

## Neuropsychological Functioning in Adolescents with Conduct Disorder at Katombora Reformatory School and Kamwala Remand Prison

Lungo Mofya Michael\* and Ravi Paul

*Department of Psychiatry, School of Medicine, University of Zambia, Zambia*

**\*Corresponding Author:** Lungo Mofya Michael, Department of Psychiatry, School of Medicine, University of Zambia, Lusaka, Zambia.

**Received:** March 15, 2023; **Published:** March 30, 2023

### Abstract

The study examines the prevalence of conduct disorder in Zambia, particularly among adolescent offenders. The International Classification Systems provide definitions of various diagnostic criteria for conduct disorder, which includes aggression, violent behavior, destruction of property, theft, deceitfulness, and/or a serious violation of rules, social norms and laws. The prevalence of conduct disorder and delinquency peaks in mid-to-late adolescence.

The study investigated neuropsychological functioning in adolescents with conduct disorder at Katombora Reformatory School, Kamwala Remand Prison, and community controls. The research found that conduct disorder subjects displayed significant deficits in cognitive abilities, set shifting and inhibition, planning, and verbal memory and language functioning. Furthermore, the group with conduct disorder displayed noteworthy impairments relative to controls in cognitive ability, set shifting, verbal memory–language functioning, and visuospatial tasks respectively.

The study revealed similar findings from studies conducted in other countries among the same populations. Based on the findings, it is imperative that correctional facilities effectively plan and engage in understanding neuropsychological functioning in adolescents with conduct disorder and employ rehabilitation and recovery, treatment and management, healthcare and educational interventional strategies and correctional approaches regarding generators of misconduct, delinquency, and aggression into criminal justice policies and system-wide policy changes such as beginning at trial, bail conditions, pre-trial detention, sentencing, and release or pardon decisions, and in addressing various triggers (causal and exacerbating) in various social environments that can contribute to violence and psychopathy in susceptible individuals.

**Keywords:** *Adolescence; Conduct Disorder; Neuropsychological Functioning; Psychopathy; Violence*

### Abbreviations

ADD: Attention Deficit Disorder; ADHD+CD: Attention Deficit with Hyperactivity Disorder + Conduct Disorder; CD: Conduct Disorder; CG: Control Group; DSM-V: Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition; EF: Executive Functioning; ICD-10: International Classification of Diseases (Version 10); I-CD: Incarcerated adolescents with Conduct Disorder; I-NCD: Incarcerated adolescents without Conduct Disorder; IQ: Intelligence Quotient; ODD: Oppositional Defiant Disorder; ZNTB: Zambia Neurobehavioral Test Battery

**Citation:** Lungo Mofya Michael and Ravi Paul. "Neuropsychological Functioning in Adolescents with Conduct Disorder at Katombora Reformatory School and Kamwala Remand Prison". *EC Psychology and Psychiatry* 12.4 (2023): 69-77.

## **Introduction**

Clinical neuropsychology is a specialty in professional psychology that applies the principles of assessment and intervention based on the scientific study of human behavior. It merges both medical neurology and psychology and bridges the biological functioning of neural cells in the central nervous system and body with the study of psychological disorders [1].

Globally, clinical neuropsychologists apply the models of brain-behavior relationships to determine whether expected neurobehavioral functioning has changed to a degree that is consistent with impairment. Adolescence is a transitional stage of physical and psychological development between 13 and 19 years, but its physical, psychological, or cultural expressions may begin earlier and end later. A correctional facility is an institution in which inmates are confined and denied a variety of freedoms under the authority of the state and serves to rehabilitate inmates [6].

Zambia's total prison population stood at 25,000 prisoners in May 2017, with pre-trial detainees' and remand prisoners representing 28.0%, female prisoners representing 3.0%, and juveniles, minors and/or young prisoners representing 2.9% [2]. Conduct disorder is a mental disorder diagnosed in childhood or adolescence that presents itself through a repetitive and persistent pattern of behavior in which the basic rights of others and/or major age-appropriate norms are violated [1].

To be diagnosed with conduct disorder, four of the following symptoms must be present: aggressive behavior toward others and animals, frequent physical altercations with others, use of a weapon to harm others, deliberate physical cruelty to other people and animals, involvement in confrontational economic order crimes such as mugging, perpetration of a forcible sexual act on another, property destruction by arson, and/or destruction of proper property, engaged in non-confrontational retail theft acts such as shoplifting, disregarded a parent's curfew or rules, and committed truancy before the age of thirteen [1].

The age of onset for conduct disorder can be as early as the preschool years, with oppositional defiant disorder (ODD) being a premonitory condition. Rejection by prosocial peers and associations with delinquent peers reinforce conduct-disordered behaviors. The prevalence of conduct disorder is 2% to 10% and is more common in boys due to boys' tendency to act out violently, while girls tend to act out mostly in interpersonal relationships. Risk factors for conduct disorder include an uncontrolled temperament, a low verbal IQ, parental rejection and/or neglect, forms of child maltreatment, a parental history of ADD/ADHD and conduct disorder, and parental drug and alcohol abuse and dependence [3].

Neuropsychological deficits in the amygdala and orbito-frontal cortex have been implicated in the clinical manifestations of CD, and the lack of economic opportunities and prospects is a major cause of delinquency, parental criminality, and adolescents having unoccupied, unsupervised time. Evidence for neuropsychological deficits is provided by studies of documented cerebral lesions and case reports of patients who suffered frontal lobe injuries in childhood [4].

Conduct disorder in adolescents is a significant problem, with half or more of the children with conduct disorder committing serious criminal activities and developing arrest records. Studies have shown that mental illness is more common among the prison population than the general community. In Zambia, most common mental disorders are acute psychotic episodes, schizophrenia, affective disorders, alcohol-related problems, and organic brain syndromes [5].

## **Materials and Methods**

The study used quantitative and qualitative methods to assess the association between neuropsychological functioning and conduct disorder in adolescent inmates at both institutions. A cross-sectional design was used to collect data on more than one case at a single point in time, and questionnaires and structured interview guides were used to collect qualitative and quantitative data in connection

with two or more variables. Phase I involved the assessment for conduct disorder among adolescents at the two facilities, and Phase II examined neuropsychological functioning among adolescents with conduct disorder.

The study population consisted of inmates between the ages of 10 and 16 who were already serving a sentence or who were in custody pending trial. The inclusion criteria were age range 11 to 16, onset and duration of the disorder, symptoms such as dishonesty, theft, aggression to animals and/or others, violation of rules and/or regulations, ability to use English and a local language, informed consent, and level of education. The exclusion criteria were history of other psychiatric conditions and abuse of substances such as alcohol or narcotics.

An assessment of forty-five (45) adolescent inmates was conducted. The participants were recruited according to the demographics of adolescents at Katombora Reformatory School and Kamwala Remand Prison, serving sentences or awaiting trial; these were selected because of the inclusion criteria and conviction records. A stratified random sampling technique (a subset of a statistical population in which each member of the subset has an equal probability of being chosen) was used. A sampling frame was to be constructed by enumerating all names of adolescents with corresponding numbers in the register. Further, a Windows Excel function was used to generate a list of random numbers used to select the respondents and participants of the study.

The study employed document reviews for child and adolescent psychological background, caregiver reports (research as shown biases in self-report data), medical reports, and patient history, covering all aspects of the participants' family history, socio-economic status, education level, birth, institutionalization, and criminal record history.

Data was collected from the study participants serving their sentences and/or awaiting trial. This was done after study approval from the ethics committee. A psychiatrist and clinical neuropsychologist assessed study participants for conduct disorder. Further, key stakeholders (correctional officers, educational officers, and care givers) were interviewed on each participant using interview guides, and the interviews were recorded. In addition, diagnostic interviews and neuropsychological assessment tools were used, and assessments were based on the specific battery protocols in the Zambia Neurobehavioral Battery (ZNBT).

### **Stroop color word test**

The Stroop color word test is used in clinical practice to assess cerebral (frontal lobe) dysfunction. It is used to assess executive function because of the speed of word processing and color processing and the complexity of managing interference when the process demands both word and color processing at once.

### **Wisconsin card sorting test (WCST, 64-item version)**

The Wisconsin card sorting test (WCST, 64-item version) is used to assess abstract thinking. It is a 64-card version of variations of 1 to 4 symbols of a triangle, a star, a cross, or a circle that can be in red, green, yellow, or blue.

### **Paced auditory serial addition test (PASAT)**

The paced auditory serial addition test (PASAT) measures attention deficits, including concentration, speed of processing, mental calculation, mental tracking, and can be used for the diagnosis of cognitive impairment in persons 16 years of age and older.

### **Wechsler memory scale III (WMS-III) spatial span**

The WMS-III spatial span is a visual test of attention and memory and a derivative of the Corsi blocks test, which was first developed by Corsi in the 1970s to complement verbal memory span task.

### **Category fluency test and controlled oral word association test (FAS)**

The category fluency test and controlled oral word association test (FAS) measure verbal fluency.

**Hiscock digit memory test (HDMT)**

Hiscock digit memory test (HDMT) assesses the level of commitment with regard to participation in the study.

The collected data was entered and managed in Microsoft Excel 2016 and Access 2016, and data analysis was conducted using Statistical Package for Social Sciences (SPSS) version 25. The participants were subjected to six neuropsychological tests, and their performance was recorded and scaled. The means for each of the domain areas were used to indicate performance on dependent variables, and conduct disorder was the independent variable for analytical purposes. The two variables used for analysis were a categorical, independent variable and a continuous, dependent set variable. The independent sample T-test was used to compare the mean scores on the continuous variables (test performances) for the two different and independent groups of participants (CD group and the CG). The Shapiro-Wilks test for normality was applied to detect departure from normality, and information obtained from interview guides was coded and analyzed using a thematic analysis.

**Results and Discussion**

Before examining differences in test scores amongst teenagers, the data collected from research participants was checked for normalcy to ensure the exclusion of outliers. All test results were within the normal distribution range. Since all of the Shapiro-Wilk test values were over 0.05, the test results received from the study participants did not require Lilliefors Significance Adjustment to be applied.

Domain	Tests	Statistic	df	Sig. (p)
Executive Functioning	SCWT	0.965	45	0.181
	WCST	0.975	45	0.447
Attention and Working Memory	PASAT	0.984	45	0.768
	WMS-III	0.972	45	0.355
Verbal Functioning	CFT	0.916	45	0.103
	FAS	0.981	45	0.652
Lilliefors Significance Correction - Significance at p > 0.05				

**Table 1**

**Comparisons of CD and CG adolescents in executive function (EF) tests**

Domain	Tests	Sub-Tests	Sample	n	MEAN	MD	SD	t	p
Executive Functioning	SCWT	Stroop	CG	20	11.8	5.88	2.931	5.32	.000*
		Color W	CD	25	5.92		4.183		
		Stroop	CG	20	10.2	4.36	3.764	4.54	.001*
		Color C	CD	25	5.84		2.672		
	Stroop	CG	20	16.35	8.87	3.787	6.65	.001*	
	Color CW	CD	25	7.48		4.9			
	WCST	Total Trials	CG	20	4.9	1.42	2.5	-2.04	.047*
			CD	25	6.32		2.09		
		P. Errors	CG	20	1.5	0.94	0.51	6.15	.001*
			CD	25	2.44		0.50		
		Categories	CG	20	2.7	0.2	0.73	0.069	.045*
			CD	25	2.68		1.1		
		N.P. Errors	CG	20	3.1	0.82	0.71	3.03	.004*
			CD	25	2.28		1.02		
1 <sup>st</sup> Trails Attempts	CG	20	1.9	2.62	0.85	12.79	.001*		
	CD	25	4.52		0.51				

**Table 2:** \*Significant at p < 0.05 with 95% confidence.

Two tests were administered to research participants in the executive functioning domain. The Stroop color and word test (SWCT) and the Wisconsin card sorting test (WCST). First, a variety of cognitive abilities, such as goal orientation, the capacity to suppress, habitual response, automatic reaction, and selective attention, were assessed using the SWCT. Intentional blocking of highly automated previously learned answers is required for the test to determine a subject’s ability to switch cognitive categories [7]. Failure of the inferior frontal, dorsolateral prefrontal, and anterior cingulate cortices, as well as neuropsychiatric illnesses, can affect performance on the Stroop test [7].

The control group’s adolescent inmates scored much higher on the test on average (mean scores). This means that the tests showed that controls were generally quicker at processing words and colors and at managing the complexity of word- and/or color-related interference with executive functioning, respectively. This generally showed that control group respondents were substantially more capable of switching between cognitive sets or tasks, planning, organizing, and inhibiting a pre-potent response.

Cognitive flexibility and set shifting were further assessed in the study using the Wisconsin Card Sorting Test (WCST). It is particularly used in clinical fields to measure perseverative behaviors (the continuing recurrence of an error, such as continuing to call a square a circle even after feedback that the name is wrong or repeating the same answer to a series of different questions) that refer to an individual’s insistence on wrong behavior.

Further, set-shifting difficulties were indicated by significant perseverative errors; thus, higher scores on the assessment test represented worse performance [8]. The results obtained could justify existence of frontal lobe dysfunction by supporting executive functioning difficulties in terms of one’s ability to shift between tasks, plan as well as organize, and also inhibit pre-potent response(s).

The results of the test’s scoring analysis, which took into account “total trials,” “initial trial efforts” and “preventative errors,” showed that patients with conduct disorders scored higher on average. The findings showed that people with conduct disorders had higher rates of “total trials,” “first trial attempt” and “preventative errors,” respectively. This showed that the control group’s concept development performed much better than the conduct disorder group’s under the subject’s requirements to employ both positive and negative feedback to formulate problem-solving methods.

A more thorough comparison of the overall mean score showed a 26.78% difference in executive functioning test results. Results showed that the mean test performance score for adolescents in the conduct disorder group was 26.78% lower than the mean test performance score for adolescents in the control group. Generally, this showed that participants with conduct disorder had distinct and severe challenges with visual and auditory attention, conceptual ability, verbal and graphic fluency, and cognitive flexibility.

**Conduct disorder and attention and working memory**

Domain	Tests	Sub-Tests	Sample	n	Mean	MD	SD	t	P				
Attention and Working Memory [AWM]	PASAT	PASAT	CG	20	13.05	7.53	3.26	7.74	.001*				
		Attempted	CD	25	5.52		3.21						
			PASAT	CG	20	10.5	4.42	3.77	4.41	.001*			
			Correct	CD	25	6.08		2.94					
	WMS-III		WMS-III	CG	20	6.3	1.4	1.21	3.37	.002*			
			Forward	CD	25	4.84		1.59					
			WMS-III	CG	20	6.9		2.6			1.16	6.05	.001*
			Backward	CD	25	4.24					1.66		
		WMS-III	CG	20	9.2	4.12	2.11	6.32	.001*				
		Total	CD	25	5.08		2.21						

**Table 3:** \*Significant at  $p < 0.05$  with 95% confidence.

The neuropsychological domains of working memory and attention were evaluated using the paced auditory serial attention test (PASAT) and the Wechsler memory scale III (WMS-III) spatial span test. The paced auditory serial attention test (PASAT), created by Gronwell in 1977, is a test of cognitive function that evaluates auditory information processing speed and flexibility as well as mathematical aptitude [10]. The assessment of attention deficits, as well as concentration, processing speed, mental computations, and mental tracking, is done on a global scale [13].

The test findings revealed very significant differences between the teenagers in the Conduct Disorder and Control Group in terms of mean test performance. The study’s “PASAT attempts” and total mean test scores were significantly lower for adolescents with conduct issues than for those in the control group, with a mean difference of 7.53 for each. Additionally, while controls had a mean “PASAT correct” score that was typically higher, the mean difference for right answers was a little lower at 4.42. Research has shown that young offenders with conduct disorder (CD) frequently experience issues with concentration, information processing speed, mental arithmetic, and mental tracking.

The Wechsler memory scale III (WMS-III) spatial span evaluates working memory capacity as well as the capacity of the brain to temporarily store and handle information (the ability to hold a visual-spatial sequence of events in working memory). The spatial span subtest gauges a person’s ability to hold onto spatially oriented visual sequences in working memory and then replicate the sequence in general [9,10]. The test findings revealed significant variations between test subjects. Adolescents with conduct issues received progressively lower mean scores on each of the subtests.

The mean difference was 4.12 overall when the subtests were added together. The findings indicated that adolescents with conduct disorders have challenges with working memory. In fully comparing the overall mean scores, a 67.7% difference in the performance of the attention and working memory tests in teenagers was noted. This typically suggests that conduct disordered study participants had specific and serious attention problems, including deficiencies in concentration, processing speed, mental calculation, and mental tracking, respectively. This supported R.A. Barkley’s independent investigation on the working memory planning deficits paradigm and ODD/CD, AD/HD, and related disorders [10].

**Conduct disorder and verbal functioning**

Domain	Tests	Sub-tests	Sample	n	Mean	MD	SD	t	p			
Verbal Functioning	CFT	CFT	CG	20	5.6	2.36	1.72	5.17	.001*			
		Animals	CD	25	3.2		1.33					
		CFT	CG	20	3.4	1.32	1.14					
		Actions	CD	25	2.08		0.81					
	P. Errors	CFT	CG	20	0.25	0.12	0.14	2.8	.007*			
		P. Errors	CD	25	0.37		0.14					
		FAS	FAS F	CG	20	5.05	1.25			1.39	2.64	.011*
				CD	25	3.8				1.7		
	FAS A		CG	20	5.45	1.77	1.19	4.06	.001*			
			CD	25	3.68		1.62					
	FAS S	CG	20	4.75	1.27	1.44	2.67			.011*		
		CD	25	3.48		1.68						
FAS	CG	20	0.64	0.16	0.23	2.11		.041*				
	P. Errors	CD	25		0.80				0.27			

**Table 4:** \*Significant at  $p < 0.05$  with 95% confidence.

The participants were subjected to the controlled oral word association test (COWAT) and category fluency test (CFT) animal-action assessments, which were used to assess organized memory search, sustained production, and semantic fluency, respectively. According to the literature, adolescents with conduct disorders have problems with verbal learning and memory, higher rates of psychosis and childhood abuse, and more serious aggressive behavior-all effects with a larger effect size. According to Närhi, *et al.* group-level studies have shown that adolescents with conduct disorder have impaired linguistic and executive functioning [11].

The study showed that adolescents with conduct disorder had a lower mean score on test letters, which indicates that they had lower verbal skills, learning, and memory. In addition, there weren't any significant differences in perseverative errors, indicating that conduct disorder adolescents and control group adolescents had slightly equal difficulty in switching among the specific categories.

Furthermore, the category fluency test (CFT) was given to the study participants in order to evaluate verbal fluency and/or brain damage and the outcomes were comparable because they enforced stringent language constraints. Furthermore, there are strong connections between the COWAT-FAS and CFT tests [12]. The results of the exam showed that adolescents in the control group performed much better on both test categories than adolescents with conduct disorders, indicating that they had stronger linguistic abilities, learning, and memory [11].

Compared to the control group, adolescents with conduct disorder showed more category preservative errors, suggesting that switching between two categories may be difficult for control group adolescents. A complete comparison of the overall mean scores revealed a difference in verbal functional test results of 39.85%. Also, data showed that adolescents who had conduct disorders had mean test performance scores that were 39.85% lower on average. This generally showed that study subjects with conduct disorder exhibited severe verbal functional deficiencies, including impairments in memory search, sustained production, and semantic fluency.

**Summary of mean tests Scores**

Domain	Tests	Population	n	M	MD	SD	t	p
Executive Functioning	SCWT	Control Group	20	34.45	17.2	4.347	9.78	.001*
		Conduct Disorder	25	17.24		6.827		
	WCST	Control Group	20	21.50	2.82	3.576		
		Conduct Disorder	25	24.32		4.298		
Attention And working Memory	PASAT	Control Group	20	21.55	11.95	5.615	7.56	.000*
		Conduct Disorder	25	9.60		4.967		
	WMS-III	Control Group	20	20.40	8.24	4.235		
		Conduct Disorder	25	12.16		4.432		
Verbal Functioning	CFT	Control Group	20	7.00	3.68	2.224	6.71	.001*
		Conduct Disorder	25	3.32		1.435		
	FAS	Control Group	20	13.25	4.290	2.531		
		Conduct Disorder	25	8.96		2.606		

**Table 5:** \*Significant at  $p < 0.05$  with 95% confidence.

## **Conclusion**

The study examined the neuropsychological functioning of adolescents with conduct disorder. Further, forty (40) incarcerated adolescents and twenty (20) community individuals forming a control group were examined using a conduct disorder schedule and components of a neuropsychological test battery (ZNTB). The criteria for conduct disorder were met by the prison population (n = 40). In order to conduct a thorough assessment, seven interview guides were distributed to guardians of the sixty (60) adolescent participants.

The study found, that when compared to controls, adolescents with conduct disorders displayed significant deficits in verbal memory-language, set shifting, cognitive ability, and visuospatial skills when compared to the control group, the conduct disorder group showed significant differences on the bulk of the neuropsychological tests and significantly underperformed on verbal, cognitive, and visual-spatial tests. The study produced findings that were consistent with those of various studies conducted among similar demographics in other nations. It is imperative to plan for, engage in, and employ rehabilitation and recovery, treatment and management, healthcare and educational interventional strategies, correctional approaches regarding generators of misconduct, delinquency, and aggression, and system-wide policy changes in order to better understand neuropsychological functioning in adolescents with conduct disorder.

## **Acknowledgements**

Dr. Paul Ravi, Professors Robert Serpell and Anitha Menon, Mrs. Joyce Ncheka, Mr. James Mwanza, staff members at the Department of Psychiatry and Mental Health, School of Medicine at the University of Zambia, Milongo Sikombe, Tiza Ng'ambi, stakeholders and study participants who provided their informed consent, and fellow students for their moral support, tolerance, and inspiration.

## **Conflict of Interest**

"No conflict of interest exists for any of the authors in this study. I/we have received no funding or other support from any organization that might have a financial interest in the results of this study. Additionally, I/we have no financial relationships with any companies that manufacture or distribute products related to the subject matter of this research. Finally, I/we have no personal or professional relationships that might bias our interpretation of the data or the presentation of the results." This statement assures readers that the authors have no competing interests that could potentially influence the results or interpretation of the study.

## **Bibliography**

1. American Psychiatric Association. Diagnostic and Statistical Manual for Mental Disorders. 5<sup>th</sup> edition, American Psychiatric Publishing (2013).
2. World Prison Brief. "Prison Studies - Zambia". World Prison Brief, Lusaka (2018).
3. Olvera RL., *et al.* "Neuropsychological Deficits in Adolescents with Conduct Disorder and Comorbid Bipolar Disorder: A Pilot Study". *Bipolar Disorders* 1 (2005): 1-21.
4. Prinz RJ and JE Dumas. "Prevention of Oppositional Defiant Disorder and Conduct Disorder in Children and Adolescents." *Handbook of Interventions that Work with Children and Adolescents: Prevention and Treatment*, edited by R. C. Murrihy., *et al.* Wiley (2004): 425-446.
5. Mayeya J., *et al.* "Zambia Mental Health Country Profile". *International Review of Psychiatry* 16.1-2 (2004): 1-13.
6. Nawa N. "An Evaluation of the Literacy Programme at the Lusaka Central Prison in Zambia". Master's thesis, The University of Zambia (2015).



7. Fuster Joaquín M. "Executive Functions and the Frontal Lobes: A Meta-Analytic Review". *Neuropsychology Review* 19.4 (2009): 473-478.
8. Egner Tobias and Joy Hirsch. "Cognitive Control Mechanisms Resolve Conflict through Cortical Amplification of Task-Relevant Information". *Nature Neuroscience* 8.12 (2005): 1784-1790.
9. Ozonoff S. "Executive Functions in Autism". *Learning and Cognition in Autism*, edited by E. Schopler and G. B. Mesibov, Springer (1995): 199-219.
10. Henry KL, et al. "The Wechsler Memory Scale-Third Edition Spatial Span in Adolescents with Conduct Issues: Relationship to Offending Behaviors and ADHD". *Journal of Attention Disorders* 13.3 (2009): 292-300.
11. Närhi V, et al. "Cognitive Functioning and Externalizing Behavior in Adolescence: Reciprocal Influences Over Time". *Journal of Child Psychology and Psychiatry* 51.5 (2010): 585-592.
12. Lezak MD, et al. "Neuropsychological Assessment". *Oxford University Press* (2004).
13. Tombaugh TN. "A Comprehensive Review of the Paced Auditory Serial Addition (PASAT)". *Archives of Clinical Neuropsychology* 21.1 (2006).

**Volume 12 Issue 4 April 2023**

**©All rights reserved by Lungo Mofya Michael and Ravi Paul**