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Living with Violence and Its Relationship with Executive Function in Childhood and Adolescence: Literature Review

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Abstract

The purpose of this article is to conduct a literature review of studies that have investigated the relationship between violence and the development of executive function (EF) in children and adolescents. A search was carried out in the PsycINFO, PubMed/Medline, BVS, Lilacs, Web of Science, Scopus, and Gale databases with the following descriptors; violence, executive functions, child, children, adolescence, an adolescent. A total of 486 articles, published in the last 10 years, were found. After reading the abstracts and considering the inclusion and exclusion criteria, eight articles remain that are related to the topic. It was found that all the studies investigated the relationship of abuse in children and adolescents. Diversity was also observed in terms of the EF components evaluated as well as in the instruments for assessing EF. Moreover, seven of the eight studies established that victimization impairs EF.

Keywords: executive function, violence, children and adolescents

1. Introduction

Violence has become an issue of public health, responsible for deaths and illnesses, leaving in its wake consequences for all age groups in the population. Intentionality is one of the more complex elements in the concept of violence, however, the World Health Organization (WHO) explains that any act causing implications for an individual's health is considered a violent act, even when sustained by the culture or when there was an intention to use force without the intention to cause harm [1].

As far as the typology is concerned, violence is divided into three types: self-inflicted, interpersonal, and collective. Self-inflicted violence is subdivided into suicidal behavior and self-abuse; collective violence, into social, political, and economic; lastly, interpersonal, divided into two subcategories: violence within the family or by a close partner, which mostly occurs between family members, and community violence, which takes place among people who are unrelated [2].

With regard to the nature of violent acts, these may be classified as physical, sexual, psychological, deprivation or abandonment. The four types of violent act

occur in each of the main categories and subcategories, except for self-inflicted violence. Violence towards children, committed inside the home, for example, may include physical, sexual, or psychological abuse, as well as negligence or abandonment [3].

Specifically, with regard to children and adolescents, violent acts (physical, sexual, psychological, negligent) are called maltreatment and refer to various forms of violence, in the majority of cases with events being repeated and committed by someone close or the guardian of the child or adolescent [4].

Studies into violence, conducted by Finkelhor et al. [5], assert that living with or experiencing situations of violence, with the particular potential to cause trauma, is called victimization. Studies into victimization describe five types of violence: victimization through conventional crime, victimization through maltreatment, victimization by peers, sexual victimization and indirect, witnessed victimization.

Victimization through conventional crime is commonly identified by the police authorities as, for example, assault, theft, vandalism, and prejudice. As for violence through maltreatment, this is detected through living with situations of violence directly related to the family or to guardians. This type of victimization also includes negligence, physical and psychological abuse, in the form of depriving children and/or adolescents of basic necessities like food and hygiene. Victimization by peers is characterized by the aggression that occurs by individuals within the same age group, normally among students. In this respect, aggression through the practice of bullying is also taken into account as well as attacks by groups and physical and psychological violence. Sexual victimization relates to aggression related to issues of sexuality. For Finkelhor et al. [5], sexual victimization is more than just penetration, it also includes lewd acts without the consent of the individual or even with consent where the children are not old enough to be responsible for their choices; this also encompasses sexual aggression by an adult, by peers, sexual harassment, rape or attempted rape and sexually-related verbal harassment. Lastly, indirect victimization refers to the witnessing of violence suffered by others, and this also covers issues such as witnessing domestic violence, seeing parents attack siblings or their spouses, witnessing attacks, robberies, homicides, shootings, terrorism, and exposure to ethnic conflict.

In epidemiological terms, studies show that approximately 40 million children in the world, under the age of 15, have suffered abuse and negligence [1] and, in the USA, between 25% and 66% of children and adolescents are exposed to traumatic events during childhood [6, 7]. As far as Brazil is concerned, a survey by the Brazilian Center for Latin American Studies, based on the Ministry of Health's Mortality Information System (SIM), shows that the number of homicides of teenagers, between 1980 and 2010, rose 346%.

Brazilian researcher that investigates violence directed against children and adolescents point to alarming data. According to the National Human Rights Ombudsman, 58.9% of the complaints received via channels such as Dial 100 refer to some type of violence against children and adolescents. The main types of violence reported are mistreatment: negligence (61,416), psychological violence (39,561), and physical violence (33,105). In 2017 alone, there were 84,049 reports of physical violence and, in the previous year, there were 76,171. In this sense, the data indicate that 68% of Brazilian children and adolescents aged up to 14 years, which is equivalent to 30.3 million children and adolescents, have already suffered corporal violence at home [8].

An exploratory/descriptive desk study conducted by Júnior et al. [9], analyzed the characterization of cases of domestic violence against children and adolescents in the Brazilian city of Volta Redonda, situated in the state of Rio de Janeiro. The investigation was carried out based on an analysis of the patient records of

registered children and adolescents cared for as victims of maltreatment by parents, relatives, and/or guardians in the city's Specialized Social Welfare Reference Center (CREAS). The results indicated that, of the 210 patient records analyzed, 29% were victims of physical violence, 29% sexual violence, 29% were linked to negligence and 13% were cases of psychological violence. Although this study cannot be generalized as it makes use of a convenience sample, some important points were deliberated. The prevalence of the identification of physical violence, as it leaves marks on the body, and sexual violence, as it causes significant harm to the victims' health, is capable of mobilizing more the child protection institutions and society in general, which probably explains the higher volumes of identification. As for negligence, though difficult to identify, as it involves the economic and social aspects of each family or social group, detection is possible when there is already contact between the social institutions and the families in situations of risk and vulnerability. On the other hand, psychological violence, which accounted for the smallest percentage of identification, requires children's welfare professionals to redouble their attention because the indicators of its manifestation are not so straightforward, however, the consequences are equally serious for the victims' mental health.

One study conducted by Lin et al. [10] investigate the link between serious child abuse and cerebral activation based on Magnetic Resonance Imaging examinations during a sustained attentional task. A total of 70 individuals (13 to 20 years old) took part, divided into three groups: history of abuse before 12 years old; psychiatric control group (no maltreatment but with psychiatric disorders); control group (no maltreatment, no psychological disorders). The results indicated that the participants exposed to child abuse exhibited results that show that the longer the youngster suffered abuse, the worse the performance in capacity to maintain sustained attention.

Another important piece of data indicates that, according to the Ministry of Women, Family and Human Rights (MMFDH), of the accusations received via Helpline 100 in 2018, over 17,000 were related to sexual abuse and sexual exploitation involving children and adolescents. Thus, based on the data presented and seeking protective measures for children and adolescents, in Brazil, the Child and Adolescent Statute (ECA) is regarded as one of the most advanced pieces of legislation in the world in terms of child protection [11]. Among the general clauses, the law establishes full protection for children and adolescents, considering that children, for the purposes of the law, are those aged under 12 while adolescents are those aged between 12 and 18 years. In terms of protection against violence, article 5 of the ECA states that no child or adolescent shall be the object of any form of negligence, discrimination, exploitation, violence, cruelty, or oppression and that any attempt, through commission or omission, against their fundamental rights must be punished in accordance with the law. Despite the ECA and the penalties it imposes on people who commit violence against children and adolescents, the percentage of victims within this age group is still significant.

Despite the ECA being a statute that provides for severe infractions for those who are aggressors, the number of victimizations is still significant. The aim of the ECA, therefore, is the full protection of children and adolescents, seeking to guarantee their cognitive, psychosocial, and physical development. The dividing line between child and adolescent is important, mainly as it considers that significant, important differences exist during each period of their lives [12].

Development in childhood is characterized by constant processes of development in terms of cognitive function and social skills. In the third stage of childhood, between six and 11 years of age, cognitive development is seen as an increase in cognitive skills that permits an improvement in the ability to learn as well as preparation for academic performance. In terms of psychosocial development, relationships

between peers, schoolmates, and others take on fundamental importance. In adolescence, interest in peer relationships remains strong, however, with a greater concern to belong to a group, which may exert positive or negative influences. Cognitive development is characterized by the ability to think in abstract terms, but immature thinking persists in some attitudes and conduct, with more impulsive behavior [12]. Situations of violence may adversely affect this important period of development, causing impairment of cognitive, social, emotional skills and, consequently, may compromise the quality of life of victimized subjects.

With regard to the damage to quality of life, for victimized children, a study by Matos, Pinto, and Stelko-Pereira [13], which aimed to investigate the existence of a possible connection between exposure to sexual abuse in childhood and inferior quality of life in university students, noted that childhood sexual abuse is negatively associated with quality of life in adults. The results of another study, conducted by Dias [14], although investigating a different age group, specifically relating to the impact of violence on the quality of life of adult females, showed that violence exerts a negative impact on the quality of life of victims and also generates physical trauma, posttraumatic stress disorder, stress, and depression.

Studies into the relationship of experience of violence in childhood and adolescence have increased as a result of the recognition of the dimensions of the phenomenon as a serious public health problem, on account of the high index and the consequences they have for the physical, psychological and cognitive health of people who suffer violence [15]. In order to identify victimization, for the most part, studies look to institutions that protect victimized children, as well as instruments (questionnaires and/or scales) that can be answered by the parents/guardians or by the child or adolescent him/herself. The instruments most frequently employed are the Child Maltreatment Questionnaire, Child Trauma Questionnaire, and Juvenile Victimization Questionnaire [4, 10, 16, 17]. The last two instruments in this list include validity studies in the national context conducted by Grassi-Oliveira et al. [18] and Faria and Zanini [19], respectively, and are not instruments restricted to the use of psychologists.

Despite the variety in the way victimization is identified, studies have shown impairment to cognitive functions in this age group [4, 10, 20]. However, there are still very few studies available that have sought to investigate the impact of violence specifically on executive functions.

Executive function (EF) refers to the processes called upon whenever it is necessary to focus attention, manage and control behavior or action towards a goal, evaluate the efficiency of this behavior, and readjust strategy when required. Thus it is possible to assert that the human capacity to adapt to different situations is heavily associated with good executive function [21–24].

In spite of the agreement between the theoretical models that EF is important for good brain function, insofar as it relates to its definition and component structure, there seems to be a divergence in ideas [14, 25–27]. Thus, several different EF models have been developed and studied.

One of the more influential theories about EF proposes the association between the frontal lobes, their principal connections, and the Supervisory Attentional System (SAS). SAS is a model developed by Norman and Shallice [28] and describes EF as a specific system in the processing of information, which takes place based on two processes. An automatic process is the ability to automatically select responses based on information in an existing repertoire. The controlled process is identified as the modification or even the construction of new responses, including decision-making, mental flexibility, inhibitory control, and planning [28, 29]. In this regard, there are some studies about the relationship of violence with EF [10, 30] which used attention as a component of EF.

One widely accepted model is that of Miyaki et al. [31], for whom EF is composed of three basic components or nuclear EFs, namely: working memory (WM), cognitive flexibility (CF), and inhibitory control (IC). Subsequently, Diamond [21] carried out a new study corroborating the idea that three nuclear EFs exist, but that they are the basis for the development of more complex components such as planning, deductive reasoning, and problem resolution, subsequently designated complex executive functions. For a better understanding of the model, it is necessary to define each of these components.

IC involves the ability to control the behaviors of attention, thoughts, and emotions, inhibiting an automatic behavior or a distraction and, instead of generating said behavior, do what is most appropriate or necessary [22]. WM is defined as the ability to keep information in one's mind and deal with it over a short period of time, enabling understanding, learning, and reasoning, as well as problem resolution [32]. CF involves the capacity to change perspectives, alternate attentional focus, favoring the ability to adapt to the environment, enabling the individual to evaluate his/her performance in a particular situation, seeking to comply with rules, and problem resolution [22, 33]. With regard to complex EFs, planning involves the ability, based around an initial starting point, to set an objective, define the best ways to achieve it, organize the necessary steps to this end, analyze the efficacy and, if necessary, adjust the execution [22]. Problem resolution involves the ability to create and test solutions for conflicts, through mental representation, in the planning and implementation of strategies and monitoring [34].

Another skill developed from the three nuclear components is decision-making, crucial for day-to-day functioning because it involves a process of choice of one among many alternatives in situations that include uncertainty, generally guided by an emotional or motivational component. During decision-making, other EF components are involved like operational memory, cognitive flexibility, inhibitory control, and planning [23, 34].

Regarding the development of EF in the early years of life, it is considered a unitary construct, that is to say, in this phase it is not possible to distinguish between each component, however, it is already possible to identify an improvement in the performance of the components in the first year of life [35].

From school age, the development of operational memory and cognitive flexibility is relatively linear; in this period, the EF components appear in sequence: firstly working memory, then inhibitory control. The two components in combination permit the development of cognitive flexibility [23, 36].

Adolescence is characterized by an increase in impulsiveness and, consequently, by a pattern of immediatist choices, changes in the course of action without making a conscience judgment, unintended behaviors, and a tendency to act without planning. All these aspects lead to risk-taking behavior without evaluating the consequences, suggesting a lesser capacity for self-regulation and inhibitory control [23].

WM is an essential ability in learning, both in childhood and in adolescence and, although there are a series of abilities required for learning, there is evidence that working memory is one of the best predictors of performance at school [37, 38]. In this regard, it is important to stress that the development of EF is directly related to the ability of children and adolescents in the learning processes, as well as the ability to adapt to new situations.

As EF is important for the learning processes, the evaluation of this function must investigate, in minute detail, if each of the components is developing as expected. There are specific batteries for its evaluation, such as the Behavioral Assessment of the Dysexecutive Syndrome (BADS) and the Delis Kaplan Executive Function System (D-KEFS). These batteries perform an overall evaluation of EF and serve a population ranging in age from eight to 87 years.

There are several favorable psychological tests, which evaluate EF, as well as instruments validated for use. The Wisconsin Card Test, for example, is used to evaluate EF, specifically cognitive flexibility, as well as Trail Making Test and the Five Digit Test (FDT). To evaluate WM, the WISC-IV subtests are used, such as digit span and numbers and letters sequencing and, to evaluate inhibitory control, FDT, Stroop Test, and the Hayling Test are used. On the one hand, the wide variety of tests to evaluate EF permits a full investigation based on the collection of data from all the components, however, with regard to the comparison of data in studies, it may make analysis difficult as the studies use different instruments and tests.

Despite the diversity, in the way, the data is collected, either for identifying violence or evaluating EF, international studies point out the consequences of victimization for children and adolescents. Some studies have investigated the consequences of short- and long-term violence with victims who presented with a condition indicative of posttraumatic stress disorder, psychiatric disorders, or the use of illicit substances such as alcohol and drugs [39–43]. Other studies have shown that victimization as a result of maltreatment, as well as sexual victimization, may impair the development of EF in terms of the components of working memory, cognitive flexibility, and inhibitory control [39, 41, 44, 45].

So, based on the data presented, the present study aimed to perform a literature review of the literature concerning studies that investigated the relationship between living with violence and the development of EF in children and adolescents, over the last 10 years. It also intends to demonstrate how these impairments can affect the quality of life of these children and adolescents.

2. Method

2.1 Materials

Articles in scientific reviews, published within the last 10 years, which sought to assess the relationship between living with violence and executive function in children and adolescents aged between six and 16, located in the following databases: PsycINFO, Pubmed/Medline, BVS, Lilacs, Web of Science, Scopus and Gale.

2.2 Procedures

In order to carry out this literature review, the following databases were used: PsycINFO, Pubmed/Medline, BVS, Lilacs, Web of Science, Scopus, and Gale, with articles, published up to October 2019. In these databases, the potentially relevant documents were selected using the following descriptors: executive functions, violence, child, children, adolescent, and adolescence, inserting the *and*. Boolean operator between the descriptors:

Studies between 2009 and October 2019 were accepted, reviewed by peers, and published in the English, Spanish and Portuguese languages. Initially, 486 articles were located, of which 200 were repeated articles. After a reading of the titles and abstracts of the remaining 286 articles, 221 were excluded, in accordance with the following criteria: articles that were not available in their entirety (16), that had no connection with the proposed topic (172), comprising longitudinal studies (7), with a target demographic of subjects over 16 years of age (10), with a target demographic of subjects under 6 years of age (11), related to the use of illicit drugs (5). A total of 65 articles remained, selected for a full-text reading, to be subsequently included or excluded in accordance with the following criteria:

Flowchart of studies selected for review

Figure 1.
Flowchart of studies selected for review.

Inclusion criteria: (1) articles that investigated the relationship between violence and EF, (2) articles with a target demographic between six and 16 years of age, (3) studies with a control group. Exclusion criteria: duplicated articles (2), articles not available in full, (3) articles with a target demographic under 6 years of age, (4) articles that did not indicate the instruments used to evaluate EF. Based on the final analysis of the selection, the studies were characterized by author and year of publication, objective, age range of target demographic, type/nature of violence, instruments used, evaluated EF components and results. **Figure 1** represents the detailed flowchart of the study selection process.

Figure 1 indicates that the initial search of the databases identified 486 files. After applying inclusion and exclusion criteria, 65 articles remained for full-text reading. After the reading, the following studies were excluded: outside the studied age range (n = 25), those that did not have a control group (n = 23), those without instruments to measure EF (n = 13), and those which were literature or systematic reviews (n = 4), leaving a total of eight articles.

3. Results

There follow a series of tables with the results obtained in this review study. **Table 1** describes the eight articles selected according to the inclusion criteria, identifying the authors, number of participants, age group, and study objectives.

The results displayed in **Table 1** show that the number of participants ranged from 26 to 1851. As far as the age range is concerned, just one study analyzed only children [30], three investigated both children and adolescents [39, 45, 46] and four studies investigated adolescents [10, 16, 17, 47]. With regard to the objectives

Authors	Participants	Objective
De Bellis et al. [30]	Children (7 and 8 years old)	To investigate impairment in cognitive functions in neglected and sexually abused children. The children were divided into three groups: neglected and with symptoms of PTSD; neglected but no PTSD, children neither neglected nor PTSD (control group). The following cognitive domains were investigated: IQ, reading, math, fine-motor coordination, speech, visuospatial perception, memory, attention/ executive function.
Nooner et al. [45]	202 children (11 and 12 years old).	To investigate the impact of maltreatment on cognitive functions, comparing boy and girl victims. The cognitive functions investigated were: attention, speech, memory, intelligence, EF, and academic performance (reading, writing). The children were divided into 4 groups: boys with and without maltreatment; girls with and without maltreatment.
Spann et al. [16]	30 adolescents (12 to 17 years old).	To investigate the relationship between maltreatment and EF, specifically cognitive flexibility in adolescents without psychiatric disorders. The adolescents, divided into two groups: with and without a history of maltreatment.
Borges and Dell’Aglio [39]	26 children and adolescents (8 to 13 years old)	To identify the manifestation of symptoms of PTSD and impairment of attention, verbal memory, cognitive flexibility/ executive function in girls that suffered sexual abuse. Divided into 2 groups: girls who were victims of sexual abuse and girls without a history of sexual abuse.
Smith et al. [46]	80 adolescents (11 to 18 years old)	To investigate if adolescents who suffered maltreatment exhibited worse performance in EF than the group which did not suffer maltreatment. Divided into 2 groups; with and without maltreatment.
Tran et al. [17]	1851 children and adolescents (12 to 17 years old)	Cross-sectional study investigating associations between different forms of maltreatment and emotional function, cognitive function, physical health, as well as the effects of the moderation of ethnicity and gender. Divided into 2 groups, with and without maltreatment.
Lim et al. [10]	70 adolescents (13 to 20 years old)	To investigate the link between serious child abuse and cerebral activation based on Magnetic Resonance Imaging examinations during a sustained attentional task. History of abuse before 12 years old; psychiatric control group (no maltreatment but with psychiatric disorders); control group (no maltreatment, no psychological disorders).
Vasilevski and Tucker [47]	82 children and adolescents (12 to 16 years of age)	To investigate to what extent maltreatment impacts cognitive performance, including the EF of adolescents who suffered maltreatment. Divided into two groups: the first composed of adolescents who suffered severe maltreatment and the second, adolescents who did not suffer any maltreatment.

Table 1.
Authors, Participants, and Objective of the study.

of the studies, it was possible to observe that all the articles included studies related to maltreatment. Two studies sought to identify a correlation between maltreatment, cognitive/executive functions, and Post Traumatic Stress Syndrome (PTSD) [30, 39], and one sought to identify the difference in the impact of maltreatment in adolescents with psychiatric disorders [10].

Table 2 shows that the most studied form of violence is interpersonal based on an investigation into maltreatment, however, several articles investigated specific types of maltreatment, namely negligence, physical abuse, sexual abuse, emotional

Authors	Type of violence	Investigation instrument
De Bellis et al. [30]	Negligence (excludes sexual abuse).	Department of Social Services (DSS).
Nooner et al. [45]	Maltreatment, negligence, physical abuse, sexual abuse, witnessing interpersonal violence at home, and emotional abuse.	Child Protection Service (agency).
Borges and Dell’Aglia [39]	Sexual abuse	Reference services for sexually abused children.
Spann et al. [16]	Physical abuse, emotional abuse, and negligence.	Childhood Trauma Questionnaire (CTQ).
Smith et al. [46]	Physical, sexual, or emotional abuse, negligence, and domestic violence.	Collection of records from teachers and tutors.
Lim et al. [10]	Severe child abuse.	Childhood Trauma Questionnaire (CTQ).
Tran et al. [17]	Physical abuse, sexual abuse, and negligence.	Child Maltreatment Questionnaire
Vasilevski and Tucker [47]	Maltreatment	State government of Victoria, Department of human services

Table 2.
Authors, types of violence, and instruments employed.

abuse, and witnessed violence. Five articles investigated negligence ([30]; Nooner et al. [45]; [16, 17, 46]); four studies investigated physical abuse [16, 17, 45, 46]; four, sexual abuse [17, 39, 45, 46]; two, emotional abuse [45, 46]; two, domestic violence [45, 46]; and one article investigated maltreatment, without specifying the nature thereof [47].

As for the way to identify violence, five studies recruited children or adolescents from institutions or agencies responsible for caring for victimized children and/or adolescents [30, 39, 45–47], two studies used the Child Trauma Questionnaire [10, 16] and one the Child Maltreatment Questionnaire [17]. Both instruments are self-report inventories composed of items to identify emotional, physical, or sexual abuse, and negligence in children and adolescents.

The results observed in **Table 3** show that the components of EF evaluated in six of the eight studies agree to the Miyake et al. [31] model that considers cognitive flexibility, working memory, and inhibitory control as the basic components for the evaluation of EF, but only one study evaluated the three components in conjunction [46]. Two studies evaluated two components: working memory and cognitive flexibility [39, 47]; a further two studies only analyzed cognitive flexibility [16, 45]; and one study only evaluated WM [17]. Two studies [10, 30] considered the EF model of Norman and Shallice [28], who describe EF as a unique system of cognitive functions, named the Supervisory Attentional System (SAS).

As far as the EF measurement instruments are concerned, it was possible to identify diversity. For the evaluation of CF, the following tests were employed: *Wisconsin Test Card*, *Trail Making Part B*, and the WISC III and WISC IV digit span backward and number and letter sequences subtests [16, 45, 47]; for the evaluation of WM, the following tests were performed: *Listening Recall Task* and the *Odd-One-Out Task*, *Digit Span Task*, WISC IV subtests (digit span forward and number and letter sequences), *Trail Making Part A* [17, 39, 46]. To analyze IC, the Verbal Inhibition/Motor Inhibition task from the D-KEFS Color-Word Interference Test was used [46].

Authors	Instruments, respective EF components	Results
De Bellis et al. [30]	Conners' Continuous Performance Test-II. Sustained attention.	Neglected children demonstrated a significantly worse performance in sustained attention, memory, planning and problem resolution.
Nooner et al. [45]	Wisconsin Card Sorting Test. Cognitive flexibility.	Boys who suffered maltreatment demonstrated worse EF performance than girls who suffered maltreatment and boys in the control group.
Borges & Dell'Aglia [39]	WISC-III digit span forward and backward; Trail Making Test Part A and B. Working memory and cognitive flexibility.	No differences were found between the groups in terms of working memory and cognitive flexibility.
Spann et al. [16]	Wisconsin Card Test. Cognitive flexibility.	Adolescents who suffered physical abuse and negligence showed worse performance in cognitive performance.
Smith et al. [46]	Listening Recall Task and the Odd-One-Out Task; (Delis-Kaplan Executive Function), Verbal Inhibition/Motor Inhibition task (D-KEFS Color-Word Interference Test). Working memory, inhibitory control, and cognitive flexibility.	Adolescents who suffered maltreatment demonstrated worse performance in working memory, fluency, and inhibition, however, cognitive flexibility was not affected in comparison with the control group.
Lim et al. [10]	Sustained Attention Task. Sustained attention.	Participants exposed to child abuse exhibited results that show that the longer the youngster suffered abuse, the worse the performance in capacity to maintain sustained attention.
Tran et al. [17]	Digit Span Task. Operational memory.	The experience of sexual abuse and negligence throughout their lives were related to worse performance with operational memory.
Vasilevski and Tucker [47]	WISC-IV. Working memory, cognitive flexibility, and executive function.	The results showed that the group of adolescents that suffered maltreatment demonstrated impaired EF, attention, and working memory.

Table 3.
Authors, Instruments, and Results.

As for the results of the articles, only one of the studies was unable to find significant correlations between maltreatment, specifically, sexual abuse and EF [39]. The remaining seven studies [16, 17, 45–47] noted impairment with EF based on the components evaluated, namely: WM, CF, and IC, as well as in attention [10, 30], in children and adolescents suffering maltreatment.

4. Discussion

The present study, the aim of which is to carry out a literature review of the literature in respect of the impact of violence on the executive functions of children and adolescents, outlines the picture of the last 10 years' studies on the topic, in both the domestic and international arenas.

The first issue to mention is that all the studies located investigated victimization through maltreatment; some of them specified the types (negligence, physical

abuse, sexual abuse, emotional abuse, and the witnessing of interpersonal violence at home), while others considered maltreatment in a general sense. The prevalence of studies on the topic may be connected with the fact that epidemiological data indicate growing victimization through maltreatment in childhood and adolescence, as noted in *Ending Violence in Childhood: Global Report* [48]. Another aspect that should be considered is the typical development of the components of EF in this period between childhood and adolescence, extremely important for the processes of learning [36–38]. Thus, it has become important to investigate the situations which could interfere with this process, as is the case of violence.

The fact that there are four types of maltreatment might also explain the number of studies on this topic, as the specific studies consider sexual abuse and even physical abuse as maltreatment, including them in a single group. On the other hand, for Finkelhor et al. [5], sexual victimization is a form to be evaluated separately because sexual abuse includes lewd acts without the consent of the individual or even with the consent of children at an age when they cannot be responsible for their choices, including sexual aggression by an adult, by peers and sexually related verbal harassment. So, considering the study of victimization from Finkelhor et al. [5], sexual abuse would be in distinct study groups.

In this study, no articles were found concerning the impact of victimization through conventional crimes, violence by peers, and indirect or witnessed violence, which points to the scarcity of studies that evaluate other forms of victimization. In relation to indirect or witnessed violence, one study evaluates the impact of witnessing interpersonal violence, however, it does not include the witnessing of other forms of violence such as robberies, street attacks, and aggression between colleagues. In this sense, the results of the study conducted by Brancalhone et al. [49] indicate impairment of EF in the group of children victimized by bullying and also in those who witness it. They also pointed out that the impact of indirect violence or violence witnessed by children is evident in the course of their development, causing symptoms of depression and a drop in school performance.

As far as the evaluation of EF is concerned, only two studies [10, 30] used the model of Norman and Shallice [28], who describe EF as the Supervisory Attentional System (SAS) and, based on this, they considered sustained attention as a component of EF. The others used the model proposed by Miyake et al. [31], corroborating the literature that regards this as the model most used in both empirical and theoretical studies into EF. Just one study considered all three components, while the others used one or two components, considered responsible for the evaluation of EF. The result corroborates the literature, which is quite diverse in terms of the structure of the components [14, 26, 27], which results in complexity with the process of evaluating EF.

Despite the theoretical diversity, studies have shown that, for the most part, components of EF were impaired in children and adolescents who suffered maltreatment and only two of them presented different results. In the study by Borges & Dell’Aglia [39], girls aged between eight and 13 who suffered sexual abuse had no impairment of working memory and, in Smith et al. [46], adolescents who suffered maltreatment showed no CF impairment, but no studies were found with results that corroborate these data.

Working memory was the most studied component, appearing in four of the eight articles studied; of these four, three identified impairment with WM in children and adolescents victimized through maltreatment. Working memory is an ability essential to learning [37, 38, 50], so, the interest in investigating the impact of violence in this EF component can be justified. Studies have shown that maltreatment can impair WM in both childhood and adolescence and, consequently, the processes of learning, as well as academic performance.

As regards the instruments for EF evaluation, these are diverse, which could influence the comparison of the results found. To evaluate WM, the subtests *Listening Recall Task* and the *Odd-One-Out Task*, *Digit Span Task* were used in addition to the WISC IV tests (digit span forward and number and letter sequences) and Trail Making Part A. The WISC-IV Digit Span Forward and Number and Letter Sequences subtests are standardized and can be quickly applied. The Digit Span and the Trail Making Test A are standardized neuropsychological instruments, however, they are not regarded as psychological tests and, therefore, they are not used exclusively in psychology.

For the evaluation of CF, the following tests were used: *Wisconsin Test Card*, *Trail Making Part B* and the WISC III and WISC IV subtests Digit Span Backward and Number and Letter Sequences, all of which are quick to apply. To evaluate IC, the subtest Verbal Inhibition/Motor Inhibition task, from the D-KEFS Color-Word Interference Test, was used. The diversity of instruments used corroborates the literature, which points to the complex nature of evaluating EF and its components.

Studies show that children and adolescents are part of a vulnerable age group and, as a result, they are more subject to experiencing violence in its various forms. Self-report instruments that seek to identify the different types of violence, that is to say, those to which the children or adolescents themselves respond, are capable of analyzing the perception of living with violence in a more sensitive way or one that better approximates the extent to which this child or adolescent could be affected, and are thus considered to be more effective instruments, as they identify the perception of living with violence. In this regard, adolescents, the group with the largest number of studies, have greater capacity to identify this experience as their cognitive and emotional repertoire is better developed in terms of perception.

From childhood to adolescence, living with violence impairs the nuclear components of EF, namely working memory, cognitive flexibility, and inhibitory control, which are the basis for the development of the following complex components: planning, problem resolution, and decision-making. These components may be impaired, not to mention the processes of learning, of adaptation to situations in both cognitive and social aspects, which are characteristic of this age group, leading to difficulties that will be omnipresent in diverse situations throughout their lives.

Apart from the impairment of executive functions that the processes of victimization may cause in children and adolescents, these impairments may adversely affect the quality of life in this important age group. In this sense, a study conducted by the Center on the Developing Child, at Harvard [51], indicated that typical development in executive function skills help children to remember and follow instructions with various stages, to avoid distractions, control precipitous responses, adjust when the rules change, persist with the solution of problems and control long-term obligations which are directly associated with quality of life. Moreover, Matos et al. [13] noted that child sex abuse is negatively associated with quality of life in adulthood.

In short, the study notes the scarcity, mainly in the domestic setting, of studies investigating the relationship between living with violence and the development of EF. However, the studies that were found point out, for the most part, the impairments that living with violence may bring to the development of EF and with the processes of learning. It has become important that future studies investigate not only experience of maltreatment but also that of other types of violence, justifying on scientific basis the need for investment in public policies that can avert living with violence, as well as in intervention policies and care for children and adolescents who are victims of violence.

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