

Attention, Reaction Time and Visual-Motor Integration in Hyperkinetic and Conduct Disordered Children

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- *Department of Psychiatry, St. John's Medical College Hospital, Bangalore*
Malavika Kapur, - *Department of Clinical Psychology, National Institute of Mental Health & Neuro Sciences, Bangalore 560 029, India*
Shanmugham V, - *Department of Biostatistics, National Institute of Mental Health & Neuro Sciences, Bangalore 560 029, India*

Abstract

The distinctiveness of the Hyperkinetic Syndrome of childhood, from Hyperkinetic Conduct Disorder and Unsocialized Conduct Disorder with regard to deficits in attention, reaction time and visual-motor integration was explored. Intervention strategies to handle these deficits, specific to the different clinic groups has been discussed.

Key words -

**Hyperkinesis,
Attention,
Reaction time,
Visual-motor integration**

Out of the many problems faced by a hyperkinetic child, that of being unable to attend to a task, being distracted easily and being impulsive, are the most distressing. The ninth revision of the International Classification of Diseases defines the Hyperkinetic Syndrome of childhood as disorders in which the essential features are short attention span and distractibility. ICD-10 also emphasises "a pervasive lack of persistence in activities that require cognitive involvement, together with disorganized, ill-regulated and excessive activity, recklessness and impulsiveness".

The third revision of the Diagnostic and Statistical Manual has replaced hyperkinesis with 'Attention Deficit Disorder' emphasizing that developmentally inappropriate short attention and poor concentration are the hall marks of this disorder, DSM-III R reasserts the prominence of an overflow of motoric activity, restlessness and impulsivity.

The present investigation, a part of a larger study, explores deficits in attention, reaction time and visual-motor integration in Hyperkinetic boys as compared to Conduct Disordered boys.

Aim

To study attention, concentration, impulsivity, reaction time and visual-motor integration in Hyperkinetic boys as compared to Conduct Disordered boys.

Material and Method

The sample consisted of 123, 5-10 year old boys- 20 diagnosed as Simple Disturbance of Activity and Attention (314.0 on ICD-9); 30 diagnosed as Hyperkinetic Conduct Disorder (314.2); 30 diagnosed as Unsocialized Disturbance of Conduct (312.0) and 43 normal controls, matched to age. The groups did not differ on family status, religious background, family type, consanguinity and parent's age. Boys with history of overall delay in developmental milestones, with history suggestive of organic involvement or already on medication were excluded from the sample. The sample of clinic boys was drawn from the Child Guidance Clinic, NIMHANS, Bangalore, after a detailed case history and clinical examination. The normal boys were taken from schools in the city and screened on the Children's Behaviour Questionnaire Proforma-B [1] for behaviour problems.

Tools

1.Colour Cancellation Test [2]

The Colour Cancellation Test, used to measure attention, concentration and impulsivity, consists of a sheet with 150 coloured dots, arranged in random order.

There are two parts of the test - Simple Colour Cancellation and Complex Colour Cancellation. In the former, the subject is instructed to cross out all the yellow and red dots within the time limit of one minute. For the present study, the number of correct dots cancelled, the number of wrong dots cancelled and the number of missing dots were recorded.

2.Bender Visuo-Motor Gestalt Test (BGT) [3]

The BGT, a test of visual-motor integration, developed by Lauretta Bender [4], consists of 9 cards with abstract designs. The subject is required to copy the designs one at a time, on a blank sheet of paper.

In the present study, Koppitz scoring system, standardized for ages 5-10 years at 6 month intervals, was employed. Each design is scored, where appropriate, for distortion of shape, for rotation of the whole design or part of it, for failure to integrate the parts of the design and for preservation. There are a total of 30 scoring time with low scores indicating better performance.

3.Porteus Maze Test [5]

This test consists of 11 mazes arranged in order of increasing difficulty for children ranged 3 through 14 years. In the present study, the Vineland Revision or Original Series was used. All subjects started with the third year maze and proceeded until two consecutive failures were recorded. Instructions and qualitative scoring as per the manual was carried out. The qualitative scoring, is concerned with errors in drawing or execution rather than in planning. The score is intended to reveal any haphazard, impulsive or over confident habits of action. The higher the Q score, the worse the record.

4.Reaction time Test [6]

Reaction time is the period between the onset of the stimulus and the beginning of the response. The reaction time (RT) apparatus was first invented in 1850 by the famous Physiologist Helmholtz. The RT test consists of the Simple and Choice RT tests. In the former, the subject is instructed to release the button his finger is on as soon as he sees the red light (visual stimuli) or hears a tone (auditory stimuli). Ten visual trials and ten auditory trials are given and the reaction time recorded.

In the Choice RT task, two coloured lights or two sounds are presented and the subject is instructed to respond only to one. Reaction times and the number of wrong responses made are recorded. Recording was done on an eight-digits chronoscope connected to the RT apparatus.

Results and Discussion

On the Colour Cancellation Tests, the Hyperkinetic boys crossed out significantly lesser number of correct dots, they were impulsive, crossing out more wrong dots and missing out more correct dots, when compared to the normals (Tables IA, B & IIA, B). Comparing the Hyperkinetic Conduct Disorder group with the normals, on the Simple Colour Cancellation Test, the clinic group did not cross out a significantly greater number of wrong dots: Whereas on all the other variables, the normal groups of performance was significantly better.

Table IA - Scores on the simple colour cancellation test

Table IA - Scores on the simple colour cancellation test

Table IB - Difference between groups on the simple colour cancellation test

Table IB - Difference between groups on the simple colour cancellation test

Table IIA - Scores on the complex colour cancellation test

Table IIA - Scores on the complex colour cancellation test

Table IIB - Difference between groups on the complex colour cancellation test

Table IIB - Difference between groups on the complex colour cancellation test

The normal group and the Conduct Disorder group did not differ significantly on any of the variables considered on the Colour Cancellation Tests. The Conduct Disordered boys were attentive, not distractible nor impulsive.

Comparing the clinic groups, the Hyperkinetic and Hyperkinetic Conduct Disordered boys were found to have similar attention deficits which differentiated them from the Conduct Disordered boys who had no attention deficits.

Chawla et al [7] also found hyperkinetic children to be impulsive in cognitive style, making several mistakes on the Colour Cancellation Test.

On the BGT (Table IIIA, B), the Hyperkinetic and Hyperkinetic Conduct Disordered boys made more errors of Distortion, Rotation, Integration and Preservation, earning a lower Age Equivalent than the normal boys of the same age. The Conduct Disordered group did not differ significantly from the normals in terms of the errors they made in drawing and the Age Equivalents they earned. The findings

suggest an association between hyperactivity and the degree of visual-motor deficits as has been reported earlier in Loney et al's [8] study, where boys with a higher score on the Hyperactivity factor made a significantly greater number of errors on the BGT, using the Koppitz method of scoring. Wikler et al [9] also found hyperactive children performing poorly on the BGT. Clements and Peters [10] used the BGT as a measure of perception and visual motor coordination. Errors in spatial arrangement, preservation, "dog ears", rotations, curvature, closure etc. were noted. Some children learnt to compensate for poor visual-motor coordination by drawing dots first or short lines.

Table IIIA - Scores on the Bender Visuo-Motor Gestalt Test

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Table IIIB - Difference between groups on the Bender Visuo-Motor Gestalt Test

Table IIIB - Difference between groups on the Bender Visuo-Motor Gestalt Test

On the Porteus Maze Test failures were recorded often for the Hyperkinetic and Hyperkinetic Conduct Disordered boys, resulting in the test being terminated with few mazes being attempted. The Conduct Disordered boys also attempted fewer mazes than the normal boys. The Hyperkinetic children were impulsive in their approach. (Table IVA, B).

Table IVA - Scores on the Porteus Maze Test

Table IVA - Scores on the Porteus Maze Test

Table IVB - Difference between groups on the Porteus Maze Test

Table IVB - Difference between groups on the Porteus Maze Test

On the Reaction Time tests the mean reaction time recorded for the Hyperkinetic and Hyperkinetic Conduct Disordered boys using both verbal and auditory stimuli, was longer than that of the normals. However, the two groups did not differ on the number of wrong responses made, that is releasing the finger at the exposure of the wrong stimulus. The Hyperkinetic boys were not found to be more impulsive than the normal boys were, but took more time to decide whether the stimulus was the correct one or not. The Hyperkinetic boys would often fiddle with the other knobs on the board and their attention had to be often drawn to the task at hand.

The Conduct Disordered boys did not differ from the normals on any of the variables considered on the Reaction Time Test. Comparing the Simple Hyperkinetic and Hyperkinetic Conduct Disordered groups, the latter's reaction time was shorter than the former's on the Choice Reaction Time Test, using both visual and auditory stimuli. However, they did not differ on the number of errors committed.

The Colour Cancellation Tests and the Bender Visuo-motor Gestalt test are useful tools to identify attention deficits in children. Performance on these tests also highlight the intervention strategies to be planned for the different clinic groups. For the Hyperkinetic and Hyperkinetic Conduct Disordered groups, remedial work should focus on tasks to improve attention, concentration and spatial perception. Sorting out and matching beads or objects of different shapes, colours and sizes, colouring and painting within lines, join-the-dot games, jig-saw-puzzles, identifying differences between pictures and finding hidden animals in pictures are few of the activities that could be suggested to parents.

The Reaction Time apparatus could be used with Hyperkinetic children to help to increase speed of

accurate responding. A behavioural chart could be maintained whereby the child is reinforced for quick and correct responses.

The Porteus Mazes could also be used along with the same behavioural lines in teaching the child self-control methods to control his impulsivity. Further work involves the preparation of therapeutic packages to handle attention deficits in children.

Understanding the kind of deficits in attention, reaction time and visual motor integration found in hyperkinetic children helps in planning of appropriate intervention strategies.

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