Why did it happen?

Most parents of boys with XXYY Syndrome have a normal number of chromosomes themselves.
The cause of the extra chromosomes is most likely to be a mistake that occurred at conception, when the baby was made, or during the formation of the father's sperm and possibly the mother's egg cells. When sperm or egg cells are forming, the two members of each pair of chromosomes usually separate so that each sperm or egg contains 23 chromosomes. Not uncommonly, one pair of chromosomes fails to separate. This is called non-disjunction.

The extra chromosomes are usually assumed to come from the father. Non-disjunction is more common in older mothers, but not in older fathers and the cause is not understood. There is no evidence that XXYY Syndrome is caused by anything that parents did before or during pregnancy. It has not been associated with environmental, drug or alcohol exposure, illness or medications.

Can it happen again?

Most XXYY syndrome occurs by chance so it is unlikely that it will occur in a subsequent pregnancy. However, some parents choose to have a test of the baby's chromosomes in their next pregnancy.

Fertility

The additional X chromosome impairs sperm production and the semen of men with 48,XXYY generally contains no sperm. Treatment with testosterone does not affect this but although men are not fertile, they may be sexually active.

Strengths

With their strong visuo-spatial abilities and sometimes good memory, boys with XXYY are relatively good at activities such as board games, computer games and direction finding. As a group they are friendly and non-judgmental and can be thoughtful, caring and considerate.

Inform Network Support

Understanding chromosome disorders
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Rare Chromosome Disorder Support Group,
G1 The Stables, Station Road West, Oxted, Surrey RH8 9EE, UK Tel/Fax: +44(0)1883 723356
info@rarechromo.org | www.rarechromo.org

The XXYY Project
PO Box 2172, Littleton, CO 80161-2172, USA.

inquiry@xxyysyndrome.org | www.xxyysyndrome.org | www.facebook.com/xxyyproject

AXYS
info@genetic.org | www.genetic.org

Unique mentions other organisations' message boards and websites to help families looking for information. This does not imply that we endorse their content or have any responsibility for it.

When you are ready for more information, *Unique* can help. We answer individual queries and publish a full leaflet on XXYY Syndrome.

This information sheet is not a substitute for personal medical advice. Families should consult a medically qualified clinician in all matters relating to genetic diagnosis, management and health. The information is believed to be the best available at the time of publication and the content of the full leaflet on which this text is based was verified by Nicole Tartaglia, MD, Fellow in Developmental-Behavioural Pediatrics, UC-Davis Medical Center MIND Institute October 2004 and by Professor Maj Hulten, Professor of Medical Genetics, University of Warwick, 2005.

Rare Chromosome Disorder Support Group
Registered in England and Wales

Charity Number 1110661
Company Number 5460413

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XXYY syndrome

rarechromo.org

What is XXYY Syndrome?

XXYY Syndrome, also known as 48,XXYY, is an uncommon sex chromosome variation. It only affects boys and men.

All our genetic information is contained in each cell in our body. The genetic material that contains this information is the DNA, tightly coiled and forming 46 rod-like structures called chromosomes. These 46 chromosomes occur as 23 pairs. The first 22 pairs are numbered 1 to 22.
The remaining pair are the sex chromosomes: girls and women have two X chromosomes (XX) and boys and men have an X and a Y chromosome (XY).

Boys and men with 48,XXYY have an extra X and an extra Y chromosome. Until recently, XXYY Syndrome was considered a variant of Klinefelter's Syndrome (47,XXY) but it has distinctive features.

Key features

Features do not affect every boy and vary in extent.

- Vulnerability to social and behaviour difficulties. Boys may be immature, shy and lack emotional judgement. They may be prone to outbursts of temper.
- Incomplete sexual development. Boys may be born with small genitalia and/or undescended testes. Sexual maturation may fail to develop fully at puberty. Many boys, but not all, have a low testosterone level.
- Tall compared with other family members, with long limbs.
- Delay in speech development.

Behaviour

Boys are vulnerable to behaviour difficulties although not all will develop problems. Typically, as babies, boys are relaxed and easy-going. As toddlers, they seem eager to please but can be easily frustrated. By early to mid-childhood a typically pleasant personality unfolds but boys can be prone to sharp mood swings and temper outbursts. Parents should be offered behaviour management training when their son is still young.

Approaches that parents have found successful in managing their son's behaviour include:

- Medication
- Behaviour support
- Music therapy
- Clear routines, a calm and supportive environment

Development

Learning

The spectrum of learning ability is very broad. With each extra sex chromosome, the rule-of-thumb is that overall IQ falls by 10-15 points, a natural difference between brothers and sisters in the same family. While many boys with 47,XXY or 47,XYY have no discernible learning difficulty, others meet problems specific to reading and writing. Boys with 48,XXYY show more difficulties with learning.
One boy in 10 has an IQ within the normal to above-average range, while most have a mild learning difficulty. Boys with 48,XXYY are said to be visual learners who have more difficulty processing auditory information. Their performance IQ is typically higher than their verbal IQ.

Speech

Boys with 48,XXYY usually have a specific speech delay. While some have a delay in comprehension, most boys understand better than they speak. Difficulties with word retrieval, short term memory, sentence structure, volume, articulation and word order are common. Boys learn best from visual repetition and strategies to help them to organise their thoughts.

Sitting, moving …

Muscle tone in babies is often low and balance and coordination can be affected, delaying sitting, crawling and walking. Lack of muscle mass can lessen strength and stamina. Occupational and physiotherapy help to improve muscle tone and advance skills in movement and while some boys have more marked motor delays, many develop into agile movers.

Growth

Boys are usually born a normal weight and length. From an early age they usually grow noticeably tall and the extra height is most obvious in their long limbs. Most boys reach at least six foot (183cm). Extra testosterone (either naturally around puberty, or given as treatment) helps to bring the growth spurt to an end. However, the extra height in boys with XXYY is not only due to low levels of testosterone but also to genes on the extra X and possibly the extra Y chromosome.

Medical concerns

Puberty

In some boys, puberty proceeds normally. In others, puberty is delayed or remains incomplete because not enough testosterone is produced. Boys should be followed through puberty by an endocrinologist from 9-10 years due to the likelihood of testosterone deficiency. If secondary sex characteristics (growth in penis size, male hair distribution) do not develop or if puberty remains incomplete, testosterone replacement therapy can be given. This has not been shown to lead to any increase in aggressive behaviour.

Orthopaedics

Many boys have flat feet and while some boys outgrow this, others need orthopaedic insoles or special footwear. Radioulnar synostosis (a fusion of the two bones in the forearm, making it impossible to twist or sometimes straighten the arm) also occurs and some boys have contracted elbow joints.

Dental care

Many boys have missing or extra teeth (especially adult molars), severely decayed teeth or taurodontism, a condition in which the teeth have very large pulp chambers and long roots. Boys should have regular dental reviews.

Heart and circulation

All boys should have a careful cardiac examination. One boy in 12 is born with a heart anomaly. Some examples are small holes in the septum of the heart, pulmonary stenosis (narrowing of the artery that takes blood to the lungs), tetralogy of Fallot and mitral valve prolapse (a weak valve on the left side of the heart). Boys with some heart conditions need protective antibiotics before dental surgery.

Asthma and allergies

The rate of asthma and allergies appears to be raised in boys with 48,XXYY. It is unclear whether respiratory infections are more common but some boys appear to be prone to chest infections in the winter. This vulnerability means that all boys should be fully immunised.

Neurological

A few boys with XXYY have signs of neurological involvement. Some have an intentional tremor (their hands tremble when they try to perform a purposeful task); a few have a repetitive tic; many have difficulties with fine motor skills and co-ordination; and seizures are more common than in the general population.