

A Search for Neuropsychological Indicators: A Comparative Study with Children with Conflict in Law

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Abstract

Law violation amongst adolescents have become a very important area of concern for the nation as a whole. In the current study, the objectives are to find whether there exist any neuropsychological markers that will help to differentiate children in conflict with law (CCL) from neurotypicals who have never engaged in law violation and also to find whether there exists any significant difference between CCL-I, CCL-E and CCL-M with respect to the neuropsychological markers. The sample included 59 adolescents out of which 10 were neurotypicals, 14 CCL with predominantly internalising manifestation (CCL-I), 17 CCL with predominantly externalising manifestation (CCL-E), 18 CCL with both internalising and externalising manifestation (CCL-M). The tools used in the study are Child Behaviour Checklist- Youth Self Report (CBCL/YSR), Bhatia Battery of Performance tests and three subtests from Delis- Kaplan Executive Functioning System. Statistical analysis was done using Kruskal Wallis test. Test results included significant differences between the groups with respect to 'Twenty Questions Test' and 'Colour-word Interference Test'.

Key words: law violation, children in conflict with law, internalising, externalising, neuropsychological marker.

Introduction

Juvenile offenses have become a matter of utmost significance, especially because of its spiralling tendency. As per a report by National crime Records Bureau in 2013, the percentage of juvenile crimes has increased by 13.6% and 2.5% in 2013 under the Indian Penal Code and Special Local Law¹. Furthermore, this has become an issue of great challenge for law makers and administrators, since the youth constitutes a major asset for any nation and it is a matter of great concern if the youth get more engrossed in negative

pursuits.

These reports point out to the need to understand 'Children in conflict with law' (CCL). The Juvenile Justice Act (2015)² defines a CCL as a 'child who is alleged or found to have committed an offence and who has not completed eighteen years of age on the date of commission of such offence'. Research till now has focussed mostly on understanding the causal factors of law violation. However, the need of the hour requires the identification of indicators that will differentiate children in conflict with law from

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children without any history of law violation. These indicators will help in early identification as well as help in planning remediation programme.

This is somewhat in line with 'Risk-need Model' of Offender Rehabilitation approach. This model suggests that offenders who are released should be classified on the basis of the risk they pose to the society. The higher the risk, the more intensive the rehabilitation approach. This model also states that the needs of these 'at risk' people should also be identified so that the rehabilitation can be accurately planned³.

During the course of our work, it was also realised that most CCL are either predominantly 'Internalising' type (CCL-I) or 'Externalising' type (CCL-E). Many of them also possess both Internalising and Externalising traits and constitute the third group known as 'Mixed' type (CCL-M).

Research literature has also indicated that 'Children in conflict with law' has both externalised manifestations like aggression and rule breaking, as well as internalised manifestations like withdrawn behaviour and anxiety⁴. Other studies have also indicated the children in conflict with law often have features of conduct disorder^{5,6}. Similarly, features of depression or anxiety have also been found among this group^{7,8}. A study has also indicated that children experiencing internalised features also develop externalised features later on⁹.

It is also important to understand whether there exists any significant difference in the neuropsychological markers of CCL-I, CCL-E and CCL-M.

Thus, on the basis of the existing literature, currently two objectives were identified:

- Whether there exist any neuropsychological markers that will help to differentiate children in conflict with law from neurotypicals who have never engaged in law violation.
- Whether there exists any significant difference between CCL-I, CCL-E and CCL-M with respect to the neuropsychological markers.

METHOD

Participants

Data was initially collected from 94 adolescents, but 18 subjects had to be excluded from the Neurotypicals and CCL group because of below average intellectual functioning (3 from Neurotypicals, 3 from the CCL-I; 7 from CCL-E and 5 from CCL-M). Once data collection was started 17 subjects dropped out which included both neurotypicals and CCLs. Final data collection included 10 neurotypicals, 14 CCL with predominantly internalising manifestation (CCL-I), 17 CCL with predominantly externalising manifestation (CCL-E), 18 CCL with both internalising and externalising manifestation (CCL-M).

Sampling was done using purposive method. Only males were included in the study. All the adolescents were between the age range 12-17 years. All the participants have completed at least 10 years of formal education. Participants having below average level of intellectual functioning were excluded from the study.

The neurotypicals do not have any history for violation of law. Their scores were in the 'average' range in all the domains of YSR, hence there was no history of any psychopathology. Those included in the 'Children in conflict with law' group have been in a child care institution for law violation for at least 2 months. 'Children in conflict with law' were also administered the same checklist and on the basis of the scores, the participants were divided in three categories: CCLs with predominantly Internalising manifestation (having 'clinical' range in the domains of Depression or/and Anxiety or/and Somatic Symptoms), CCL with predominantly externalising manifestation (having 'Clinical' range scores in the domains of Aggression and Rule Breaking) and CCL having internalising and externalising manifestation (having 'clinical' range scores in both internalising and externalising categories) and participants in all the groups were matched in terms of age.

Tests Administered

- **Child Behaviour Checklist (Youth self report)**¹⁰: This self rating scale helps to develop a profile of the behavioural and emotional problems of adolescents. The scale has good external and internal reliability with test-retest reliability measuring upto .95 and cronbach's alpha amounting to an

average of 0.83.

- **Bhatia battery of Performance Tests of Intelligence¹¹**: In this study, this test was administered on all the participants as a screening test. Test-retest reliability of the scores for the literate group is 0.851 and the same for the illiterate group is 0.841. The validity of the test for the literate group is 0.703 and for the illiterate group is 0.717¹².
- **Delis-Kaplan Executive Functioning Test¹³**: This test is a measure of executive functioning and includes 9 subtests, all of which can be administered together or independently. Three subtests were administered to this group: Design Fluency, Colour-word Interference Test and Twenty Questions test. Previous research has indicated that the reliability and validity of the total scale is 0.79 and 0.78¹⁴

Procedure

The work received approval from the Institutional Ethics committee in the year 2021 (Ref No: 08/ET/21-22/1792). The Ethical committee ensured that proper consent is taken before conducting the assessment, no hazardous substances were being used for assessment and that no damage will be caused to the participants. Along with that approval was taken from requisite Government bodies to visit child care institutions related to CCLs and to conduct necessary assessments. The tests were translated to regional languages for easier comprehension. The translations were done following the guidelines stated by Gudmundsson (2009)¹⁵. Following this, CCLs residing in institutional homes were addressed. Their consent was taken, following which detailed background information is collected from them. They were then administered the Child Behaviour Checklist (Youth Self Report). On the basis of the profile, CCLs were categorised into three groups. Bhatia Battery of Performance Test of Intelligence and Delis Kaplan executive functioning test were administered, following COVID protocol. In addition to this, data was also collected from children residing in the

community following necessary ethical guidelines. Data Collection was done within August 2021 and December, 2021. Post data collection, statistical analysis was done. After conducting initial analysis of normality distribution, it was found the scores of the CCL were not normally distributed. Thus, non-parametric analysis of Kruskal- Wallis test was done. Statistical analysis was done using IBM SPSS Version 25 and the statistical significance was set at 0.05 level.

Results

As per the objectives, the graph indicates the mean and the Standard deviations of all the three groups

Insert Graph 1.1

The second table shows the presence of significant differences, if any amongst neurotypicals, CCL-I, CCL-E and CCL-M.

Insert Table 1.1

The result table indicates that there exists a significant difference between the scores of neurotypicals and CCL-E, neurotypicals and CCL-I and neurotypicals and CCL-M with respect to all the domains of the Twenty Questions Test. The three domains of this test are 'Initial Abstraction', 'Total no of questions asked' and 'Total weighed score'.

For the colour word Interference test, significant differences exist with respect to the domains of inhibition/switching versus colour naming and inhibition/ switching versus Inhibition. For the former, significant differences exist between CCL-I and CCL-E, neurotypicals and CCL-E, neurotypicals and CCL-M and CCL-I and CCL-M. For the latter domain, difference exists between the scores of neurotypical and CCL-E, neurotypicals and CCL-I and neurotypicals and CCL-M.

There exists no significant difference among the groups with respect to the 'Design fluency test'.

Table 1.1: This table is a comparative study of Neurotypicals. CCL-I, CCL-E and CCL-M.

Subtest	Groups	Test statistic	P value
Twenty Questions: Initial Abstraction	Neurotypical-CCL-I	21.743**	<.001**
	Neurotypical-CCL-E	26.159**	
	Neurotypical- CCL-M	19.350**	
	CCL-I-CCL-E	4.416	
	CCL-I-CCL-M	-2.393	
	CCL-E-CCL-M	-6.809	
Twenty Questions: Total no. of questions asked	Neurotypical-CCL-I	25.729**	<.001**
	Neurotypical-CCL-E	30.844**	
	Neurotypical- CCL-M	24.772**	
	CCL-I-CCL-E	5.116	
	CCL-I-CCL-M	-0.956	
	CCL-E-CCL-M	-6.072	
Twenty Questions: Total weighed score	Neurotypical-CCL-I	21.550**	<.001**
	Neurotypical-CCL-E	31.888**	
	Neurotypical- CCL-M	24.578**	
	CCL-I-CCL-E	10.338	
	CCL-I-CCL-M	3.028	
	CCL-E-CCL-M	-7.310	
Design fluency	Neurotypical-CCL-I		.068
	Neurotypical-CCL-E		
	Neurotypical- CCL-M		
	CCL-I-CCL-E		
	CCL-I-CCL-M		
	CCL-E-CCL-M		
Colour Word Interference Test: Inhibition Versus Colour naming	Neurotypical-CCL-I		.302
	Neurotypical-CCL-E		
	Neurotypical- CCL-M		
	CCL-I-CCL-E		
	CCL-I-CCL-M		
	CCL-E-CCL-M		
Colour Word Interference Test: Inhibition/Switching Versus Colour naming and Word Reading	Neurotypical-CCL-I	1.871	.024*
	Neurotypical-CCL-E	15.535**	
	Neurotypical- CCL-M	14.356**	
	CCL-I-CCL-E	13.664**	
	CCL-I-CCL-M	12.484**	
	CCL-E-CCL-M	-1.180	
Colour Word Interference Test: Inhibition/Switching Versus Inhibition	Neurotypical-CCL-I	14.786**	.026*
	Neurotypical-CCL-E	18.618**	
	Neurotypical- CCL-M	18.444**	
	CCL-I-CCL-E	3.832	
	CCL-I-CCL-M	3.659	
	CCL-E-CCL-M	-0.173	

Discussion

Mental health disturbances during adolescence are associated with low cognitive control and lack of control on emotional reactivity¹⁶. A hypothesis by Crone and Dahl (2012)¹⁶ states that a poor cognitive control and increasingly reactive subcortical regions make it difficult for adolescents to control their emotional reactivity.

In the present study, it has been observed that there is a significant difference between the Neurotypicals and the other three groups, namely CCL-I, CCL-E and CCL-M with respect to the different domains of 'Twenty Questions test': initial Abstraction, Number of Questions and Total weighed score. The study table indicates that neurotypicals have significantly higher score than the other groups on this domain.

As it has already been mentioned, Twenty Questions test is a measure of abstract reasoning, hypothesis testing and concept formation¹⁷. Neurotypicals were therefore better in abstract reasoning, hypothesis testing and concept formation than the other groups. The reason for this maybe that since they were devoid of any significant externalising or internalising symptoms, they had more cognitive control and their emotional reactivity was also within limits. In other words, there was a synchronisation between the pre-frontal activity and the activity of the amygdala, leading to a more harmonious mental health¹⁸.

There is no significant difference in the scores of Twenty Question test between the CCL-I and CCL-E, thereby suggesting that exacerbation in either emotional or behavioural problems leads to over-activation of the limbic system and reduced connections between the prefrontal cortex and limbic system, causing emotionality to take over rationality.

Considering each of the domain of twenty questions test, Initial abstraction measures the ability to engage in hypothesis testing, that is the ability to formulate a rule to categorise objects¹³. In the test, initial abstraction measures how many items the participant is able to eliminate with the very first question. This requires careful deliberation of any situation. Previous research has indicated that Children in conflict with law have reduced

connections between the prefrontal cortex and the amygdala¹⁹, which has also been proposed in other research papers on developmental immaturities in brain of adolescents²⁰. Because of their inability to understand the underlying meaning of the situation, they often respond in impulsive manner. Similarly, because of their inability to inhibit responses, they continue responding in their impulsive manner.

This pattern of responding is synonymous to their functioning in daily life situations as well. In their everyday functioning as well, CCL often finds it difficult to understand the probable consequences of their behaviour in situations which they perceive to be exciting or emotionally loaded. This results in poor decision making and eventually to law violation.

Hypothesis testing is a higher-level function and it includes two stages: Hypothesis formation and Hypothesis testing²¹. Reduced functioning of the prefrontal cortex leads to reduced Hypothesis formation and thus, ability to engage in abstraction and form concepts also gets reduced. Inability to generate hypothesis often leads to cognitive inflexibility and perseveration. As a result of cognitive inflexibility, ability to think divergently gets impacted. Similarly, because of perseveration, respondents continued with same style of incorrect responding. Therefore, they often ask questions impulsively naming one object after the other, thus increasing the total number of questions asked. On the other hand, the questions asked by the neurotypicals were more strategically planned, gradually moving from more generic categories to specific categories, as designed to meet the needs of the task and hence they could complete the task using lesser number of questions. Similarly, in case of total weighed score, the scoring has been designed in a way that only participants who follow the correct strategy of asking questions would receive the highest score. As already mentioned, since the responses of CCL were given impulsively, the scores they received were comparatively lower.

It is also important to mention here that there are no significant differences among the groups with respect to the 'Design Fluency Test'. This test measures creativity of individuals and results indicate that there is no significant difference between the groups with respect to creativity. The reasons for this can be inferred only after further research in this domain.

Result Table 1.1 also indicates that there is a significant difference between the groups with respect to two domains of 'Colour-Word Interference Test': Inhibition/Switching versus Colour Naming and Word Reading and Inhibition/Switching versus Inhibition. For the former category, neurotypicals have performed better than CCL-E and CCL-M. CCL-I have also been found to have better scores on this domain than CCL-E and CCL-M. In the latter category, neurotypicals have scored higher than CCL-I, CCL-E and CCL-M.

From the test results, it appears that the poor performance of CCLs with externalising features or mixed manifestations may be due to their language difficulties. Studies have often indicated that children with behavioural problems often have language difficulties²². The test results are not suggestive of similar difficulty in those with internalising manifestation. On the contrary, it may be inferred that significant differences of CCL-I with neurotypicals in the last domain may be a result of deficits in cognitive flexibility, set shifting or verbal inhibition.

Thus the results of the 'Colour Word Interference Test' helps to further explain the findings of the 'Twenty Questions Test'. For CCL-E and for CCL-M., the basic deficit is most likely at the level of verbal fluency. Inability to generate verbal concepts makes further processing of information difficult, whereas the findings are somewhat different for CCL-I. Their basic deficit is at a higher level of functioning, wherein they lack the cognitive flexibility and the ability to shift their set.

It is important to mention here that lack of Verbal fluency is not simply a result of poor academic or societal exposure. It is also a result of neuropsychological deficiency and needs further detailed investigation.

Conclusion

What emerged to be very significant from this research is that CCL-I and CCL-E have different neuropsychological indicators. These indicators will direct therapeutic intervention at community level. However, only identifying neuropsychological indicators may not be prove to be helpful. These indicators will have to be integrated with other

psychological attributes.

Conflict of Interest: None

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