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ABSTRACT

Hyperactivity in children is explained in relation to behavioral characteristics, precipitating factors, and stimulant medication therapy. The basic mechanism of hyperactivity is seen to be impulsive style in motility, attention, and socialization. Problems caused by impulsivity are noted to include feeding problems, school difficulties, and peer alienation. Two factors are reported to precipitate hyperactivity which are emotional (stress) and chemical (food additives). The use of stimulant medication therapy is discussed in terms of goals; type and advantages of drug chosen; dosage; when to stop medication; and effects on growth, appetite, and sleep. (SB)

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HYPERACTIVITY

Based on a presentation to the Heinz Seminar at the Annual Meeting of the Canadian Paediatric Association, Toronto, Ontario, 1975.

An excessively impulsive life style characterizes organic hyperactivity. Of this style, extreme motility is a variable and relatively insignificant component. A more important and usual component is extreme impulsivity of thinking and decision-making. The child can be helped in his or her efforts to think before acting by stimulant medications; but this therapy should not be used unless the physisican is prepared to exert the same degree of care and continuous supervision as with other important, critical, long-term medications, such as insulin.

The purpose of clinical inquiry is to guid the choice among available management options for the patient. The only clinically justified questions are those which help one make that choice. Questions which do not help one make practical choices should be avoided because they are confusing and clinically unjustified. For this reason, I shall discuss hyperactivity only at the behavioural level; only behavioural considerations have any practical importance in hyperactivity. Chemical analyses, electrical recordings, and other laboratory procedures are not clinically useful though they may have research interest.

The basic mechanism, at the behavioural level, of organic hyperactivity is the impulsive sty;e: impulsive style in movement, making for the excessive motor activity which gives the condition its name; impulsive style in shifting attention, making for the distractibility which is actually much more important; an impulsive style in social relating, making for social ineptness, which is just as important. Now these three main aspects - - motility, attention and socialization -- are differentially salient at different stages in child development. In the infant the excessive movement is the most striking. Infants do not yet socialize, so they cannot be criticized for how they are doing it. Although infants certainly attend, we have rather vague ideas about how much attention is typical of a baby, so we can only judge in extreme cases. But it is hyperactive infants' movements that are particularly striking clinically.

They may even be internally striking to mothers before birth, or so we are sometimes told. Many if not all these children are unusually mobile, even very soon after birth. They are also sometimes seen as advanced in motor development. In other words, they use their motor capability to the observable full. That does not usually give rise to complaints until later, when the child is mobile and able to destroy property. In the first year of life, that is rarely the case. However, two other aspects of increased motoric activity do come to notice. Frequently there are feeding problems. The baby is irritable on feeding, maybe thought to have excessive gas, maybe having gulped air greedily when on the breast or the bottle. Also, the baby may have sleep disturbance. Actually, the person who has sleep disturbance is the parent. A few hours after going to sleep, the child may feel awake and ready to go, whereas the parents have a different opinion. These complaints do not bring the child to a doctor as often as they might, for the following reasons: In most households, of the two parents, only the mother feeds and comforts the child. So, it is only she who is substantially inconvenienced by the feeding and sleep problems. If she is a conventional mother, she is probably so guilt ridden that she assumes that any problem is of her own making, and that she should live with it rather than present what is a real problem for clinical attention and possible help. So, we do not see these children as often as we should when they are very small.

The effect of the excessive mobility escalates when the child is a toddler, because he damages both property and himself. At this point, fathers tend to agree that there is legitimate reason for medical consultation, since the child falls into chasms, or ingests the tranquilizers which are often understandably present in the medicine chests of parents of hyperactive children. So one way or another, particularly when derived from middle-class homes, the children come to attention as pre-schoolers on account of the manner in which they move.

It is not so much the extent to which they move but the times at which they move, times at which it might be wiser to be still. Attempts to document an overall excessive amount of movement on the part of hyperactives have usually been inconclusive. They move when others do not. They are the "fools who rush in" where introverted "angels fear to tread." But this excessive mobility is not a primary manifestation; it is secondary to a rapid change of thoughts. The impulsive child keeps changing what she/he is observing. Now, the younger the child the more will thought be reflected in movement. In the infant, thought and movement are identical, so that one can see the child think and observe whether he/she is impulsive. As the child grows older, the hyperactive's impulsive style of thinking may remain unchanged; but in the course of all children's development, thought increasingly dissociates from overt movement. There may, therefore, be a mistaken impression that the condition is remitting. All that may be happening is that the motor accompaniment of impulsive thinking becomes less conspicuous, and this by itself is no indication for suspending clinical concern about the patient. By adolescence, these children hardly ever seem to move unduly.

The attentional component -- distractibility -- becomes apparent when the child is first in a situation in which maintained attention is required. This of course, is school or, increasingly often, pre-school. In those settings teaching personnel observe that the child does not seem to attend well in a group situation; the child does not seem incapable of attending but rather seems to need continuous attention from an adult, who has to be with her/him individually in order for attention to remain focussed on a task. In other words, impulsive changing of train of thought occurs unless there is very definite structure about the child which continually refocusses him/her on the task in hand. Such structure usually works to some extent, except in the most extreme cases. So these children rather readily come to the attention of teachers who have more than one child in a class

and to whom this is a considerable imposition. This factor becomes increasingly serious in terms of the social interaction between the child and the teacher as the child grows older and the classroom structure becomes more rigid. The attentional problems may or may not be reflected in impaired performance. If the child is very bright, then even moments of attention are probably sufficient to acquaint her/him with the essence of content on a typical day in class. This is much to the teacher's mortification, because the child is patently inattentive, knows everything the teacher could want him/her to know. If the child is mentally sluggish, then intermittent attention will not be sufficient, and school failure will result. But school failure is not an essential or diagnostic ingredient of the hyperactivity-impulsivity syndrome.

The third and in the long run perhaps the most important component is the socialization problem. These children are impulsive in the way they make their social approaches to others. They do not play the courtship game of approach, look, hesitate, gather signals and cues. They crash in and are often rejected from the group just as fast. The hyperactives are the excessive extroverts, the traveling salesmen of childhood. Their personal styles are such as to alienate their peers, and this becomes increasingly serious until in adolescence it is a major problem, making for an alienated and a potentially delinquent individual. The prognosis for hyperactivity is even more dubious with regard to social adaptations than to intellectual achievement.

The basis for the impulsivity can only be discussed in general terms at this time. There are some mechanisms in the brain which program rapid impulsive action, and there are others which help the individual stop and think. The stop mechanism is subject to maturation.

Older children and adults are better able than young children to stop and think, when this is appropriate. But hyperactives seem slow even for their age in applying those intellectual brakes to their actions. The etiology could be genetic or early acquired damage or just polygenic variation; but the problem is the same, and the management is the same, regardless of etiology.

I have discussed hyperactivity as a personality trait that characterizes a child's behaviour right through her/his development. But there have been some recent claims for factors precipitating hyperactivity. These are of two kinds, emotional and chemical. Emotional stress might precipitate impulsive, chaotically disorganized behaviour. Maybe at any rate it makes overt a pre-existing sub-clinical tendency to behave in this way. The other claims have been for factors of a chemical nature. Supposed precipitating factors range from hypoglycemia through fluorescent lighting to additives and colouring matters in food. The problem with these claims is that it takes less time to generate them than to disprove them. The situation is peculiar in this area of medicine. It is customary in medicine that someone who makes claims feels called upon to validate them before pontificating. Here, however, the pontifications come first, and the challenge is "Prove that I'm wrong; otherwise do what I say" (which is, usually, to make a radical and seemingly senseless change in the patient's life). I am in no position to dismiss as irrelevant all ~~these~~ various hypothesized factors; they come up too fast. I do want to draw attention to the fact that concern with food additives is not new to the North American continent. The paranoid style in cookery has been prevalent here for hundreds of years, and before you further feed that paranoia, may I urge you to insist on proper data? If it can be shown in a rare case that a particular chemical, when ingested, causes hyperactive behaviour, of course that child should avoid it. But prior to a positive provocative test is is unjustified to impose the fantastic dietary restriction that is called for by this theorizing.

Only those agents should be eliminated from the diet that have been positively incriminated.

In contrast to those speculative approaches, the management of hyperactivity with stimulant medication has been around for some 35 years. It has been very thoroughly explored and well documented and a number of definite things can be said about it. Stimulant therapy with family counselling is the mainstay of management for this condition. Occasionally the need for other measures is apparent. Almost always these two are needed. The way to use stimulants becomes clear upon understanding how they work. There is a mistaken and misleading impression that stimulants have a paradoxical effect on hyperactive children. It is argued that, whereas stimulants stimulate normals, they sedate hyperactives. This is wrong. Stimulants at the dose levels in question do not stimulate normal people; college students do not take them before examinations to be stimulated. They take them to be better able to concentrate, which is exactly why hyperactive children take them. Hyperactive children are not sedated by stimulants either. The goal of stimulant therapy is to enable the hyperactive child to think before acting. If they achieve that goal, their effect is physiologically desirable. If any other effect is achieved, that is the wrong effect, and the treatment has not been implemented properly. Stimulant medication seems to activate that part of the brain which I called the stop system. It perhaps does so indirectly by activating the reticular formation which itself projects to the stop system. But that is hypothetical and inessential for our practical discussion. The important point is that there are some children who are unduly impulsive, and they can be helped in this way.

One cannot tell whether a child would be so helped until the medication has been tried, because excessive motor activity is not only caused by impulsive mental processes; it also has a variety of other causes, including pathological disinhibition in imbeciles or even high energy levels not tolerated by uptight adults.

Distractibility is also caused by things other than hyperactivity -- anxiety, emotional disorder and so forth. Social incompetence obviously has many causes. There is no way of being sure that the child will respond beneficially to stimulant ahead of trying that treatment. So the clinician expects to try the effect of stimulants on far more children then she/he will continue to use them on. When stimulant therapy is begun, it should never be done on a long-term basis. The proper way is first to try it and make it clear to the parents that one of three things will happen: the child will get better; will get worse; or will remain the same. If the child gets better, you and they will discuss whether she/he should remain for longer periods of time on that medication. If the child gets worse, you stop. If the child does not change, you have obviously not given enough to form an opinion, so you increase the dose. Over a period which usually does not exceed two weeks, you will be able to determine whether stimulant therapy holds promise for a given child, and then you can discuss whether it should be instituted.

If it is instituted, it has to be used with the following concerns. The manner of use will depend upon which drug is chosen. The available ones are amphetamines, methylphenidate, and pemoline. The most commonly used drug is methylphenidate. Studies have shown it to have perhaps fewer side effects than dextroamphetamine (and much the same as pemoline). On the other hand, dextroamphetamine is far less expensive and just as effective behaviourally. Dextroamphetamine has two advantages over methylphenidate. One advantage is that it exists in spansule form. This is important. Any one pill of dextroamphetamine or methylphenidate acts for no more than four hours. If given once a day, it covers four hours. Twice a day, eight hours, still does not cover the child's day. The drawback of not covering the child's day is a rebound impulsivity when the effect wears off.

And sometimes even between pills a child may have a rebound of impulsivity. This can be confusing in assessing the results of the treatment. A regime of the pills three times a day is the minimum that is reasonable to give. Twice a day will not do, because of the inevitable rebound in the evening and the insomnia that will probably follow. When even three times a day gives a fluctuating effect, a spansule can be instituted. The other advantage of dextroamphetamine is that it is more robust in the face of gastric juices. Methylphenidate is destroyed by gastric acidity. If given with meals, it is not given effectively; it should be given a half hour before meals. Not all parents remember this, and sometimes this can again confuse the appraisal of what the medication is achieving. Dextroamphetamine does not have this restriction in its use. Pemoline seems to have the same effect as the other two agents, but it is slower acting and cumulative. This could be of use when hyperactivity on waking and before the morning pill has taken effect is a problem. But in general the transitory effect of stimulant is an advantage. If you stop the medication, you can tell very quickly if the hyperactivity is still present, for in a properly managed case, the changes are dramatic, even after leaving out a single dose.

The need for drug in terms of dose is variable, and a dose which is appropriate when the medication began may not be so two or three months later. It is important to maintain contact by telephone with the patient's parents for the following reasons: When the initial effect wears off because of a relative tolerance to the agent, all the guilt feelings and the doubts about having the child on "drugs," all the rubbish that comes flooding in from neighbours, the media, and other parties take effect. It is then quite possible that parents will come not back to tell the doctor that the medication is no longer working but rather will feel guilty about having ever given the medication and resort to some quackery instead.

So it is important to inspire the parents with sufficient confidence that they will report any relapse. An adjustment of dose at that time usually has a more long lasting effect.

When to stop? When it is no longer needed. There is no way of predicting the time. One can only find out by trying the child off medication, say once a year. Usually there are natural experiments: Children do not much like to take these pills, and they and the parents may forget: Then the observation may be made that the child was not really very different off the medication, or, to the contrary, that the child reverted to impulsive and maladaptive behaviour. No commitment should be made about how long treatment will continue. It might be six months, it might, for all I know, be a lifetime. The important thing is that you do not begin to give this medication unless it is really needed, and if it is really needed, you give it for as long as it is really needed.

Stimulants are appetite depressants, and they will depress children's appetite, particularly initially. As you know, obesity is a killer, and so this depression of appetite has a positive aspect. I have known many cases in which diminished food intake bothered parents but none in which it harmed the child. Actually, the children enjoy what they do eat more, and since they gobble less, mealtimes become more enjoyable for the whole family.

The question of insomnia is interesting. Much of the insomnia is due not to the stimulant but to rebound from its use. There are two kinds of insomnia. One is due to too much impulsive responding which, being a release phenomenon, is best treated by giving more stimulant. The other is on the contrary due to excessive persistence of some single thought, which is more what can happen with too much stimulant.

Attention is too focused. For that kind of insomnia, it is better to reduce the dose.

Now for the question of growth. A recent report suggested that hyperactive children on high doses of methylphenidate or on dextroamphetamine do not gain height and weight as fast as hyperactive children who are untreated. Before discussing the merits of this claim let us note in passing how indicative of the current panic about "drugs" it is that one preliminary report has had such wide currency without benefit of replication. In any case, the children who were in the control group were "hyperactives" for whom stimulant therapy had been rejected; a curious group not necessarily valid for control purposes. Also, the nurses who measured height and weight were not blind to the treatment conditions, and their attitudes could easily have contaminated the data. In any case, other centres with extensive experience with stimulants have not found such growth effects. Finally, when it really comes to the crunch, why give stimulants? If for trivial reasons, don't give them at all. If for vitally important reasons, these reasons override minor considerations: I would sooner be a well-adjust dwarf than a crazy giant.

It is important to be aware of the overdosage effect of stimulants. If stimulants are given to children who do not need them if too large a dose is given to children who do need them, the effects are as follows: anxiety, fearfulness, withdrawal, paranoia, ultimately an autistic locking in of behaviour. When these phenonmena are observed, the answer is to cut down the dose.

What of the behavioural alternatives to medication? Behaviour modification is an interesting case in point. One fundamental characteristic of these children is that they are difficult to condition. That is why they are so hard to raise as children and why it is so hard to counsel parents.

Rewards and punishments do not seem to move them very much and there are good physiological reasons for this. To my mind, behaviour modification for the untreated child is the wrong decision. However, it is often an excellent option for the medicated child. Medication is not to be thought of as an alternative to any other measures; on the contrary it provides a favourable base state for behavioural measures. Having achieved whatever one is going to with the medication, one has a new baseline to determine what more needs to be done. Usually, quite a bit more needs to be done, by behaviour modification, family counselling, or psychotherapy.

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