

Maaïke Kempes
Walter Matthys
Han de Vries
Herman van Engeland

Reactive and proactive aggression in children

A review of theory, findings and the relevance for child and adolescent psychiatry

■ **Abstract** The clinical population of aggressive children diagnosed as having an oppositional defiant disorder (ODD) or a conduct disorder (CD) is heterogeneous, both with respect to behav-

our and aetiology. Recently, the following distinction has been proposed that might further clarify this heterogeneity: reactive aggression is an aggressive response to a perceived threat or provocation, whereas proactive aggression is defined as behaviour that anticipates a reward. In this article we examine various aspects of this distinction. We will [1] examine the evidence that reactive and proactive aggression are distinct phenomena by discussing the theories underlying the distinction between the subtypes in humans and we briefly review evidence for a similar distinction in animals; [2] we critically review the literature on the measurement in children via questionnaires and behavioural observa-

tions; we then point out that the correlation observed between the subtypes is due to the fact that many children show both types of aggression; [3] we review the literature on specific characteristics of the subtypes giving attention to social information processing, peer status, biological correlates and developmental history, and demonstrate that there is some evidence to suggest that reactive and proactive aggression are distinct dimensions; [4] we discuss the relevance of the distinction between reactive and proactive aggression for child and adolescent psychiatry.

■ **Key words** reactive aggression – proactive aggression – oppositional defiant disorder – conduct disorder

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M. Kempes (✉) · W. Matthys ·
H. van Engeland
Dept. of Child and Adolescent Psychiatry
University Medical Center Utrecht
Heidelberglaan 100
PB 85500, Hpnr.B01.324
3508GA Utrecht, The Netherlands

H. de Vries
Behavioural Biology
Utrecht University
Padualaan 14
3584 CH, Utrecht, The Netherlands

Introduction

There is a growing consensus that the population of children diagnosed as having either an oppositional defiant disorder (ODD) or a conduct disorder (CD) is a heterogeneous one, both with respect to behaviour and aetiology. This heterogeneity may be caused by the presence or absence of comorbid disorders such as attention deficit hyperactive disorder (ADHD) or anxiety and mood disorders. However, it is unclear whether the heterogeneity in ODD/CD can be fully explained in terms of comorbidity. We review a recently proposed distinction between reactive and proactive aggression that should enable us to understand and to some extent to integrate, past subtyping approaches such as impulsive

versus controlled aggression; this distinction might also shed new light on the aetiology and treatment of children diagnosed with ODD and CD.

Definition of aggression

Because aggressive behaviour occurs in the context of other types of antisocial behaviour, the two terms are often aggregated [50]. In view of this, a first step is to formulate clear definitions of aggressive behaviour and of antisocial behaviour.

In human research, a widely used definition of aggression is behaviour deliberately aimed at harming people and/or objects [15]. In this definition harm has implicitly been defined as hurting someone physically,

e. g. by kicking. However, other forms of harm, like psychological harm, e. g. humiliating, and relational harm such as malicious gossiping, are just as important. In addition to physical aggression, two other forms of aggression are currently recognised, namely psychological aggression and relational aggression [11]. Antisocial behaviour is defined as behaviour by which people are disadvantaged and basic norms and values are violated. Examples of such behaviours are lying, stealing and truancy. Aggressive behaviour then is a specific form of antisocial behaviour.

Theory of two types of human aggression

Up to the 1960s aggression was seen as a more or less homogeneous category of behaviour. At that time there were two competing theories that dominated the theories about aggression in humans: the frustration-aggression theory and the social learning theory. The frustration-aggression model posited by Dollard and colleagues [18] and refined by Berkowitz [4] considers aggression as a hostile, angry reaction to a perceived frustration. According to this theory, anger, perceived threat or goal blocking are regarded as factors that instigate an aggressive response. According to the social learning theory of Bandura [1] on the other hand, aggression is considered to be an acquired instrumental behaviour that is controlled by an anticipated reward. In this theory the instigating factor is the expected success of the behaviour rather than the punishment.

Although the social learning theory and the frustration-aggression model were first regarded as opposing theories of aggression, both Berkowitz and Bandura gradually recognised that each theory referred to a different aspect of aggression [2, 3]. Thus, it became apparent that a comprehensive theory about aggression would have to recognise that aggressive behaviour manifests itself in multiple forms.

Subtypes of adult human aggression

Although this differentiation in aggressive behaviour in humans has only been recognised for a few decades, most legal systems have been using a similar distinction for many centuries. In homicide a verdict of voluntary manslaughter, which is a crime committed in the heat of passion and instigated by strong provocation, is distinguished from a verdict of first-degree murder, which is described as killing with malicious intent.

In adult psychiatry there are two lines of research that reflect this distinction into two types of aggression. One involves research into impulsive forms of aggression, which is typically explosive and uncontrolled and is accompanied by high levels of arousal and emotions such

as anger and fear [51]. The other line focuses on non-impulsive aggression, which is goal-oriented and accompanied by low arousal [51]. With respect to non-impulsive aggression, there is an extensively researched group of people, referred to by forensic psychiatrists and psychologists as psychopaths, who are known for the instrumental way in which they use aggression. Psychopathy is characterised by traits such as dominance, callousness, lack of emotion, and a lack of guilt [24]. The violence that psychopaths show is instrumental and unemotional; this type of violence seems to fall into the category of non-impulsive aggression.

With regard to the distinct forms of aggression in adults, research has focused mainly on two perspectives: measurement of neurotransmitters like serotonin and psycho-physiological arousal. One of the most consistent findings regarding these two types of aggression concerns the measurement of serotonin metabolites in the cerebrospinal fluid. Subjects showing impulsive aggression have lower serotonergic activity than do non-impulsive individuals as indicated by low levels of these metabolites [27]. With regard to physiological arousal measures, the evidence for a distinction between two types of aggression is less robust. Although in general the resting heart rate and skin conductance level are lower in antisocial individuals [46], there is only indirect evidence for a difference in arousal between impulsive aggressive and non-impulsive aggressive individuals. Low heart rate in antisocial individuals is thought to reflect underarousal [46] and is probably indicative of non-impulsive aggression. In contrast, it has been found that increased or extreme levels of arousal, e. g. high heart rates and skin conductance, facilitate impulsive aggression [54].

Subtypes of aggression in animals and humans

In addition to the differentiation in human aggression, biologists have also distinguished between various types of aggression in animals. On the basis of the topographical features of behaviours [31, 37] and the biochemical and neuro-anatomical aspects that underlie these behaviours, several different forms of aggression have been distinguished, e. g. maternal aggression, irritable aggression, fear-induced aggression, territorial aggression, instrumental aggression and predatory aggression [37].

Both human and animal biological researchers [19, 23, 45, 48, 53] have made numerous attempts to categorise these forms of animal aggression into a bimodal classification based on the differences in psychological and neurochemical processes that are associated with these behaviours. They differentiated between an aggressive defensive response in reaction to stimuli like threat that may be real or perceived, i. e. affective/defensive aggression, and an offensive/instrumental, highly

organised aggressive response, instigated by an anticipated reward, i. e. predatory aggression.

In the literature on these two types of aggression in humans and animals many different terms are used to divide these subtypes. In the animal literature frequently used terms are defensive vs. offensive, and affective vs. predatory, whereas in human research the more commonly used terms are non-impulsive vs. impulsive aggression, hostile vs. instrumental aggression and reactive vs. proactive aggression (see Table 1). Some articles on human aggression even take over terms from animal literature, e. g. affective vs. predatory for the categorisation of aggression in humans [51]. Although the description in animals seems to fit the distinction made in humans, some caution is called for. A review of the literature shows that most human and animal forms of affective aggression are very similar both in description and in the display of the behaviour [53]. However, the assumed similarity of predatory aggression in animals and instrumental aggression in humans is less clear. Although the characteristics of predatory aggression may show some remarkable similarities to instrumental aggression or even aggression seen in psychopaths [35, 36], there are a couple of differences. First of all, the behavioural elements that make up a predatory attack do not include threat or provocation, both of which are elements that could be considered important in instrumental aggression. Predatory attack may not be a form of aggression but may simply be a behavioural strategy in the context of feeding behaviour [31]. Another difference is that predatory attack in animals occurs between species whereas in humans most aggression studied is intra-specific. Therefore, the instrumental aggression we describe cannot be equated entirely with predatory aggression. Taking this into account one must be very careful about transposing the distinction found in animals onto humans.

Subtypes of aggression in children

Much of the research conducted on the two types of aggression in humans and their psychological and biological correlates has focused on children. In 1987, Dodge

and Coie [14, 15] introduced the distinction between reactive and proactive aggression in children. Reactive aggression was defined as a response to a perceived threat or provocation whereas proactive aggression was defined as behaviour that anticipates a reward.

Questionnaires

Several questionnaires have been developed in order to examine the distinction between reactive aggression and proactive aggression in children. These questionnaires have been used in samples from general populations [6, 14]. The most extensively used questionnaire is the teacher-rating scale developed by Dodge and Coie [14]. It is composed of three reactive aggression items, i. e. *this child strikes back when teased*, *this child blames others in fights*, and *this child overreacts to accidents*, and three proactive aggression items, i. e. *this child gets kids to gang up*, *this child uses force to dominate peers*, and *this child threatens others in order to get his/her own way*. Items were scored using a 5-point scale, ranging from 1 (never) to 5 (almost always). Factor analysis revealed that the items loaded almost exactly as predicted on two factors, enabling the construction of a reactive and a proactive aggression scale. However, the second factor, with high loadings of the three proactive aggression items, had an eigenvalue that was less than the conventional cut-off of 1.0. Furthermore, a high correlation ($r=0.76$) was found between the two scales. A later study, using the same questionnaire in another population-based sample, confirmed that there was a high correlation ($r=0.83$) between the two scales [41]. Only when a sample of aggressive boys was used [13] was there a moderate correlation ($r=0.42$) between the two scales.

In addition, Brown and colleagues [6] tried to develop a new questionnaire that had better psychometric properties and included more instrumental items, i. e. items referring to the use of aggression in obtaining a goal. Factor analyses showed a two-factor solution. However, reactive and proactive aggression were again found to be highly correlated ($r=0.66$).

Although reactive aggression and proactive aggression were found to be substantially related, confirmatory factor analysis performed by Poulin and Boivin [40] using the questionnaire developed by Dodge and Coie demonstrated that a two-dimensional model produced a better fit than a one-dimension model. These findings support the view that reactive and proactive aggression as measured by the Dodge and Coie [14] questionnaire can be distinguished reliably.

In addition, other features of aggression helped to explain the high correlation between reactive and proactive aggression. In an attempt to disentangle the function of aggression (“the whys”) from the form in which

Table 1 Subtypes of aggression

Subjects	Terminology	Reference
Animals	Defensive vs. Offensive	19
	Affective defence vs. Predatory	23, 45, 48, 53
Adult psychiatric patients	Impulsive vs. Non-impulsive	51
	Affective vs. Predatory	51
Children	Hostile vs. Instrumental	53
	Reactive vs. Proactive	14

aggression occurs (“the whats”) Little and colleagues [28] developed a self-report questionnaire for adolescents. The questionnaire included questions referring to the forms in which aggression occurs, i. e. overt versus relational aggression, and to the functions of aggression, i. e. reactive versus proactive aggression. When variance associated with the form in which aggression occurs, i. e. relational or overt, was partialled out, no correlations were found between reactive and proactive aggression [28].

On the bases of the scores on the teacher-rating scales, researchers have formed groups of reactive-only, proactive-only and reactive/proactive aggressive children, characterising only small groups as reactive-only or proactive-only and a large group as both reactively and proactively aggressive [14, 41] thereby questioning the usefulness of this categorical approach.

■ Behavioural observations

In addition to developing questionnaires, some studies investigated the distinction between reactive and proactive aggression by using behavioural observations of playgroup interactions between peers in laboratory settings [5, 7, 14, 17, 41, 47]. In these studies reactive aggression was defined as aggression involving both high arousal and impulsive acts, whereas proactive aggression consisted of both bullying aimed at aggressive domination of a person and instrumental aggression, i. e. object acquisition through antisocial behaviour. Just as with the teacher-rating measures, these behavioural measures of reactive and proactive aggression were found to be substantially correlated ($r = 0.48$) [47].

In observational research of aggressive behaviour the labels ‘reactive’ and ‘proactive’ can be applied in two different ways. First of all, reactive and proactive can be used to qualify any type of behaviour on the basis of certain contextual characteristics and/or accompanying features, such as the intensity of arousal and the time lag between the behaviour of a peer and the subsequent behaviour of the focal child. If the time lag is shorter than a certain criterion value and the behaviour is highly aroused it can be labelled as reactive, otherwise it is said to be proactive. Secondly, the set of various aggressive behaviours can be labelled beforehand as reactively or proactively aggressive. This approach was used by Dodge and Coie [14].

Another important aspect in the distinction is the role of dyadic interaction. In most investigations of children’s aggressive behaviour, aggression has been considered to be a characteristic of individuals, the assumption being that the aggressive tendency of a child is an internal, stable personality trait. However, there is emerging evidence to suggest that in children the individual variation in aggressive behaviour is situation spe-

cific [34] and also depends on the interactive partners [17, 32]. For example, Dodge and colleagues [17] found that, within playgroups consisting of six boys, 50 % of all aggressive episodes occurred in only 20 % of the dyads. This concentration of aggression was not due to the fact that some boys were more aggressive than others. Even when the most aggressive boys were considered, 46 % of their aggressive behaviours occurred in only 20 % of their dyadic relationships. This evidence emphasises that it is important to consider dyadic relationships in research on reactive and proactive aggression.

■ Correlation between teacher-rating scales and behavioural measures of the subtypes

The correlations between teacher-rating and observational measures of reactive and proactive aggression are rather inconsistent. Dodge and Coie [14] found moderate correlations between the teacher-rating and observational measures of the two subtypes (reactive aggression: $r = 0.27$; proactive aggression: $r = 0.27$); these correlations virtually vanished when the common variance attributable to the other form of aggression was partialled out [14]. A later study, however, supported these findings only partly [41]. Only when proactive aggression was partialled out a moderate positive correlation ($r = 0.23$) was found between teacher-rated reactive aggression and the observed reactive aggression. Likewise, a moderate correlation ($r = 0.45$) between teacher-rated proactive aggression and observational measures of bullying among children attending kindergarten was found when reactive aggression was partialled out [41]. However, among 6 and 7 year-olds a non-significant correlation ($r = -0.17$) was found [41].

■ Social information processing

According to Crick and Dodge’s [12] social information-processing model, children, when faced with a social situational cue, engage in five mental stages of responses before enacting competent social behaviours; the five stages are encoding of cues, interpretation of cues, clarification of goals, access of responses and response decision. Reactive aggression and proactive aggression were found to be related to deficiencies in different stages of social information processing [10, 14]. Reactive aggression was specifically correlated with problems in the first two stages of information processing, i. e. encoding and interpretation of cues [10, 14, 47]. Boys who were rated as reactively aggressive, reacted with aggression when faced with ambiguous provocations and tended to interpret peers’ behaviour as hostile when it was not [10, 14, 47]. They did not show any problems in the later stages of social information processing [10, 47].

However, these results seem to be affected by age. Inaccuracy in the interpretation of peers' intentions and reactive aggression was only significantly related in children around 8 years old but not in children around 6 years old [14]. Furthermore, in another study [10] this relation was found only in children around 11 years old but not in children around 8 and 9 years old. A possible explanation is that the cognitive abilities needed to process information concerning others' intentions properly are not fully developed until the age of 8. Therefore the differences in information processing would be more pronounced at a later age.

In contrast to reactive aggression, proactive aggression was found to be correlated with problems in the last three stages of information processing, i. e. clarification of goals, response access and response decision [10, 14]. Proactive children were found to have problems with accessing competent behavioural responses [10], and were found to select instrumental rather than relational goals [10] and to have significantly more positive outcome expectancies of aggressive behaviour. In addition, they were also found to be more confident about enacting aggression [10]. Finally, proactive aggressive children were also shown to have less hostile attributional biases than reactive aggressive children [10, 14, 47], although one study reported these deficits to be present both in reactively and proactively aggressive children [16].

■ Peer status and evaluation

On the basis of peer assessments it was found that among children around 6 years old directing reactive aggressive behaviour toward peers is associated with social rejection [41] and frequent victimisation [47] whereas proactive aggression is not. Specifically, reactive aggression was significantly negatively related to classroom peer status, i. e. the average rating a child receives from all classmates, negatively related to leadership and co-operation but positively related to peers' perceptions of 'who starts fights' and 'being angry' [41].

In contrast, proactive aggressive children were viewed less negatively, namely as having humour, leadership and being co-operative [14, 41]. Proactive aggression was significantly positively related to mean group ratings, i. e. the average rating a child received from all classmates, and unrelated to negative social preference but only when common variance attributed to reactive aggression was partialled out [41]. However, peers' judgement of proactive aggression seems to be related to age. Bullying behaviour was evaluated positively by children attending kindergarten but negatively by children around 6 years old [41]. In the case of older children, peers tended to make more negative evaluations of proactively aggressive children as more negative [16].

■ Psychophysiology

Although there is a considerable amount of literature on the biological bases underlying aggression in children [20, 44] little is known about the physiological differences relating to reactive and proactive aggression. In general, antisocial behaviour is related to low basal levels of arousal i. e. a lower heart rate and skin conductance. One of the theoretical interpretations of these results is the fearlessness theory. According to this theory low levels of arousal are markers for low levels of fear. A lack of fear could predispose children to antisocial and violent behaviour because low fear of socialising punishment in children would contribute to a lack of conscience development [43]. In line with this theory, proactive aggression is also described as fearless, calculative and "cold-blooded" behaviour [15]. This suggests that, during a resting state as well as during mild stress, proactive aggression would be related to a low heart rate and a low level of skin conductance. So far, no empirical evidence has been found for a relation between proactive aggression and low heart rate and low skin conductance levels [25, 39]. However, there are some findings with respect to reactive aggression. According to the hypothesis [15], reactive aggression is "hot-blooded" [15]. When heart rate reactivity was examined [39], higher heart rate levels were found in reactively aggressive children during provocation than in reactive/proactive children, although in another study [25] no clear differences in heart rate reactivity of the two subtypes could be found. This last study did find, as expected, reactive aggression to be positively related to skin conductance reactivity whereas proactive aggression was not [25]. The authors suggested that these inconclusive results relating to heart rate reactivity might be caused by the fact that attention and arousal processes have had completely opposite effects on heart rate reactivity [25]. The heart rate of children tends to increase when children are emotionally aroused but decreases when they are orienting or attending to something in their environment. It is therefore harder to predict how children will respond in terms of heart rate reactivity than in terms of skin conductance reactivity when showing reactive or proactive aggression. Altogether there is some evidence for physiological differences in reactive and proactive aggression and it is well worth investigating this thoroughly.

■ Developmental history

Not only children's physiological and social cognitive characteristics but also their early life experiences are related to the development of the different types of aggression. In a sample from the general population a strong link was found between physical abuse and reac-

tive aggression whereas proactively aggressive children did not differ from non-aggressive children on any measure of early life experiences [16]. However, when a psychiatric population was considered, reactively and proactively aggressive children were all found to have had many early family problems and traumas [16].

Furthermore, proactive aggression but not reactive aggression predicted delinquency and ODD and CD problems in mid-adolescence [52]. Reactive aggression even moderated the link of proactive aggression to delinquency but not to ODD and CD [52]. This is in line with another study [42], which shows that many proactive-, but not reactive-aggressive male adolescents are likely to perform criminal behaviour later in life.

■ Age and gender

Younger children are more physical and impulsive in their aggressive behaviour. With age cognitive ability progresses and the ability to set goals aggressive behaviour becomes more planned and calculative in nature. Therefore, it is hypothesised that reactive aggression would start at a much younger age compared to proactive aggression. This is partly supported by the finding that reactive aggression was negatively related to age [8].

With respect to gender it is known that girls are more likely to show relational aggression such as gossiping, whereas boys are more likely to show overt aggression [28]. Reactive aggression includes mostly overt aggressive behaviour, whereas proactive aggression is often displayed in a more covert manner. One may therefore expect that boys show more reactive aggression and girls show more proactive aggression. A recent study on this subject [9] did not find any gender differences between reactive and proactive aggression.

Validity of the distinction

During the last two decades a new theoretical perspective on aggression in children has been developed. By using teacher-ratings and by direct behavioural observations, researchers have attempted to demonstrate that there are two distinct types of aggression, i. e. reactive and proactive aggression, and that aggression is thus not really a homogeneous phenomenon. From a theoretical point of view this distinction gives us a better understanding of the nature and underlying mechanisms of aggression. However, notwithstanding the theoretical distinction between reactive and proactive aggression, a reliable behavioural distinction between the two forms of aggression by means of questionnaires or direct behavioural observations is still somewhat problematic. It is clear that, although the magnitude of the correlations between the two subtypes varies between studies, the

operational measures of the two dimensions are substantially correlated. This could be due to the fact that the two forms cannot be dissociated behaviourally because of the ambiguity that arises when the concepts of reactive and proactive aggression are used in observational studies. It might also be due to the fact that there are many children who show both reactive aggressive and proactive aggressive behaviour.

The difficulty in distinguishing between reactive and proactive aggression often has to do with emphasis. Behaviour that looks like an instance of reactive aggression can in fact have a proactive goal. For instance, a boy gets angry when he is denied the toy he wants because he expects that being angry will help him obtain the toy. On the other hand, a seemingly proactive aggressive act can sometimes be a delayed reaction to an earlier event, e. g. a boy takes his revenge after being teased a couple of hours before. Thus, it is particularly in borderline cases that the time span between the stimulus and the aggressive act cannot be used unambiguously to distinguish reactive aggression from proactive aggression. At the extremes, on the other hand, the distinctions are clear.

The fact that a substantial correlation was observed between the two dimensions does not necessarily imply that a one-dimensional model is more appropriate than a two-dimensional model. In spite of the high correlation between the subtypes, a confirmatory factor analysis revealed that a two-dimensional model that distinguishes between reactive and proactive aggression was more accurate than a one-dimensional model [40]. Moreover, the usefulness of a two-dimensional model also depends on the unique ability of the theory underlying each dimension to generate a distinct, and theoretically consistent, pattern of predictions. As earlier studies have shown [10, 41], the two types of aggression are related to different kinds of variables in ways that are theoretically consistent with their definitions: reactive aggression is correlated with hostile attributional biases, peer rejection and negative early life experiences; proactive aggression is correlated with a positive evaluation of the consequences of aggressive behaviour and with leadership and humour.

In order to achieve a clear distinction between reactive and proactive aggression one also needs to disentangle the relation between these two types of aggression and other types of aggressive behaviour, such as relational and overt aggression. In this respect it is important to distinguish between the form in which aggression occurs and the underlying mechanism of aggressive behaviour as predicted from theories describing reactive aggression and proactive aggression. This means that reactive and proactive aggression can be manifested in various forms. In one recent study that took into account the form in which aggression occurred, i. e. overt or relational, reactive and proactive ag-

gression were found to be two different constructs that were uncorrelated [28].

So far, the reactive-proactive dichotomy has only been applied to aggressive behaviour. However, the concepts of reactive (i. e. tending to be responsive or to react to a stimulus) and proactive (i. e. acting in advance to deal with an expected difficulty) might also be applied to other classes of behaviour such as oppositional behaviour, antisocial behaviour and prosocial behaviour. For example, a temper tantrum following a command is an instance of reactive oppositional behaviour, whereas deliberately dawdling is an example of proactive oppositional behaviour. Similarly, telling a lie is an act of reactively antisocial behaviour when used defensively in reaction to an accusation, but it is proactive antisocial behaviour if a child tells a lie in order to obtain an advantage. Likewise, a child who deliberately tries to please a peer to prevent the peer from being nasty to him is showing proactively prosocial behaviour, whereas being prosocial in direct response to the antisocial behaviour of a peer is a form of reactive prosocial behaviour.

Relevance for child and adolescent psychiatry

So far most of the research on the two subtypes of aggression has been performed in the general population of children. Although the distinction is of special importance in children with severe aggressive behavioural problems only a few studies have focused on a clinical population of children with an aggressive behavioural disorder [9, 16].

The clinical population of aggressive children is known to vary substantially with regard to the environmental, social cognitive and/or biological risk factors that are associated with these disorders. It is doubtful whether the aetiology of these disorders could be clarified solely by using the categorical distinction between ODD, CD and the associated comorbid disorders such as ADHD, anxiety and mood disorders. Up to now many subclassifications, e. g. overt versus relational [11] and callous unemotional (psychopathic) versus non-callous and unemotional [21], have been proposed. However, the first distinction, i. e. overt aggression versus relational aggression, differentiates only between forms of aggression and does not explicitly examine the underlying mechanisms. The distinction between callous unemotional aggression versus non-callous and unemotional aggression, which is promising, focuses mainly on the presence or absence of callous unemotional traits and related characteristics e. g. social information processes and neurobiological correlates [38]. It is still not clear whether there is any overlap between callous unemotional traits and proactive aggression.

An important issue is whether certain elements of the

distinction into reactive and proactive aggression are not present in the currently used distinction into ODD or CD and comorbid disorders. ODD symptoms such as “often loses temper” seem to resemble the features of reactive aggression, whereas CD symptoms, such as “often bullies, threatens, or intimidates others”, resemble the features of proactive aggression. Studies that examined the onset of ODD and CD symptoms found that ODD is often diagnosed at an earlier age than CD [30]. Likewise, in both samples from general and aggressive populations reactive aggressive children were found to initiate their problematic behaviour two years earlier in life than proactive aggressive children [16]. However, not all symptoms point to an analogy between the distinction into reactive and proactive aggression and the familiar distinction between ODD and CD. For example, ODD symptoms like “often deliberately annoys people” are more similar to the features of proactive aggression. Finally, in the case of some diagnostic criteria for ODD and most of the criteria for CD such as “is often a truant from school” it is unclear whether these criteria are reactive or proactive.

As for comorbid problems, it was expected that comorbidity with ADHD would result in more reactive aggression because of the impulsivity problems found in children with ADHD. Indeed, it was found that reactive aggression in normal children was strongly correlated to ADHD symptoms and impulsivity, whereas proactive aggression was not [16]. However, differences between reactively and proactively aggressive children remained when data were controlled for ADHD symptoms [16]. Therefore, ADHD does not seem to account for all reactive aggressive behaviour but might simply aggravate the reactively aggressive features.

In sum, the subtyping into reactive and proactive aggression does not overlap entirely with the distinction into ODD and CD with comorbid ADHD. The current division into ODD, CD and comorbid ADHD does distinguish children with deviant aggressive behaviour and other disruptive behaviour from normal children. However, the Diagnostic and Statistical Manual of Mental Disorders is only based on symptoms and not on underlying mechanisms. A further division into reactive and proactive aggression would refine the current categorical division into ODD and CD with and without comorbid ADHD. Until now researchers have used a categorical approach in their studies of proactive aggression and reactive aggression, characterising a large group as both reactively and proactively aggressive and only small groups as reactive-only or proactive-only. In the future, a dimensional approach of the distinction into reactive aggression and proactive aggression next to the distinction into ODD, CD and comorbid ADHD might be more appropriate.

Given the putative underlying mechanisms of reactive and proactive aggression, there are some potential

implications for intervention. In order to alter highly reactive aggressive behaviour, intervention should take the form of programmes that focus on anger management and that are designed to remedy hostile attributional processes. An example of such a programme is the Anger Coping Program [29]. In the Anger Coping Program, children aged 8 to 12 years in small groups are assisted in recognising the level of arousal and anger they experience in difficult interpersonal situations, and the triggers that lead to these high arousal reactions. Children then are assisted to use several coping techniques to manage the arousal and to avoid an impulsive rage-filled response. The Anger Coping Program focuses also on children's social problem-solving: children practise brainstorming multiple possible solutions to social problems and then evaluate the long-term and short-term consequences of each solution.

In addition to such programmes, since reactive aggression is considered to be related to poor self-control, pharmacological treatment, e.g. the administration of methylphenidate, may reduce the disinhibition problems [26]. Besides, both risperidon and lithium are recommended for the treatment of impulsive outbursts of aggression [22]. Furthermore, because of the serotonergic dysfunction reported in patients with impulsive aggression, investigators are now studying the effect of selective serotonin reuptake inhibitors [49]. On the other hand, highly proactive aggressive behaviour could be influenced by contingency management procedures and social problem solving skills programmes that focus on making aggressive children understand the negative ef-

fect of aggression on others and that emphasise the benefits that can accrue from prosocial actions [33].

Conclusion

The main objective of this review was to investigate the validity of a distinction between reactive and proactive aggression in children by examining the literature. Some evidence for this distinction was found in research on adult psychiatric patients and to some extent in animals; however, one must be very careful with transposing the distinction found in animals onto humans. The literature on the measurement in children via questionnaires and behavioural observations shows that the subtypes can be distinguished but are substantially correlated. This proved to be mainly due to the fact that many children show both types of aggression and only small groups are characterised as reactive-only or proactive-only. Moreover, literature on specific characteristics of the subtypes such as social information processing, peer status, biological correlates and developmental history shows that the two types of aggression are related to different kinds of variables in ways that are consistent with their definitions, suggesting that they form distinct phenomena. Until now most studies have focused on children from the general population. Future research should include children with aggressive behaviour problems as the putative underlying mechanisms of reactive and proactive aggression imply differential types of intervention.

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