

Collective Expert Report

Conduct disorder in children and adolescents

Summary

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Inserm

Institut national de la santé et de la recherche médicale
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This document presents the summary and recommendations of the expert group brought together by Inserm (the French National Medical Research Institute) within the framework of the collective expertise procedure to answer the questions raised by the French Health Insurance Fund (*Caisse Nationale d'Assurance Maladie des travailleurs indépendants*, CANAM) concerning the screening, management and prevention of conduct disorder in children and adolescents.

It is based on scientific data available during the first semester of 2005: the documentary basis of this collective expert report consisted of more than 1,000 articles and documents.

The Inserm collective expertise centre has co-ordinated this collective expert report with the Department of Scientific Partnership and Events (*Département Animation et Partenariat Scientifique*, Daps) and the Archive Division of the Department of Scientific Information and Communication (*Département de l'Information Scientifique et de la Communication*, DISC) for the bibliographical research.

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Foreword

Conduct disorder in children and adolescents may be expressed in the form of any of a range of diverse behavioural patterns, from the frequent and intense temper tantrums and persistent disobedience of the difficult child to the delinquent's serious acts of aggression, such as theft, violence and rape. The major characteristic of the disorder is the violation of the rights of others and social norms. The question therefore arises as to where conduct disorder is situated within the social phenomenon of delinquency. The concept of delinquency belongs in the legal field, and its precise definition can vary with changes in police or judicial procedure. The clinical approach used in this collective expert report does not specifically address delinquency although the antisocial behaviour which characterises conduct disorder commonly leads to serious infractions of the law. The most relevant way of establishing a link between conduct disorder and delinquency is to consider the former as a risk factor for the latter, and one which may interact with other factors. However, it is important to remember that not every adolescent who is convicted for an act of violence or vandalism would necessarily be diagnosed with conduct disorder.

The clinical approach to the problem is evolving with ongoing scientific research in the area of mental health. Up until quite recently, psychiatrists considered conduct disorder as a mental disorder that was difficult or even impossible to treat. Although many questions remain as to the definition of the condition, its aetiology, risk factors and the mechanisms involved in its pathogenesis, today it is possible to think about treatment of conduct disorder based on a well-defined, evidence-based multidisciplinary clinical approach.

In order to complement the collective expert report on Mental Disorders published in 2002, the Canam (*Caisse nationale d'assurance maladie des travailleurs indépendants*: the French Health Insurance Fund) commissioned Inserm (the French National Medical Research Institute) to conduct an in-depth review of paediatric conduct disorder with the goal of improving screening, prevention and treatment, and also of identifying the topics on which research is required to extend our understanding of etiologic factors and the mechanisms underlying expression of the disorder.

Inserm convened a multidisciplinary group of experts in psychiatry, psychology, epidemiology, cognitive science, genetics, neurobiology and ethology to perform a critical analysis of published results from various disciplines in different countries. The following issues were raised:

- Within the entity of behavioural problems, how are conduct disorder, attention-deficit/hyperactivity disorder and oppositional defiant disorder defined?
- Is conduct disorder beginning in childhood fundamentally different from conduct disorder which begins during adolescence? Are there gender-specific patterns? What is the relationship of conduct disorder with antisocial personality disorder?
- How prevalent is conduct disorder in the population as a whole and among young delinquents in particular? How frequent is co-morbidity?
- What is the available information about perinatal risk factors? What is the importance of parental relationships in the onset and persistence of conduct disorder?
- How do temperament, personality and genetic factors interact with the familial and social environments? What links exist between conduct disorder and known neurocognitive deficits?
- How do the various symptoms of conduct disorder develop and to what extent are there symptom-specific risk factors?

- How can risk factors be recognised and addressed, in order to delay the development of conduct disorder? Are there any validated preventive programmes?
- How can conduct disorder and associated problems be treated? Which therapies are the most effective?
- Is there any current fundamental, neurobiological research which might help define the pathogenic mechanisms of conduct disorder and lead to the development of new treatments? Are animal models of any relevance to understanding this condition?

In the course of eight working sessions, the group of experts reviewed the international medical and scientific literature to seek answers to these questions. Following this, they formulated a series of different measures to raise consciousness and provide information about conduct disorder in general, and more specifically, how to prevent it, screen for it and manage it. The group also identified some lines of research which might be profitably followed to expand our knowledge of aetiology of the conditions, to dissect its underlying mechanisms, and to improve its treatment.

Summary

International classification systems (such as DSM-IV and ICD-10) provide definitions of various diagnostic criteria for conduct disorder, including aggression, violent behaviour, the destruction of property, theft, deceitfulness and serious violation of rules. This broadly covers the various different classes of delinquent behaviour. Although conduct disorder is defined in terms of violation of established social norms in a given socio-cultural context, no antisocial act can be attributed purely to conduct disorder.

In the field of mental health, the word disorder refers to a set of morbid conditions characterised by impairment of an individual's behavioural, interpersonal and psychological functioning according to the norms expected at his or her age. In this context, conduct disorder is primarily defined by the repetition and persistence of behaviour patterns which flout societal rules and other people's fundamental rights. As with the majority of so-called exteriorised behavioural problems, the clinical expression of conduct disorder will depend on the subject's age. During childhood, the manifestations are usually confined to school and the family environment; the disorder will affect the child's general functioning and may be associated with learning disorders. By adolescence, it encompasses the adolescent's whole social setting and can entail high-risk behaviour, unprotected sex, premature pregnancy, substance abuse and even criminal activity.

Depending on the age of onset (whether it is before or after ten years of age), both the symptoms and the course of development of the problem differ, with the prognosis being poorer and the likelihood of progression to full-blown antisocial personality disorder in adulthood being greater in cases of early onset.

Attention-deficit hyperactivity disorder and oppositional defiant disorder are often associated with some form of conduct disorder. Such co-morbidity exacerbates the conduct disorder and can promote its persistence. The question of links between these three problems nevertheless remains controversial in terms of shared risk factors, predictors and clinical entities. Conduct disorders can also be associated with other mental problems such as anxiety and mood disorders, problems due to psychoactive substance abuse, and learning disorders.

Longitudinal studies are particularly important for the study of the evolution of the different symptoms of conduct disorder (e.g. aggression, theft, deceitfulness and the contravention of established rules). It is now recognised that oppositional behaviour and aggression are quite normal in young children, disappearing with advancing age. Therefore, the key question to be addressed is why aggressive, antisocial behaviour persists in certain cases.

The etiologic factors are unknown and the risk factors appear to be many and various. It is clear that there is no single factor which, on its own, can either predict or explain why some children keep or adopt aggressive or antisocial behaviour patterns. The question of personal predisposition to conduct disorder is quite different from that of the conditions that cause a predisposed individual to manifest antisocial behaviour. Most experts emphasise that multiple risk factors interact to perpetuate antisocial behaviour patterns and conduct disorder. When it comes to devising and implementing preventive programmes, identifying predictors and risk factors remains a priority, especially since such factors might be present from pregnancy. It is ultimately hoped that it may be possible to effectively screen potential problem behaviours and instigate early intervention.

There is much current research into how environmental conditions—familial and psychosocial factors—might interact with personal factors such as genetic susceptibility, temperament and personality. The persistent, cumulative effects of environmental factors may influence cognitive processes, neuro-endocrine function (especially stress management), and the activities of certain cerebral structures. Research in the field of neuroscience, largely based on animal models, is shedding light on the how a variety of neuro-physiological systems are involved in expression of the disorder.

Conduct disorder manifests as various symptoms defined in the classification systems

Conduct is defined as a way of acting and behaving, a definition which includes a degree of moral judgement. The phrase "conduct disorder" implies a behaviour pattern which contravenes accepted social rules. Such a disorder is therefore at a junction between psychiatric, social, and legal concepts.

Historically, since Lombroso's idea of the "born criminal"¹, paediatric conduct disorders have raised questions regarding the frontier between responsibility and blame as well as between law and medicine. Some experts have proposed constitutional explanations based on ideas such as a "congenital abnormality of instinct" while others (influenced by ideas from psychoanalysis) point to the importance of environment. Different terminologies reflect different attitudes, often coloured with some form of moral judgement, e.g. perverse child, guilty child, psychopath, etc.

In 1968, the term conduct disorder was first used in the Diagnostic and Statistical Manual of Mental Disorder (DSM-II) drawn up under the auspices of the American Psychiatric Association (APA). In 1977-78, the term was taken up by the World Health Organisation (WHO) in its updated International Classification of Diseases (ICD-9).

In DSM-IV and its updated version (DSM-IV-TR), one chapter is entitled "Attention-Deficit Disorder and Disruptive Behaviour" in which a distinction is made between four entities, namely attention-deficit/hyperactivity disorder (ADHD), conduct disorder, oppositional defiant disorder (ODD) and non-specific disruptive behaviour disorder.

Conduct disorder covers three criteria (A, B and C). Criterion A defines the disorder as "A repetitive and persistent pattern of behaviour in which the basic rights of others or major age-appropriate societal norms or rules are violated, as manifested by the presence of three (or more) of the following criteria in the past 12 months, with at least one criterion present in the past 6 months." Symptoms are broken down into four broad categories:

- aggression to people or animals;
- destruction of property (without physical aggression);
- deceitfulness or theft;
- serious violations of rules.

Diagnostic Criteria (A) of DSM-IV

Aggression to people and animals (Criteria 1-7)

1. Often bullies, threatens, or intimidates others
 2. Often initiates physical fights
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¹ Lombroso C. Criminal Man-Moral Imbecile-Epileptic. Félix Alcan, Paris, 1887 (1876)

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3. Has used a weapon that can cause serious physical harm to others (e.g. a bat, brick, broken bottle, knife, gun)
 4. Has been physically cruel to people
 5. Has been physically cruel to animals
 6. Has stolen while confronting a victim (e.g. mugging, purse-snatching, extortion, armed robbery);
 7. Has forced someone into sexual relations

Destruction of property (Criteria 8-9)

8. Has deliberately engaged in fire setting with the intention of causing serious damage
9. Has deliberately destroyed others' property (other than by fire setting)

Deceitfulness or theft (Criteria 10-12)

10. Has broken into someone else's house, building, or car
11. Often lies to obtain goods or favours or to avoid obligations (i.e. "cons" others)
12. Has stolen items of non-trivial value without confronting a victim (e.g. shoplifting, but without breaking and entering; forgery)

Serious violations of rules (Criteria 13-15)

13. Often stays out at night despite parental prohibitions, beginning before age of 13
 14. Has run away from home overnight at least twice while living in the parental or parental surrogate home (or once without returning for a lengthy period)
 15. Is often truant from school, beginning before the age of 13
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Criterion B addresses the degree of impairment in social, academic, or occupational functioning. If the individual is 18 years of age or older, a diagnosis of conduct disorder can only be made if the criteria for antisocial personality disorder (criterion C) are not met.

Two parameters have to be taken into account, namely the age of onset and the severity of the disorder. With respect to age, the distinction is made between childhood-onset (prior to the age of 10) and adolescent-onset (after the age of 10). These two types differ in terms of symptoms, development, relative prevalence in boys and girls, and co-morbidity. The severity of the problem is graded as mild, moderate or severe.

Similarly, ICD-10 defines conduct disorder as a repetitive and persistent pattern of behaviour in which the basic rights of others or societal norms or rules are violated, again with the idea that the behaviour has persisted for at least six months. This system gives a list of 23 identifiable symptoms and the type of conduct disorder depends on which of these symptoms are found together in the patient:

- socialised or un-socialised, depending on whether or not the child has normal relationships with his/her peers;
- conduct disorder confined to the family environment;
- oppositional defiant disorder (ODD), which is included in conduct disorder.

DSM-IV and ICD-10 agree on the global definition of conduct disorder and on the value of differentiating childhood-onset and adolescent-onset. However, there are differences: ICD-10 emphasises the socialisation aspect and classifies ODD as a sub-type of conduct disorder whereas in DSM-IV, ODD is a distinct, strictly personalised diagnostic category.

In ICD-10, attention-deficit/hyperactivity disorder is called hyperkinetic disorder and there is a special mixed category for those in whom hyperkinetic disorder and conduct disorder co-occur.

Although the first version of the French classification system for mental disorders was quite different from the international systems, the version published in 2000 was more similar, including a "conduct and behaviour disorder" category.

The different classification systems have made no distinction between symptoms in boys and girls. In girls, the data on age of onset are variable and the prognosis for late-onset is considered as being the same as for early-onset, unlike observations in boys. Some experts propose that, to distinguish between early and late onset in girls, the threshold of puberty is more relevant than the age of 10. Adolescent-onset in girls is characterized by sexual behaviour problems, premature pregnancy and depression. In general, girls commit fewer aggressive acts and more frequently manifest manipulative behaviours.

The virtue of category-based classification systems such as ICD and DSM is that they specify groups of symptoms and make it possible to constitute uniform groups of patients for studies and trials to evaluate treatment modalities. However, such systems do not characterise relationships between the different types of disorder or the probability of one developing into another. As mentioned above, ODD is classified as a conduct disorder in ICD-10 whereas it is a quite separate entity in DSM-IV. It is considered as a precursor for conduct disorder in some cases and as co-morbidity in others. Should ADHD –which is classified as a separate entity– also be considered of conduct disorder or a co-morbid condition?

Finally, it is important to note the definition of antisocial personality as being one who exhibits "a pervasive pattern of disregard for and violations of the right of others occurring after the age of 15". To meet these diagnostic criteria, the subject must be at least 18 and must have met the diagnostic criteria for conduct disorder since at least the age of 15. Thus, antisocial personality disorder is both a differential diagnosis and a possible sequel to conduct disorder. Some experts have questioned the notion of antisocial personality as a diagnostic entity, and its inclusion in classification systems for mental disorder given the absence of any effective treatment coupled with the possibility that the diagnosis might be used to avoid penal sanctions.

The prevalence of conduct disorder in boys of 15 years-old is between 5% and 9% in the general population

Many studies—including some multiple cohort studies with long follow-up times—have yielded high-quality data on the prevalence of conduct disorder in children and adolescents in the general population. Key factors affecting the pertinence of such studies are how representative the sample is, the use of validated instruments for evaluation, and high follow-up rates (for prospective studies). Fewer studies have focused on young offenders or those in special educational establishments.

Based on the classification systems used to establish the psychiatric diagnoses (ICD or DSM), a distinction is usually made between ODD and conduct disorder (which itself is divided into two types, namely aggressive and non-aggressive).

In studies focusing on children, the parents are not the ideal source of information and the diagnosis is often established after talking to the child and his/her teachers. In adolescents, it is the subjects themselves that are the best source of information.

In the population as a whole, the prevalence of ODD peaks at 8-10 years of age (reaching 3-4%) in both sexes, thereafter dropping (to 1-3%). The prevalence of conduct disorder

increases up until 15 years, after which it stabilises in boys (at 5-9%) and drops in girls. Aggressive-type conduct disorder is very rare in girls.

Prevalence of oppositional defiant disorder and conduct disorder (aggressive and non-aggressive types)

	Children (5-12)			Adolescents (13-18)		
	Girls (%)	Boys (%)	Total (%)	Girls (%)	Boys (%)	Total (%)
Oppositional Defiant Disorder	2-3	4-5	3-4	1-2	2-4	1-3
Conduct Disorder	0-3	1-2	2	2-5	5-9	3-9
Aggressive type	-	-	<1	0	4	1-2
Non-aggressive type	-	-	1-2	-	-	4-6

Conduct disorder tends to persist with two-thirds of children thus diagnosed still being diagnosed as having the disorder in adolescence.

Studies in populations of delinquents show prevalence of 30-60% for conduct disorder and of 8-30% for ODD. The scarce data available on delinquent girls tend to suggest that both problems are equally as common in this group as in delinquent boys. The prognosis is usually considered as poorer if the disorder appeared before the age of 10 (childhood-onset) as opposed to later (adolescent-onset). However, among girls in prison, later onset seems to be associated with more severe conduct disorder than in boys.

The results of studies show that the great majority of adults with antisocial personality disorder have a history of conduct disorder, and that about half of all young people with conduct disorder will go on to have antisocial personality disorder in adulthood. The risk of developing antisocial personality disorder seems to be higher in young people with a conduct disorder who also abuse psychoactive substances in their teenage years and adulthood.

In France, a single study conducted in 6-11 year-olds in 18 primary schools in Chartres reported a prevalence of 6.5% (9% in boys, 3% in girls) with 2.8% with a severe form. The level was significantly higher in special classes (17%) than in normal classes. No difference emerged between private and public schools.

Conduct disorder is often associated with other mental problems

Conduct disorder is rarely found in isolation. The international literature reports a high level of inter-current morbidity with a great diversity of co-morbid conditions. One of the most commonly associated psychiatric disorders is ADHD with several epidemiological studies pointing to a continuity between paediatric ADHD and conduct disorder in adolescence. ADHD during childhood seems to be all the more predictive of subsequent conduct disorder if it is combined with ODD. Other more recent studies have suggested that the symptoms of ODD and ADHD are often associated with physical aggression (a symptom of conduct disorder) from very early childhood.

The relationship between ODD and physical aggression in small children could lead to specific problems—both clinical and developmental—in adolescence, thus constituting a prodrome for adult antisocial personality disorder. According to other experts, the clinical picture in which hyperactivity, impulsiveness and attention-deficit are associated with conduct disorder would be characterised by high rates of aggression and criminal violence.

Co-morbid depression is also common. Depression could be involved in the development and persistence of conduct disorder and vice versa, and such a synergy could increase the likelihood of suicide. Studies conducted in clinical populations have shown co-morbidity with bipolar disorder in 17-42% of cases. Some experts believe that bipolar disease in childhood could predispose to the development of conduct disorder whereas others believe that the simultaneous onset of both problems reveals the existence of a specific sub-group. Co-occurring conduct disorder and depression would increase the likelihood of developing antisocial personality disorder in adulthood as well as increase the chance of dependence on alcohol or other psychoactive substances.

General population studies indicate a fairly high level of co-occurring/co-morbid anxiety disorders. Most studies—of both general populations and patients—indicate that anxiety problems have a moderating effect on the severity of both conduct disorder and antisocial behaviour. However, this effect seems to disappear in severe forms of conduct disorder, especially in prison inmates. One anxiety problem which is commonly associated with conduct disorder is post-traumatic stress disorder. This co-morbidity is most often observed in adolescents who have experienced sexual violence or those with severe conduct disorder (e.g. those in prison). Moreover, adolescents with conduct disorder are at higher risk of post-traumatic stress disorder since they tend to expose themselves to situations in which trauma is likely. Finally, the existence of post-traumatic stress disorder increases the risk of conduct disorder.

Main psychiatric diseases co-occurring with conduct disorder (taken from Angold et al., 1999)

	Percentage of subjects with conduct disorder + the inter-current disease	Odds Ratio [95% IC]
Attention-Deficit/Hyperactivity Disorder	3-41	10.7 [7.7-14.8]
Depression	0-46	6.6 [4.4-11.0]
Anxiety Disorder	0-41	3.1 [2.2-4.6]

Psychoactive substance abuse is commonly associated with conduct disorder. The age of onset and severity of the conduct disorder are key factors in the initiation and maintenance of abusive behaviour, and reciprocally, early substance abuse is associated with more severe forms of conduct disorder. It seems therefore that the synergy might act in both directions insofar as the one problem exacerbates the other. In addition, this strong co-morbidity could be the expression of a cumulative continuity: drug abuse promotes delinquent behaviour and delinquent behaviour involves the use of illicit substances. Substance-abusing teenage girls with co-occurring conduct disorder are more commonly depressed or anxious whereas boys with a similar clinical profile tend to commit violent or criminal acts.

In the opinion of some experts, the association of conduct disorder and ADHD seems to promote psychoactive substance abuse whereas others emphasise the association between conduct disorder and ODD. With respect to cannabis, longitudinal studies have shown that conduct disorder is predictive of early use, a link which is stronger in girls. Finally, some studies have shown that the superimposition of depression or anxiety on a developing conduct disorder might increase the likelihood of substance abuse.

Apart from co-morbid psychiatric disease, it has been shown that certain high-risk activities are associated with conduct disorder, including risky games, extreme sports, dangerous driving, bulimia, sexual risk-taking, harassing behaviour and violent suicidal behaviour. These high-risk behaviour patterns reveal impaired self-control and behavioural inhibition mechanisms, as well as some degree of difficulty or even inability to foresee possible adverse

consequences of high-risk behaviour on the part of children and adolescents suffering from conduct disorder.

Studying populations of children to define how the symptoms of conduct disorder develop

In order to identify factors which predispose to and protect against conduct disorder, it is important to understand how the problem develops. This entails formulating working definitions of the relevant symptoms at different ages and following cohorts longitudinally from birth to the age of 18 in representative samples. Few studies to date have adopted this approach.

Conduct disorder must be considered from a developmental point of view. The developmental aspect is highlighted by the fact that it is a prerequisite to the diagnosis of antisocial personality disorder in adulthood. Moreover, DSM-IV-TR specifies two different types of conduct disorder: that beginning before 10 years of age and that beginning after.

Individuals who develop early-onset conduct disorder (before 10) are usually physically aggressive throughout childhood and boys are more likely to develop a personality disorder in adulthood. Those who develop conduct disorder later (after 10) are not particularly aggressive and are at low risk of antisocial personality disorder. Thus, the prognoses associated with the two different types are quite different. This underlines the importance of studying how the various symptoms of conduct disorder develop.

Aggression against people and animals includes physical aggression such as "fighting", "physical cruelty" and "bullying, threatening or intimidating others". Most children begin to commit acts of physical aggression at a very young age with the frequency of such acts increasing around the age of 4. Subsequently, this type of behaviour becomes rarer in most children but in a minority (3-11%), the level of aggression is sustained into adolescence; this minority includes those children who are identified as suffering from childhood-onset conduct disorder. In these children, the frequency of acts of physical aggression tends to rise again in adolescence although not back up to the rate seen in young childhood; however, the consequences for the victims are more serious because of the aggressor's greater strength and the possible use of weapons. At the beginning of adulthood, the frequency of acts of physical aggression seems to drop sharply, even in those with a chronic history of conduct disorder with physical aggression. The available data suggest that it is extremely rare that a child who has never manifested any evidence of physically aggressive behaviour before the age of 10 will exhibit such behaviour at a later stage.

Behaviour patterns involving the "destruction of property" have not been studied longitudinally to the same extent as physical aggression. Such acts begin in early childhood and are observed in the majority of children. The frequency of such acts also seems to drop with age although a relatively high level of this type of behaviour is sustained in a minority of children (including those with conduct disorder). With increasing age, the property destroyed tends to be of increasing monetary value and usefulness to the community (e.g. serious vandalism such as the burning of motor cars or school premises).

Theft—either with or without confrontation of the victim—begins in young childhood and lying is also common in young children. How stealing, lying and deceitfulness develop in relation to the diagnosis of conduct disorder remains poorly understood. It is likely that those who are identified as suffering from early-onset conduct disorder often lie or steal. Deceitfulness is probably a type of behaviour that appears later in development although this of course depends on the definition used.

Symptoms corresponding to "serious violations of rules"—such as "staying out at night before the age of 13", "running away and staying away from home overnight" and "playing truant from school before the age of 13"—can begin in preadolescent children with childhood-onset conduct disorder. In these children, such serious violations of established rules represent an extension of a disorder which first appeared in young childhood. For the others, such violations might be symptoms of adolescent-onset conduct disorder or the expression of other adaptive problems.

Co-morbidity studies show that a diagnosis of conduct disorder is commonly associated with a diagnosis of ODD or ADHD. It has often been suggested that hyperactivity and oppositional problems induce conduct disorder. Longitudinal studies following young people from the beginning of primary school up to the end of adolescence show that early physical aggression is more predictive of violence in adolescence than are either hyperactivity or oppositional behaviour. These findings together with the association between hyperactivity, physical aggression and oppositional behaviour at the age of 18 months suggest that these types of problem often appear simultaneously and interact with one another from early childhood through adolescence. As a result, hyperactivity might be a less reliable predictor of violence during adolescence than physical aggression in young childhood. Physical aggression, antisocial behaviour and delinquency are not often associated with anxiety whereas reactive aggression is.

Given that chronic physical aggression begins in early childhood and persists into adulthood in the most serious cases, it is not surprising to see that similar risk factors for the trait are observed in young children, older children and adolescents. One of the risk factors is the child's gender: even though small boys tend to commit more acts of physical aggression than girls, the difference is actually small until primary school, by which time the difference has become more significant; by adolescence, there is a substantial difference between the sexes with respect to rates of arrest for acts of physical violence.

The risk factors for high levels of physical aggression resemble those for conduct disorder, antisocial behaviour and delinquency—whether evaluated at a single or at a series of time points. The main factors are a parental history of antisocial behaviour during adolescence, the mother being young at the birth of her first child, the mother's educational level being low, the mother being a smoker, family conflict, poverty, and coercive behaviour towards the child by the parents.

In the absence of data on the developmental pathways of behaviour patterns associated with "deceitfulness, lying, stealing, destruction of property and serious violations of the rules", the relevant risk factors cannot be identified. However, it seems likely that the majority of risk factors for physical aggression will be good predictors for other symptoms of conduct disorder because pathologically aggressive children tend to exhibit the other symptoms. Nevertheless, some children who are diagnosed with conduct disorder do not show a high level of physical aggression, e.g. some are thus diagnosed because they steal, lie, commit fraud or violate rules without any aggressive component. The risk factors in these cases are as yet unknown and they may differ from those implicated in children with a high level of physical aggression. Proportionally speaking, more girls than boys are diagnosed as having conduct disorder with no manifestation of physical aggression.

Longitudinal studies which have addressed developmental pathways during the primary school years with a view to predicting medium- and long-term social adaptation show that, in boys, the path towards chronic physical aggression is a better predictor of delinquency—both with and without violence—in late adolescence than it is in girls. These studies also show that children who develop multiple symptoms of conduct disorder are at high risk of failing to adapt socially, possibly leading to academic failure, rejection by their peers,

precocious sexual activity, promiscuity, smoking, alcohol or substance abuse, membership of delinquent gangs, depression, suicidal thoughts, child pregnancy, unemployment and poor physical health.

To our knowledge, there have not been any studies of pathways to physical aggression as a risk factor for antisocial personality disorder in adulthood although most children who exhibit a high level of physical aggression continue to do so through adolescence and also present most of the other symptoms of conduct disorder. However, from the available information, it seems fairly clear that the older the individual, the less they resort to the types of behaviour which correspond to DSM-IV criteria for conduct disorder or antisocial personality disorder.

Genetic determinance of conduct disorder is around 50 %

As with any other multifactorial disease, the question of genetic determinism revolves around the idea of predisposition. Genetic factors increase the risk, modify how the disorder is expressed, and have to be appreciated in the context of a set of dynamically interacting etiologic factors. Epidemiological data give indications of the relative weight of genetic and environmental factors that specifically predispose to conduct disorder, ODD or ADHD. The same studies have yielded clues as to genetic factors that are common to all three problems.

The first clue which points to a genetic component in these disorders is the fact that relatives of an affected subject are more likely to suffer from the same problem. Family studies find a strong clustering of ADHD in families. Although there are no specific studies on conduct disorder, being related to a hyperactive child is known to increase the risk of conduct disorder and ODD. This clustering in families indicates a common etiologic basis. It actually corresponds to cosegregation of ADHD and conduct disorder. In practice, only those forms of ADHD which are inter-current with conduct disorder increase the familial risk of the latter – and in the relatives, the conduct disorder is itself often associated with ADHD. This cosegregation of conduct disorder and ADHD suggests that there is a familial form of ADHD which is associated with antisocial behaviour; at least some of the etiologic mechanisms of this form would be distinct from those involved in isolated forms of ADHD. This familial impact on the development of conduct disorder cannot be extrapolated to independent forms of ADHD and, moreover, familial clustering does not necessarily imply that genetic factors are involved – which can only be confirmed by quantifying the heritability of the condition.

The genetic component corresponds to the part of the phenotypic variance which can be attributed to genetic factors. This is equivalent to the percentage of the disease that can be accounted for in terms of genomic differences between different individuals, estimated using methods designed to separate the influence of heredity from that of the environment, notably adoption and twin studies.

The type of adoption study which has yielded the most information on paediatric problems is based on comparisons of unrelated siblings who have been adopted with brothers and sisters who have been adopted by the same family. Such studies have resulted in estimates of 40-70% genetic heritability in the case of ADHD, and 55% for externalizing problems.

A similar degree of genetic heritability has been found in twin studies – of the order of 50-60% for externalizing symptoms. Such studies also suggest reasons for this average weighting of genetic factors as well as the extreme diversity of the results. In the first place, permanent, non-contextual disruptive behaviour patterns are the most heritable ($h^2=80\%$). Secondly, the various different diagnostic categories which cover disruptive behaviour do

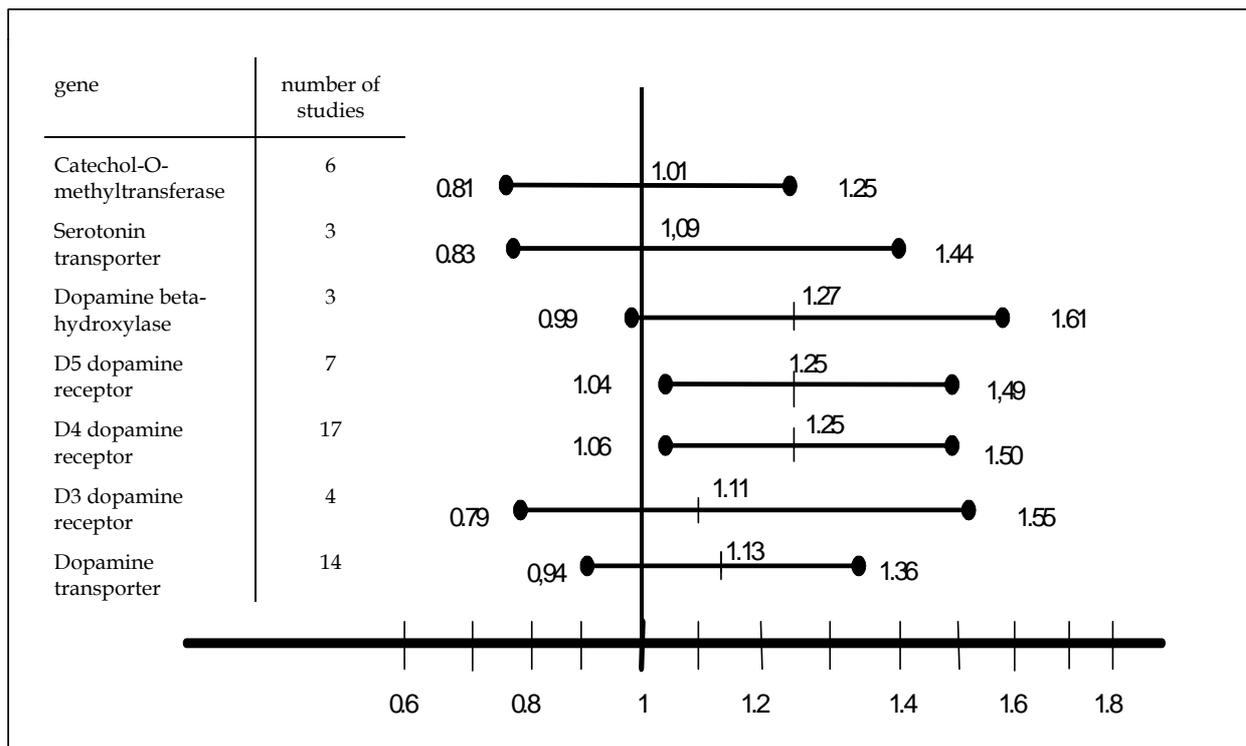
not share the same degree of genetic heritability: ADHD is strongly heritable (70-80%) with a greater genetic component than in the dimension of motor hyperactivity or in comorbid forms. The minor contribution of environmental factors observed in twin studies does not mean that such factors are not important in the etiology of ADHD since the heritability component includes interactions between genetic factors and the environment. Conduct disorder appears to be less heritable than ADHD – about 50%. This seems to be independent of the child's gender but may vary with age, heritability being higher for antisocial behaviour which begins at school age than for that which begins either earlier or in adulthood – although these findings remain to be confirmed in longitudinal studies. Finally, among the symptoms of conduct disorder, physical aggression is the most heritable ($h^2=60-70\%$) with other symptoms mainly depending on shared environmental factors.

Summary of twin studies on the heritability of different types of disruptive behaviour

	Study type	Genetic heritability (%)	Minimum-maximum (%)
Externalizing disorders	15 dimensional studies	50-60	34-81
Attention-Deficit/Hyperactivity Disorder (ADHD)	15 dimensional studies	70-80	50-98
	6 category-based studies		
Conduct Disorder	12 dimensional studies	50	28-74
	3 category-based studies		
Oppositional Defiant Disorder (ODD)	5 dimensional studies	50	39-66

Twin studies also reveal the relative genetic and environmental components in etiologic factors common to the different problems. The phenotypic covariance between exteriorised and internalizing problems is predominantly environmental. In contrast, conduct disorder, ODD and hyperactivity share genetic susceptibility, with up to 87% of the covariance attributable to genetic factors. In addition to these common global factors, there are on the one hand, supplementary genetic contributions in ADHD and in the temperamental trait of the seeking of novel experiences, and on the other hand, specific environmental components in conduct disorder and substance abuse.

These consistent findings justify looking for vulnerability genes. The functional approach involves selecting candidate genes and testing their links with the various disorders. Many such molecular genetics studies have been undertaken, giving highly disparate results. Of the mono-amine-based neurotransmitter systems, attention has focused on the dopamine system which is known to be involved in motor excitability and concentration. Also, psychostimulants which target dopaminergic neurotransmission have been used to manage ADHD. Recent meta-analyses show a link between ADHD and the genes that encode dopamine receptors D4 and D5 although the correlations are weak and do not by any means fully account for the epidemiological picture with the presence of each of the alleles associated with ADHD increasing the risk by a factor of just 1.25. However, most of these studies have been category-based and have not been conducted on enough subjects to yield information about comorbid forms – even though these are the most heritable. A few studies have pinpointed a specific link between the gene for the D4 dopamine receptor and inter-current ADHD/conduct disorder, and between the D5 receptor and inter-current ODD/substance abuse. Finally, the most recent studies have sought to define cognitive profiles and drug response patterns in children with ADHD in order to identify phenotypes that are particularly tightly linked to certain candidate genes.



Meta-analyses of studies addressing the link between ADHD and intra-familial polymorphisms in candidate genes (Odds Ratios and 95% confidence intervals)

An alternative way of identifying genes which predispose to conduct disorder involves the holistic investigation of multiple risk factors. Genetic factors are all the more difficult to define because their frequency varies in parallel to the variability of environmental factors. Exposure to a particular type of environment might exacerbate the situation in a genetically predisposed child to a greater extent than would result from the simple addition of risk factors. Moreover, certain genetic or environmental factors might be protective. There are many reasons for studying interactions between genes and the environment. Firstly, that such interactions do indeed occur is illustrated by the fact that the same genetic factors are associated with conduct disorder, ADHD and ODD whereas the relevant environmental factors are specific to each of these conditions. Secondly, adoption studies based on a parent-child model show that physiological susceptibility can be revealed by life events, and interacts with the parents' child-raising practices: the child-raising strategies of adoptive parents tend to be less successful with children from a biological family with a history of antisocial behaviour. Such studies also point to a link between disruptive behaviour and biological history emerging only if the child is removed from the adoptive home. It is therefore logical that interactions between genes and environment be taken into account when we are looking at the genetics of conduct disorder – and such approaches are yielding valuable information. The allele which is associated with reduced monoamine oxidase A activity appears to be associated with the development of antisocial behaviour, but only in subjects who have been mistreated during childhood. This does not correspond to a simple superimposition of risk factors but rather a synergistic effect between different vulnerability factors. Taking interactions between life events and genes into account could help shed light on why the results of different studies are so divergent, and could reveal the type of susceptibility conferred by genes in multifactorial problems such as disruptive behaviour – making it a potentially useful approach to the genetics of behaviour.

Temperament and personality may be factors that predispose to conduct disorder

For many years, the impact of personality and temperament were neglected in favour of sociological explanations for conduct disorder and delinquency. However, many studies have shown that personal variables such as temperament and personality are key factors in the development, maintenance and severity of conduct disorder.

In children, the existence of a set of traits which collectively constitute a difficult temperament (e.g. negative mood, lack of perseverance, inability to adapt to situations, readiness to be distracted, intense emotional reactions, hyperactivity and social withdrawal) is strongly predictive of impaired psychosocial adaptation in adolescence and adulthood. A difficult temperament is especially predictive of conduct disorder if the child comes from a dysfunctional family. However, it is not specific to conduct disorder since it is also found in ADHD and internalised problems such as anxiety and depression. In fact, a difficult temperament seems to be a common precursor for mental problems in general.

On the other hand, of the full range of temperament-related behavioural characteristics that can be ascertained at an early age, aggression against others, weak emotional self-control and disobedience are most predictive of adolescent conduct disorder, independently of both the family environment and the nature of the child's peer group. Impulsiveness is also predictive of this type of problem, as well as delinquency insofar as this paediatric temperamental dimension may inhibit socialisation processes, e.g. by entailing difficulties with relationships or poor social adaptation. Although impulsiveness is far from specific to conduct disorder (it is also associated with ADHD and ODD), it is particularly marked in the more severe forms (e.g. among prison inmates).

Impaired behavioural control has been shown to be involved in conduct disorder and antisocial behaviour in both boys and girls. But this type of temperamental trait is involved in a non-specific way and is broadly predictive of exteriorised problems such as ADHD. However, it seems that it is mostly the coupling of a strong need for behavioural activation with weak behavioural inhibition which is predictive of conduct disorder. The involvement of both these systems (activation/inhibition) could promote the expression of certain personality dimensions (e.g. psychoticism).

In terms of emotional dimensions, it has been shown that a lack of guilt feelings in a child is strongly predictive of physical aggression, delinquency and conduct disorder. The individuals concerned are less empathetic, less able to recognise emotions such as anger and sadness in others, and have a lower level of affective morality. Self-esteem does not seem to be a significant risk factor for conduct disorder insofar as it is not specific to a type of trait. On the other hand, egocentrism (the tendency to relate everything to oneself) and narcissistic personality could be typical of certain forms of conduct disorder with physical aggression.

Some experts believe that all these emotional characteristics express a personality trait defined by affective coldness, insensitivity and a tendency to charm. Adolescents with conduct disorder coupled with this personality trait tend to be relatively aggressive and violent, and exhibit more symptoms of ODD (92% of cases) and ADHD (48%). This trait associated with conduct disorder might correspond to a specific group which constitutes a predictor of psychopathy in adulthood, especially if the subject exhibits high impulsiveness.

The profile—combining both temperament and character—which would be specifically characteristic of conduct disorder would be one of strong "novelty seeking" (exploratory excitability, impulsiveness, extravagance) coupled with relatively low levels of "pain avoidance" dimensions (i.e. low levels of fatigability, timidity, fear of the unknown and anticipatory anxiety), "dependence on compensation" (lack of empathy, little sensitivity to

social reinforcement) and "determination" (low level of individual maturity and sense of responsibility).

Psychoticism (tough-mindedness, interpersonal hostility, self-centredness, affective coldness) seems to be predictive of conduct disorder and antisocial behaviour in both boys and girls insofar as this dimension reflects a tendency towards antisocial attitudes and impulsive behaviour. Extraversion and neuroticism seem to be particularly important in delinquent girls and less serious delinquent behaviour whereas people who commit extremely violent acts are usually relatively introverted.

A longitudinal study has shown that character traits such as affective coldness, a tendency to manipulate, cynicism and aggression could significantly influence the age at which aggressive behaviour is manifested, the stability of conduct disorder through adolescence, and antisocial personality disorder in adulthood.

A number of studies have set out to analyse links that might exist between the temperament of the child and parental attitudes. To a greater or lesser extent, all findings point to the centrality of the "goodness of fit" phenomenon between parents and child in the development of conduct disorder. According to this hypothesis, conduct disorder is the consequence of incompatibility between the child's temperament (e.g. one who is impulsive without great inhibitory capacities) and the demands of those close to him (e.g. child-raising style). Thus, a boy with a "resistant" temperament (who has trouble concentrating, a tendency to oppose and little capacity for inhibition) would only be susceptible to conduct disorder if his parents adopt a broadly "permissive" child-raising style, and the outcome would be quite different if they were to exert adequate control. In addition, according to some studies, mother-child interactions which are typified by reciprocal anger and poor emotional adjustment (laughing/anger) or—in contrast—emotional insensitivity could lead to conduct disorder but only in boys.

The involvement of personality and temperamental traits in the occurrence and maintenance of conduct disorder should be situated in a dynamic developmental perspective in which physiological and environmental factors interact with one another.

Perinatal events might be involved in the pathogenesis of conduct disorder

Various antenatal and perinatal events have been proposed as possibly exacerbating the risk of conduct disorder. Nevertheless, it seems unlikely that such events would have any very specific impact; rather, interactions with other risk factors (notably genetic) would determine the form of the disorder.

It is generally accepted that the mother's life style—especially if psychoactive substances were used during critical period of the pregnancy—can affect cerebral development in the foetus with long-term repercussions upon the child's neuro-behavioural future. In this context, a large number of studies have consistently shown that the offspring of mothers who smoke are more likely to develop conduct disorder; a significant correlation has emerged in several longitudinal studies between maternal smoking and the occurrence of conduct disorder, especially in boys.

With respect to drinking, the worst manifestations are seen when the mother's alcohol consumption during pregnancy is very high, leading to a set of physical and neurological problems collectively referred to as foetal alcohol syndrome. However, a number of longitudinal studies have suggested that prenatal exposure to even moderate levels of alcohol can have adverse effects on a child's cognitive and behavioural development.

In longitudinal studies, a correlation has been observed between cannabis smoking during pregnancy and behavioural problems in the child, notably impulsiveness and impaired concentration. An increased level of exteriorised problems has also been reported, especially in boys whose mothers took cocaine during pregnancy: these boys scored two times higher in tests for aggressive behaviour and delinquency than did those in a control group.

Premature birth and low birth weight have both been suggested as possible risk factors for conduct disorder, and a relationship has been identified between health problems in premature babies and the incidence of exteriorised problems at the age of 5, notably oppositional behaviour and hyperactivity. Similarly, low birth weight correlates with ADHD and antisocial behaviour.

Complications during delivery can also lead to neurological deficit which itself is associated with neuro-behavioural problems. Recent studies conducted on large populations have shown that there is a correlation between obstetric complications and antisocial behaviour in childhood or adolescence. Among the various problems that may arise during delivery, experts have singled out foetal asphyxia as a specific risk factor for conduct disorder.

There is now clear evidence of an association between the mother's age at pregnancy and the likelihood of conduct disorder in the child. In a study conducted at a special centre, it was shown that pregnancy at a young age (before 20 and to an even greater extent before 18) directly correlated with the number of symptoms of conduct disorder in sons between the ages of 6 and 13. If the mother had a history of conduct disorder, the likelihood of her becoming pregnant at a young age was higher as was the incidence of the diagnosis of conduct disorder in her children.

In addition, it emerged that head injury, even mild, during early childhood may be associated with an increased rate of ADHD and conduct disorder between 10 and 13 years of age.

Other risk factors such as maternal smoking and complications during delivery have been identified in methodological robust studies however they seem to be relatively non-specific and the correlations with pathology in later life could involve other parameters such as disturbance of the mother-child relationship or parameters related to the family environment in general.

The pathogenesis and persistence of conduct disorder are affected by familial and environmental factors

Various contextual factors—essentially related to family or psychosocial environment—are associated with conduct disorder in adolescence and adulthood. Adverse environmental conditions are all the more important in that they are commonly systematic, long-term and associated with other risk factors. Poverty in itself is not a risk factor, but extreme poverty is associated with multiple risk factors, which have impact on parenting behavior.

Quite a lot of studies have addressed the impact of parental problems, be it behavioural problems in the father or mother, dysfunction in the couple, maternal post-natal depression, parental alcoholism or other forms of dependence.

These studies have consistently identified a link between conduct disorder in the offspring and antisocial personality disorder in one of the parents. The children of fathers who are substance-dependent, particularly to alcohol, and also have an antisocial personality are at higher risk of both conduct disorder and ADHD; and the sons are at greater risk of themselves becoming addicted. Similarly, if the mother has an antisocial personality, the

likelihood of the children developing conduct disorder is enhanced, a fact that was underestimated for a long time.

Maternal depression is known to have an effect on the development of the child although the magnitude of such effects in conduct disorder remains controversial. However, it can be readily appreciated that depression-related disturbances of the relationship between mother and baby could have adverse long-term consequences on the ability of the child to concentrate and control his/her emotions. The children of mothers who experience post-natal depression may constitute a specific high-risk group.

Adolescent pregnancy is associated with conduct disorder in the offspring. The risk of conduct disorder with aggressive behaviour is particularly high among boys whose mothers were very young and whose educational level is low.

In several longitudinal studies of a high risk population, insecure attachment and disturbances or disruption of relationships within the family significantly exacerbated the risk of behavioural problems among children. Insecure attachment between child and both parents seemed to increase the risk of conduct disorder substantially, specifically if associated with temperamental difficulties, adverse family events and disturbances in parent-children relationships. A child whose relationship to principal attachment figures has been disrupted at a very young age tends to exhibit aggressive and directive behaviour towards their parents, particularly if the child has been subjected to violence or sexual abuse. Disorders of attachment, compounded with other dimensions (e.g. temperament, unsuccessful parental strategies, a dysfunctional family environment, etc.) exacerbate the future risk of conduct disorder. Attachment could be involved in gene/environment interactions as a resilience factor when the attachment is secure and as a risk factor when it is insecure—especially if attachment is disorganized. Many experts have drawn attention to a link between disruption of the family structure, through divorce and subsequent aggressive behaviour, conduct disorder and delinquency. However, it has been shown in longitudinal studies that this factor acts long before the actual separation of the parents, and it may be more closely related to the conflict between the parents rather than to the divorce itself. Thus, the long-term impact of a divorce on subsequent problems in the child may be more due to conjugal discord than to the eventual separation. Parental conflict disrupts children's capacities to regulate their emotions and, as a result, inhibits their ability to learn how to control aggressive behaviour. If one of the parents has an antisocial personality or is substance-dependent, or if there is conjugal violence, the separation may help protect the child.

Various studies have shown that deleterious parental attitudes and inappropriate child-raising strategies emerge as a family characteristic linked to delinquency. Parenting style seems to be more important when it comes to predicting aggressive and oppositional behaviour patterns than for ADHD. Results agree that a failure on the part of the parents to provide adequate control of their child's behaviour is primordial, as is also inconsistency or overly strict discipline. Parental indifference to truancy from school or to the absence of the child from the family home is predictive of antisocial behaviour and delinquency, particularly in under-privileged settings.

The influence of siblings cannot be ignored. Various studies have shown that a child with a brother or sister (especially if he or she is older) who has been convicted for an act of delinquency is significantly more likely to come before the courts. It may be that, in a family in which there is already a child with conduct disorder, his or her siblings may be directly influenced, independently of any other risk factors. This association is significantly amplified in under-privileged settings. Similarly, the fact of having older brothers or sisters who perform well at school may be protective.

Many experts agree that the type of aggressive and violent behaviour patterns that are common in under-privileged settings depend on the concurrence of diverse risk factors. Concentrations of gangs of children and adolescents with conduct disorder in certain neighbourhoods tend to attract other young people from the same neighbourhood, and mixing with delinquents doubles the risk of aggressive or delinquent behaviour patterns being sustained through adolescence. Young misfits reinforce each others' antisocial behaviour patterns, sometimes in response to rejection by their better-adjusted peers.

The available data suggest that schooling experiences need to be taken into account when evaluating risk factors for conduct disorder—truancy, rudeness at school and academic failure have all been related to conduct disorder and delinquency. When children are presenting symptoms of both ADHD and early-onset conduct disorder, they are very likely to fail at school.

Numerous studies have revealed a significant link between exposure to media violence and aggressive behaviour in young people. Recent studies have confirmed that 8 year-old children who watch violent shows on television are far more likely to act aggressively in the long-term (11 to 22 years later). This correlation is independent of intelligence quotient (IQ) and socio-economic status. Televised violence may not only lead to real violence but it also leads to desensitisation, entailing trivialisation and habituation, resulting in a passive reaction to and tolerance of violent acts. In certain children, playing violent games enhances physiological excitation, exacerbates aggressive attitudes and inhibits positive social behaviour patterns. The inundation of children—who might already be vulnerable by virtue of their family or social environment, or who might already be presenting signs of nascent conduct disorder—with violent stimuli such as are so ubiquitously and continuously dispensed via television and video games, enhances the attraction of violence, all the more so since the violent behaviour is at best trivialised or exempted of any feeling of guilt, and at worst glamorised and encouraged. It is nevertheless important to remember that it is children who already have problems with real violence who are the most affected by exposure to virtual violence in the media.

Neurocognitive deficits are associated with conduct disorder

Two types of neurocognitive deficit seem to be associated with conduct disorder in children and adolescents, namely impaired verbal skills and impaired executive inhibition mechanisms.

It has long been recognised that children and adolescents with conduct disorder perform poorly on the verbal components of psychometric tests compared with their performance as a whole. Adolescents with severe conduct disorder—particularly characterised by violence—tend to have a lower Verbal Intelligence Quotient (VIQ) than those without any significant conduct problem. Furthermore, poor verbal skills represent one of the most important risk factors for delinquent behaviour in adulthood. The fact that this deficit persists over time from childhood through adulthood is probably evidence that language functions play a key role in the development of so-called disruptive behaviour patterns. For example, retrospective analysis often identifies delayed language acquisition in children with ADHD. These children also exhibit many verbal difficulties, including poor comprehension, limited vocabulary and low verbal fluency. Similarly, particularly aggressive children tend to have greater difficulty with both oral expression and written language than their non-aggressive peers. Both of these types of difficulty are also seen in delinquent adolescents and are good predictors of criminal behaviour in adulthood.

Three explanations could account for the functional importance of verbal deficit in the cognitive mechanisms which underlie conduct disorder. The first concerns the regulatory function of language in human behavioural control processes. It is now generally accepted that the steady improvement in self-control that is seen in the course of development is associated with parallel improvement in children's capacities for understanding and verbal expression. The progressive internalisation of language during development—in the form of an "internal dialogue"—allows the child not only to plan and guide his behaviour more effectively but also, and more importantly, to acquire an understanding of what he should do and what he should not do according to aim and context—before the action is executed. Verbal deficits can inhibit the development of the child's or adolescent's ability to formulate symbolic and abstract representations, resulting in a lesser understanding of situations in which social understanding is called for. The idea of "rules" is also integrated into an individual's psychological functioning in the form of mental representations constructed around language-based concepts such as "You can do this but not that". Adequate language development is therefore essential to establishing prosocial behaviour patterns and this necessitates anticipating the consequences of actions and referring to accepted norms of conduct in a given socio-cultural environment.

The second explanation pertains to the capacity of language to express the subject's emotions in an accurate fashion, and also to decode the emotions being expressed by others (i.e. empathy). Verbal deficit can therefore restrict a child's ability to express his own emotional experiences as well as his ability to process and express the emotions felt by those around him. A low level of empathy has been documented in children and adolescents with conduct disorder: any such deficit will compromise the quality of communication and trigger defensive or aggressive reactions in the child.

The third explanation emphasises the high correlation known to exist between verbal skills and academic abilities. Impaired verbal skills are associated with poor academic performance and the subsequent school career of children arriving at kindergarten with poor verbal skills is characterised by difficulty in learning to read and learning disorders in general.

In parallel to poor verbal skills, many empirical observations also suggest that children and adolescents with conduct disorder have impaired executive functions. The idea of executive function covers a whole set of complex, disparate cognitive processes which are necessary for the performance of goal-driven tasks, including concentration, the ability to select and refine a course of action, the inhibition of automatic responses, the monitoring of an action underway, and checking the efficacy of the response in view of the goal envisaged and the context. In accordance with this definition, impaired executive skills in a child or adolescent would compromise his capacities for analysis, for abstract reasoning, for formulating appropriate responses in the context of the relevant demands, and motor control (impulsiveness).

A number of studies have suggested that children and adolescents with conduct disorder exhibit poor executive control, particularly those with a tendency to violent behaviour. The correlation between executive deficit and conduct disorder is stronger if the latter begins at a relatively early stage of development. Executive deficit could also account for the severity of the conduct disorder and its persistence into adulthood. However, many experts minimise the strength of the link between executive dysfunction and conduct disorder since ADHD was not taken into account in most of the relevant studies. Further studies are needed in which executive performance is evaluated in children and adolescents with isolated conduct disorder, conduct disorder plus ADHD, and controls.

These two types of cognitive deficit—verbal and executive—are as common in boys as in girls but, in the opinion of some experts, their impact may not be identical in the two sexes in the course of development, as a result in particular of the modulation of their effects by environmental factors which may be gender-dependent. There are presently however insufficient data for age- and gender-based comparison so it is difficult to draw any conclusions on this point.

In terms of brain anatomy, poor verbal skills in children and adolescents with conduct disorder are probably due to impaired function in the temporal regions of the left hemisphere. Executive deficit is associated with the frontal lobes, and more broadly speaking with fronto-striato-thalamic circuits. However, precise morphological magnetic resonance imaging (MRI) data or functional magnetic resonance imaging (fMRI) data in children and adolescents with conduct disorder are presently lacking. Recording of cerebral activity (e.g. by evoked potential) should also shed light in coming years on the neuro-physiological processes underlying conduct disorder. By way of illustration, some interesting experimental results have shown a significant reduction in the amplitude of P300 waves in adolescents with conduct disorder. The degree of attenuation is closely related to the severity of the disorder and appears to be more specifically related to cases in which conduct disorder is associated with rule violation. Before the age of 16, this electrophysiological abnormality is focused in the posterior regions of the cerebral cortex but later shifts to the anterior regions. It is observed in both affected boys and girls and might possibly reflect delayed maturation of the frontal regions responsible for executive functions, as opposed to a frank defect. Although such perturbation of the P300 wave is not specific to conduct disorder (being also observed in ADHD and schizophrenia), it supports the idea that neurodevelopmental factors are involved in the pathogenesis of the condition in children and adolescents.

A diagnosis of conduct disorder requires rigorous multimodal evaluation

Before a child or adolescent can be diagnosed with conduct disorder, the diverse nature of the symptoms and the frequency of inter-current problems require that a multimodal investigation be undertaken by a multidisciplinary team based on diverse sources of information, and taking into account the history of the family and its functioning.

Categorical and dimensional measures have been developed in English to review the patient's history, and to identify and grade the clinical manifestations of conduct disorder. The value and relevance of these instruments—be it a standardised interview, a behavioural scale or a questionnaire to be completed by the patient—varies according to their psychometric validity and how ease of use in daily practice. Most of the scales designed to evaluate behaviour or aggression are available in versions for both parents and teachers. Diverse instruments should be used in parallel in order to ensure as global an overview of the symptoms as possible.

Results should be interpreted in the light not only of the symptoms of the child or adolescent with suspected conduct disorder, but also of the parents' tendency to minimise the gravity of the problem. It is thus important to compare the information given by the child and his/her parents with information from other sources such as teachers or peers. In the same way, it is important to take into account the child's level of cognitive development when he is asked to evaluate his own behaviour (especially his verbal understanding which will affect his perception of the problem as well as how he expresses his experiences). In addition, given the variability over time of behavioural manifestations in developing children, it is important to perform regular assessments in a child at risk of conduct disorder, e.g. one who is

exhibiting high levels of physically aggressive activity and/or showing the symptoms of ADHD.

Instruments used to evaluate conduct disorder

	Abbreviation	Author	Age (years)
Broad-spectrum interviews	K-SADS	Orvaschel et al., 1982	6-16
	ISC	Kovacs, 1985	8-13
	DISC-IV	Shaffer et al., 2000	6-17
Behaviour scales	CBCL	Achenbach, 1983	4-16
	CTRS	Conners, 1969	3-17
	CPRS	Conners, 1982	3-17
	ECBI	Robinson et al., 1980	2-12
	HSQ/SSQ	Barkley, 1997	4-11
	SESBI-R	Eyberg et al., 1999	2-16
	Aggression scales	OAS	Yudofsky et al., 1986
BDHI		Boone and Flint, 1988	12-17
DIAS		Björkqvist et al., 1992	8-15
CSBS/CSBT		Crick and Grotpeter, 1995; Crick, 1996	8-11

K-SADS: Kiddie Schedule for Affective Disorders and Schizophrenia expanded; ISC: Interview Schedule for Children; DISC-IV: NIMH Diagnostic Interview Schedule for Children - version 4; CBCL: Child Behaviour Checklist; CTRS: Conners Teacher Rating Scale; CPRS: Conners Parent Rating Scale; ECBI: Eyberg Child Behaviour Inventory; HSQ/SSQ: Home and School Situations Questionnaires; SESBI-R: Sutter-Eyberg Student Behaviour Inventory-revised; OAS: Overt Aggression Scale; BDHI: Buss-Durkee Hostility Inventory; DIAS: Direct and Indirect Aggression Scale; CSBS/CSBT: Children's Social Behaviour Scale / Children's Social Behaviour Scale for Teacher

Most of these instruments have yet to be translated into French and validated in populations of French-speaking children and adolescents – a task requiring a significant amount of work.

Preventive measures will depend on vulnerability factors

A distinction may be made between three classes of preventive measure dependent on the degree of vulnerability of the subjects being targeted. "Universal" preventive measures concern the population as a whole or those in the population who present no particular risk of conduct disorder. "Selective" preventive measures target individuals or groups who are at high risk by virtue of environmental, social or family factors: in the case of conduct disorder the targets might be people living in under-privileged urban neighbourhoods, poor children and parents, the children of young, single mothers, children growing up in a conflict-ridden family environment, and the children of alcoholics or drug addicts. "Indicated" preventive measures target individuals or groups with personal risk factors or who are already exhibiting early symptoms of conduct disorder. Indicated prevention programmes may target young people with learning disorders, children manifesting impulsive and/or aggressive behaviour, and children who have already been diagnosed with ADHD or ODD.

There are few specific programmes aimed at conduct disorder. The majority of programmes are designed to combat delinquency, aggressive behaviour or violence in general, and neither DSM-IV nor ICD criteria are ever used in evaluations. The efficacy of programmes is judged on the basis of measurements of aggressive and/or antisocial behaviour patterns

derived from standardised questionnaires and official reports from the judicial system or the police.

Hundreds of programmes designed to combat violence are already in use, especially in Britain and America, although only about twenty have been validated. For a programme to be validated and qualified as evidence-based, certain criteria must be fulfilled: intervention modalities must be based on a reference theory; the intervention programme must be stipulated in a protocol and there should be monitoring of subject adherence to the programme; interventions must be demonstrated to have been effective in an empirical context (a rigorous, quasi-experimental plan, significant positive effects, results duplicated in at least two different sites, available scientific data, etc.).

Validated conduct disorder prevention programmes require special intervention modalities. These modalities can be classified according to the age of the subject (very young children, children and adolescents) and the target (affected subject, parents, teachers or the subject's environment). One or more preventive measures may be planned in a given programme – which is thus classified as either unimodal or multimodal. Such measures are integrated into a preventive programme which might be universal, selective or indicated; although in the prevention of conduct disorder, a distinction is rarely made between the last two; the same programmes targeting both groups.

Measures to prevent conduct disorder and examples of validated programmes targeting young children (0-3 years of age)

Target	Preventive measures	Programme
Parents	Home visits	Elmira Home Visitation
	Parental support: health education, parenting skills counselling, etc.	The Perry Preschool Study
Children	Development of social, cognitive and emotional skills	The Perry Preschool Study / The Preschool Curriculum Comparison Study

Validated preventive measures for small children (0-3 years of age) mainly focus on the parents, and on the children's capacities to control themselves and their own behaviour. This involves home visits and support to the parents in the form of health education and counselling on parenting skills. At crèches and kindergartens the emphasis is on developing social, cognitive and emotional skills. The *Elmira Home Visitation Study* and the *Perry Preschool/Preschool Curriculum Comparison Study* have proven effective in this field. Both are selective/indicated programmes, the first aimed at children up to 2 years of age, and the second focusing on 3-4 year-olds.

Other validated methods are integrated into preventive programmes aimed at children and adolescents between 3 and 16 years of age. Interventions focused on these young people are designed to develop their social, cognitive and emotional skills through such modalities as conflict-resolution, anger-management, emotional understanding, and the fostering of prosocial attitudes and reasoning ability. Most of the validated programmes are based on this type of intervention strategy, whether combined with another type of modality or not. Some of these programmes (*Linking the Interests of Families and Teachers*, *Seattle Social Development Project*, *Montreal Prevention Experiment* and *Fast Track*) include interventions aimed at the parents as well as at their offspring. In most cases, this involves training to help develop emotional control, the establishment of a positive disciplinary routine and improved communication. Training programmes can also be formulated for teachers, and programmes like the *Seattle Social Development Project* and *The Incredible Years Series* are designed to

promote co-operative teaching, proactive management, positive reinforcement and conflict-resolution, amongst other goals.

A few preventive programmes have focused on the environment. Two such methods have been validated, one based on interventions at school (e.g. the *School Transitional Environmental Project* and the *Olweus Bullying Programme*) and the other on a mentoring system (the *Big Brother/Big Sister of America* programme).

Apart from these validated methods, scientific data built up over the last twenty years in this field make it possible to identify the characteristics of successful preventive programmes. Interventions which have been proven to be effective have integrated interactions with experienced counsellors which go well beyond the simple transmission of information. The successful programmes also tend to be long-term and intensive, running for many years with an annual investment of at least 20 hours. Programmes involving different methods and targeting several different factors (the young person, parents, teachers, etc.) have proven particularly effective. The same is true of those which match the intervention method to the target population. The extent of presence on the ground is also crucial: the idea of an "effective programme" only has meaning if it is closely associated with tight control of the intervention processes. Finally, the latest information about the development of aggression and associated factors highlights the importance of the early (post-natal and pre-school) implementation of selective and indicated interventions focusing on promoting the mother's parenting skills.

Measures to prevent conduct disorder and examples of validated programmes targeting children and adolescents (3-16 years of age)

Target	Preventive measures	Programme
Young person	Development of social, cognitive and emotional skills	<i>Second Step</i> : a unimodal, universal programme (4-14 years old) <i>Promoting Alternative Thinking Strategies</i> : a unimodal, universal programme (6-10 years old) <i>Linking the Interests of Families and Teachers</i> : a multimodal, universal programme (6-10 years old) <i>Seattle Social Development Project</i> : a multimodal, universal programme (6-10 years old) <i>The Perry Preschool Study / The Preschool Curriculum Comparison Study</i> : a multimodal, selective programme (3-4 years old) <i>Montreal Preventions Experiment</i> : an indicated programme (7-9 years old) <i>Fast Track</i> : a multimodal indicated programme (6-10 years old)
Parents	Parental training: positive discipline, child anger-management, communication...	<i>Linking the Interests of Families and Teachers</i> : a selective/indicated programme <i>Seattle Social Development Project</i> : a selective/indicated programme <i>Montreal Prevention Experiment</i> : a selective/indicated programme <i>Fast Track</i> : a selective/indicated programme <i>The Incredible Years Series</i> : a multimodal

		universal/selective/indicated programme (2-10 years old)
Teachers	Training: cooperative teaching, conflict-resolution, proactive management, positive reinforcement...	<i>The Incredible Years Series</i> : a universal/selective/indicated programme <i>Seattle Social Development Project</i> : a universal/selective/indicated programme
Environment	Improving the school environment	<i>School Transitional Environment Project</i> : a unimodal universal programme (10-16 years old)
	Mentoring	<i>Olweus Bullying Program</i> : a unimodal universal programme (6-15 years old) <i>Big Brother/Big Sister of America</i>

In conclusion, it seems that at the international level, many different measures have been developed for the assessment of conduct disorder and numerous validated preventive programmes are currently in use. However, the situation in France remains problematic. No results from any French programme designed to prevent either conduct disorder or violence in the broader sense have been published in the scientific literature to date. It might be that interventions are currently underway in France in the framework of the prevention of violent behaviour, but if this is so, they remain isolated, one-off instances, the results of which have not been published. Moreover, such studies are generally not scientifically validated and outcomes are not rigorously evaluated—evaluation in France seems to be confined to descriptive parameters which give no real information about the effects of a given measure or its success.

Psychotherapy incorporates various treatment approaches

The management of conduct disorder should involve different, complementary treatment approaches whenever possible. So-called psychosocial management strategies include interventions focusing on the parents, aimed at the child him- or herself and, in some cases, his/her teachers. The global goals of management can be summarized under four objectives:

- establishing a system to provide back-up and social support for the entire family;
- promoting the child's contacts with "prosocial" peers;
- reducing the child's contacts with "antisocial" peers;
- stepping up support in school and contacts with teachers

The treatment approaches which have been shown to be the most successful in controlled studies in Great Britain and America have been based on providing support for the whole family of the young person with the conduct disorder. The Functional Family Therapy (FFT) programme is supervised by trained, experienced therapists and involves three phases spread out over a dozen sessions over a period of three months, often conducted at home in the most difficult cases. The purpose of the "commitment and motivation" phase is to establish a therapeutic bond with every family member by minimising distancing factors (cultural and/or social). In this phase, availability and respect are essential to fostering confidence and promoting collaboration. The second "parent training" phase aims to modify how family members interact with one another by facilitating communication and working on ways of resolving conflicts. The third "generalisation" phase aims at extending or broadening any positive interactional changes that have occurred in the family to their

relationships with other community systems, including mental health and legal authorities. Taken together, the results show that this programme has significantly reduced the rate of relapse of serious antisocial behaviour patterns in young people with conduct disorder. Even among those with persistent antisocial behaviour, the programme reduces the severity of the acts. Improvement was sustained, with results stable over five years.

Books (e.g. *Living with Children*) and video tape recordings can help to reinforce the parents' daily efforts, and therefore increase confidence and compliance with the programme. Success rates are enhanced if the video aid is used in a discussion group supervised by a therapist. Daily, structured exercises help parents generalise and apply at home the principles and methods that they have learned at the therapeutic unit, relating to positive reinforcement of the child's behaviour, the setting of limits, a non-violent disciplinary approach, the respect of rules, conflict resolution...

Although the programme is aimed at the child, it is designed to foster empathy, anger-management, friendship, communication and positive relationships with the school and teachers. Incorporation of a teacher-centred component into the child-centred intervention enhances the outcome in personal programmes in terms of capacities of adaptation, behaviour and conflict resolution.

Multisystemic therapy (MST) involves a precise evaluation of the overall environment in which the young person lives and grows up (family, school, friends, neighbours and neighbourhood) and his/her interactions with all these systems with the aim of identifying the main factors underlying the problems. The goals of management are to: try to keep the child away from unsuitable friends (who set a poor example); reinforce his/her relationships with conventional institutions such as family or school; enhance the family's ability to monitor the child and enforce discipline; and enhance the adolescent's social and academic skills. The therapists may use various methods, including family therapy and interventions at school as well as cognitive and/or behavioural techniques. The programme is conducted by a team of three or four trained therapists who are closely supervised and are available to intervene around the clock seven days a week. The programme lasts three to five months on average, representing a total of about sixty hours of intervention time, mostly with the young person and the family but including the social network. It is crucial that a collaborative relationship be established between parents and teachers. Multisystemic therapy has been shown in controlled studies to be effective in the long-term at reducing criminal activity, violent acts, arrests for substance abuse, assignments to special centres and the incarceration of subjects with conduct disorder. Relapse is also substantially reduced.

Special schools and centres, often located in out-of-the-way places, have been used for decades as a social, "therapeutic" response for young delinquents and aggressive adolescents. Apart from the high cost of this type of strategy (which requires a high ratio of supervisory and security personnel), far from attenuating behavioural problems, bringing troubled young people together seems to broaden the "misfit's" repertoire of aggressive behaviour patterns. Disappointing outcomes led to a switch towards foster care programmes for young people with conduct disorder. Foster care treatment programmes use methods based on parental guidance, both for the biological family and the foster family. Such programmes are run by therapists and a full-time experienced supervisor. The supervisor contacts the foster family every day to review the subject's behaviour that day and, if necessary, adjust the treatment regimen. A set of procedures aims at improving the subject's behaviour in a sustained way. The foster families are also taught how to work together with the programme personnel and with the school. Whenever possible, they are asked to participate in family therapy sessions together with the biological (or adoptive) family because the ultimate goal is for the child to go back to his/her own home. Outcomes have been far better with this sort

of programme than with placement in a special centre, with better compliance on the part of the troubled young people who run away less often and more often complete the treatment programme. Over the follow-up period, fewer days of incarceration are recorded, and the rate of relapse is reduced. As for other treatment models, changes in the way the family manages the child's behaviour (following parental training) and distancing the subject from "misfit" peers seem to be the key determinants of general improvement.

Finally, the purpose of individually focused interventions is to enhance the child's social skills, i.e. his sociability. Working in collaboration with a therapist, the child learns conflict resolution strategies through role playing and situational scenarios. In a more general way, cognitive/behavioural interventions focusing on the child have a slight-to-moderate effect on aggressive and antisocial behaviour patterns, particularly in children over 10. It seems that combining this type of treatment (which has proven successful in other problems like hyperactivity) with a parental training component helps normalise the child's behaviour in a sustainable way.

Drugs can be useful as second line strategies

Drugs may have a place in a global, priority-ranked, multimodal treatment strategy. They are usually prescribed following the failure of other strategies—apart from emergency situations (e.g. violence or aggression against others or self).

No specific drugs exist for conduct disorder but certain drugs can moderate aggressive behaviour. Various pharmacological classes have been tested in this context, often on the basis of knowledge about the neurobiology of impulsiveness and aggression, both of which are known to involve dopamine, serotonin and GABA pathways (among others). Most of the information on efficacy and safety was first established in adults, in most cases in the context of problems other than conduct disorder. As is the case for psychopharmacology in children and adolescents in general, there is little specific data from controlled studies in this age group. A review of the last twenty years of publications yields about thirty relevant articles, but only ten describing studies based on rigorous methodology (with at least 500 subjects of between 6 and 18). Fewer than ten studies report any efficacy with regard to conduct disorder.

Three major classes of drugs have been evaluated, namely antipsychotic drugs, central nervous system stimulants and thymoregulatory drugs.

Although antipsychotic drugs are in widespread use for aggressive behaviour, only four controlled studies have been carried out focusing on conduct disorder, two with neuroleptics (haloperidol and molindone) and two with new-generation drugs (risperidone and olanzapine). The last two have a promising pharmacological profile in that they inhibit both serotonin and dopamine receptors; both systems being closely associated with aggressive behaviour. They are also better tolerated than the classic neuroleptics, especially with respect to neurological side effects such as tardive dyskinesia. All reports indicate efficacy against aggressive behaviour which is supported by the results of open studies and case histories. Classic side effects are observed; notably weight gain, drowsiness and dystonia. Numerous medium-term studies conducted with risperidone for other indications (such as invasive developmental problems) indicate broadly satisfactory tolerance. In contrast to lithium and anticonvulsive drugs, antipsychotic drugs act immediately on the dimensions of aggression and agitation, and are particularly useful in acute or emergency situations.

Unlike the antipsychotic drugs, central nervous system stimulants promote executive cognitive functions. They attenuate impulsiveness by inducing inhibition mechanisms and

enhancing self-control. They mainly act by stimulating dopamine-based transmission in the brain but also have some stimulatory activity in noradrenaline and serotonin pathways. They are prescribed to treat ADHD which is known to be the most common co-morbidity of conduct disorder. Therapeutic trials (seven controlled studies) have been conducted to evaluate the efficacy of methylphenidate against conduct disorder (with inter-current ADHD in six of the seven studies). Methylphenidate was found to have some degree of efficacy against aggression in moderately severe conduct disorder and the treatment proved quite safe (with side effects confined to negative effects on appetite and sleep).

Seven controlled trials conducted to evaluate the efficacy of thymoregulatory drugs, notably lithium, have yielded mixed results in that in three cases no efficacy was detected. Data on safety were more consistent with a high incidence of adverse reactions (weight gain, acne, gastrointestinal upset and polyuria), some of them serious (kidney failure and hypothyroidism). Such reactions entailed compliance problems in a population which is in any case resistant to restrictions. This was compounded by the fact that lithium's low therapeutic index means that regular blood testing is necessary to monitor the concentration of the drug in the blood throughout the course of treatment. Nevertheless, lithium is a preferred drug in conduct disorder associated with bipolar disease.

Other thymoregulatory drugs belonging to the anticonvulsive class have also been evaluated. Recently, very promising outcomes were obtained in two controlled studies of sodium valproate. Regular blood testing is required with this drug as well but not so often as lithium because of its higher therapeutic index. As with lithium, this drug is indicated in subjects with inter-current bipolar disease or who experience mood swings.

Because the serotonin system is known to be intimately involved in the pathogenesis of aggression and impulsiveness, trials have been carried out to investigate the efficacy of selective serotonin reuptake inhibitors (SSRIs) and non-selective serotonin receptor stimulants like buspirone. Only two clinical trials have been conducted in children and adolescents but both these reported efficacy against aggression: an open study of trazodone which addressed several symptoms of conduct disorder; and a study of citalopram in aggressive children and adolescents with conduct disorder. Side effects were moderate: mainly headache, drowsiness and nightmares.

Anecdotally, small, uncontrolled trials have been reported on alpha 2-adrenergic receptor stimulants (clonidine), beta-adrenergic inhibitors, benzodiazepines and opioid inhibitors such as naltrexone. Clonidine gave promising results in an open, pilot study, with reduced aggression correlating with decreased GABA levels in the blood following treatment.

In confirmed case of conduct disorder, the treatment strategy should be formalised and matched to the subject, based on an accurate evaluation of the disorder itself as well as any inter-current problems.

Animal models can be of use in investigating behaviour patterns associated with conduct disorder

Of all the types of behaviour that interest ethologists and behavioural scientists, it is aggression that has generated the greatest number of publications – which is to be expected since this type of behaviour represents one of the key factors driving evolution and the establishment of territory. However, in the laboratory, choices have to be made about which parameters are to be studied since the experimenter must simplify the model in order to be able to make meaningful measurements reflecting the influence of any given factor.

Studies of agonistic conduct patterns in animals have revealed numerous behavioural correlations which are helping us to understand human conduct disorder, especially in the context of motor hyperactivity, attention-deficit and anxiety, all questions which have been studied in depth in laboratory animals.

Ethologists, and more recently biologists and geneticists, have traditionally divided agonistic conduct patterns into two broad classes, making a distinction between "defensive" aggression in response to attack, and "offensive" aggression which is typical of the interactions between males of a species. The latter includes predatory aggression in which the victim is killed and eaten, not necessarily for reasons of pure hunger. Other types of aggression exist, e.g. prepubertal playful aggression and the aggression of the breast-feeding mother—the purpose of which is to protect her offspring against male aggression. These various forms of aggressive conduct which are easily differentiated by specific associated behaviour patterns, have been carefully characterised and described.

Investigation of exogenous etiologic factors which lead to aggressive conduct in laboratory animals—both prenatal and postnatal factors—has focused on the paradigm of stress. Physical or social stress can be used to modulate an animal's reactions. It is important to highlight the importance of the temporal dimension in the effects of stress on agonistic conduct: the literature shows that chronically stressed animals are more aggressive than controls whereas animals who experience a single, highly stressful event tend to become more passive. The fact that the consequences of stress differ according to whether it is acute or chronic provides reference points when it comes to dissecting the pathogenic mechanisms underlying conduct disorder, notably with respect to the temporal dimensions—duration, repetition—of relevant life events.

The duration and the intensity of stress also seem to be important parameters in the pathogenesis of motor hyperactivity, attention-deficit and impaired behavioural inhibition which all commonly co-occur with conduct disorder in humans.

In rodents, three to eight weeks of chronic exposure to repeated, unpredictable, moderately intense stressors stimulates activity and exploratory behaviour. In contrast, exposure to varied, unpredictable stressors of much greater intensity leads to reduced physical activity. Acute exposure to a severe stressor over a much shorter time frame increases locomotion without any effect on exploratory behaviour, but if this type of stress is sustained for a longer period, the rats' global level of locomotor activity drops within 24 hours.

There appears therefore to be a link between stress and motor activity. Depending on the intensity of the stressor, the victim's motor activity either increases or decreases. The effect of chronic stress seems to have a converse and more complex effect, pushing the victim towards the "impulsive" end of the "psychomotor" dimension; this is compatible with the idea of a drop in cerebral serotonin levels.

Unawareness of the environment entails indifference to danger. This is clearly observed in chronically stressed animals exposed to high-risk situations (e.g. being placed on an unstable surface where there is a risk of falling off). This type of behaviour associated with "unawareness of the danger" is typical of impaired inhibition mechanisms and it resembles in some ways the effects of certain anxiolytic drugs. In the same way, in stressed animals performing free exploratory tasks, hyperactivity manifests as impaired habituation, in other words as a failure to ignore irrelevant information from the environment. Thus, relatively mild but chronic stress (modelling chronically stressful life events) has a major effect on selective attention and leads to serious impairment of behavioural inhibition mechanisms. The enhanced psychomotor reactivity of these animals can be addressed—as in the hyperactive child—from the perspective of attention-related processes and their consequences on inhibitory mechanisms.

Moreover, the aggressive responses to such environmental effects (i.e. stress) depend on the state of the subject (age, endocrine parameters, etc.). Experiments in which animals are confronted with a violent environment (e.g. living with aggressive peers) at different ages reveal the existence of a relatively short sensitive period around puberty during which exposure to violence can lead to vulnerability. Living with violent subjects around the age of puberty leads to the transformation of perfectly well-characterised, playful-type aggression into adult-type aggression which is itself perfectly well-characterised. The same is true for social isolation which seems to have opposite effects according to whether it occurs before this critical period (in which case aggression is exacerbated) or after (in which case passivity is increased).

Comparison of the findings on aggression in small laboratory animals and epidemiological and neurobiological data on conduct disorder in children and adolescents, underlines the inverse relationship between anxiety and aggressive behaviour. Psychobiological correlations with aggressive behaviour together with the results obtained in rats and mice are providing explanations which are of great heuristic value because they make it possible to isolate the effects of two variables which are fundamental to aggression, namely fear (which is difficult to address in human experiments) and anxiety. The fact that these two variables can be separated in animals has shown aggression and anxiety to be independent of one another (as are aggression and the effects of anxiolytic drugs) whereas aggression and fear are directly related, the latter being independent of anxious reactions. This line of research may lead to new pharmacological options for the treatment of conduct disorder.

Research in biology, neurobiology and brain imaging is enhancing our understanding of conduct disorder

In biology, the study of aggression and violence is a relatively recent endeavour currently indicating parameters which might be relevant to conduct disorder.

Abnormally low cholesterol levels have been observed in the blood of men who have committed violent acts and in people who have attempted suicide by violent means. A possible causal relationship between low blood cholesterol levels and aggressive or violent behaviour is suggested by the fact that monkeys on a low-cholesterol diet tend to be more aggressive. Moreover, people taking cholesterol-lowering drugs (statins) have reported episodes of severe irritability, aggression and even impulses to torture and murder. However, other studies have failed to confirm these results showing that the relationship between blood cholesterol and aggressive or violent behaviour is a complex one, probably under the control of many as yet undefined factors which vary substantially from one individual to another.

Episodes of behavioural perturbation associated with low levels of blood cholesterol could result from changes induced in neurotransmission in serotonin, dopamine and GABA circuits in the brain, although solid data are scarce.

It is generally accepted that peripheral sympathetic hypoactivity could be associated with social indifference, low emotional reactivity (e.g. in response to punishment), attention-deficit and impulsiveness. Children and adolescents of 6-16 years of age with conduct disorder have been shown to have abnormally low levels of dopamine beta-hydroxylase activity in their blood. This enzyme is released along with noradrenaline in response to sympathetic stimulation. Consistent with this finding, the average heart rate (which is under the direct control of the sympathetic system) in young boys (11-12) with conduct disorder and aggressive/impulsive behaviour patterns has been shown to be lower than in their non-

aggressive peers. However, this relationship between heart rate and antisocial or aggressive behaviour seems to disappear in the course of development and is no longer observed in adulthood.

Other observations consistent with those concerning the sympathetic system suggest that conduct disorder could be related to hypoactivity in stress systems, probably in relation to the emotional deficit and social indifference observed in affected subjects. On the basis of results reported in animals, there could also be a causal relationship between low blood cortisol levels and conduct disorder.

On the other hand, early studies pointed out the existence of a positive link between elevated blood testosterone levels and aggressive or violent behaviour but no systematic trend has really been observed. It might be that this profile may be relevant in a sub-population of subjects, but no such group has yet been characterised in terms of genetics, temperament or biological characteristics.

According to extensive work in the field of clinical biology, an important factor in conduct disorder and the commission of violent acts could be serotonin (5-hydroxytryptamine or 5-HT), the levels of which are determined by fluctuations of its precursor tryptophan at the periphery. As a general rule, a reduction in the concentration of this essential amino acid (which is exclusively derived from food in humans and rodents) exacerbates aggressive behaviour; inversely, an increase in tryptophan intake can moderate aggressive conduct. However, such effects remain relatively modest and are not systematically reproducible.

It has been established however that specific biological patterns are related to certain neurobiological patterns, notably affecting neurotransmitter systems in the central nervous system.

Findings from this type of research have been compared with data on how neuroactive and psychotropic substances work to attenuate this type of behaviour, especially neuroleptic drugs, antidepressants and anxiolytics. Consideration of the molecular targets of various classes of drug have led to the conclusion that serotonin, the catecholamines (especially dopamine) and GABA are involved in impulsiveness, aggression and possibly the other traits of antisocial personality disorder. Studies performed in humans (including school children) and laboratory animals tend to confirm this conclusion. However, other neuroactive compounds—in particular neuropeptides like substance P, arginine-vasopressin and corticotropin releasing hormone (CRH)—also play important roles in the neurobiological mechanisms which underlie behaviour, including impulsive behaviour and aggression.

In parallel, the development of relevant animal models, especially in rodents (rats and mice—including genetically modified lineages) but also in primates, has refined our understanding of how the various neuromediators (e.g. neurotransmitters such as the monoamines and neuropeptides) might be involved in regulating the expression of impulsive and aggressive behaviour, and violent manifestations. Impulsiveness and aggression have been observed to be exacerbated in mice in which the 5-HT_{1B} serotonin receptor has been knocked out. This has triggered a search for agonists of this receptor which might attenuate such behaviour patterns. Effective agonists have been generated (called "serenics") but prolonged administration of these candidate drugs leads to tolerance and reduced responsiveness so no clinically useful psychoactive compounds have as yet been identified.

Finally, recent advances in brain imaging techniques are paving the way towards a new era in research into neurobiological mechanisms through identification of the key neural circuits involved, including those associated with impulsive, aggressive and violent behaviour.

Limbic structures (the hippocampus, the hypothalamus, the septum, the amygdala and the bed nucleus of the stria terminalis) and the anterior cingulate and orbito-frontal areas of the pre-frontal cortex have been pinpointed as being the parts of the brain in which activities are altered in association with impulsive, aggressive and violent manifestations. In consequence, it is now known that limbic structures play a key role in controlling emotions and self-control mechanisms whereas motivation and passage to violent action is associated with activation of the anterior cingulate and orbito-frontal areas of the pre-frontal cortex. In patients, these are the very areas in which changes are observed in the activity of neural networks implicating monoamines and other neuropeptides – which clearly play a central role in the expression and regulation of these types of behaviour. The deficit in serotonin which has been associated with impulsiveness and aggression might well affect the anterior cingulate and orbito-frontal areas of the pre-frontal cortex where certain serotonin receptors are known to be particularly dense. This deficit could result in a decrease in the cortical efferent capacity to inhibit the sub-cortical structures that are responsible for aggression and passage to violent action. Consolidation of serotonin-based regulatory systems in particular, and monoamine-based systems in general, through diverse environmental and/or pharmacological interventions could therefore correct a functional deficit in the frontal cortex. At this time, the most likely hypothesis is that this functional deficit appears in childhood or adolescence. It is known that the prefrontal cortex is the last part of the brain to be differentiated in humans with definitive connections only ultimately becoming established by the end of adolescence, under the control of multiple genetic and environmental influences. Childhood and adolescence are therefore critical periods in the construction of personality via the progressive maturation of different neurotransmitter systems, especially in this particular part of the brain. In other words, conduct disorder could be related, at least in part, to impaired development of the cortico-sub-cortical circuits involved in the control of impulsiveness, aggression and social interactions. It is reasonable to believe that progress in functional brain imaging techniques – coupled with the elucidation of the mechanisms of action of those neurobiologically active and psychotropic agents which are known to have some degree of efficacy in the treatment of conduct disorder, ADHD or ODD – will help advance our understanding of the etiology of these conditions and may open the way towards new therapeutic options.

Recommendations

Progress in the fields of clinical medicine, cognitive science, neuroanatomy, biology and genetics of conduct disorder and identification of common co-occurring conditions is making it possible to propose new ways of detecting, diagnosing, managing and preventing this disorder. However questions remain, requiring further research on the interaction between personal and environmental risk factors if we are to improve management and prevention.

Conduct disorder, oppositional defiant disorder (ODD) and attention-deficit/hyperactivity disorder (ADHD) in children are brought together under the term "disruptive behaviour" in the two main international classification systems (DSM and ICD). The question of the distinction between ODD and conduct disorder remains controversial since the two systems deal with it in different ways. Although most children with conduct disorder also exhibit ODD, by no means will all children with ODD develop conduct disorder. Most of the longitudinal studies indicate that ODD precedes conduct disorder raising the question as to whether they represent variants of the same latent problem, one of which tends to develop before the other?

It is also important to make a distinction between antisocial behaviour which is persistent and that which is confined to adolescence. The first is characterised by early-onset and associations with hyperactivity and cognitive deficit. Family-related factors include antisocial behaviour in the parents and general familial dysfunction, with peer influence being particularly important. The question of whether these two forms are fundamentally different or whether they merely represent differential expression of the same underlying vulnerability remains unresolved. The antisocial behaviour which accompanies hyperactivity appears to have a greater genetic component and is predominant in boys. Do co-occurring ADHD and antisocial behaviour define a special type of disruptive behaviour? Alternatively, does the occurrence of ADHD predispose to the development of antisocial behaviour? Few studies have attempted to probe this relationship via a longitudinal design starting in early childhood – even though the understanding of the mechanisms underlying this co-morbidity have important therapeutic implications.

It is the accumulation of a number of negative experiences which seems to lead to the development and persistence of conduct disorder, as well as determining its severity. It is now recognised that personal factors (genetic, temperamental, personality-related) can make an individual more vulnerable to environmental stress. A priority therefore is to study how genes interact with the environment. The ultimate causal mechanism could involve dynamic interactions between a set of multiple and highly disparate factors.

Although the multiplicity of casual factors makes conduct disorder difficult to treat, nonetheless successful intervention strategies have been developed. These tend to focus on parental guidance, help with cognitive deficits (including training in conflict resolution) and therapeutic approaches which take into account a wide range of environmental parameters. However, marked personal differences have emerged in responses to different intervention strategies: it is important to understand the reasons for this in order to best to define those components of the programmes most likely to lead to success. To compensate for these difficulties, most programmes involve a variety of different types of intervention.

Training and Information

RAISE THE AWARENESS OF FAMILIES, TEACHERS AND THE GENERAL PUBLIC ABOUT THE EARLY SYMPTOMS OF CONDUCT DISORDER

Contrary to general belief, conduct disorder does not necessarily only develop in adolescence. Two-thirds of adolescents, mostly boys, with conduct disorder already manifested the problem in childhood. ODD and ADHD are often associated with conduct disorder persisting into adulthood as antisocial personality disorder. Conduct disorder can manifest itself in various symptoms which can be divided into four groups: aggression towards people or animals; destruction of property without aggression; deceitfulness or theft; and serious violations of established rules. In the course of development, these symptoms may be expressed in the home, at school or elsewhere, in an age-dependent pattern. In order to distinguish them from normal childhood behaviour, symptoms such as physical aggression, lying and theft (which are relatively common in all small children) are only considered "pathological" if they are very frequent and persist beyond the age of 4. By adolescence, such acts tend to have more serious consequences.

The group of experts recommends that the general public be provided with fuller information about the various symptoms of conduct disorder at different ages. Validated information about symptoms and risk factors could be disseminated via an institutional Web site and made available at special centres. This information system should help detect at-risk children and promote early management.

Truancy, rudeness at school and academic failure are all associated with conduct disorder. The group of experts recommends raising the awareness of teachers about the various behavioural manifestations of conduct disorder, and encouraging them to collaborate with professional health care providers on early intervention in children and adolescents.

Many studies have pointed to a significant link between exposure to media violence and aggressive behaviour in young people. The group of experts emphasises the importance of providing information to families about the potentially adverse consequences of watching violent television or playing violent video games, especially for children who are already behaving aggressively or who are naturally attracted by this type of activity.

TRAIN PHYSICIANS AND OTHER HEALTH CARE PROFESSIONALS TO RECOGNISE CONDUCT DISORDER

Conduct disorder is classified as a mental disorder in the ICD-10, DSM-IV and French classification systems on the basis of several overlapping criteria.

The group of experts recommends that professional health care providers be made aware of these various criteria in their initial training as well as in ongoing education programmes. Staff members employed in the Mother and Child Protection system (*Protection maternelle et infantile*, PMI) and at medical psychology units, medico-psycho-educational centres and educational aid units as well as school doctors ought to be given special training to enable them to recognise the symptoms of conduct disorder. They should also be made aware of the negative effects of parental psychological problems on their children's development and onset of conduct disorder.

RAISE AWARENESS IN THE JUDICIAL SYSTEM ABOUT THE RISKS AND CONSEQUENCES OF CONDUCT DISORDER

In the course of its development, conduct disorder may be expressed in the form of acts of delinquency which end with the child or adolescent appearing before the courts. The group of experts recommends promoting exchange between health care providers and the judges and officers in young offenders' and family courts with a view to fostering better awareness of conduct disorder and its characteristics.

The family environment may, in certain circumstances, constitute a risk to the child, e.g. in the event of a parent with antisocial personality disorder or severe problems related to substance abuse, or siblings with antisocial behaviour patterns. Evaluation at a paediatric psychiatry clinic or medico-psycho-educational centre might help the judge make decisions as to whether intervention in the relationship between a young child and his/her parents should be envisaged in the interest of the child.

ESTABLISH STRUCTURES WHERE CHILDREN, ADOLESCENTS AND THEIR PARENTS MAY RECEIVE ADVICE AND INFORMATION

The behavioural problems associated with conduct disorder are highly diverse, encompassing aggression, impulsiveness, hyperactivity, theft and deceitfulness. Adolescents, children and their parents may have questions about the meaning of such behaviour patterns. The group of experts recommends the creation, on a nation-wide basis, of special centres where parents and their children can seek advice and be referred if necessary to a specific institution. Consultations should be free and not require an appointment. "Adolescent Units" should be encouraged to provide adolescents with advice on addiction, relationship problems and difficulties at school. These centres should also be able to counsel parents who are looking for ways of helping an adolescent with problems.

Screening

IMPROVE SCREENING

Health examinations are organised in France from pregnancy through adolescence with regular paediatric visits programmed on Day 8, Month 9, Year 2 and between 5 and 6 years of age. Advantage should be taken of these examinations for the monitoring of typical signs of conduct disorder and risk factors (both familial and environmental) at the earliest stage possible, including pregnancy.

The group of experts recommends using health visits with their systematic paediatric monitoring from young childhood through adolescence to improve the efficiency of screening of both conduct disorder and its risk factors and simultaneously correct any previous incorrect labelling of normal behaviour as pathological. It recommends a visit at 3 years of age, an age at which difficult temperament, hyperactivity and the first symptoms of conduct disorder may well be detectable. Early screening might make it possible to organise preventive interventions.

The group of experts recommends introducing certain age-appropriate items into the parameters recorded in a child's Health Records in order to identify signs that may indicate nascent conduct disorder. These items might cover symptoms, such as physical aggression

(fighting, attacking, hitting, biting or kicking), oppositional behaviour (disobedience, lack of remorse or failure to modify conduct), and hyperactivity (inability to stay put or wait for his turn, constant fidgeting). Clinical notes should also provide clear guidelines to the health professional for differentiating normal and abnormal behaviours. These observations should provide information but are in themselves insufficient for a formal diagnosis of conduct disorder.

The group of experts draws the attention of teachers to the risks associated with the persistence of aggressive behaviour in a child of over 3-4 years of age, coupled with frequent temper tantrums throughout infancy and language difficulties. Awareness of the potential beneficial effects of early intervention on the part of kindergarten staff and educators (in the broadest sense) should increase their sensitivity to at-risk behaviours at an early age.

Concertation between school doctors and teachers could provide a more comprehensive profile of every child's developmental track. The resultant information could be used to orient children at risk towards the most appropriate form of intervention for their case.

The group of experts recommends encouraging health care providers and teachers to use simple questionnaires designed to detect conduct disorder at the various different stages of a young person's development through childhood and adolescence. These questionnaires would address risk factors in various dimensions, from the emotional (difficult temperament, lack of empathy) through behavioural (hyperactivity, impulsiveness and aggression) to cognitive (impaired language skills and learning disorders).

ESTABLISH A SYSTEM TO SCREEN AND MONITOR CHILDREN AT RISK AS OF CONCEPTION

In the prenatal period, certain factors have been empirically linked with the likelihood of the child subsequently developing conduct disorder, notably a family history of conduct disorder, criminal activity in the family, a very young mother, and substance abuse during pregnancy. The group of experts recommends incorporating special monitoring procedures into the routine perinatal surveillance system for families with any of these risk factors. A system of meetings at the maternity service could be organised between the various people concerned in prevention with a view to addressing the question of intervention in collaboration with the child's family.

The group of experts recommends encouraging and promoting relationships between parents and premature children during the post-natal care period, and developing "Follow-up Units" near the maternity service.

In order to try to minimise the risk of future problems in children born to high-risk families, the group of experts recommends the establishment of a monitoring system involving PMI services, school doctors and teachers.

In families in which there are serious psychological problems, the group recommends rigorous evaluation of the parents' capacities to look after their children's development, and regular monitoring of children being cared for by the social services (*Aide Sociale à l'Enfance*, ASE).

ESTABLISH A SYSTEM TO SCREEN AND PROVIDE SUPPORT FOR ADOLESCENTS AT HIGH RISK OR WHO ALREADY SHOW SIGNS OF NASCENT CONDUCT DISORDER

Conduct disorder is particularly prevalent in delinquents, both boys and girls. In prison, adolescent-onset conduct disorder seems to have more serious repercussions in girls than in boys.

Other problems are often associated with conduct disorder, notably ADHD, depression, anxiety and, most commonly, heavy drinking and drug taking. Conduct disorder is predictive of early cannabis smoking, especially in girls.

The group of experts recommends that adolescents who are showing signs of nascent conduct disorder should be referred to services specialising in the diagnosis of this problem, and in the identification of associated conditions. It recommends psychological and psychiatric monitoring of adolescents in penal institutions, and psychological evaluation and monitoring for all adolescents who have attempted suicide.

Diagnosing and treating conduct disorder

RIGOROUS CLINICAL EVALUATION IS ESSENTIAL FOR DIAGNOSIS

The diagnostic criteria of the international classification systems characterise conduct disorder as a specific mental disorder associated with variable symptoms, namely aggression, oppositional behaviour, deceitfulness and crime. Clinical evaluation of the disorder should cover its severity and the impact on personal (physical and psychological), social and academic functioning.

Associated problems should also be evaluated, whether closely related (ADHD and ODD) or co-morbid psychiatric disorder (bipolar disorder, depression, anxiety and substance abuse).

To help with the diagnostic process, several special instruments have been developed. These are either based on categories or dimensions. Most behavioural scales have been developed for versions use with the child, teachers and parents. The young person's tendencies to conduct disorder and also any tendency on the part of the parents to minimise the importance or severity of the problem should be taken into account in the interpretation of the results. Information from these sources should be compared with information from the child's teachers and peers. In addition, when a child is asked to assess his own problems, it is important to take his verbal skills into account because these will affect not only his ability to express his experiences but also his perception of the situation.

The group of experts recommends carrying out a rigorous clinical evaluation in a child or adolescent suspected of having conduct disorder, based on a variety of validated diagnostic and evaluation instruments coupled with information from different sources, including the subject himself, parents and teachers. It recommends regular evaluation, preferably carried out by a multidisciplinary team (given the variability of behavioural types manifested in the course of development). The treatment strategy should be based on the details of diagnosis and the specific symptoms identified.

MATCH TREATMENT TO SEVERITY

The first stage in the treatment of conduct disorder involves psychological and social interventions focusing on the child, the parents or the teachers. Child-centred interventions are intended to promote empathy, improve anger and impulse management, foster the ability to establish relationships with other people (especially peers) and enhance

communication skills. The most effective treatment strategies include the whole family. These entail a commitment and motivation phase followed by parent training and finally a generalisation phase aimed at extending any positive changes obtained within the family to other community-based systems. Successful programmes usually address the adolescent's whole living environment. The group of experts recommends using treatment strategies which have been demonstrated to be effective, such as personal or group therapy for the child, and personal or collective parent training. By teaching appropriate attitudes, parental guidance programmes can attenuate the symptoms of conduct disorder. Working in collaboration with educational authorities and teachers is also highly recommended.

Cutting down contact with "misfit" peers is an important component in therapeutic interventions in young people with conduct disorder. Assignment to a "special rehabilitation unit" does not seem to be of benefit since it appears to add to the child's repertoire of aggressive behaviour patterns. Foster care in a trained family with an appropriate psychoeducational support network may also be beneficial.

Pharmacological treatment may have a place in a global care strategy but usually represents a second-line option. There are no curative or specific pharmacological agents for conduct disorder, treatment being essentially symptomatic. Three major therapeutic classes of drug have been evaluated, namely antipsychotic drugs, central nervous system stimulants and thymoregulatory drugs, all of which have been shown to mitigate aggressive behaviour. The advantage of the antipsychotic drugs is that they are fast-acting. Central nervous stimulants reduce impulsiveness to promote better behavioural control and thymoregulatory drugs are indicated in subjects with inter-current bipolar disorder.

The group of experts recommends subject-matched pharmacological treatment strategies based on a detailed evaluation of the conduct disorder and any associated problems.

Prevention

USE VALIDATED PROGRAMMES AND METHODS

Few preventive programmes specifically address conduct disorder, most having been developed to prevent delinquency, aggressive behaviour or violence in general. About twenty programmes have been validated in Britain and America, with intervention strategies based on recognised theoretical principles and described in detailed protocols. Their efficacy at reducing the incidence of violence has been demonstrated. Some programmes target very young children, and others older children or adolescents. They may focus on parents, the young people themselves or teachers, combining different methodologies. The population as a whole may be targeted (universal programmes) without any risk factor being identified, or it may be aimed at groups with familial, social or environmental risk factors (selective programmes), or alternatively those who are already showing evidence of nascent conduct disorder (indicated programmes).

The group of experts recommends consolidating experience to date in the prevention of aggressive, antisocial or delinquent behaviour acquired in France, and complementing it with validated preventive methods which have been developed elsewhere. In the light of pilot trials, interventions should be generalised to existing educational institutions (PMI, crèches, schools, etc.) by providing training on these preventive modalities for staff members (kindergarten workers, teachers, social workers, etc.).

ENCOURAGE THE DEVELOPMENT OF CHILDHOOD VIOLENCE PREVENTION PROGRAMMES

In the first years of life, most children learn behaviour patterns to preclude aggression—forms of behaviour that are a characteristic of normal young childhood. However, violent behaviour is perpetuated in some children, often in association with risk factors (personal, familial, environmental, etc.) which are now fairly well defined. The most recent data suggest that the behaviour patterns that characterise conduct disorder become established very early in development. From the methods and programmes which have already been validated, it is important to choose those which are compatible with the scientific data relating to the aetiology of aggression and which address the factors associated with violent behaviour.

The group of experts recommends implementation of programmes designed to prevent violence as early as possible in the developmental process. Consideration of the literature indicates that it is the perinatal and pre-school period that seems to be most propitious for interventions to prevent conduct disorder and violence in the broader sense.

Interventions centred on small children (0-3 years of age) such as home visits, parental support and parental training programmes which aim to improve the child's social, cognitive and emotional skills, have been demonstrated to be effective in preventing violence and conduct disorder in a number of different countries. Programmes which begin with the pregnant mother and continue up through the first three years of the child's life seem to be most effective. The mother's lifestyle during pregnancy and the baby's first years are crucial when it comes to learning self-control and prosocial behaviour patterns.

The group of experts recommends promoting interventions in high-risk families, in particular with poor, young mothers of low educational level having a first baby. Whereas there is a well-structured social support network for young children and their families in France (PMI, crèches, kindergartens, etc.), few programmes of this type are currently running. These structures could provide an ideal framework for such programmes.

Promote research

COMMISSION CROSS-SECTIONAL EPIDEMIOLOGICAL STUDIES TO ESTABLISH THE TRUE PREVALENCE OF CONDUCT DISORDER IN FRANCE

According to international surveys, the prevalence lies between 5 and 9% in 15 year-old boys. The prevalence is lower in girls. Only one study (the Chartres Study) set out to estimate the prevalence of this mental disorder in France. Given the dimension of the public health problem that it represents (with risks of premature death, co-morbidity, etc.) and the cost to society it entails, it is essential to know the true prevalence if effective, rational prevention policies are to be formulated.

The group of experts recommends commissioning a cross-sectional epidemiological survey in a representative sample of children and adolescents in France to estimate the prevalence of conduct disorder and its various symptoms (aggression, property destruction, deceitfulness and rule violation) as well as the frequency of inter-current conditions at different ages in both sexes. Such a study would yield valuable information about the links with ADHD and ODD.

The international data suggest that prevalence is far higher in certain environments (in prison, special schools and underprivileged urban settings). The group of experts also recommends that specific surveys be conducted in high-risk populations.

COMMISSION ONE OR MORE LONGITUDINAL STUDIES

Conduct disorder has to be considered in the context of development. Distinction is made between two sub-types depending on age of onset: childhood-onset (before the age of 10) and adolescent onset (over 10). A history of conduct disorder is also a prerequisite to a diagnosis of antisocial personality disorder in adulthood.

Among the four classes of symptoms (namely aggression against people or animals, property destruction, deceitfulness or theft, and rule violation), the developmental track of aggressive behaviour has been the most extensively studied in longitudinal studies beginning in early childhood. Such studies identify risk factors amongst which are antenatal or perinatal risks such as young age at birth of first child, smoking during pregnancy and complications during delivery. It is therefore important to have longitudinal data from cohorts of children who have been followed from early childhood. Very few studies have been conducted which would permit the definition of risk factors and signs associated with the other symptoms of conduct disorder.

The group of experts recommends studying a cohort of children from before birth through adolescence in order to investigate the effects of events in the first year of life on the subsequent development of the symptoms of conduct disorder in early childhood, the evolution of symptoms in the course of development, the onset of related health problems and the effects of conduct disorder and comorbidities on social adaptation. The special features of conduct disorder in girls also warrants further description. Such longitudinal studies should be based on validated versions of the most effective diagnostic and evaluation instruments.

INVESTIGATE LINKS BETWEEN PERSONAL AND ENVIRONMENTAL FACTORS

The most recent data show that conduct disorder is the result of complex interactions between personal (genetic, emotional and personality-related) and environmental risk factors. This means that exposure to a certain type of environment could exacerbate the risk of conduct disorder in children who are genetically predisposed or have certain character traits, be they genetically conditioned or not. The neurodevelopmental aspect of conduct disorder is consistent with the fact that specific environmental conditions (be they beneficial or deleterious) during critical periods of development (childhood and adolescence) may have a lasting effect on behaviour problems due to genetic and/or temperament-related factors.

Conduct disorder, ODD and ADHD share genetic susceptibility although the last seems to have a greater genetic component than the other two, i.e. in addition to the shared factors, ADHD has an extra genetic component. The environment plays a specific role in conduct disorder. The group of experts recommends studying interactions between certain genes and the environment to understand how the factors shared between the three disorders interact with environmental factors which are known to be specific to each of the three different conditions. The outcome depends on an effect which, rather than corresponding to the addition of a set of vulnerability factors, results from synergy between the various factors.

Certain types of temperament (e.g. a difficult temperament, impulsiveness, novelty-seeking behaviour and affective coldness) seem to predispose to conduct disorder. However, it could be that the conduct disorder is the consequence of incompatibility between the child's temperament (e.g. combining impulsiveness with poor self-control) and the exigencies of those around him, resulting in an inappropriate child-rearing strategy (e.g. either too permissive or too coercive). The group of experts recommends studying how poor matching between parents and children may play a role in the development of conduct disorder and in the specific profiles observed in girls and boys respectively. Research should also be carried out on the role of early bonding with the parents.

Studying the cognitive deficits associated with conduct disorder (affecting verbal skills and executive function) may shed light on the complex transactions which bring endogenous and environmental factors together. The group of experts recommends commissioning research in the field of cognitive neuroscience to investigate those processes which are specifically impaired in conduct disorder. One important aspect of this work would be to define causal relationships between a given deficit and a given symptom of conduct disorder at different ages in both sexes. This type of research could only be undertaken in clinically homogenous groups of children in whom confounding factors such as socio-economic status and the presence of comorbidities (especially ADHD) have been carefully controlled for.

IMPROVE THE RESEARCH ON HOW PREVENTIVE STRATEGIES ARE EVALUATED

As yet, no results have been published on measures implemented in France to prevent conduct disorder. To fill this gap, the group of experts recommends reviewing and assessing the success of all current relevant programmes, both those specifically addressing conduct disorder and those dealing with violence in general.

Certain universal, selective and indicated preventive programmes have been shown to be effective in some countries. These interventions need to be adapted to the French context with its local particularities and logistics. The advantage of these experimental projects is that they have been conducted in the framework of longitudinal studies so the long-term effects of interventions could be assessed. The group of experts recommends setting up pilot experiments based on validated preventive programmes with a fixed protocol (setting both procedures and outcome evaluation strategies). Results should be disseminated in reports, protocols, scientific articles and on-line. On the basis of these data, those interventions which have been shown to be successful could be extended throughout the country.

REVIEW THERAPEUTIC PROTOCOLS

Following cross-cultural validation, a number of psychosocial treatment strategies have been subsequently implemented in relation to "risk" populations in numerous countries, however, in France, such psychotherapeutic approaches have been little exploited, if at all. The group of experts recommends adapting such psychosocial strategies to the French context and subsequently comparing their performance in relation to other forms of therapy (e.g. interpersonal versus behavioural therapy, individual versus group therapy, family versus multisystemic therapy, and mixed therapies).

If warranted by the severity of the disorder, pharmacological treatment may be prescribed. Three classes of non-specific drug are currently in use (antipsychotic drugs, central nervous system stimulants and thymoregulatory drugs), all of which basically attenuate aggressive

behaviour. The group of experts recommends encouraging new clinical trials to test combination therapies and novel compounds.

PROMOTE RESEARCH INTO NEW COMPOUNDS

Experiments in animals and clinical research have shown that various neuromediators (serotonin, dopamine, GABA, neuropeptides, etc.) are involved in impulsiveness, aggression and passage to violent action. The group of experts recommends fostering research on genetically modified mice to identify compounds that might act on these pathways to attenuate impulsive or aggressive behaviour.

If new drugs that could be used to prevent or treat conduct disorder are going to be found, it is important to elucidate the mechanisms of action, on the basis of empirical results, of the compounds that are already in use. This approach could lead to the identification of new molecular or cellular targets for innovative ways of treating the condition.

MAKE THE MOST OF RESEARCH ON SMALL LABORATORY ANIMALS

Experiments in small laboratory animals can address some of the symptoms of conduct disorder such as aggression and the kind of hyperactivity that is associated with attention-deficit. In particular, they can be used to investigate aetiological factors underlying the symptom related to the environment, e.g. physical and social stress. Around puberty in rats and mice, there is a period in which the animal is particularly sensitive: confrontation with violence or isolation during this period renders it vulnerable to developing aggressive behaviour patterns.

A direct relationship between aggression and fear can be shown in small animals, as well as a more complex one with anxiety. The group of experts recommends continuing this line of research with a view to dissecting the mechanisms which lead to aggressive behaviour.

To investigate those behavioural manifestations which are directly related to stress, special attention should be paid to the hypothalamo-pituitary-adrenocorticotrophic (HPA) system which regulates all adaptive physiological responses to stressful situations. Abnormalities in this system associated with conduct disorder seem to be characterised by both impaired baseline function (constitutionally present even in the absence of stress) and exaggerated reactivity when challenged. Creating models to mimic these dysfunctions in small laboratory animals could shed light on the neurobiological and behavioural (impulsiveness and aggression) consequences of these abnormalities.

EXPAND THE USE OF BRAIN IMAGING TECHNIQUES

Modern imaging methods can map the parts of the brain in which activities are directly modified in association with impulsive, aggressive and violent behaviour patterns. This mapping together with identification of the key neural circuits involved (monoamine and neuropeptide-based circuits) may permit observation of the effects of psychosocial or pharmacological interventions in affected subjects at the neurobiological level. The development of the prefrontal cortex and its connections is influenced by many factors, both genetic and environmental, and it is the very last part of the brain to differentiate (which process is not finalised until the end of adolescence). Thus, it is hypothesised that functional impairment in this part of the brain could be involved in the development of conduct

disorder. The group of experts encourages further work on functional brain imaging in order to extend our understanding of the etiology and pathogenesis of this disorder, as well as those of ADHD and ODD which are so often associated with it.