to people than to things" (p. 17 in a list form of a box), and they also list 26 other specific benefits that they claim are associated with attachment parenting (p. 14). Furthermore, they add that because of *The Baby Book* [1] "many children and parents are happier, healthier, and more connected" (p. xiii). Unfortunately, they do not cite any of the research that they supposedly reviewed to support most of these claims, they have not conducted their own research regarding these claims, and there is no research comparing attachment parenting with other parenting styles.

Attachment parenting has become popular due to many fallacies. One of the "Sources of Psychological Myths" is the exaggerated kernel of truth. That is, each of the above components has some kernel of truth in the sense that they're all aimed at promoting breastfeeding, and breastfeeding is a great option whenever possible. Moreover, the argument that something works because it has been used for a long time is called the appeal to tradition fallacy. Another fallacy at work here is the appeal to authority fallacy. William Sears has an M.D. and has sold millions of books. Similarly, Mayim Bialik has a Ph.D. in neuroscience. Having a doctoral degree does not mean you are automatically correct about everything you say. (However, if you are prone to be influenced by the appeal to authority fallacy, we'd like to take this moment to point out that both authors of this book also have doctoral degrees.)

In this chapter we have taken a critical look at three of the core aspects of attachment parenting. Another major aspect is immediately responding to the baby's cries during bedtime. Although most parents respond to most baby cries, there are times when parents should feel okay about letting a baby cry, even though this would be contrary to attachment parenting. In particular, Sears et al. [1] suggest that parents should "beware of sleep trainers" (p. 328) and that they should avoid the "cry-it-out" method. In fact, we have decided to dedicate Myth 13 to the belief that letting babies cry it out is harmful to their development.

What you need to know

Parents can find useful information regarding infants in the book *What to Expect in the First Year* [23], which provides a balanced approach to making decisions about breastfeeding, sleeping arrangements, and many

other topics related to babies. While *The Baby Book* [1] pushes the attachment parenting approach, *What to Expect in the First Year* describes pros and cons associated with different and often challenging decisions that parents make in the first year.

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Myth #6

Identical twins have identical genes

Do you remember in the Introduction when we said that we believed a lot of these myths until recently? Well, this myth might be the most recent one to be debunked for us, and it's a good example of how science continues to change the way we think about child development. Just about every child development textbook teaches that *fraternal twins* occur when two different sperm fertilize two different eggs, creating two different siblings with two different sets of genes. Alternatively, *identical twins* occur when one sperm fertilizes one egg, and then that zygote completely divides into two separate zygotes with identical genes. It turns out that the term "identical" is being used a little too loosely because research shows that identical twins commonly have very slight differences in their genetic make-up [1].

There are actually several different causes of variability in the genes of identical twins, and we'll focus on one of the most recent discoveries. After the original zygote divides into two different "identical" zygotes, those zygotes grow by making copies of themselves (and the DNA that they contain). By the end of the first week, each of the zygotes has over 100 cells (each containing the same DNA). Now, imagine making one photocopy of a sheet of paper; you now have two sheets of identical paper. Then, copy each of those papers one time so you have four sheets, and keep copying each sheet until you have over 100 sheets. Would all of the sheets be identical? Yes, pretty much, but there might be very slight differences between the sheets due to a speck of dust on the copy machine or due to the position of the paper when it was copied. This metaphor is designed to help make two points. First, due to "copy-number variations" (CNVs) any two cells in your own body can contain slightly different genetic information. Secondly, and because of this, many identical twins really don't have identical DNA. Do any twins have 100% identical DNA? It seems plausible, but the important point here is to recognize that a lot of identical twins really don't have identical DNA. We suggest that from now on, these monozygotic siblings should be referred to as *very-nearly identical twins*.

Myth #7 A woman who is already pregnant can't get pregnant again

Most of us assume that once a woman is pregnant she can't get pregnant a second time until after she has the first baby. Indeed, pregnancy does cause changes to a woman's body that make this assumption true most of the time. However, there are a few documented cases of what is called *superfetation*, defined as [2] "the fertilization and implantation of a second ovum sometime after the start of a pregnancy, resulting in two fetuses of different gestations" (p. 219). In one such case, the two fetuses (one male and one female) were about four weeks apart in their conception but were born on the same day as part of an "uneventful" delivery (p. 220).

Myth #8 The Chinese lunar calendar accurately predicts the sex of a baby

The Chinese lunar calendar is often used to predict the sex of a baby based on the mother's birthdate and the date of conception. It's one of the few sex prediction methods that can be used on the day of the conception! Some skeptical researchers [3] discuss the lunar calendar and point out a website that says this method is up to 93% effective, and they

also indicate that part of the allure of the lunar calendar is that it was lost in a tomb for centuries. In what must be the largest study in our entire book, these same researchers analyzed data from almost three million births in Sweden and found that the method was no more accurate than flipping a coin.

Myth #9 Female fetuses have faster heart rates than male fetuses

According to Perry et al. [4] many medical professionals believe that female fetuses have faster heart rates than male fetuses. They also suggest that "this assumption is probably based on the fact that boys are slightly larger, and larger individuals tend to have slower heart rates …" (p. 173). Research has demonstrated, however, that there is not a significant difference in the heart rates of female as compared with male fetuses [5]. This same study also demonstrated that there is no difference in how variable the heart rates are for the different sexes. So, like the lunar calendar, fetal heart rate cannot be used to accurately predict the baby's sex.

Myth #10 Epidurals create a high risk of harm during delivery

In the movie *Baby Mama* [6], a medical professional asks the pregnant women in her class the following questions: "How many of you are planning on doing natural childbirth? … And how many of you are planning on using toxic, western medications to drug your baby?" In answering the questions, everyone in the class is planning to do natural childbirth, except for the woman (played by Amy Poehler) who has already demonstrated a pattern of selfish behavior in the movie. Similarly, in the movie *What to Expect When You're Expecting* [7], one of the mothers-to-be is asked if she is going to get an epidural, and her response is, "Do I look like somebody who wants to drug my baby?" Statements like these reflect the worries of a lot of future parents. Family doctor Harriet Hall [8] suggests that "The natural childbirth movement seems to view childbirth as an extreme sport or a rite of passage that is empowering and somehow enhances women's worth. Women who 'fail' and require pain relief or C-section are often looked down upon and made to feel guilty or at least somehow less worthy" (para. 4). However, research shows that women shouldn't feel guilty about using an epidural. A recent review of 38 studies involving nearly 10,000 women found that epidurals were *not* associated with negative outcomes such as lower scores of newborn health using the Apgar scale [9]. Although epidurals can be associated with some

negative side effects (e.g., fever in the mother), the risk of complications is very low. Hall [8] points out that even Novocain has some risks "but can you imagine a dentist telling a male patient to 'man up' and have a root canal procedure without any anesthetic? Because it will be safer? Because embracing the pain will be empowering?" (para. 11). Based on logic like this, we believe this should be a personal choice for every woman, but we have to admit that we'd go straight for the epidural the moment we stepped in the hospital.

Myth #11

More babies are born during a full moon

According to the subtitle of a story in one popular news source "Experts say moon has gravitational pull on embryonic fluid around baby" [10]. Supposedly, the same forces that create a high tide cause a pregnant woman's waters to break. A study involving over 500,000 births, however, reported that there was no relation between the moon's cycle and births [11]. The study also debunked the related belief that moon cycles influence birthing complications. Lilienfeld et al. [12] also debunk the similar myth that full moons cause an increase in crimes and emergency room visits. This phenomenon is also called "The Lunar Effect," and terms such as "lunatic" and "looney" are derived from the Latin term for moon (i.e., *luna*). Lilienfeld and colleagues point out that the myths tied to The Lunar Effect persist due to selective perception and memory. For example, medical professionals might notice there was a full moon on a night when they delivered a large amount of babies. They easily remember the connection between the full moon and the high rate of births. However, they may be less likely to take notice of a night when there was a high number of births despite there being only a crescent moon. In addition to being an example of selective perception, this myth also provides an excellent example of an *illusory correlation* in which a person believes one event is connected to another event even though they are actually unrelated to each other [13].

Myth #12

Pre-chewing a baby's food has no known risks

The practice of pre-chewing a baby's food has been around for thousands of years. This appeal to tradition was part of actress Alicia Silverstone's reasoning for pre-chewing her 11-month-old son's food in a viral video posted on her website [14]. Pre-chewing food (also called "kiss feeding" or "premastication") is often described as being a part of weaning. Silverstone indicated that her son "literally crawls across the room to attack my mouth

if I'm eating" (para. 1). Though this practice may be harmless at times, it also may be a method of disease transmission [15] and transfer of bacteria that can cause cavities [16] from mother to baby.

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