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Synthesis

How important is it?

Most parents of first born are shocked and understandably worried when they see their infant child attempt to hit them when angry. Very few parents expecting their first child know that beautiful young babies express anger with hits and kicks long before they learn to walk. The frequency of physical aggressions increases with age over the first three to four years after birth. Physical aggression is the leading problem in child care centres and the leading reason why preschool children with behaviour problems are referred for clinical help. However, persistent physical aggression usually does not happen in isolation; it frequently co-occurs with other developmental problems like emotion dysregulation, impulsivity, inattention, and delays in language and communication skills. Studies that followed large cohorts of children over many years showed that persistent physical aggression increased the risk for later juvenile delinquency and adult violence.

What do we know?

Most children start using physical aggression between one and two years of age as a response to frustration and as a means to reach a goal. The first aggressive acts displayed with peers are often tugging at another child's toy, soon followed by hitting. Physical aggression tends to increase in frequency until 30 to 42 months of age and then declines when children develop the ability to regulate their attention and emotions, control their impulses and use verbal communication to resolve conflicts and express needs. There are important differences between individual children in the early display of aggressive behaviour: a majority of children will act aggressively occasionally, a minority will display little or no aggression, and about 5% to 10% of children, mostly boys, will frequently use physical aggression. These children are at greater risk of chronic aggression into late childhood, adolescence and adulthood. Studies showed that chronic physical aggression is associated with social factors, namely mothers' young age at first delivery, low education, history of behaviour problems, smoking during pregnancy, and low income. Inadequate parenting, conflict in the house, and parental mental health and substance abuse issues are also associated with children's chronic physical aggression. The consequences of aggressive acts become more serious with age as children become stronger and are less

supervised. Chronic physical aggression is a serious social concern because of its individual and social costs.

Sex differences in frequency and level of physical aggression have been consistently reported. Scientists have proposed both social and biological explanations for this difference. Higher levels of physical aggression for boys have been reported by mothers from 17 months of age. Sex differences in aggression therefore appear before they could be extensively affected by socialization. Even though most children show a decrease in the frequency of physical aggression as they grow up, girls tend to reduce their aggression earlier, and the sex differences tend to stay stable through childhood and adolescence.

As physical aggression declines, face-to-face verbal aggression increases, followed by social and relational aggression around 4-5 years of age. The goal of relational aggression is to harm a person's social relationships and self-esteem, for example by becoming friend with someone else in revenge. It includes non-verbal behaviours such as disdainful facial expressions and direct expressions of rejection. These forms of aggression are slightly more common in girls but are also used by boys, sometimes in conjunction with direct verbal and physical aggression. Both physically and relationally aggressive children tend to lack empathy and attribute hostile intentions to others, but perpetrators of relational aggression are likely to have advanced language skills, contrary to physically aggressive children. Indirect forms of aggression may cause as much pain in victims as physical aggression but perpetrators are less likely to face disapproval by adults and peers. A better understanding of the development of aggressive behaviours should help to establish effective prevention programs.

What can be done?

Most children will show physically aggressive behaviour occasionally, and then learn other means of expressing emotions and solving conflicts. A minority of children will not. Interventions at an early age aimed at helping these children to learn adequate behaviour and emotional responses are warranted.

Intervention can address the at-risk child's developmental deficits directly (e.g., improving emotion regulation skills) or indirectly by changing the child's environment (for example by providing parental training). Targeted programs combining parent and child intervention in the preschool years have resulted in improved parenting and decrease in children's negative

behaviour. Interventions can be universal (offered to all children - e.g., a whole child care or kindergarten group) or target specific problems and the children who have them. Prenatal to toddlerhood home visits to support at risk families have been shown to reduce later behaviour problems. Universal programs in preschool can improve children's emotion regulation and reduce later aggression. A multi-modal intervention for aggressive boys in kindergarten was shown to improve high-school graduation and reduce criminality 15 years later.

Targets for intervention

Development of effortful control in early childhood is critical for the reduction of aggressive behaviours and impulses. Effortful control refers to the voluntary regulation of attention and behaviour, including inhibition of undesirable behaviour and activation of appropriate behaviour. It is linked to the development of conscience, empathy, and internalization of social norms. Poor effortful control is associated with reactive aggression, that is, emotionally-driven reaction rather than unprovoked aggression, and with externalized behaviour problems. Warm, positive parenting can help reduce behaviour problems but the effect of parental behaviour is facilitated by children's effortful control. Interventions can address children's problem-solving strategies, support gentle parental discipline, and foster supportive teaching.

Young children learn self-control, reciprocity and adequate behaviour in part through play with peers, specifically play that demands turn-taking, negotiation, shift in control and restraint like rough-and-tumble play. Studies in other mammals (rats and apes) showed that rough-and-tumble play is critical for the development of the brain area responsible for executive control. One consequence of lacking the opportunity to play in these animals is misreading social signals that could prevent an encounter from escalating into aggression. Human children who engage in rough-and-tumble play show better social skills and play with peer is facilitated by a positive previous experience of playing with parents. This suggest that encouraging play could help children develop the abilities that will help them control their aggressive impulses and assess correctly their peers' reactions during interactions. When rough-and-tumble play is not socially acceptable, peer-play with similar properties (turn-taking, shift in control, self-restraint) should be encouraged.

Regarding indirect aggression, it should be recognized that social and relational aggression are seriously harmful behaviours perpetrated by both boys and girls. Intervention could start in preschool and preferably involve parents and teachers. The goals would be to teach how to deal

with relational aggression, as well as strategies for relationship building and problem solving.

Whatever the strategy, several keys to successful intervention targeting aggression in preschool children are proposed:

1. Intervention should include parents;
2. Intervention must be flexible yet faithful to protocol;
3. Parental intervention should address both parenting behaviour and parents' knowledge of child development;
4. Schools/centres should plan strategies to engage parents in intervention; needs for staff training must be realistically assessed.

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The Development and Prevention of Physical Aggression

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Introduction

Physical violence exhibited by adolescents and young adults is a major concern in all modern societies. Indeed, the risk of being arrested and found guilty of criminal behaviour is higher during late adolescence and early adulthood than at any other point in life. Over the past 50 years, hundreds of studies have attempted to shed more light on how playful children become violent juvenile delinquents. Poor parental supervision, family break-up, negative peer influences and poverty have all been shown to be associated with violent juvenile delinquency.[1,2] Males account for the majority of arrests made for violent crimes. The principal explanation for violent behaviour has long been the following: “aggressive and violent behaviours are learned responses to frustration, they can also be learned as instruments for achieving goals, and the learning occurs by observing models of such behaviour. Such models may be observed in the family, among peers, elsewhere in the neighbourhood, through the mass media, or in violent pornography.”[3]

Recent Research Results

Although most studies of aggressive behaviour tend to focus on adolescents and adults, longitudinal studies using large random samples of new-born children started to follow the development of physical aggression from infancy approximately 40 years ago. These studies have now shown that most children start to use physical aggression between the end of the first and second year after birth.[4,5] However, there are major differences in the frequency of physical aggression among infants as well as among toddlers.[6,7,8,9] A majority of children make occasional use of physical aggression, a minority use physical aggression much less often than the majority, while another minority make much more frequent use of physical aggression than the majority. Preschool children who are referred to clinics for behaviour problems are generally referred for

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physically aggressive behaviours.[9]

Longitudinal studies on the development of physical aggression during the preschool years have shown that the frequency of physical aggression use increases during the first 30 to 42 months after birth and then decreases steadily.[6-8] Fewer girls than boys reach the highest frequency levels, and girls tend to reduce the frequency of their aggression earlier than boys.[10,11] Longitudinal studies from early childhood to adolescence show that preschool is a sensitive period for learning to regulate physical aggression. Indeed, the minority of elementary school children (5% to 10%) who continue to show high levels of physical aggression are at greatest risk of engaging in physically violent behaviour during adolescence.[12,13]

Interestingly, while the frequency of physical aggression was found to decrease from the third or fourth year after birth, the frequency of indirect aggression (making disparaging remarks about another person behind his or her back) increases substantially from 4 to 7 years of age, and girls tend to use this form of aggression more frequently than boys.[14,15]

The main risk factors for women to have children with serious physical aggression problems are the following: a low level of education, a history of behaviour problems, first delivery at a young age, smoking during pregnancy, and low income.[6-8,16,17] Studies of large samples of twins also show important genetic effects.[18]

Conclusions

Contrary to traditional belief, children do not need to observe models of physical aggression to initiate the use of physical aggression. In 1972, Donald Hebb, a father of modern psychology, wrote that children did not need to learn how to have a temper tantrum.[19] In his 1979 book on social development, Robert Cairns reminded human development students that the most aggressive animals were those that had been isolated from the time they were born.[20] Indeed, like other animals, human infants spontaneously use physical aggression when strongly driven to achieve their goals, for example when they are angry or when they strongly desire an object in the possession of someone else.[21] Thus, the studies on the frequency of physical aggressions during the early childhood years indicate that children do not need to learn to use physical aggression from their environment; they rather need to learn not to use physical aggression. This learning occurs through various forms of supervised interactions with their peers at home, in their neighbourhood and in daycare.[22] Experimental studies of preventive interventions to help

aggressive children in early elementary school have shown impressive positive long-term effects during adolescence and adulthood.[23]

Although recent research on the development of aggression during early childhood has substantially increased our understanding of the life-span development of aggression, we still need research to advance our knowledge on the mechanisms that explain why some infants are more physically aggressive than others, why some engage in very little physical aggression, why girls tend to engage in physical aggression less often than boys, why most children learn alternatives to physical aggression before they enter school while a minority do not.

Service and Policy Implications

The research summarized above has important implications for the prevention of physical aggression among humans. First, early childhood is probably the best window of opportunity for helping children at risk of becoming chronic physical aggressors, because most children learn alternatives to physical aggression during that period.[24] To achieve this aim, we need to give intensive support to high-risk families starting during pregnancy.[25] Second, since most humans have used physical aggression during early childhood, most are at risk of using it again if they find themselves in a situation where they do not see a satisfactory alternative. This would explain why many violent crimes are committed by individuals who do not have a history of chronic physical aggression, and why so many conflicts among families, ethnic groups, religious groups, socioeconomic classes and nations lead to physical aggression.[26] This is the reason why we also need policies that reduce to their minimum the situations which create conflicts among citizens of all ages.

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Development of Indirect Aggression Before School Entry

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Introduction

Attempts to understand and prevent childhood aggression have been predominantly guided by a male-oriented model with a focus on physical aggression. However, children can also hurt their peers in more subtle ways, however, for example through social exclusion or rumor spreading.[1,2] These forms of aggression are as harmful and elicit the same physiological and neural pain responses as physical aggression.[3] They also have a range of negative and potentially long-lasting effects on the victims, including reduced school performance,[4] somatic complaints,[5] anxiety, depression,[6] and even suicide attempts.[7]

Subject

Different labels have been used to describe these more subtle forms of aggression. *Indirect* aggression,[8] consists of a set of circuitous strategies that implicate peers as a means to sabotage the victim's social relationships and self-esteem, for example, through slanderous rumors or by becoming friends with another as revenge. The indirect nature of the aggressive act often enables the aggressor to remain unidentified, thereby avoiding a counterattack from the victim and disapproval from other peers or adults. *Social aggression*[9] and *relational aggression*[10] also encompass directly expressed rejection of the victim and non-verbal behaviours such as facial expressions of disdain. Despite the slight differences, all these terms describe highly related constructs.[11]

Problems

It has been argued that indirect aggression is more typical of girls.[8,12] However, a meta-analysis of 148 studies shows that, while boys are consistently more physically aggressive than girls, gender differences with regard to indirect aggression are minimal regardless of children's age and ethnicity.[13] It thus seems that – while girls may prefer the use of indirect over physical

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aggression[14] – both girls and boys employ circuitous strategies as a means to attack others. Indeed, many aggressive children use both forms of aggression, and this seems to be especially the case for those who those who are chronically aggressive.[13,15] Nevertheless, studies have consistently revealed that physical and indirect aggression constitute two forms of aggression that are clearly distinguishable already in pre-school-aged children.[16-21]

Research Context

The recognition that aggression can be expressed through different means is strengthened further by the fact that physical aggression diminishes for most children from early childhood onwards, whereas indirect aggression increases.[15,22,23,24] Moreover, many physically aggressive children increase their use of indirect aggression over time, whereas the reverse does not seem to be the case.[25,26] These diverging developmental trajectories concord with the theoretical model of aggression proposed by Björkqvist and colleagues.[8] According to this model, very young children aggress against others primarily through physical means due to a lack of other expressive tools. As verbal and social cognitive skills evolve, children begin to use verbal aggression and, at around four years of age, add indirect aggression to their repertoire. Because indirect aggression can be as damaging as physical aggression with much less risk of retribution, indirect aggression eventually becomes the primary strategy.

Key Research Questions

The different developmental trajectories have highlighted the need for a better understanding of the risk factors and potential developmental outcomes associated with indirect aggression and how they compare to those of physical aggression.

Recent Research Results

Genetically informed studies support the proposition of Björkqvist and colleagues[8] that, despite their diverging developmental trends, physical and indirect aggression have common roots. Thus, indirect and physical aggression are not only to a large extent influenced by the same underlying genetic factors, but they also share certain familial risk.[25,27,28] Indeed, both indirect aggression and physical aggression have been linked with harsh and overly controlling parenting and a lack of parental warmth and positive encouragement during the preschool years.[29] There is also evidence, however, that overly permissive or neglectful parenting may foster either form of aggressive behaviour in children.[29] In addition to family-related factors, indirectly and physically

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aggressive children share certain cognitive patterns such as the attribution of hostile intent to others and a lack of empathy.[30,31] Associations with other aspects of social cognitive functioning seem to differ, however. Contrary to predominantly physically aggressive children, indirectly aggressive children often show advanced language abilities, know how to persuade others to do their bidding, and are highly capable of predicting another person's thoughts and actions already prior to entering elementary school.[32-36] The most pronounced differences between indirect and physical aggression lie in their social environmental correlates and outcomes, however. In contrast to physical aggression, the frequent use of indirect aggression is generally not related to social difficulties with the peer group. Despite - or perhaps because of - their manipulation of others, many indirectly aggressive children have a rather large network of close friendships.[37,38] Moreover, although they may not be liked by many of their peers, they often hold a prominent and influential place in the group and indirect aggression is often successfully used to achieve or maintain a high social status.[39-43] These social benefits seem to be especially pronounced for children who avoid engaging in physical aggression and exclusively employ indirect aggression.[37,44] However, physically aggressive children also sometimes achieve high social standing in their peer groups and recent studies show that whether the peer group values—or rejects—aggressive behaviour plays a critical role for aggressive and non-aggressive children's further developmental adjustment.[45] Indeed, already 6-year old children with a disposition for physical or indirect aggression are much more likely to engage in such behaviour if peer group norms are favorable.[46] Their peers are also more likely to affiliate with and adopt aggressive children's behaviour under these circumstances.[47-50] Research also indicates that especially physical aggression can procure protection against teasing or other provocations by peers when social norms are favorable, which may be a further incentive to maintain or increase such behaviour.[51] Nevertheless, the ostensible advantages of aggressive behaviour may be relatively short-lived, as especially children who engage in high levels of both behaviours seem to fare worse than others in the long run and tend to show elevated delinquency and internalizing problems when they become adults.[52]

Research Gaps

While the past decades have seen a sharp increase of research on indirect aggression, most of this work focuses on school-age children and adolescents. Comparatively few studies have examined the risk factors and psychosocial outcomes of different forms of aggression before age 6.[53] In particular, further research is needed to understand how childcare providers or peer

group characteristics in daycare may facilitate–or prevent–the early development of indirect aggression. Another concern is that the reported links rest predominantly on studies with participants from Western countries, although children from a wide variety of ethno-cultural backgrounds engage in both physical and indirect.[54] Thus, there is still little knowledge about the developmental course, as well as the predictors and consequences of different forms of aggression in children from diverse cultural backgrounds. Addressing this question is important, as cultural norms may impact children's use of aggressive behaviour, including indirect aggression.[53]

Conclusions

Despite the current research gaps, it is safe to say that indirect aggression first appears in children's behavioural repertoire at about four years of age and is observed in both genders. Indirect aggression and physical aggression seem to have some common etiological roots and especially younger children often use both behaviours to hurt others. However, whereas physical aggression decreases in most children over the course of development, indirect aggression tends to increase. This increase may in large part be due to the fact that indirect aggression often enables the perpetrator to do considerable damage with a relatively low risk of detection and punishment. Indirect aggression is therefore also employed by children with advanced cognitive and language skills. The use of both indirect and physical aggression is further facilitated when social norms in the peer group favor such behaviour, and indirect in particular aggression may often help achieve influence and power among peers.

Implications for Parents, Services and Policy

While especially indirect aggression may not always entail negative consequences for the perpetrator, any form of aggressive behaviour clearly presents a serious risk for the mental and physical health of the victims. However, evidence suggests that adults feel less negative toward – and are less likely to intervene against – children's use of indirect aggression compared to physical aggression.[55-58] A first step to prevention is thus to dispel the myth that indirect aggression is an exclusively female or relatively benign behaviour. It is also important to acknowledge that not all aggressive behaviours result from deficient socio-cognitive skills, but that it is sometimes highly socially intelligent children who use their abilities to attack others. Efforts to reduce aggression therefore should not be focused exclusively on physical aggression. Indeed, there is evidence that maternal coaching about about peer conflicts involving indirect

aggression can help reduce such behaviour in preschool children.[59] Still, multi-component programs that also include the extra-familial environment are likely to be most effective.[60] Especially in elementary-school aged children, having a warm and supportive teacher may help decrease aggressive behaviour and develop alternative social interactive strategies.[61] Most of the recent prevention programs employ school-based approaches and incorporate several sessions that focus specifically on how to recognize and deal with indirect aggression and they also teach prosocial strategies to build relationships and resolve interpersonal conflicts with.[62,63] About half of these programs show a statistically significant reduction in physical or indirect aggression or both, but effects are generally small. While the inclusion of parental components could offer additional support, another possible explanation may be that existing prevention and intervention efforts commence too late to have a large impact.[64] Unfortunately, with one exception,[65] prevention programs that target multiple indirect aggression have so far focused on children older than 5 years of age. However, given that indirect aggression emerges at around four years of age, prevention efforts may already need to start in the early preschool period. There is indeed some evidence that an early day-care-based program with 3- to 5-year old children can successfully reduce not only physical aggression but also indirect aggression.[65] Nevertheless, even the most comprehensive programs are likely to fail unless they are sustained over an extended period of time[60] and more research is needed to evaluate the sustainability of such effects.

Finally, concerted efforts to reduce indirect as well as physical aggression may need to extend beyond the school or family context. Indeed, even films that are considered nonviolent often contain a large extent of indirect aggression, something that is already apparent in animated movies popular among pre-schoolers.[66] Importantly, viewing indirect aggression in the media has been causally linked to increased hostile intent attributions as well as increased use of indirect aggression in children.[67-69] For almost two decades already, researchers have therefore called for a modification of the current rating system of media content for parental guidance.[70,71] Such a change would be especially useful because parental mediation of their preschoolers' media consumption (e.g., by monitoring the time spent with media and content restrictions) seems to buffer against the deleterious effects of indirectly aggressive media content on children's behaviour.[72] Only with a greater awareness of the potential dangers of aggression in all its forms and in a variety of contexts can we hope to prevent the negative repercussions for its victims.

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Sex Differences in the Development of Aggression From Early Childhood to Adulthood

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Introduction

Sex differences in aggression are of considerable practical importance in view of the societal problems caused by violent behaviour, and the consistent finding that these mainly involve young men.[1-5] Their significance is subject to considerable debate between biologically-oriented and socially-oriented scientists.[6-9]

Subject

The topic is the origin and subsequent development of sex differences in aggression, their various forms and individual differences, and their manifestation in adulthood.

Problems

The main scientific problems concern their age of onset; whether they increase with age; whether the developmental progression differs for different types of aggression; and whether violent behaviour can be traced to influences in early childhood.

Research Context

Most research has been carried out in modern western nations, although some key findings, such as the occurrence of sex differences in aggression early in childhood and the peak of violent aggression in early adulthood, have been confirmed in other societal contexts.[4,6]

Key Research Questions and Results

Aggression is first seen in infants when they express facial anger. The beginning of aggressive acts against peers is tugging at another child's toy, hitting coming later.[10,11] An observational study[12] found a large sex difference for "grabbing another child's toy" at 27 months. Large-scale

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longitudinal studies show higher levels of physical aggression for boys at 17 months and at 2 years, based on mothers' reports.[8,9,13,14] These early sex differences occur before the children have been subject to the socialization agents that are, in some accounts, held to cause the differences.[15] Overall, there is not an increasing magnitude of sex difference in aggression as the child becomes older.[14]

Physical aggression typically declines from its peak between 2-4 years, to be replaced by alternative ways of resolving conflicts.[8,9] Both sexes show the decrease, although the early sex difference is maintained through childhood and into adulthood.[6] Of more practical concern are those children who display unusually high levels of physical aggression. Large-scale longitudinal studies show that for around 10% of the sample, the early high level of physical aggression is maintained until 11 years or older. These are mostly boys:[14] yet most boys are not in this group. In contrast, just over a third of the sample shows very little physical aggression throughout childhood, and most of these are girls.[14] Studies of young adults show a wider variation among men than women,[16] and that there are proportionately more men than women committing dangerous acts of violence.[6,7]

Along with the decline in physical aggression with age, there are two other important developmental changes, first an increase in non-physical forms of aggression; and second, the increasing seriousness of physical aggression when it does occur.

Verbal aggression includes threatening actions that accompany physical aggression, and arguments and verbal-put-downs whose aim is to denigrate the other's social standing.[14] These tend to have their specific forms in boys and girls that fit the differences between their social groups and what is held to be important in these. Bearing in mind these differences, face-to-face verbal aggression tends to be more common in boys than girls, from early in life, to adulthood.[6,7]

Indirect verbal aggression is more common in girls than in boys.[6,17] It involves seeking to harm the person's reputation or social standing, and may include social ostracism. Finnish studies involving peer reports found that indirect aggression peaked between ages 11 to 17 years,[18,19] and girls' higher involvement than boys increases from middle childhood to 17 years.[19] Longitudinal studies using mothers' reports show that overall, while physical aggression decreases during childhood, indirect aggression increases, although a majority of the sample have consistently low levels.[20-22] Girls show a greater overall tendency than boys to increasingly use indirect aggression with age from 4 to 8 years.[22] When looked at in terms of the joint amount

of indirect and direct aggression, girls are more likely than boys to show high indirect aggression together with low or medium declining physical aggression; boys are more likely to have low indirect aggression together with medium declining physical.[22]

Although physical aggression shows a decline with age, its severity – in terms of the injuries inflicted – increases, to a peak in late teenage and early adult years, as assessed by violent crime and homicide statistics. This peak is almost entirely male, both in terms of its perpetrators and its victims.[1-4,6,7] These violent crimes have their roots in influences that begin at conception and continue thereafter, making it more likely that the individual will follow a violence-prone pathway.[8,9]

Serious forms of violence begin to decline in the late twenties, as do other forms of physical aggression,[6] and continue thereafter, with the sex difference maintained into middle life.[6] There are few studies of aggression in old age, although what evidence there is indicates that the typical sex difference in physical aggression is still found at ages 65 to 96 years.[23-25]

Research Gaps

There is no definitive answer to the extent to which early sex differences are dependent on prenata *androgens*.[26] Although there are some studies of mediators of sex differences in aggression[27-28] these are relatively limited.

Conclusions

Sex differences in physical aggression are found early in childhood, and are maintained through childhood into adulthood. There is a smaller difference for verbal aggression. Girls show more indirect aggression throughout childhood, in particular in adolescence. These overall differences hide specific groups, for example a persistently aggressive group that contains a higher proportion of boys and a consistently non-aggressive group that contains a higher proportion of girls.

Implications

The early development of sex differences in aggression implies that they are not the result of socialization influences. A few particularly aggressive boys contribute disproportionately to problem behaviour in schools, and girls' higher level of indirect aggression has a negative impact on social life in schools.

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The Development and Socialization of Aggression During the First Five Years of Life

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Introduction

Preschoolers who have not successfully developed age-appropriate strategies for regulating aggressive behaviour are at high risk for engaging in chronic aggressive and antisocial behaviour. Aggression co-occurs with several common problems in early childhood including impulsivity, emotion dysregulation and language delays, and is a common reason for clinical referral. Exactly how these other problems interact with aggression is still under investigation. Aggression may be worsened by these co-occurring problems in some children. In other children, deficits in these other areas of functioning may have preceded the difficulties with aggression. Aggression problems typically develop in the context of interactions between biological and social risk factors, learning history, and parent behaviours.[1]

Subject

Major developments in cognitive and social-emotional domains occur during early childhood. Regarding cognitive development, the emergence of increasingly sophisticated verbal skills, self-awareness and goal-directed behaviour contribute to a strong push for independence on the part of the child. Simultaneously, parents begin to impose rules and limits, both in response to the child's newfound autonomy and as a natural part of the socialization process. Clashes between the child's self-assertions and a parent setting limits lead to more frequent episodes of frustration and upset. Thus, some aggressive behaviour in response to frustration is developmentally typical early in life. Emerging skills appear to influence the trajectory of early aggression. For example, a child's increasing ability to regulate attention and negative emotions, inhibit impulsive responding, and draw on social communication to resolve conflict or express needs provide a foundation for utilizing behaviours other than aggression in response to frustration, anger, fear, etc. In fact, the intensity of anger response in toddlers exposed to frustrating tasks is associated with levels of aggression later in childhood.[2] Assessing a child's

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developmental skill set is important for determining whether delays in other areas of functioning should be addressed.

Problems

Defining atypical aggression during the preschool years has been controversial,[3] due in part to reluctance to label or diagnose young children or apply developmentally inappropriate concepts from the literature on aggression in older individuals. Aggression has been broadly defined in the developmental and abnormal psychology literature,[4] resulting in a set of behaviours that range from typical and adaptive to atypical and maladaptive. We now know that young children who are manifesting high levels of aggression are at high risk for continued problem behaviour and are in need of services.5,6 Aggressive behaviour is associated with deficits across a range of developmental domains (e.g., physical, social, cognitive) and can be exacerbated by co-occurring problems. For example, delays in language development may impede communication of needs, impair the socialization of empathy and emotion regulation, and negatively impact peer relations. Language delays also contribute to social skills deficits that may lead to increased aggression into middle childhood.[7]

Key Research Questions

Aggressive behaviour emerges early,[8] and even these early forms can persist and become problematic.[1,4,5] Moreover, high levels of aggression occurring as early as the toddler period, is predictive of later disruptive behaviour disorders.[9] As a result of these findings, a greater appreciation has been developed for the capacity of studies of chronic aggression in young children to inform research on the causes of serious aggression. Many critical deficits that establish the foundation for persistent or problematic aggressive behaviour emerge during the first five years of life.[10] Dysregulated emotion, inattention, impulsivity and other developmental delays, particularly in the domain of social communication, likely influence the course of aggressive behaviour. Gene-environment interactions are also likely to be an important influence. For example, serotonin transporter gene haplotypes appear to moderate the effect of unsupportive early parenting on noncompliance and aggression.[11,12] Given the heterogeneity in presentation of early aggression, characterization of risk factors and co-occurring problems should be key research targets.

Recent Research Results

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Within the past decade, evidence has been accumulating to clarify subtypes of aggression, the relative influences of some risk factors such as callous-unemotional (CU) traits, and the influence of child maltreatment on development of aggressive behaviours.

Children exhibiting CU traits demonstrate higher risk of developing reactive aggression in adolescence, but the contribution of CU traits to relational aggression appears to be moderated by presence of comorbid internalizing problems.[13] Moreover, early-onset of antisocial behaviours including aggression is a better predictor of adolescent and early adulthood antisocial behaviour than the presence of CU traits.[14] Trauma and maltreatment have long been identified as important correlates of aggression in youth, and recent evidence in a Norwegian sample suggests that children who have experienced abuse (i.e., physical, emotional, or sexual) are more likely to develop aggression than children subjected to neglect or non-maltreated children. These data are limited by a homogeneous sample, and because this sample included many children older than age five.[15] However, a larger and more diverse study demonstrated that a particular form of child maltreatment (chronic exposure to community violence) was associated with development of aggression even in children as young as age three, potentially due to emotional desensitization to violence.[16]

The intergenerational transmission of severe aggressive behaviour is likely driven by interactions between assortative mating, genetics, and social-environmental influences, rather than any one risk factor in isolation.[17] Several child traits have been identified as moderators of the development of aggression, including IQ, effortful control of emotions/behaviours, theory of mind, understanding of emotions, and hostile attribution bias.[18]

Intervention

Aggression in preschool-aged children is not considered a mental health condition or diagnosis per se but is typically addressed in the context of interventions for other conditions such as externalizing problems, disruptive behaviour disorders, or psychiatric and developmental comorbidities. For example, reducing problems with aggression in the context of a developmental delay typically requires interventions targeted at the delay, not simply at reducing the aggressive behaviour. Psychopharmacology, behavioural and family-based therapies, and broader early-intervention services are frequently used to target aggression in this population. Early intervention programs that are not *specifically* targeted toward aggression, such as Head Start, have demonstrated beneficial effects on aggressive behaviour.[19]

Much of the evidence supporting the efficacy of psychopharmacology for preschool aggression is based on trials of treating co-occurring mental health and psychiatric conditions.[20]

Psychotherapeutic interventions for reducing and preventing aggression in young children have typically been evaluated as part of larger treatment protocols for externalizing behaviours. Within this literature, individual and group-based parent behaviour therapies are recognized as well-established evidence-based treatments.[21] *Time-out from positive reinforcement*, (an operant conditioning procedure typically referred to as simply "time-out") is among the safest and most effective interventions to reduce preschool aggressive behaviours when used by a parent/caregiver in a planned, predictable manner in combination with other behavioural management strategies. Time-out appears to be particularly effective at addressing child behaviours that are intentionally oppositional, and there do not appear to be immediate or long-term side-effects associated with its use.2[2,23] In addition to strong evidence supporting its effectiveness, time-out is compatible with behavioural, family-systems, attachment-based, and trauma-informed approaches to discipline.[24]

Research Gaps

Two areas of research are still in early stages of development. The first is the understanding sex differences in early aggression. Numerous studies demonstrate sex differences in the continuity of early aggression.[25] Research on sex differences in the characterization of co-occurring problems with aggression will contribute to the ability to propose causal models of chronic aggression across development. One example of such a study is by Hill and colleagues[26] of more than 400 preschool girls and boys from ages 2-5 years. Poor emotion regulation and inattention at age 2 were important predictors of chronic and clinically significant levels of aggression and defiance for girls, whereas inattention was a predictor for boys.

The second area is identifying subgroups of aggressive children who demonstrate specific patterns of co-occurring behaviours and corresponding alterations in biological systems. For example, heart rate and skin conductance have been used to differentiate subtypes of aggression that demonstrate different patterns of co-occurring problems in older children.[27] Testing such hypotheses in younger children may help disentangle whether the autonomic arousal is a cause or an effect of aggression.

Conclusions

Aggression develops early in life and in most cases demonstrates a gradual decline over the first five years of life. Most children learn to inhibit aggressive behaviours and replace them with prosocial skills that develop over the course of early childhood. Some young children engage in aggression that is pervasive, frequent and severe. Persistent aggression that emerges during the first five years of life is impairing and associated with later mental disorders, poor social outcomes, and accumulation of deficits. Problematic early aggression typically develops as a result of interactions between risk factors, social learning processes, and other environmental influences.[1] Comorbidities are common in the context of persistent and high aggressive behaviour including language problems, impulsivity, hyperactivity, poorly regulated negative emotions and defiance. Although the direction of effect (i.e., which problem came first) is not always evident, the co-occurrence argues for a comprehensive assessment of developmental functioning when concerns about early aggressive behaviour arise.

Implications

Although the first five years of life is a period of risk for the development of persistent problems with aggression, this same period can be viewed as the optimal opportunity for supporting the development of emotional and behavioural regulation and communication to increase the probability of healthy social development. Pathological patterns of aggression can be effectively treated with behavioural modification, family therapies, and medications in the context of effective management of comorbid medical, psychiatric, and developmental problems.
 Developmental progression along cognitive, emotional, behavioural and social domains should be assessed systematically and regularly throughout the first five years of life. Because of the interrelatedness of each of these domains on the acquisition of prosocial skills, delays in one dimension could affect development in others, resulting in an accumulation of deficits. The encouragement of use perspective taking, emotion and behavioural regulation, delay of gratification, and effortful control are associated with declines in aggression. Therefore, significant delays or deficits in the basic psychological processes that support these areas of growth will impede the normal decline in aggression observed over the first five years of life. Any effective intervention for aggression will require an assessment of deficits across domains, and additional supports to address such deficits.

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Best Practices in the Development of Effortful Control in Early Childhood

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Introduction

Effortful control (EC) is a dimension of temperament related to the self-regulation of emotional reactivity and behaviour.[1] EC allows increased control over action and adjustment to situational demands in a flexible and willful manner. The concept includes aspects related to attention, including the ability to voluntarily move, focus and sustain attention as needed, and behavioural regulation, which includes both inhibitory control of action (not eating a candy) as well as activation control (eating a fruit instead). From very early in life, children greatly differ in their EC abilities. During infancy caregivers provide much of control over children behaviour and it is not until the end of the first year of life that early forms of self-regulation start to develop. Subsequently, the capacity for effortful control increases markedly in the preschool years and may continue to develop into adulthood.[2] However, despite the progressive development due to maturation, EC appears to show within-subject stability from toddlerhood through preschool and into early school age years.[3]

Subject

Given its role in emotion regulation and adjustment, EC is considered an important contributor to the socio-emotional development of the child.[4] When experiencing negative emotions it is useful to use attention in order to shift thoughts away from the source of distress. It can also be helpful to use inhibitory control to stop aggressive impulses or mask the expression of negative emotion when needed. Finally, it can also be good to use activation control to take actions that may ameliorate the situation. The same range of abilities may help in a variety of situations in which regulation is required. Many of these situations in children's lives happen at school, and it has been shown that EC is an important predictor of academic achievement and social adjustment at school.[5-7]

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Individual differences in EC are related to aspects of cognition such as theory of mind (i.e., knowing that people's behaviour is guided by their mental state, which includes beliefs, desires and knowledge). There is also evidence showing that EC plays an important role in the development of conscience, which involves the interplay between experiencing moral emotions (i.e., guilt/shame or discomfort following transgressions) and behaving morally, in a way that is compatible with rules and social norms.[8] Besides, children who are high in EC appear to be more able to display empathy toward other's emotional states and pro-social behaviour.[4] EC is thought to provide the attentional flexibility required to link emotional reactions (both positive and negative) in oneself and others with internalized social norms and action in everyday situations.

Problems

Poor regulatory abilities often place the child at risk of developing pathologies such as disruptive behaviour problems or ADHD.[9] In relation to behaviour problems, it is important to distinguish between reactive aggression (emotionally-driven conduct problems) and proactive aggression (unprovoked, unemotional aggression that is used for personal gain or to influence and coerce others). EC shows a consistent negative correlation with behaviour problems based on reactive aggression but not so much on proactive aggression.[10] Across cultures, it has been shown that children who show high levels of emotional reactivity, either in a surge-approaching (e.g., impulsivity, sensation and reward-seeking) or a negative (e.g., anger and frustration) mode or both, often show externalizing behaviour problems when having poor EC abilities.[4] Conversely, children with covert proactive behaviour problems such as stealing do not always exhibit self-regulation difficulties. Aspects of the home environment are also important in the development of behaviour problems. In fact, a direct relationship between positive parenting (warmth/positive expressivity) and low levels of externalizing behaviour problems has been established. Nevertheless, this relationship appears to be mediated by children's EC,[11] meaning that positive parenting is facilitated when children show more regulated behaviour.

Research Context

EC is often measured with parents, teachers or with self-reported questionnaires. These are made up of questions about children's reactions to everyday situations on the variety of dimensions included in the definition of EC (focusing and shifting attention, inhibitory control and activation control). It can also be measured with tasks designed to elicit temperament-related reactions (i.e., receiving an undesired gift) in the laboratory, or by means of direct

observations in naturalistic settings. In addition, given the conceptual link between EC and attention, experimental tasks often used to measure attentional control are also utilized to measure individual differences in self-regulatory abilities.[12] Such tasks usually require resolving conflict between stimuli and/or responses. One example of this type of task is the Flanker task. In this task, a target stimulus is surrounded by irrelevant stimulation that can either match or conflict with the response required by the target. When distracting stimulation conflict with the correct response, the time to respond is delayed with respect to when the distracting information matches the target response (there is no conflict). This delay in reaction time can be used as an index of efficiency of attentional control (larger delays indicate poorer control of the distracting stimulation). Performance of conflict tasks in the laboratory have been empirically linked to aspects of children's EC in naturalistic settings. Children who are relatively less affected by conflict receive higher parental ratings of EC and higher scores on laboratory measures of inhibitory control.[12] Moreover, using experimental tasks is particularly effective when it comes to understanding the brain basis underlying children's control skills, because the child can perform those tasks while neural activation is registered with brain imaging techniques. It has been shown that a brain network including the *anterior cingulate cortex (ACC)* and lateral *prefrontal cortex* areas, mostly modulated by the neurotransmitter *dopamine*, subserves the function of regulating thoughts, emotions and responses.[13] Patterns of activation of these brain structures are related to the efficiency of resolving conflict[14] and variations in the size and structure of the ACC have been related to the EC score obtained in temperament questionnaires.[15]

Key Research Questions

Key research questions that are currently addressed in relation to EC are about the genetic and experiential factors that may influence individual differences in EC and its development. One important question is whether the regulatory abilities central to EC are subject to intervention, and if so, what are the educational practices, whether provided at home or at school, more likely to potentiate children's EC.

Recent Research Results

From early models, temperament has been thought to have a constitutional basis.[1] Recent evidence is showing that polymorphic variation in dopamine-related genes is associated to individual differences in EC and attentional control.[16] However, the relevance of the biological endowment for EC does not mean that this ability cannot be influenced by experience. Computer-

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based training programs targeting attention focusing and control has proven to enhance efficiency of the brain attention system in young children as well as reasoning capacities.[14] It has also been shown that classroom curricula that emphasize regulation and executive functions skills, such as Tools of the Mind,[17] improves children's cognitive control.[18] But home environment is also important. Aspects of parent-child relationships such as attachment security, early positive mutuality, warmth, responsiveness and discipline have been shown to play a role on the development of regulatory abilities. Recent evidence suggests that autonomy support (i.e., offering children age-appropriate problem-solving strategies and providing opportunities to use them) is the strongest predictor of children performance on cognitive control tasks.[19] In children who are more likely to display externalizing behaviour problems, it has been shown that the use of gentle discipline (i.e., giving commands and prohibitive statements in a positive tone) by parents results in the development of greater EC, whereas the use of reasoning explanations and redirections in neutral tone is associated to poorer EC later on.[20] In line with this, other studies have shown that positive parental control can buffer the risk of developing externalizing behavioural problems in children low in EC.[21] A similar result is also found for teacher-child relationships. Supportive teaching appears to safeguard the risk of academic failure in children who are low in EC.[22]

Research Gaps

Since the entire human genome sequencing a decade ago, lots of research efforts have been devoted to understanding genetics of behaviour and cognition. Variations in a number of genes have been associated with particular developmental pathologies (i.e., VNTR-type 7-repeats *polymorphism* of the *DRD4 gene* is associated with increased risk for developing ADHD).[23] However, it would be worthwhile to explore whether genetic variation interacts with experience to determine patterns of behaviour and cognitive efficacy. Related to this question, recent research suggests that particular polymorphisms, often those linked to risk for pathology, make the individual more susceptible to be influenced by parenting and other experiences.[24-26] For example, children carrying the 7-repeat variation of the DRD4 appear to benefit more from interventions directed to prevent behaviour problems than those carrying other variations of the gene.[24] Nonetheless, further research is needed on how and to what extent EC skills may be influenced by the interplay between constitution and experience.

Conclusions

Effortful control is a dynamic temperamental dimension determined by a multiplicity of factors including both constitutional dispositions as well as experience. It captures individual differences in the voluntary and effortful regulation of thoughts, emotions and responses. Individual differences in EC are important for a broad range of behaviours that significantly influence children's social adjustment and their success in school. There are strong increases in this function during early childhood followed by a more progressive development during late childhood and adolescence, as brain processes related to executive control become progressively more refined and efficient. Efficiency of systems of self-regulation is partially determined by the genetic endowment of the individual and is also affected by environmental factors such as parenting and education. Susceptibility to experience provides an opportunity to promote EC by means of appropriate educational interventions. Determining the interventions and experiences most likely to foster EC may serve the purpose of helping children to become successful and happily-adjusted members of society.

Implications for Parents, Services and Policy

Effortful control is a quality that is key to socialization. Children need to develop self-control to resist temptations, stay focused despite distractions, persist to complete tasks even when the reward may take time to arrive, and avoid acting in a way that they might regret, giving considered responses rather than impulsive ones. Evidence shows that improving EC will promote children's adjustment to society and pro-social attitudes, and will help to prevent the development of regulation-related disorders and conduct problems.[4,8] An important challenge for parents and educators is to provide children with the type of learning experiences that will help them to succeed in this endeavour.[27] Parental attitudes involving secure and affectionate responsiveness toward the child together with discipline and autonomy support appear to promote the development of EC.[11,19-22,25] Also, emerging scientific evidence shows that particular educational experiences support the acquisition of regulatory skills.[14,18] This type of studies provides an opportunity to turn research findings into curricular improvement.

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Effective Daycare-Kindergarten Interventions to Prevent Chronic Aggression

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Introduction

Societal concern about antisocial behaviours of children and adolescents has increased over the years, in part due to the enormous financial costs of youth crime,[1,2] as well as the devastating consequences of violence in schools.[3] Conduct problems (especially among boys) are the most frequent childhood behavioural problems to be referred to mental health professionals.[4] Aggressive and disruptive behaviour is one of the most enduring dysfunctions in children and, if left untreated, frequently results in high personal and emotional costs to children, their families and to society in general. A great deal of research has therefore been conducted to investigate the causes, treatment and prevention of conduct problems,[4] often using models emphasizing risk and protective factors addressing children's social competence and contextual family variables as research and intervention frameworks.[5]

Subject

Longitudinal research indicates that young children who develop disruptive behaviour problems are at an elevated risk for a host of negative adolescent and adult outcomes including chronic aggression and conduct problems, substance abuse, poor emotion regulation, school failure, peer problems and crime.[6,7,8] Early-appearing externalizing behaviours can disrupt relationships with parents and peers, initiating processes that can maintain or exacerbate children's behavioural problems.[9] Therefore, very early intervention (e.g., in day care, preschool, or kindergarten) can be important in interrupting the potential path to chronic aggression in children who display aggressive behaviour or who are at risk for developing aggressive behaviour.

Risk factors for aggression in young children include a complex array of child, family and environmental factors that can often operate in additive and interactive ways. At the child level, temperamental features evident in infancy and toddlerhood such as irritability and negative

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affect, low agreeableness, weak effortful control, high surgency and approach, lack of persistence and low adaptability increase the risk of behaviour problems[10,11,12,13,14] as do certain neuropsychological, genetic and neurobiological traits.[15,16,17,18,19] At the family level, parenting practices including punitive discipline, inconsistency, low warmth and involvement, and physical aggression have been found to contribute to the development of young children's aggressive behaviour.[20,21] Children who are exposed to high levels of discord within the home and whose parents have associated harsh parenting and mental health and/or substance abuse issues are also at heightened risk.[22,23,24] Other important correlates of aggression in children that can contribute to chronic aggression include children's faulty social-cognitive processes affecting their perceptions, goals and decision-making in difficult social interactions, often acquired from their relationships with parents and peers[25,26,27] and rejection from their young peers.[28]

Problem

Early-emerging disruptive behaviour problems tend to be highly stable, can disrupt important developmental processes, and are predictive of negative outcomes in adolescence. Therefore, effective interventions targeting very young children are needed that target malleable risk factors for aggression.

Research Context

Effective day care-kindergarten interventions designed to prevent chronic aggression are essential to the long-term psychological well-being of children between 2 and 5 years of age. Although some of the current literatures state that children tend to grow out of or see decreases in externalizing behaviours by early childhood,[29,30] other research indicates that some children, especially boys, who exhibit sharp increases in aggressive behaviour between 2 and 3 years of age, tend to exhibit stable levels of aggression as they mature.[31,32] Most of the research which has demonstrated effective school-based aggression prevention interventions has been conducted with children in the elementary and high school years.[33] However, there have been fewer intervention programs designed for children in the 0-5 age period that have been rigorously researched and shown efficacious for aggression prevention.

Key Research Questions

A key research question is whether psychosocial school-based interventions demonstrated to be efficacious in older children can be translated for use in younger children. In addition, research

must demonstrate whether psychosocial interventions can be powerful enough to protect against the numerous risk factors shown to influence early childhood aggression such as low socioeconomic status, poor parental attachment, negative parenting practices, and child temperament and genetic factors,[34,35] and whether intervention effects are mediated through changes in parenting practices and in children's emerging self-regulatory abilities. Children as young as 36 months can use metacognitive strategies to alleviate their negative arousal states. As they continue to develop in preschool, and are influenced by the emotion regulation strategies of parents and other adults, their use of regulation strategies becomes more sophisticated.[36,37,38] Thus, the use of psychosocial interventions in this age range appears promising.

Recent Research Results

During the prenatal-to-infancy period interventions such as nurse home visitation programs have been shown to reduce children's early emotional vulnerability,[39] and decrease later criminal and substance use behaviour among high-risk groups through age 12 to15,[40] although the nature of the specific maternal at-risk factors has varied across studies. When the youth reached age 18, the intervention had improved some aspects of youths' academic performance, but did not have overall effects on youth behaviour problems or substance use.[41]

In the post-infancy years, early childhood education settings (e.g., day care, preschool, kindergarten) offer an important opportunity to identify at-risk youth and provide prevention and early intervention programming. In the past several decades, a number of preventive interventions have been developed and tested for use in early childhood settings to prevent chronic aggression.[42,43]

Universal prevention programs seek to prevent child behaviour problems by teaching all classroom students core social and emotional competencies. The Promoting Alternative Thinking Strategies (PATHS) curriculum provides weekly classroom lessons and extension activities to improve preschool children's social-emotional awareness and behaviour. In a randomized trial with 246 children in 20 Head Start classrooms, children exposed to the PATHS program had higher emotion knowledge skills and were rated as more socially competent and less socially withdrawn at the end of the school year.[44] Another study of preschool PATHS in 113 preschool centers found that PATHS had effects on children's emotion understanding but limited effects on other socioemotional skills and no effects on academic skills.[45] When PATHS was implemented in a more comprehensive way, along with a language and literacy curriculum, as part of the Head

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Start REDI (Research-based Developmentally Informed) program in a separate study in [44] Head Start classrooms, significant reductions in children's aggressive behaviour were also observed[46] and intervention effects on children's social-emotional functioning continued to be seen through third grade.[47] At a six-year follow-up when children were in 5th grade, children who had received the REDI intervention had better long-term social adjustment and academic engagement than control children but the intervention effects on behaviour problems were no longer significant.[48]

Coping Power Universal (CPU) is a recent adaptation of a targeted prevention program, Coping Power,[5] and has been developed for use as a universal prevention program for preschool classrooms. CPU for preschoolers has 24 weekly sessions delivered by the classroom teacher, and the lessons, following the Coping Power model, focus on self-control, awareness of feelings, awareness of physiological arousal, and problem-solving. The lessons use storytelling, singing, role-play and puppetry. In three randomized control studies, children who received CPU for preschoolers had reduced rates of behavioural difficulties at post-intervention according to both parent and teacher ratings,[49,50,51] and improvements on teacher-rated academic abilities[50] and on standardized[51] academic tests of mathematical and language skills.

Targeted or indicated prevention programs seek to identify children with elevated risk for aggressive behaviour and to alter their developmental trajectories by addressing malleable risk factors. The Incredible Years (IY) Training Program[52] was originally developed as a parent training intervention for parents of children with clinical diagnoses of Oppositional Defiant Disorder and Conduct Disorder. Similar intervention programs that have combined parent workshops with simultaneous training program for high-risk 2- to 5-year-olds and their siblings, and with a joint activity time for parents and children, have resulted in decreases in oppositional child behaviours, decreases in harsh punishments from parents, and improvements in the effectiveness of parental discipline.[53] IY has subsequently been expanded to include child and teacher components and has been evaluated for use as a prevention tool. Several randomized trials of IY delivered to Head Start teachers and parents[54] have produced favorable effects on reducing child noncompliance and negative behaviours and improving parent competence and child prosocial behaviours,[52] especially for preschool children with more behaviour problems[55] and for boys and children with depressed mothers.[56]

Parent-Child Interaction Therapy (PCIT) is another form of early intervention for preschool-age children with aggressive behaviour. PCIT and related interventions[57] intervene directly with the parent-child dyad.[58] PCIT has been shown to produce lasting improvements in child and sibling

behaviours at home and school, as well as improvements in parenting and parent well-being in a number of university-based treatment studies, and has been adapted for use with parents and infants.[59] PCIT has been adapted for use in preschool classrooms and other community settings.[58]

Research Gaps

Despite the emergence of several preventive interventions for aggressive behaviour in early childhood settings, a number of key research gaps remain. First, longer-term follow-up studies are needed to better determine whether prevention programs provided in early childhood settings produce lasting reductions in children's aggressive behaviour. Boisjoli and colleagues[60] found that aggressive boys who participated in a multimodal preventive intervention in kindergarten had better high school graduation rates and generally fewer had criminal records compared to control boys at a 15-year follow-up. These findings are highly promising and suggest that additional studies are needed to further document the range of long-term effects of early preventive intervention, and to identify the mediating child and parent processes underlying long-term reductions in aggressive behaviour. Second, parent training is a critical feature of most preventive interventions for child aggression. However, engaging parents of high-risk youth in such interventions can present a significant challenge. Additional research on strategies for engaging high-risk families and tailoring interventions to fit families' needs, such as the work being conducted on the Family Check-Up,[61] is warranted. Finally, future studies are needed to examine aspects of the training process and host systems that affect the ability of early childhood programs to provide sustained and effective use of preventive interventions for child aggression.[62]

Conclusions

Effective daycare-kindergarten interventions must target the known active risk mechanisms that contribute to the maintenance of aggressive behaviour, especially addressing children's self-regulatory behaviours and parents' behaviours. In the past several decades, classroom-based research has continued to develop on universal and targeted prevention programs for young children. Universal prevention programs for preschool and kindergarten settings have demonstrated that teachers can be trained to assist children's social competence. During the preschool years, psychosocial interventions with parents targeting their parenting practices have immediate effects both on parenting behaviours and on aggressive and noncompliant behaviours among children. Several different models of effective parenting programs have been found for

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the parents of children in this age group, including parent training workshops, group meetings, and coaching during interactions with children. The latter type of parent–child program that involves coaching has been used more in clinical settings or interventions targeting high-risk families than in large-scale prevention services. Such parenting programs have been combined with classroom-based programs focusing on social-emotional development.

Implications

Several key implications are evident for parents, services and policy. First, schools can indeed offer effective social-emotional learning to children in the preschool settings, but there can be long-term advantages for including tightly linked components that offer psycho-education and collaborative problem-solving to parents. Second, following emerging, innovative trends in intervention research with older aggressive children, intervention with preschool aggressive children should become adaptively flexible, while still retaining implementation with fidelity.[63] Research-based interventions in the years ahead are more likely to be based in the identification of assessed risk factors for each family, which will in turn lead to tailored versions of the intervention in which only relevant portions of the intervention will be delivered to address the identified specific risk factors for a particular child and family.[64,65] Planned capacities to tailor interventions in this way will permit clinicians and preschool and school staff to readily adapt interventions, and this will likely be evident for targeted-child interventions and parent-based interventions. Third, programs offered to parents should not only offer behavioural parent training designed to enhance parents' rewards and antecedent and consequential control of children's behaviour, but should more broadly and collaboratively address parents' developmental expectations for their children, reinforce children's emerging self-regulation, emotion knowledge and problem-solving skills that are being shaped by the child-focused components of interventions. Parents (and teachers) play a key role in modeling and reinforcing self-regulation strategies. Fourth, preschools should recognize that engaging parents in preventive interventions requires proactive planning, and specialized parent engagement strategies are often necessary. Fifth, the introduction of research-based interventions in typical preschool and agency settings requires careful attention to the intensity of training required for school staff, and to characteristics of the school settings and of the school staff that stimulate implementation of programs with high quality.[61] Finally, in terms of social policy, there is now sufficient evidence to encourage the development of widespread behavioural training programs for parents of preschool-aged children and for preschool classroom-based interventions.

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Play-Fighting During Early Childhood and its Role in Preventing Later Chronic Aggression

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Introduction

In the last decades, the opportunity for children to engage in freely occurring play has eroded due to an increase in structured activities (e.g., sports, music, dance lessons) and an increasing intolerance for anything that may be construed as aggression. Because of the risk of accidental injury or perceived opportunities for abusive contact, rough-and-tumble play (RTP) – which comprises both chasing and wrestling – has been the form of play most severely curtailed.[1] In times past, when it was not suppressed, estimates of the amount of freely-chosen play to involve RTP in children, especially males, was about 10%.[2] Given the concerns for children's safety and the relatively infrequent engagement in RTP, it would seem sensible to ban it from their lives. However, a growing body of experimental evidence with laboratory animals suggests that banning RTP may be counterproductive. RTP provides young animals with the opportunity to finely tune their behaviour in a contextually relevant manner with peers and so modify the brain mechanisms that underpin social skills.[3]

What the Research Shows

Obviously, experimentally manipulating childhood experiences to test for the effects of play is not possible. Thus, the strongest experimental evidence comes from studies of laboratory rodents, especially rats; however, there is mounting evidence from studies of children that is consistent with the findings on rodents.

Play and the laboratory rat

Once weaned, young rats spend about an hour per day engaged in RTP. Depriving young rats of the opportunity to play over the juvenile period (akin to between 5-11 years of age for children) leads to a wide range of deficits, the core of which involve an inability to attenuate their emotional reaction to novel or frightening situations, and this is associated with social deficits.

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These deficits are seen in the play-deprived rats' failings to coordinate their movements with those of a social partner – critical for successful sexual union – and in their misreading of social signals – critical to prevent social encounters from escalating into aggression. Crucial to emotional self-regulation and social skills is the ability of the prefrontal cortex (PFC) to exert executive control over the options available.[4,5] Engagement in RTP leads to a modified release of chemical factors in the brain that influence growth, and changes the number, complexity, and, critically, the function, of the cells of the PFC. In the juvenile period, RTP has been shown to affect the development of the PFC, but socially reared rats, with normal experience of RTP, given damage to the PFC as adults, exhibit deficits in social behaviour like play-deprived rats with intact brains.[6]

Importantly, unlike earlier studies with rats that relied on complete social isolation during the juvenile period, in recent decades, various paradigms have been developed that selectively affects the opportunity for social play, enabling the resultant deficits to be linked to deficient RTP experience. In addition, different methods of assessing social competency across different strains of rats strongly suggest that this role of RTP is a species typical function of play.[7,8,9] Thus, the causal link between RTP and social competency is well established in rats.[6] The same association between juvenile RTP and social competency has been experimentally established in hamsters,[10] and correlations for this association have been reported in non-human primates.[11] Together, these findings indicate that the role of RTP in socio-cognitive development may be common across many mammals, including humans.

What is special about RTP?

For RTP to remain playful, it must be, at least to some degree, reciprocal. That is, partners must show the restraint necessary to prevent one of the participants from always gaining and maintaining the advantage. Also, RTP can be unpredictable and ambiguous. Participants cannot predict when or if they will lose control of the situation, or, indeed, how they will regain it, nor always be certain about their partners' intentions. So, if one partner transgresses the playful rules by being more forceful than expected, the recipient must decide as to whether that partner is abusing the situation or has just been carried away by the exuberance of the moment.[12] Thus, RTP creates an experiential context that taxes and trains the executive functions of the PFC.[6]

Research on children

Children that engage in more RTP tend to be better liked by peers, over consecutive years exhibit better social skills, and, overall, perform more effectively in the school setting with regard to academic performance.[13] Although the PFC is not fully developed until the mid- to late-twenties, by exposing young children to playful situations that require the exercise of turn taking, executive function can be improved, which shows that the PFC is amenable to enhanced function even before it is fully mature.[14,15] Non-physical play encounters that have many of the same properties as RTP can include exercises, such as asking two children to draw something together – they would thus have to negotiate what to draw, how to draw it and determine what each individual would contribute to the drawing. Such negotiations tax the function of the PFC, as does the monitoring necessary to make sure that the partner does not cheat. Indeed, failure to engage peers in social play has been shown to retard the development of executive functions.[16]

Implications

There are different degrees of involvement of social skills in different types of aggression.[17] Lack of suitable social skill enhancement with associated emotional self-regulation could have a negative impact on aggression in at least three ways. First, as indicated by the animal experiments, play-impoverished children may misread social cues and so escalate to aggression. Second, as is also suggested by the animal literature, play impoverished children may have a smaller tool kit of options for convincing peers to cooperate, and so may resort to aggression to gain some operational advantage. Third, more specific to humans, poor adjustment to the school setting, failure to make friends and poor academic performance may lead to frustration-induced aggression.[18] Finding ways that allow children to gain the experiences that are important from RTP, either through RTP itself, or activities that simulate core experiences from RTP, such as turn taking, may be important to offset later aggression.

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