

Neuropsychological Assessment in Schooled Adolescent Offenders and Non-Offenders

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Abstract

Adolescents who break the law have experienced situations that increase the likelihood of becoming involved in criminal activities such as drug use, gang involvement, adverse economic conditions, among others. All this, added to their stage of human development, which is characterized by physical, cognitive, social and emotional changes, can lead them to have deficiencies in their cognitive processes and at the same time present educational difficulties. The purpose of this study is to evaluate different cognitive processes of these adolescents in comparison to a control group with similar characteristics but who have not committed any crime and whose education has not been interrupted. For this purpose, were included (n = 62) adolescent offenders and (n = 62) adolescent non-offenders of male sex and aged 14 to 18 years was taken. Basic sociodemographic data on their education and psychoactive substance use were collected, as well as cognitive data with tests such as Ineco Frontal Screening for executive functions, Montreal Cognitive Assessment for general functions, among others. The results showed significant differences in executive functions, attentional processes, memory and language. These difficulties can be key to school performance, therefore, educational interventions adapted to these adolescents are suggested.

Keywords

Adolescent offenders, cognitive assessment, executive function, attention, interventions.

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Evaluación Neuropsicológica en Adolescentes Escolarizados Infractores y No Infractores

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Resumen

Los adolescentes que infringen la ley han experimentado situaciones que aumentan la probabilidad de involucrarse en actividades criminales como el consumo de drogas, la participación en pandillas, condiciones económicas adversas, entre otras. Todo esto, sumado a su etapa de desarrollo humano, caracterizada por cambios físicos, cognitivos, sociales y emocionales, puede llevarlos a presentar deficiencias en sus procesos cognitivos y, al mismo tiempo, enfrentar dificultades educativas. El propósito de este estudio es evaluar diferentes procesos cognitivos en estos adolescentes en comparación con un grupo de control que posee características similares pero que no ha cometido ningún delito y cuya educación no ha sido interrumpida. Para este fin, se incluyeron ($n = 62$) adolescentes infractores y ($n = 62$) adolescentes no infractores de sexo masculino, con edades de 14 a 18 años. Se recopilaron datos sociodemográficos básicos sobre su educación y consumo de sustancias psicoactivas, así como datos cognitivos con pruebas como el Ineco Frontal Screening para funciones ejecutivas, la Evaluación Cognitiva de Montreal para funciones generales, entre otras. Los resultados mostraron diferencias significativas en funciones ejecutivas, procesos de atención, memoria y lenguaje. Estas dificultades pueden ser clave para el rendimiento escolar, por lo tanto, se sugiere intervenciones educativas adaptadas a estos adolescentes.

Palabras clave

Adolescentes infractores, evaluación cognitiva, funciones ejecutivas, atención, intervención.

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Adolescent offenders are a group of young people who have committed different types of crimes and have come into contact with the juvenile justice system in their country. This population often encounters a variety of social problems that include the environment where they live and factors that could generate criminal behaviors (Voisin et al., 2017), such as the intense or frequent stress to which this population may be exposed during childhood (Oei et al., 2023). and among other factors identified as the family environment, the state of the parents' relationship, economic, social and environmental conditions. All of these can lead to criminal behavior (Gupta et al, 2022).

In addition, Borschmann et al., (2020) found that adolescents offenders in custody may face several significant health problems and a higher prevalence rate to conditions and risks such as mental disorders, substance use disorders, neurodevelopmental disabilities, infectious diseases, among others that in addition to impacting their physical and mental health directly impacts their education by placing them at a disadvantage with adolescents who do not have these conditions. In other studies, it has been found that this population has multiple risk factors that may be involved in the recidivism of crimes among those involved are the parents of adolescents by allowing or having a passive or permissive attitude regarding drug use, criminality in family members and antisocial behaviors, as well as poor school performance or problems in school (Cardona & Trujillo, 2022; Ortega et al., 2016).

This antisocial behavior exhibited by adolescent offenders is related to lesions in the frontal lobe, and research points to executive dysfunction as a risk factor that may be present in criminal behavior (Gil-Fenoy et al., 2018). Traumatic brain injury rates reported in this population have been as high as 77% and have been associated with a higher incidence of aggressive behaviors (Katzin et al., 2020). This impairment is directly related to executive functions which encompasses functions such as planning, inhibitory control, problem solving and cognitive flexibility, all of which are important in avoiding impulsive. In fact, a deficit in executive functions in childhood can have long-term negative effects, including adaptive, socioemotional, and academic functioning (Otero et al., 2014). And with these same functions, significant differences have been found between people who break the law and those who do not (Ogilvie et al., 2011). This is why intervention in cognitive processes, especially executive functions, becomes an essential component because they seek to strengthen planning, inhibitory control and decision making and thus be able to reduce the propensity for aggressive behaviors (Mullin, & Simpson, 2007).

In summary, adolescent offenders face various social and cognitive problems that have negative implications on their lives and future. Considering the above, it is important to study the cognitive processes of adolescent law offenders in relation to their educational problems. Studying the cognitive processes of these adolescents can provide a solid basis for implementing educational strategies that promote their academic development, improve their problem-solving skills, and foster decision-making. Knowing how these cognitive difficulties may affect their school performance and decision making will allow the development of more effective educational interventions tailored to their specific needs. In the long term, the study of cognitive processes can play a fundamental role in the improvement of educational processes and the reintegration of these adolescents into society.

The crucial Role of School

The importance of education in adolescents, even in those who have engaged in offending behavior, is a crucial issue in the field of education and juvenile justice. This population face various educational problems that can result in poor school performance, school dropout and lack of educational opportunities. Offenders have difficulties compared to non-offenders are more likely to lack skills and have no qualifications compared to people of the same age who have not committed offenses (Rogers et al., 2014).

Adolescent offenders who drop out of school are more likely to experience poverty, social marginalization, and unemployment. At the same time, the absence of formal education can limit getting a job in the future and, as a consequence, the economic income, which could increase the risk of committing a crime (Na, 2017).

This study focuses on the evaluation of cognitive dimensions in an unfavorable social context. The novelty of this research lies in the application of a variety cognitive tests in adolescents who have committed crimes in an environment marked by social adversity and the constant presence of violence in a country like Colombia, where currently 8,400 young people are involved in some crime and 19.9% of them reoffend (ICBF is committed to reducing recidivism of crimes among adolescents through their risk profile, 2022). In addition, they are in intramural measure where they receive an academic education that requires the identification of possible cognitive difficulties.

The present research seeks to describe the cognitive processes in these adolescents. Therefore, the objective of this research is to identify the differences in cognitive processes between adolescent offenders and a control group with similar characteristics, but without a criminal record or interruptions in their education. In this order of ideas, it is hypothesized that there are significant differences in the cognitive processes between adolescent offenders and non-offending adolescents.

Methods

Participants

Our study included adolescent offenders ($n = 62$) and adolescent non-offenders ($n = 62$), aged 14–18 years of male gender where offenders $M = 17$, $SD = 1,006$ and non-offenders $M = 16$, $SD = 1,169$. The offender group was selected from “Centro de Reeducación el Oasis” through the foundation “Hogares Claret in Barranquilla, Colombia. Where they are imprisoned for violation of punishable offenses like sexual abuse, homicide, and theft, among others. On the other side, the control group was selected from different educative institutions in the same city and had to meet the following criteria: a) be of male gender b) be of the age of 14-18 years old, c) not have more than 12 years of education, d) absence of criminal background, e) absence of neurological, psychiatric or physical diagnosis. Both groups duly informed both their parents or legal representatives about the research by using informed consent which was filled out voluntarily or in case of participants under 18 years of age by parents or guardians. This study was approved by the Caribbean Ethics Committee and followed the ethical principles of the

Declaration of Helsinki. Our study included adolescent offenders ($n = 62$) and adolescent non-offenders ($n = 62$), aged 14–18 years of male gender where offenders $M = 17$, $SD = 1,006$ and non-offenders $M = 16$, $SD = 1,169$. The offender group was selected from “Centro de Reeducción el Oasis” through the foundation “Hogares Claret in Barranquilla, Colombia. Where they are imprisoned for violation of punishable offenses like sexual abuse, homicide, and theft, among others. On the other side, the control group was selected from different educative institutions in the same city and had to meet the following criteria: a) be of male gender b) be of the age of 14-18 years old, c) not have more than 12 years of education, d) absence of criminal background, e) absence of neurological, psychiatric or physical diagnosis. Both groups duly informed both their parents or legal representatives about the research by using informed consent which was filled out voluntarily or in case of participants under 18 years of age by parents or guardians. This study was approved by the Caribbean Ethics Committee and followed the ethical principles of the Declaration of Helsinki.

Procedure

The cognitive assessments took place over two sessions. Before commencing the study, we secured informed consent from the participating adolescents. They received comprehensive information regarding the nature of the cognitive tests, the study's objectives, and the voluntary nature of their participation. Additionally, a separate informed consent document was presented to the institution overseeing the adolescents, ensuring that parents or legal guardians were informed about the potential involvement of their adolescents. The consent form explicitly detailed the study's purpose, procedures, and any potential risks or benefits. Inclusion in the study was restricted to adolescents whose parents or legal guardians provided consent, underscoring the significance of ethical considerations and the respect for the autonomy of both the adolescents and their guardians. It's important to note that this study was approved by the Ethics Committee of the University of Magdalena in compliance with the provisions of Rectoral Resolution 427 of 2018, and it was carried out following institutional guidelines and local legislation.

Cognitive Instruments

Osterrieth Complex Figure

It is a test used to assess visuo-constructive ability and visual memory. It also allows for assessing functional impairment in multiple cognitive dimensions such as attention, concentration, fine motor coordination, visuospatial perception, planning, and spatial orientation (Zhang et al., 2021).

Ineco Frontal Screening.

It is a screening test used to detect executive dysfunction in frontotemporal dementia, neurodegenerative diseases and in other populations such as adolescent offenders (Torralva et al., 2009; Gonzales et al., 2014). It includes several subtests designed to assess different executive function processes such as motor programming, conflicting instructions, inhibitory motor control, inhibitory motor control, verbal and visual working memory, verbal abstraction ability, and inhibitory control (Pinasco et al., 2023).

Montreal cognitive assessment

It is a screening test used to detect mild cognitive impairment. The MOCA assesses the following cognitive skills such as visuospatial/executive function, naming, episodic memory, attention, language, abstraction, and orientation (Carson et al., 2018).

Stroop Color-Word Test

It is a test that allows for measuring cognitive conflict and executive control (Wang et al., 2021). The Stroop also assesses processing speed, semantic and phonetic verbal fluency, interference control, and working memory (Periáñez et al., 2021).

Verbal Fluency Tasks

It is a test that assesses verbal functioning. It also allows for measuring verbal ability and levels of executive control (Shao et al., 2014).

WAIS

This test evaluates cognitive abilities and is widely used to assess IQ. It contains 10 subtests that assess verbal comprehension, perceptual reasoning, working memory, and processing speed (Mohamed et al., 2021). The Matrices, Similarities, and Vocabulary tasks were used in this study.

Symbols And Digits Test

It is a test to detect possible motor or visual difficulties. The SDMT also allows the evaluation of attention, short-term memory, and cognitive flexibility (Ramos et al., 2018).

Statistical analyses

Data were analyzed using the Statistical Package for the Social Sciences (SPSS) version 28.0 to analyze the results obtained. We use descriptive analysis. Mann-Whitney U tests were used to compare adolescent offenders' group and adolescent non-offenders on continuous data, and Chi-square tests for categorical data.

Results

Sociodemographic

Table 1

Demographical data comparison between adolescent offenders and non-offenders

Demographical data	Adolescent Offenders N = 62 (%)	Adolescent offenders N = 62 (%)	Non- U/ χ^2	Significance level
Age ^a	17 (1,006)	16 (1,169)	1423,0	0,010
Educational years ^a	7 (2,557)	10 (1,407)	711	0,00
Socioeconomic stratum ^a	1 (0,248)	2 (0,524)	740	0,00
school dropout, yes ^b	54 (87,1)	0 (0%)	95,657	0,00
gang member, yes ^b	20 (32,3)	0 (0%)	23,846	0,00
intrafamily violence, yes ^b	9 (14,5)	1 (1,6%)	6,961	0,008
psychoactive substance user, yes ^b	50 (80,6%)	11 (17,7%)	49,077	0,00
Alcohol ^b	39 (62,9%)	11 (17,7%)	26,275	0,00
Marijuana ^b	48 (77,4%)	0 (0%)	78,316	0,00
Cocaine ^b	43 (69,4%)	0 (0%)	65,827	0,00
Age of first use of psychoactive substance ^a	13 (5,653)	0,00 (5,641)	842,5	0,00
Crime				
Recidivism ^c	20 (32,3%)			
Homicide ^c	18 (29%)			
Sexual Abuse ^c	14 (22,6%)			
Illegal possession of weapons/narcotics ^c	14 (22,6%)			
Theft ^c	10 (16,1%)			
Violence ^c	5 (8,1%)			
Kidnapping ^c	1 (1,6%)			

Note. aMann-Whitney U test performed (medians are presented with SD in parentheses). bChi-square test performed (frequencies are presented with proportions in parentheses). cDescription of frequencies (proportions in parentheses).

The age of both groups was adolescent offenders (M = 17, SD = 1.006) and non-offenders (M = 16, SD = 1.169), U = 1423,0, p = 0.010 so there are no significant differences. Regarding the

years of education, adolescent offenders ($M = 7$, $SD = 2.557$) and non-offenders ($M = 10$, $SD = 1.407$), $U = 711$, $p < 0.001$. This indicates that significant differences were obtained between the 2 groups. In addition, in the socioeconomic stratum, it was found that offenders belong to the lowest strata where ($M = 1$, $SD = 0.248$) and non-offenders ($M = 2$, $SD = 0.524$), $U = 740$, $p < 0.001$. Non-offending adolescents had a higher percentage of belonging to higher socioeconomic strata.

School dropout in the group of offenders is high due to the criminal and drug history that characterizes this population, adolescent offenders obtained (54 cases, 87.1%) and non-offenders (0 cases, 0%), $\chi^2 = 95.657$, $p < 0.001$. Offending adolescents had a significantly higher proportion of school dropouts compared to non-offending adolescents.

On the other hand, in the consumption of psychoactive substances, significant differences were found between the groups for the variables alcohol, marijuana, and cocaine, with significant χ^2 and p values ($p < 0.05$). Offending adolescents had a higher proportion of consumption of psychoactive substances compared to non-offending adolescents. Along the same lines, the age of initiation of the use of these substances, a significant difference was found in the age of initiation of substance use between the groups of adolescent offenders ($M = 13$, $SD = 5.653$) and non-offenders ($M = 0$, $SD = 5.641$), $U = 842.5$, $p < 0.001$. The offending adolescents had a significantly earlier age of onset of substance use compared to non-offending adolescents and the consumption of non-offenders was limited to alcohol which, although it is illegal for minors, obtaining this is more accessible than other drugs.

Lastly, the data obtained about crimes committed by adolescent offenders indicate that 22.6% (14 cases) of adolescent offenders had committed sexual abuse and 29% (18 cases) of adolescent offenders were involved in homicides. being the 2 types of crimes with the highest cases presented. Finally, the level of recidivism of adolescent offenders is 32.3%.

Table 2

Cognitive data comparison between adolescent offenders and non-offenders

Cognitive tests	Adolescent Offender (N = 62)	Adolescent Non-offenders (N = 62)	U	Significance level
Osterrieth Complex Figure Copy	29 (374,852)	34 (3,348)	1046	,000
Short-term memory	13,53 (8,976)	25,03 (6,643)	853	,000
Ineco Frontal Screening (IFS)				
Motor programming	3 (0,918)	3 (0,459)	1660,5	,091
Interference resistance	3 (0,844)	3 (0,371)	1541	,012
Motor inhibitory control	3 (0,954)	3 (0,432)	1785	,371
Verbal inhibitory control	2 (2,147)	5,50 (1,342)	779,5	,000
Verbal working memory	1 (0,874)	2 (0,691)	1331,5	,001
Numerical working memory	2 (1,18)	2 (0,913)	1770	,431
Visual working memory	2 (1,099)	3 (0,967)	943,5	,000

Cognitive tests	Adolescent Offender (N = 62)	Adolescent offenders (N = 62)	Non- U	Significance level
Abstraction capacity	1 (0,907)	2 (0,789)	1216	,000
IFS Total	17,50 (5,075)	22 (2,401)	695,5	,000
Montreal Cognitive Assessment (MOCA)				
Executive Visuospatial	4 (1,32)	5 (0,749)	991	,000
Identification	3 (0,882)	3 (0,587)	1541	,007
Memory	3 (1,599)	4 (1,378)	1380,5	,005
Attention	5 (1,494)	5 (0,943)	1390,5	,006
Language	2 (0,89)	3 (0,773)	1360	,001
Abstraction	1,50 (0,909)	2 (0,375)	1053,5	,000
Orientation	6 (0,805)	6 (0,548)	1836,5	,535
MOCA Total	23 (4,924)	27 (2,753)	885,5	,000
STROOP				
Word-Color	37,50 (13,261)	39,50 (11,776)	1635	,151
TFV				
Phonological Fluency	10,50 (4,24)	13 (4,623)	1158,5	,000
Semantic Fluency	16 (4,919)	18 (3,669)	1153	,000
Exclusive Fluency	9 (4,271)	13 (3,818)	896,5	,000
WAIS				
Matrices	8 (4,395)	13 (4,507)	692,5	,000
Similarities	12 (5,233)	16 (4,813)	866	,000
Vocabulary	8 (6,549)	12 (9,791)	1249	,001
SDMT				
SDMT hits	29,50 (12,948)	41,50 (10,679)	982	,000

Note. Mann-Whitney U test performed (medians are presented with SD in parentheses).

The results of the comparative analysis of cognitive test scores between Adolescent Offenders and Adolescent Non-Offenders. Mann-Whitney U test was used to assess the differences between the groups where Adolescent Offenders showed significantly lower performance compared to Adolescent Non-Offenders in several tests.

In the Osterrieth Complex Figure Copy test, Adolescent Offenders obtained a median of 29 (SD = 374.852), while Adolescent Non-Offenders obtained a median of 34 (SD = 3.348), U = 1046, $p < 0.001$. In the same test, the Short-term memory test, Adolescent Offenders obtained a median of 13.53 (SD = 8.976), in contrast to the median of 25.03 (SD = 6.643) for Adolescent Non-Offenders, U = 853, $p < 0.001$.

Regarding the Ineco Frontal Screening test. In the Verbal inhibitory control test, Adolescent offenders scored a median of 2 (SD = 2.147), while non-offenders scored a median of 5.50 (SD = 1.342), U = 779.5, $p < 0.001$. In the Verbal working memory test, the offending Adolescents had a median of 1 (SD = 0.874), in contrast to the median of 2 (SD = 0.691) of the Non-offenders, U = 1331.5, $p = 0.001$. Continuing with the working memory tests, in the Visual

working memory test, the Adolescent Offenders obtained a median of 2 (SD = 1.099), while the non-offenders obtained a median of 3 (SD = 0.967), $U = 943, 5, p < 0.001$. In the Abstraction capacity test, the offending Adolescents presented a median of 1 (SD = 0.907), in contrast to the median of 2 (SD = 0.789) of the Non-offending Adolescents, $U = 1216, p < 0.001$. Finally, in the IFS Total test, which is a global score that indicates whether there may be a possible difficulty in executive functions, the offending Adolescents obtained a median of 17.50 (SD = 5.075), while the Non-offending Adolescents obtained a median of 22 (SD = 2.401), $U = 695.5, p < 0.001$.

In the Montreal Cognitive Assessment screening test that evaluates different cognitive processes, we found that in the Executive Visuospatial test, offending Adolescents obtained a median of 4 (SD = 1.32), while non-offenders obtained a median of 5 (SD = 0.749), $U = 991, p < 0.001$. On the other hand, in the Identification test, offenders showed a median of 3 (SD = 0.882), while non-offenders obtained a median of 3 (SD = 0.587), $U = 1541, p = 0.007$. In the Memory test, Adolescent Offenders obtained a median of 3 (SD = 1.599), in contrast to the median of 4 (SD = 1.378) of Non-Offending Adolescents, $U = 1380.5, p = 0.005$.

Regarding Attention, both groups showed a median of 5 (SD = 1.494) for Adolescent Offenders and 5 (SD = 0.943) for Non-Offending Adolescents, $U = 1390.5, p = 0.006$. Regarding Language, Adolescent offenders obtained a median of 2 (SD = 0.89), while non-offenders presented a median of 3 (SD = 0.773), $U = 1360, p < 0.001$. In the Abstraction test, Adolescent offenders scored a median of 1.50 (SD = 0.909), while non-offenders scored a median of 2 (SD = 0.375), $U = 1053.5, p < 0.001$. Regarding Orientation, both groups showed a median of 6 (SD = 0.805) for offenders and (SD = 0.548) for Non-Offending Adolescents, $U = 1836.5, p = 0.535$. Finally, like the INECO, the MOCA test yields a total result, offending Adolescents obtained a median of 23 (SD = 4,924), while Non-offending Adolescents presented a median of 27 (SD = 2,753), $U = 885.5, p < 0.001$.

In the STROOP test, Adolescent offenders scored a median of 37.50 (SD = 13.261), while non-offenders had a median of 39.50 (SD = 11.776), $U = 1635, p = 0.151$. showing that in this test there were no significant differences.

In the Verbal Fluency Tasks test. In the Phonological Fluency subtest, Adolescent Offenders had a median of 10.50 (SD = 4.24), and non-Offenders had a median of 13 (SD = 4.623), $U = 1158.5, p < 0.001$. On the Semantic Fluency test, Adolescent offenders had a median of 16 (SD = 4.919), in contrast to the median of 18 (SD = 3.669) for Non-offenders, $U = 1153, p < 0.001$. Lastly, in the Exclusive Fluency test, the adolescent offenders obtained a median of 9 (SD = 4.271), while the non-offenders had a median of 13 (SD = 3.818), $U = 896.5, p < 0.001$.

Significant differences were found in the 3 WAIS-IV subtests that were used. In the Matrix test, Adolescent offenders obtained a median of 8 (SD = 4.395), while non-Offenders had a median of 13 (SD = 4.507), $U = 692.5, p < 0.001$. In the Similarities test, Adolescent Offenders had a median of 12 (SD = 5.233), while non-Offenders had a median of 16 (SD = 4.813), $U = 866, p < 0.001$. And finally, in the Vocabulary test, the offending Adolescents showed a median of 8 (SD = 6.549), in contrast to the median of 12 (SD = 9.791) of the Non-offending Adolescents, $U = 1249, p = 0.001$.

In the SDMT test, significant differences were found between the groups. Adolescent Offenders had a median of 29.50 (SD = 12.948), while Non-Offending Adolescents had a median of 41.50 (SD = 10.679), $U = 982, p < 0.001$.

Discussion

Significant differences were found in the years of education where non-offending adolescents are older than offenders despite being the same age. This difference can be explained by the fact that adolescent offenders who are in prison are likely to have disadvantages or difficulties in educational terms, showing lower scores compared to non-offending adolescents of the same age. Most juvenile offenders are more likely to be low-skilled and unskilled compared to non-offenders of a similar age (Rogers et al., 2014). This difference is still present between these two populations despite studies such as Machin, Marie & Vujic (2011) showing that improving the educational conditions of people in custody can help reduce delinquency through reinsertion rates and bring social benefits. It is even recommended that children, especially those in vulnerable environments, have their basic needs guaranteed, including quality education that will allow them to have a life free of delinquency in the future (Paterson et al., 2021).

Added to this is the fact that adolescent offenders usually have high dropout rates which is often related to a disadvantaged environment, as is the case of the sample of this study with 87.1%. Studies such as Na (2022) found that school dropout can lead adolescents to violent victimization because it can change life opportunities and lead them to risky lifestyles. It should also be taken into account that not all adolescent offenders who are serving their sentences complete their schooling in detention centers. Many may return to school after serving their sentence and continue their reintegration into society. The success of this return depends not only on the adolescent but also on the education they received in the prison and the quality of that education. In addition, adolescents who dropped out of school before being sentenced require additional support for their successful reintegration (Jaggi et al., 2019; Olaitan & Pitts, 2020).

Among the different factors that can lead adolescents to commit criminal acts is the socioeconomic stratum where adolescent offenders live in low economic levels. These low socioeconomic strata are often linked to adverse living conditions, limitations in access to different resources and lack of educational opportunities. Furthermore, they are characterized by greater exposure to situations that involve violence and greater access to psychoactive substances in their environments. Rekker et al., (2015) found that young people are more likely to commit crimes when their parents' economic income is low. This may be because poverty can prevent young people from achieving social and economic objectives that could be achieved in socioeconomic strata. higher, which leads the young person to commit crimes due to his perception of a lack of quality of life and prospects for the future.

Another important factor that is related to juvenile delinquency is the consumption of psychoactive substances, where adolescent offenders show consumption not only of alcohol but also of harder drugs such as cocaine, even at an early age, which can increase the risk of having adverse results in life. life at a social and economic level (Vergunst et al., 2022). Treatment focused on psychoactive substance abuse can be effective and reduce the risk of drug use and even reoffending (Tomaz et al., 2023). Drug use not only contributes to crime, but also has direct consequences on your mental health and overall well-being.

The results of the applied tests showed difficulties in processes involved with attention such as abstraction, and visuospatial, among other functions evaluated by the Osterrieth Complex Figure, Ineco frontal screening, MOCA, and SDMT cognitive tests.

As evidenced by the literature (O'Byrne et al., 2021; Sepúlveda et al., 2022) offending adolescents presented difficulties in executive functioning, assessed mainly through the INECO and MOCA tests. Studies that have studied adolescent offenders and non-offenders using Frontal Screening have shown difficulties in executive function, so these results could indicate a deficit in the prefrontal area that explains the differences between adolescent offenders and non-offenders (Meijers et al., 2017).

The Osterrieth Complex Figure, MOCA, and SDMT tests showed memory impairment, especially short-term memory, which is an important process related to short-term attention and information manipulation for executive functioning. In contexts similar to that of our population, difficulties have been found in different cognitive processes such as executive functions, directed and divided attention, verbal fluency and memory. This impairment in remembering processes can directly affect educational performance and their ability to learn and retain relevant information (Ramirez & Arroyo, 2014). Low scores on this test may indicate a possible future risk of developing dementia (Li et al., 2018).

In the WAIS test, there were difficulties with the similarities and vocabulary tests. These results agree with those found by Nkoana et al., (2020) who evaluated offenders from 14 to 21 years of age, where in the same tests they showed low scores compared to non-offending adolescents. Likewise, low scores have been found in the Verbal subtests of the WAIS. Wallinius et al., (2019) found that adolescent offenders who present a uniform intellectual profile have a higher prevalence of presenting a substance use disorder and of finishing school without delays in the stipulated times considering their age.

Finally, difficulties were found in different dimensions of language, such as language development, verbal reasoning, and semantic memory, among others. This difficulty was constant in offending adolescents when taking different tests such as the MOCA, TFV, and the WAIS-IV similarity and vocabulary subtests, where performance was lower compared to non-offending adolescents. These results have been shown with the TFV task, where adolescent offenders have a trend of lower scores with subjects matched by age, social class and geographic residence (Muscatello et al., 2014).

Language difficulties may lead to an increased risk of self-harm and substance abuse among adolescent offenders. This may be because of difficulty expressing emotions efficiently, difficulties in seeking help or understanding the consequences of their actions. All this because they present difficulties in verbal and nonverbal language that translates into impairment in relating effectively with others, problems in conflict resolution, interpretation of facial expressions, among others (Hughes, 2017). In addition, these adolescents are more likely to have language disorders, which would impede normal language development and would require the intervention of specialists to accompany the education stage (Chow et al., 2022).

The results of this study indicate that adolescents who break the law show sociodemographic disadvantages such as dropping out of school and consequently having lower grades than adolescents of the same age and the consumption of psychoactive substances and, on the other hand, cognitive disadvantages such as difficulties in executive functions and memory compared to adolescents who do not break the law, all of this coinciding with the hypothesis

raised in the study where significant differences were expected between both groups. Sociodemographic and psychological variables are key to reintegration processes and identification of criminal factors at an early age because these can contribute to delinquency (Savolainen et al., 2018).

For all of the above, it is important to identify and describe this problem so that it can be identified in contexts of vulnerability, school environments and minor reintegration centers. These conclusions have crucial implications for the formulation of preventive interventions and rehabilitation programs. It is suggested that future research delve into the correlation of these factors.

Conclusion

This study supports previous literature demonstrating that adolescent offenders have lower cognitive performance than their non-offending peers. The results of the evaluations carried out can reveal deficiencies in skills such as attention, memory or decision making, which guides attention towards specific educational strategies, which has an impact on the high recidivism statistics since educational strategies are designed so that they not only promote academic learning, but also social and emotional skills that contribute to reducing the probability of future criminal behavior. Knowing the cognitive performance of adolescent offenders enriches the practice of educational psychology by allowing more precise and personalized interventions, with the aim of promoting comprehensive development and reducing the probability of recurrent criminal behavior.

Limitations

While the current study offers a well-defined exploration of offenders, it is important to acknowledge specific limitations that may affect the generalizability of the results. Firstly, the deliberate focus on a male-only population was necessitated by the prevalence of male adolescents among the target group of offenders, which may limit the extension of findings to a broader gender spectrum. Secondly, the study's emphasis on geographic location poses a constraint on the broader applicability of the results beyond this region. It is crucial to explicitly highlight these limitations to ensure a nuanced interpretation of the study's outcomes and to encourage future research that includes diverse gender representations and explores different geographic regions for enhanced generalizability.

Ethics statement

This study was approved by Ethics Committee of the University of Magdalena in compliance with the provisions of Rectoral Resolution 427 of 2018. This study was carried out following institutional guidelines and local legislation.

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Conflicts of Interest

The authors declare no conflict of interest.

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