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Methodology for Experiences in Nature With Children With ADHD

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Abstract: The aim of this paper is to show a composition of methodological procedures that assessed how children with Attention Deficit Hyperactivity Disorder (ADHD) are affected by directly experiencing nature. It was applied on children from public schools in the city of Crato, Ceará, Northeastern region of Brazil, and it was evident that contact with nature enhances the cognitive and socio-affective development of children with ADHD. The proposal comprises ten steps of data collection in which different techniques were used. As a result of the use of these associated techniques, changes were noticeable in the behavior of the children regarding the aspects assessed (cognitive, social, and affective). The intensity of ADHD symptoms was lower after experiencing contact with nature in the intervention group compared to the control group.

Keywords: Method; Nature; Development; ADHD; Children.

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Introduction

The aim of this paper is to show a composition of methodological procedures that assessed how children with Attention Deficit and Hyperactivity Disorder (ADHD) are affected by directly experiencing nature. The method was used in a study that included children with ADHD from public schools in the municipality of Crato, located in the State of Ceará, Northeastern region of Brazil. We discuss whether the interaction with nature allows for advancing cognitive and socio-affective development, as well as mitigating ADHD symptoms.

Experiencing nature provides opportunities for raising awareness (both individual and collective) and increasing perception regarding environmental behavior, and it emphasizes changes in feelings and attitudes towards nature (Cornell, 2008).

Natural spaces have been considered relevant in the learning and development process for a long time. In 1887, Froebel already stated that the natural world allows for perceiving the integration between things in the world, and that children exploit it to feed their sense of inner unity, of belonging to the universe, and of development (Chawla, 2015). Studies indicate that the more contact with nature, the lower is child stress, while it increases attention and memory power, improves health and well-being, increasing children's resilience to stressful events in daily life. (Chawla, 2015; Schutte *et al.*, 2015).

The studies mentioned above do not specifically refer to ADHD children, although they address factors that are also beneficial to some disorders, whether cognitive, affective, or social. An integrative analysis of scientific databases of relevance on the contact between ADHD children and nature indicated the scarcity of this type of research, according to a study by Damasceno (2019); this highlights the relevance of the present study, as the way children with and without ADHD develop differs regarding inattention, hyperactivity, and impulsivity. Ribas (2003) states that the most evident differences correspond to how they learn and develop, as they do not follow the expected manner, time, and pace.

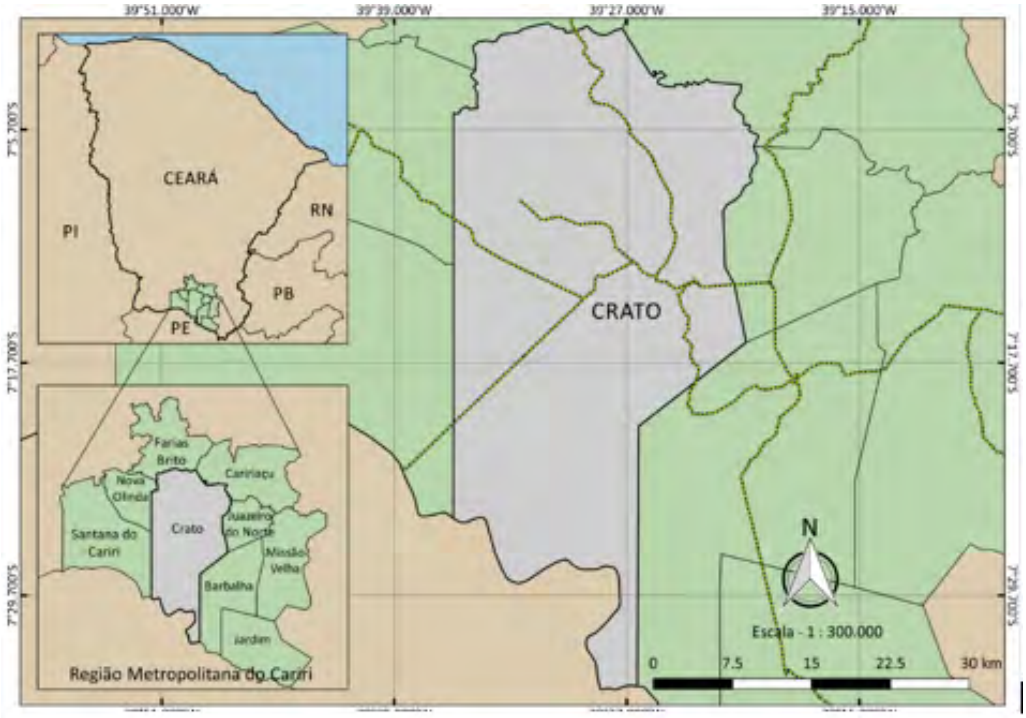
It is understood that there are consequences on the development and learning process when the inclusion of ADHD children is not effective. Therefore, this study attempted to create situations in which ADHD children had contact with nature, in order to evaluate potential impacts on cognitive and socio-affective development and on mitigation of symptoms of inattention, hyperactivity, and impulsivity.

Methodological composition of the investigation

The environment

The municipality of Crato is located in the Southern Ceará Mesoregion, in the Cariri Microregion, comprising the Metropolitan Region of Cariri - RMC, which emerged from the union of the municipalities of Juazeiro do Norte, Crato, and Barbalha, comprising a single urban conglomerate, known as Crajubar triangle. It is located 571 Km away from the capital of the State. Figure 1 shows its geographical location.

Figure 1 –Geographical location of Crato (CE)



Source: Damasceno (2017), based on geographical data and planimetric data from IBGE (2010) using the QGIS software.

In the last Census (2010), Crato's population was 121,428 inhabitants, with an estimated 131,372 inhabitants in 2018. The Municipal Human Development Index (MHDI) of 0.713 ranks the municipality in 1514th in Brazil and 3rd in Ceará (IBGE, 2018).

Crato was chosen because its municipal schools have ADHD children diagnosed and due to the possibility of Experiencing Nature at the Floresta Nacional de Araripe-Apodi (FLONA – National Forest of Araripe-Apodi), referred as one of the richest forests in environmental diversity in the Northeast, which shelters Atlantic Forest (Batista, 2014). The declared biome is caatinga (savannah), and it encompasses the municipalities of Crato, Barbalha, Jardim, Missão Velha, Nova Olinda, and Santana do Cariri, in the state of Ceará.

The experiences were conducted at Chapada do Araripe (FLONA) in Crato, which contains natural springs, grottos, diversified vegetation, and fauna and flora that provide the region with special features. Additionally, Parque Ecológico Riacho do Meio (Riacho do Meio Ecological Park) and Sítio Pinheiros (Pinheiros Farm) are located in the municipality of Barbalha. The latter two locations are preserved, forming a dense vegetation with ecological trails, three springs with crystalline water and a beautiful panoramic view of the Araripe River Basin. The activities in these environments allowed for applying the

Flow Learning Method by Joseph Cornell (2008).

The group

The group was comprised of 11 children with ADHD, who were students of public schools in the municipality of Crato. Six of them participated in all activities, and comprised the intervention group (tests and Experiencing Nature) and five comprised the control group (that performed the tests but did not participate in the experiences).

The study group can be considered small, which is justified by the fact that they were ADHD children performing outdoor activities. It would likely be difficult to study safely a group with a larger number of children.

The inclusion criteria for the sample were: children with ages between 7 and 12 at the beginning of the study, having a diagnostic report of ADHD, be regularly enrolled at municipal public schools of Crato, and have the Free Informed Consent Term (TCLE) duly signed by their guardians. Those who were older than 12 years old, or that did not have reports and did not present the TCLE duly signed were excluded.

Children and their guardians were introduced to the objectives of the study and they were asked to participate, having ensured the confidential nature of their information. Those who agreed to participate in the study signed the TCLE.

The study was forwarded to the Comitê de Ética e Pesquisa (Coepe – Committee of Ethics and Research) of the Universidade do Vale do Taquari (Univates – University of the Taquari Valley), with a favorable report for its performance.

The method

Our first decision was to choose a cohort study, which determines there must be a control group. This type of study is adequate for groups of people who have a common characteristic, working as a sample to be monitored for a certain period of time, in order to observe and analyze what occurs with them.

The cohort study of this research is retrospective, since it was performed by surveying the history of the children regarding their ADHD. Subsequently, a prospective study was conducted. The main phases of a cohort study, described by Oliveira; Parente (2010, p. 115), were adapted for the development of this study, as shown in Chart 1.

Chart 1 – Adapted phases of the Cohort study.

Phases of a Cohort study (Oliveira; Parente, 2010)	Adaptation by the researcher
a) Identify people at the beginning of the study	a) Identify the children in the study who have a diagnosis of ADHD and apply cognitive and socio-affective tests;

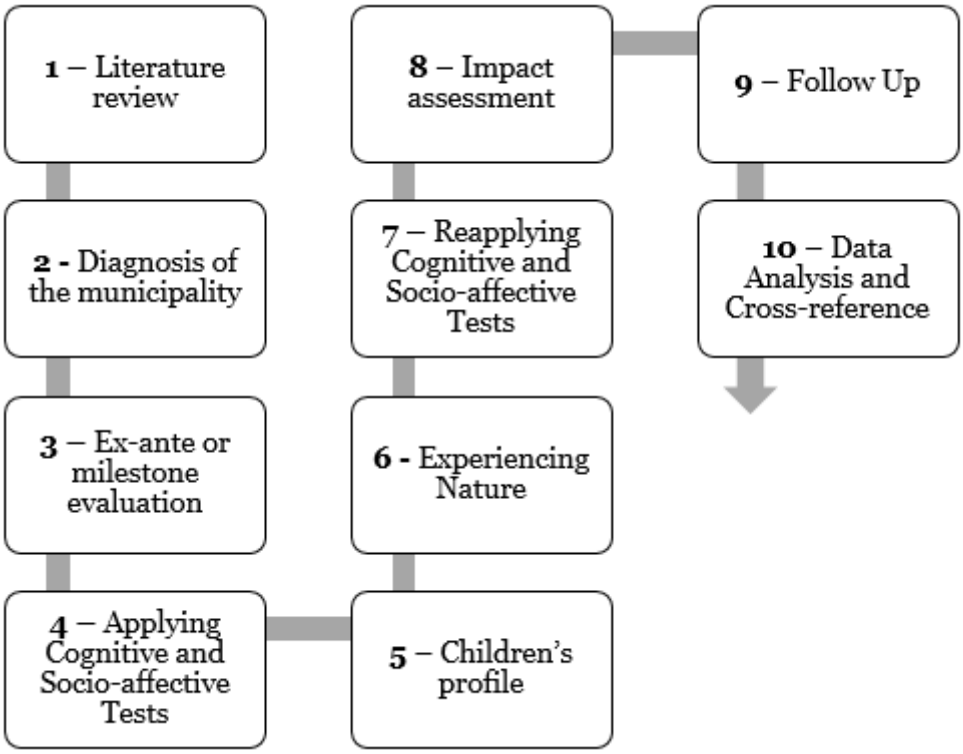
b) Form groups of individuals who are either exposed or not exposed	b) Form groups with the children who will participate in the experiential activities of contact with nature and of those who will not participate;
c) Monitor the cohort to evaluate the incidence of the disease to be studied in both groups	c) Apply tests in both groups, after the period of experiential activities;
d) Compare the incidence (risk) in each cohort	D) Compare the groups to check whether there was any change in both children exposed and not exposed to experiential activities within nature.

Source: Adapted from Oliveira; Parente (2010).

Methodological path

The proposal comprised ten steps of data sampling, using different techniques. Figure 2 shows the methodological path of the study and its steps.

Figure 2 – Design of production techniques and data analysis



Source: Damasceno (2019, p. 119).

Step 1 – Literature review

Initially, an integrative review of scientific literature was conducted in order to identify studies that addressed the topic "Nature and ADHD". The period delimited for the search was publications conducted between 2003 and 2016. The search bases adopted were Portal de Periódicos da CAPES (CAPES Journals Portal), Periódicos Eletrônicos de Psicologia (PEPSIC – Electronic Psychology Journals), PubMed and Scopus, Biblioteca Virtual em Saúde (BVS – Online Health Library), Science Direct; Scientific Electronic Library Online (SCIELO).

The descriptors used were: "Vivências com a Natureza AND TDAH" (Experiences within Nature AND ADHD); "Meio ambiente AND TDAH" (Environment AND ADHD); "Natureza e TDAH" (Nature and ADHD). During the search, it became clear that it was not possible to find related papers by cross-referencing the descriptors. Therefore, the descriptors were used separately, along with others such as: "TDAH"; "ADHD"; "Nature; Natureza"; "Health; Benefits of Nature"; "Outdoors".

Step 2 - Diagnosis of ADHD children in the municipality of Crato

A survey was conducted on the number of schools and children with ADHD in Crato. The data was provided by the Inclusion and Diversity Coordination, which integrates the Municipal Department of Education (SME). Information on the number of existing municipal schools was collected, as well as the number of students per school and the number of students already diagnosed with ADHD.

Step 3 – Ex-ante or milestone evaluation

Study participants were interviewed, and the SNAP-IV questionnaire was applied to guardians and teachers. As it is performed prior to implementing the study, the ex-ante evaluation allows assessing study viability and knowing the status of the group, thus allowing a comparison with data produced at the end of the intervention, which is typical of impact assessments (Prata, 2007).

Step 4 – Applying Cognitive and Socio-affective Tests

Both Intervention and Control groups were evaluated regarding their cognitive and socio-affective dimensions. The following tests were applied by an accredited psychologist prior to and at the end of the experiences: Social Skills Rating System (SSRS), Issues with Behavior and Academic Competence for Children, and the Wechsler Intelligence Scale for Children (WISC IV). These tests are validated in Brazil.

SSRS is an instrument that allows an encompassing assessment of the repertoire of social skills, and it provides indicators of behavior and academic competence problems in children between 6 and 13 years old (Del Prette et al., 2016). In the SSRS test, indices of social skills repertoire range from: 01 to 25 - below the lower mean value, from 26 to

35 - lower mean value, from 36 to 65 - good repertoire, 66 to 75 - elaborate repertoire, and 76 to 100 - highly elaborate repertoire.

WISC IV is an instrument used to evaluate the intellectual ability of the children and their problem-solving process. It is intended for the age group between 6 years and 0 months old and 16 years and 11 months old. It is comprised of 15 subtests, with 10 main tests and five supplementary tests, and it has four indices: Verbal Understanding Index (VUI), Perceptual Reasoning Index (PRI), Working Memory Index (WMI), and Processing Speed Index (PSI), comprising total IQ (Wechsler, 2017).

Step 5 – Children's profile

The children's retrospective profile was outlined, encompassing the criteria adopted for ADHD types: predominantly inattentive, hyperactive/impulsive, and combined. For that, we had access to their medical reports. However, some children did not have ADHD reports, even though they were referred to as having the disorder, and others had outdated reports (which are renewed every year).

The profile was complemented using the ex-ante evaluation, results of the Swanson, Nolan, and Pelham -SNAP-IV, and of the tests. The questionnaire was built based on the symptoms indicated in the Manual of Diagnosis and Statistics of the American Psychiatry Association (Coutinho et al., 2009). It has a Brazilian translation, validated by the Grupo de Estudos do Déficit de Atenção (GEDA – Study Group of Attention Deficit) of Universidade Federal Do Rio de Janeiro (UFRJ – Federal University of Rio de Janeiro) and by the Serviço de Pesquisa e Psiquiatria da Infância e Adolescência (Service of Research and Psychiatry in Childhood and Adolescence) of Universidade Federal do Rio Grande do Sul (UFRGS – Federal University of Rio Grande do Sul) (Miranda *et al*., 2011).

Subsequently (step 10), the children's profile was reassessed, using the same processes as previously, and including the observation performed during the experiences. This was performed to triangulate data through different sources.

Step 6 - Experiencing Nature

Sharing Nature proposed by Joseph Cornell (2008), creator of the Flow Learning Process, consists of playful outdoor activities that observe a sequence of four steps: 1. Awaken Enthusiasm, which is characterized by being joyful and relaxed; 2. Focus Attention, which is characterized by receptivity and broadening of the senses; 3. Offer Direct Experience, absorption; and 4. Share Inspiration, which is characterized by consolidating and widening the individual experience. Equotherapy activities were integrated to these steps.

The activities are part of the Cornell Method, with some of them being adapted and others created by the researcher. At the beginning of each encounter, children experienced a loving contact with nature, so that they could establish a close relationship with nature, thus stimulating their senses and sensitivity.

A guide for observation was elaborated based on the Experiencing Nature activities, the elements of SNAP-IV, and the elements worked in the Wisck IV test. There was a field for activities and another for observing whatever emerged as the experiences unfolded. Sixteen guides were used, with individual completion, each with five activities, which exploited the four steps. With an interval of twenty days, the experiences were conducted again to compare the observations performed in each step regarding each participant. Some experiences used during the intervention are reported in Chart 2, with their respective characteristics and objectives. The details of the activities are described in the work of Joseph Cornell (2008).

Chart 2 - Experiences of the Steps conducted with the children.

Steps of the Flow Learning Method	Experiences	Aim of the experiences	ADHD symptoms (according to the SNAP-IV) that were intended to be worked on
Step 01 Awaken enthusiasm	Crows and owls	Review concepts; Overcome passiveness and encourage participation; Awaken enthusiasm	Not standing still and acting inappropriately for the activity that is being executed; Not following instructions
	Mr. Snail	Create an atmosphere of joy and promote interaction; Recognize one self and the group as a whole and motor coordination	No interaction with peers and mediators; Difficulty in waiting for his/her turn
	Mr. Sleepyhead	Tranquility and focus; Develop the senses	Mistakes made out of inattention; Difficulty waiting for his/her turn; Not capable of performing the activity in silence.
Step 02 Focus attention	Map of sounds	Focus attention; Auditory perception; Calmness	Difficulty getting involved in activities in a calm manner and of maintaining quiet; Not following instructions;
	Where do animals live	Memory and attention; Promote interaction and socialization among peers and the group	Not following instructions; being a mile-a-minute; Difficulty in maintaining focus; Difficulty in waiting for his/her turn
	Recounting the story	Memory; Esthetic appreciation; Auditory and visual perception	Mistakes made because of inattention to activities; not capable of paying attention to details; Difficulty in organizing tasks and/or activities

Step 03 Offer direct experience	Who *amp* I?	Patience; Empathy; Deep experience within nature	Difficulty in getting involved with calm activities; Leaving their place in situations where they are expected to stay quiet
	Affection trail	Tranquility; Encourage wonderment, empathy, and love; Deep experience within nature	Difficulty getting involved in activities in a calm manner; Speaking too much; Not following instructions;
Step 04 Share inspiration	Trail of surprises	Focus attention; Increase level of concentration and raise curiosity	Mistakes made due to inattention in the works or activities; Difficulty in maintaining focus; easily distracted
	Which tree am I?	Perception; Patience; Assimilation; Memory; Esthetic appreciation	No interaction with peers and mediators; speaking too much; No attention to detail; Cannot complete the activity
	Recognizing smells	Olfactive sensorial perception; Concentration; New discoveries	Answering questions in a rushed manner; Difficulty waiting for his/her turn

Source: Adapted from Damasceno (2019).

The following was used throughout these activities; the technique of participant observation, which is derived from ethnography, and field journal to report the intervention process. Senses, movements, and observations of the process were recorded in the Field Journal.

Six scientific scholarship students helped throughout the interventions; they were students of the Physical Education course of Instituto Federal do Ceará (Federal Institute of Ceará – IFCE) who were previously selected and went through training that qualified them to apply the activities and monitor the children.

Step 7 – Reapplying Cognitive and Socio-affective Tests

Step 07 consisted of reapplying the SSRS and WISC-IV in order to check whether there was any change in the results after the period when the children participated in the Experiences within Nature, compared to those who did not experience nature.

Step 8 – Impact assessment

Impact assessment analyzes the changes in the indicators identified, prior to the beginning of the project, with the purpose of checking whether it caused changes in certain life conditions of the population (Prata, 2007). New interviews were conducted using guiding questions with guardians, teachers, and the participants. This comparison allows understanding the influence of contact with nature on the learning and biopsychosocial process of the children under study, as well as a cross-reference with data reported in the

guides that comprised the field journal.

Step 9 – Follow Up

After a period of seven months with no contact with the study participants, following up on them was required so that it was possible to reflect on whether the changes shown during the intervention with ADHD children remained or not throughout this period. Follow-up was performed to check if there were lasting changes or circumstantial changes occurred during the study period.

Step 10 – Data Analysis and Cross-reference

Both descriptive and inference non-parametric statistical analyses were performed to analyze the data referring to the SSRS, in order to broaden and corroborate the discussion of the SSRS test results, as well as the qualitative results . Descriptive statistical analyses were conducted using minimum, maximum, and mean values, and standard deviation. Relative frequencies and cross-referencing of data (Crosstabs) were also calculated. Considering sample size, the following non-parametric tests were used: U-Mann Whitney; Kruskall Wallis; Chi-square.

The data collected allowed identifying the analysis categories from a set of units organized according to any given similar aspect.

Results for each step of the method applied

Step 1 – Literature review

In the database searches, 87 papers were initially found, yet only 25 were selected a priori for this study considering the inclusion criteria. Most studies cited do not refer specifically to ADHD children, yet they provided a basis to understand the relevance of nature for development in general. The integrative analysis showed the lack of research that relates the contact of ADHD children with nature. This fact indicates the need for further studies in this area, since it brings contributions both for the psychosocial development of these children and for the scientific field.

Step 2 - Diagnosis of ADHD children in the municipality of Crato

The Coordination is comprised of professionals of the health and education areas, who perform surveys in the schools and screen the students that might have disorders, according to a diagnosis provided by a neurologist linked to the Sistema Único de Saúde (SUS – Unified Health System). The municipality of Crato has 66 municipal schools (36 rural and 30 urban schools). Of those, only 07 provide a Specialized Educational Service (SES), with four in the rural area and three in the urban area. This reality renders it unfeasible to provide better care to children diagnosed with deficiencies or Specific

Education Needs (SEN).

Step 3 – Ex-ante or milestone evaluation

The analysis of the SNAP-IV test completed by the teachers showed that most of them did not understand the relation between children's behaviors and ADHD, considering the three symptoms that characterize it: hyperactivity, impulsivity, and inattention. As for guardians, they spoke of their children naturally, and showed how little knowledge they have regarding ADHD. As for the children, one had difficulty in answering due to being strongly drowsy. When the caregiver was asked, she answered that his mother gave him medication to go to school, and that he was like that every day.

Step 4 – Applying Cognitive and Socio-affective Tests

After applying the tests, the psychologist observed that potentially the children not only had ADHD, but they had some comorbidities, such as intellectual development disorder. Six of the eleven children were selected using the online Qmin Software for minimization. The choice was to restrict the application of the research to children in urban schools. Of these children, 6 were randomly selected to comprise the Intervention group, and participated of Experiences within Nature for a period of five months, with four weekly hours. Those not selected to Experience Nature (control group) had the opportunity to participate in the activities within nature subsequently together with the intervention group, in order to promote their inclusion in the process.

Step 5 – Children's profile

The intervention group was comprised of six children, with the following characteristics, according to observation and interviews with teachers and guardians (Damasceno; Mazzarino; Figueiredo, 2022).

SI1: Nine years old, attends the 3rd school year. She is noticeably below weight and does not appear to have basic required hygiene care. She lives with her mother, her stepfather, and a twin brother, with mental deficiency. According to her mother, she is a "quite hyperactive" girl, who needs more care, has a lot of difficulty in learning, in speaking, "does not listen to anybody" and is a "brat". According to her teacher, she is a sociable child, has a very good relationship with her classmates and her teachers, participates, and arrives at school poorly fed and not warm enough. In her interview, she showed to be a friendly and interactive child, full of energy. She answered with few words and not always to what had been asked, interrupting her interviewer.

SI2: Twelve years old, attends 6th year; however, he cannot read or write. His appearance is that of a well-cared for child. He lives with his parents and two siblings. According to his mother, he is a very restless boy, does not watch TV, and is very forgetful. He has no patience, "his little head hurts a lot". He is aggressive and "does know

how to do anything" at school, which makes him sad. She says SI2 is aggressive, yet he is also caring. His teacher described SI2 as a very quiet child who does not like to get involved with anyone in the classroom; always sits at the last desk and does not like to be helped with his tasks; yet, he has difficulty even copying. When he was interviewed, SI2 showed to be very shy, and he asked for the questions to be repeated. Afterwards, without looking at the interviewer, he would answer in a very low tone. At no point did he become agitated or aggressive.

SI3: Seven years old, attends 2nd year. He seems small for his age. He lives with his mother and three other siblings (one with a severe mental deficiency), a cousin, and his mother's boyfriend. His mother described SI3 as a child who sometimes is caring and other times is confrontational, and at certain moments, even threatening. His mother reports that he has difficulty concentrating. His teacher says that SI3 does not stay quiet, keeps watching out the window, and at the slightest opportunity, he leaves the classroom. He recognizes some letters and numbers, but has difficulty learning. The interview with SI3 was very difficult because he was so drowsy he could barely lift his head. Walking a little with him helped to get answers, though they were monosyllabic. He said he likes to go to school, but he is too lazy to learn the difficult letters.

SI4: Ten years old, she is a friendly and curious child. She lives with her mother and two sisters, one younger and one older, who is mentally deficient. Her mother is older, praised her a lot, and showed to care well for her. When beginning the interview with the teacher, he already started by saying that SI4 has T-21 -*Down Syndrome* (yet the report does not attest to this information). He described her as very communicative and willing to learn, but the information relayed to her has to be repeated as she cannot retain it completely. Although she is communicative, she has problems relating to other children; that is why she cannot perform group activities, at best with another classmate. In the interview, SI4 showed to be a well-cared for and very curious child. She answered all the questions with no difficulty. However, three times she interrupted the interview to mimic animals, reproducing their movements and sounds. Other times, she grabbed the interviewer's hair and looked at her attentively.

SI5: Ten years old, attends 5th year, he is thin yet with a healthy appearance, with large, curious, and restless eyes. His mother describes him as a very happy child, with a lot of difficulty learning and focusing at school. According to her, he interacts with other children, but finds it difficult to focus on things, due to his hyperactivity. According to the teacher, SI5 is a quite restless child, who has little interaction with the classmates and does not participate in the activities very much, yet he likes to intrude. In the interview, SI5 showed to be quite restless and interrupted all the time. He made several questions and answered everything that he was asked. At first glance, the ADHD symptoms were clear, with emphasis on impulsivity and hyperactivity. He speaks very fast and loudly, and sometimes it was difficult to understand what he was saying.

SI6: Twelve years old, he is tall and thin. He looks like and behaves as an adult. He attends 6th year but has difficulty following the grade he is studying. He lives with his grandmother at a house where three other people live. His parents are separated.

His mother shows up occasionally, and his father lives in another municipality. His grandmother claims he is schizophrenic due to his behavior, and a physician allegedly diagnosed him with schizophrenia. In the interview, his teacher reported that SI6 has difficulty following classes, as he prefers to be outside the classroom with his caregiver, and that he talks too much. When interviewed, SI6 showed to be a child with learning issues, who does not like to be asked questions and answers reluctantly. His answers were always monosyllabic.

According to a characterization by Bonadio; Mori (2013) regarding the predominance of symptoms, three children of the Intervention group were in the Combined Subtype, with the presence of six (or more) inattention symptoms and six (or more) hyperactivity-impulsivity symptoms, and other three children were in the Predominantly Inattentive Type, with the existence of six (or more) inattention symptoms and less than six symptoms of hyperactivity/impulsivity. In the control group, all children had the combined type.

Subsequently (step 10), the children's profile was reassessed, using the same processes as previously, and including the observation performed during the experiences. The ADHD symptoms were confirmed with the predominance present in their retrospective profiles. However, the intensity in the control group was observed to have been mitigated, while the intervention group remained the same, except for a child who had their hyperactivity was potentialized.

Step 6 - Experiencing Nature

At the beginning of this stage, the great challenge was to inspire trust in the children of the team. Meetings were held and trainings were performed with the scholarship students throughout the intervention to ensure this process was successful. The most relevant data emerged for the research from the third encounter onwards, especially related to the need to adapt the activities based on the children's behavior. The experiences to be reproduced were selected again, inserting others that were noticeably more pertinent regarding the aspects of the development of children who required more attention.

As contact with nature occurred and experiences were conducted, the initial restlessness was noticeably mitigated, and loving contact, which only happened when requested previously, started to be a natural part of the routine.

Respecting the Method with its four steps was relevant, as the importance of leaving a state of higher restlessness to a state of calm and sharing was confirmed, thus allowing ADHD symptoms to be mitigated. By the end of the mornings, the children were happy and already looking forward to the next encounter.

Throughout the intervention, the children's behavior showed positive aspects regarding the question. However, it is important to consider that during the interval, they had no contact with nature, and received other stimuli at home or at school. We cannot overlook this influence on their behavior, since many times they showed the same behavior or a sharper behavior than at the beginning of the experiences. However, every

time a child arrived more aggressive or restless, after investigating, we discovered that something had recently happened at home, which had provoked such behavior. Other times, they reported that they had a ride they liked very much, and sometimes, they would say: "I went to the park"; "I went for a dip at the dam", or "I went to my uncle's farm".

Having contact with earth, playing within nature, touching plants, smelling flowers, and hearing the sounds of the birds enabled children's senses regarding their interaction with nature. Therefore, we understand that being with and within nature allows boosting new socio-affective bonds, and it might contribute to ADHD children feeling more connected with nature, with themselves, and with others.

Step 7 – Reapplying Cognitive and Socio-affective Tests

As for the results observed during reapplication, the Intervention Group (IG) noticeably worked harder in the activities proposed by the psychologist, even performing the entire group of tests at once, with a small interval, and showed greater social skills, which led to a better performance in the tests; this did not happen in the first step. The Control Group (CG) showed higher inattention and lower motivation. Because of that, they needed intervals so that they could complete the tasks. These results are qualitative, based on behavioral observation of the children when the tests were applied.

Comparing both groups, the result of the tests indicated that children who participated in the IG developed a wider socio-affective repertoire, evolved in the Academic Scale, and showed that symptom intensity had decreased, which was not observed in the CG.

Considering the statistical result regarding the SSRS, for instance, it is not possible to state that IG had significant differences at all scales and with all behavioral factors. What can be stated is that the central tendency of IG was predominantly higher than that of the CG. Results show that teachers' answers were those that indicated significant differences in factors such as responsibility, social skills, cooperation/affectivity, self-control, and overall academic performance. (Damasceno, 2019). For the purposes of illustration: in the intragroup analysis (before and after), results of the Chi-square test regarding the responsibility scale show that there was a significant difference in IG ($p = 0.014$) and a non-significant difference in CG ($p = 0.050$). Regarding social skills, the Chi-square test showed that IG had significant differences ($p = 0.043$) over the study, while CG remained with no significant changes ($p=0.083$). The U-Mann Whitney test showed that the scale cooperation/affectivity had a significant difference among children of the IG compared to the CG ($p=0.025$) at the end of the study. The Chi-square test indicated significant differences in IG ($p=0.030$) between the study periods.

Step 8 – Impact assessment

Before applying the second interview, we checked informally with the guardians and teachers what were their perceptions on the period with the experiences. For instance, this

happened every time the team arrived at the parents' house to deliver the children or when they contacted the teachers, and particularly when they met with the coordinator of the Specialized Educational Service (SES). Throughout the process, guardians and teachers provided information on their perception of positive changes in the children's behaviors.

Based on new interviews applied, the guardian's and teachers' speeches were grouped according to what was emerging regarding changes observed in the children; behavior, affectivity, social skills, interest in school activity and learning, considering that these changes occurred because inattention, hyperactivity, and impulsivity symptoms decreased in intensity over the period when experiences were conducted.

In the participants' speech, the following adjectives stood out: calm; happy; more attentive; well-behaved; care with nature; loving; less agitated; wants to go to school; less aggressive; cannot read yet with the help of the caregiver, he/she has done the activities; does not fiddle with other people's things, among others.

The experiences with and within nature were observed to have affected the children's development process, as children showed positive changes in their behavior according to their guardians, even if they still showed aggressiveness and difficulty performing the tasks sometimes. Overall, all guardians indicated there were changes in the children, especially because they relayed how much they liked the experiences and how they felt happy when they happened. They unanimously said they would like the experiences to continue.

As for the teachers, most of them indicated changes in social aspects and in the inattention symptom. Hyperactivity was the second item that they mentioned as "better" and impulsivity was indicated as "slightly better". Regarding the cognitive aspect, the teachers observed a few improvements; however, they indicated that interest grew, and that in general, children were remaining longer in the classroom, since the children used to stay more with the caregivers in the SES room. In an interview, the caregivers agreed that the children were calmer and staying longer in the classroom with the teachers and classmates. They said that the children had improved, even though they still had difficulties, and that they were more obedient, calmer, and relating better. They looked forward to the day they would go to the experiences and that they would come back talkative and always with something new to tell.

Step 9 – Follow Up

New interviews were conducted using guiding questions with guardians, teachers, and participants. We observed that many changes still remained, but that behaviors prior to the intervention had come back, which indicates the need for contact with nature to be something that is a regular part of these children's routine.

Step 10 – Data Analysis and Cross-reference

Based on the cross-referencing of data, the comparison of speeches of both guard-

ians and teachers, and on reading the field journals, some aspects reported stood out, yet many others did not manifest throughout the intervention. Data were observed to complement each other. However, there were indications of behaviors not declared by teachers and guardians.

One instance was the report of some teachers informing that the children refused to do the activities or that a certain child could not learn anything, or was too violent. During the intervention, there were rare occasions in which the children did not want to perform the activities, and at the slightest incentive, they already got involved. As for the analysis of teachers that they did not learn, it was evident that they do learn, just at a pace and time that are different. The presence of symptoms reported by guardians and parents was corroborated by the results of the guides and SNAP- IV. Impulsivity, inattention, and hyperactivity were present, yet other behaviors and feelings were evident in the children. Many times, they only needed to be in an environment where it was possible to give vent to all their energy, and they should feel loved and appreciated.

This cross-reference allowed to observe that the objectives related to the aspects worked on during the Experiences within Nature were achieved. For instance, passivity was overcome, and participation was fostered; there was an evident atmosphere of joy, of recognizing oneself and the other; there was an increased level of concentration, and curiosity was awakened; perception and empathy were also stimulated. These improved behaviors directly affected ADHD symptoms such as the tendency to make mistakes due to inattention, the difficulty waiting for one's turn, the lack of interaction, restlessness, and difficulty following instructions.

As indicated in the literature review, there are few studies that address the direct relationship between ADHD children and contact with nature. Among those that exist, highlights are the studies by Kuo; Taylor (2004) and Taylor; Kuo (2009 and 2011), which indicate that common activities in natural environments might be widely effective in decreasing ADHD symptoms, leading to self-confidence, calm, and concentration, with the advantage of being accessible, cost-effective, not stigmatizing, and free from side effects. Donovan *et al.* (2019) showed that proximity or exposure to natural environment is a protective factor in developing ADHD.

They corroborate this evidence from other studies with children, not specific to ADHD. Tillmann *et al.* (2018) state that nature positively affects children's mental health. Dankiw *et al.* (2020) showed that games played within nature have positive impacts on physical, behavioral, and cognitive aspects. Mann *et al.* (2022) suggest that learning outdoors has socio-emotional, academic, and well-being benefits that are measurable.

Considerations about applying the proposal

The methodology used proved to be effective since children's behavior noticeably changed. The intensity of the ADHD symptoms became lower throughout the study, as proven by the two study moments.

In activities with equotherapy, it became evident how much contact with horses in

a natural environment was significant to children. The synchrony between children, horse, and nature provided quite satisfactory responses in their behavior. Inside the context of the experiences, equotherapy emerges as a powerful possibility. The study emphasized that Experiences with and within Nature showed their effectiveness in the social and affective aspects of children, as well as in the cognitive aspect at a smaller scale. Additionally, changes in the intensity of symptoms were quite noticeable.

The flow used in the methodology proved to be effective to reach the results regarding the question of the research. The guides were quite revealing, since using them helped both develop the experiences and monitor children's behaviors, indicating aspects that had changed. The methodology proved its pertinence for studies with experiences with and within nature and ADHD children.

This study was an attempt to provide a contribution to the studies that involve ADHD with a specific group. However, even with its particularities, this study indicated the possibility of some universality. The methodology created here using Experiences within Nature to mitigate ADHD symptoms, is more of a supplementary instrument in aiding this disorder, since the children showed satisfactory results. The results were indicated in a qualitative manner and statistically compared, which suggests the effectiveness of the study. The work performed with the group of children in this study followed the principles of well-being, joy, trust, involvement, and stimulus.

Finally, as study limitations, the period worked with these children was considered short, and the sample was considered small. For future studies, a longitudinal study with larger samples is required for results to be broadened.

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AMBIENTE & SOCIEDADE 25 anos 25 años 25 years

SciELO

Metodologia para Estudo de Experiências na Natureza com Crianças com TDAH

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Resumo: O artigo tem como objetivo apresentar uma composição de procedimentos metodológicos que pesquisou como crianças com Transtorno do Déficit de Atenção e Hiperatividade (TDAH) são impactadas por experiências diretas na natureza. Sua aplicação ocorreu com crianças de escolas públicas do município de Crato, Ceará, região Nordeste do Brasil, quando se evidenciou que o contato com a natureza potencializa o desenvolvimento cognitivo e socioafetivo de crianças com TDAH. A proposta compreende dez etapas de coleta de dados, em que se fez uso de diferentes técnicas. Como resultados do uso destas técnicas associadas, perceberam-se mudanças no comportamento das crianças em relação aos aspectos em observação (cognitivo, social e afetivo). A intensidade dos sintomas do TDAH apresentou-se de forma mais tênue após as experiências de contato com a natureza no grupo de intervenção em relação ao grupo controle.

Palavras-chave: Metodologia; natureza; desenvolvimento; TDAH; criança.

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Artigo Original

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SciELO

Metodología para el Estudio de Experiencias en la Naturaleza con Niños con TDAH

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São Paulo. Vol. 28, 2025
Artículo Original

Resumen: El artículo tiene como objetivo presentar una composición de procedimientos metodológicos que investigaron cómo niños con Trastorno por Déficit de Atención con Hiperactividad (TDAH) son impactados por experiencias directas en la naturaleza. Su aplicación se realizó con niños de escuelas públicas del municipio de Crato, Ceará, región Nordeste de Brasil, cuando se demostró que el contacto con la naturaleza potencia el desarrollo cognitivo y socioafectivo de los niños con TDAH. La propuesta consiste de diez etapas de recolección de datos en las que se utilizaron diferentes técnicas. Como resultado del uso de estas técnicas asociadas, se notaron cambios en el comportamiento de los niños en relación con los aspectos observados (cognitivo, social y afectivo). La intensidad de los síntomas del TDAH se mostró de una manera más tenue después de las experiencias de contacto con la naturaleza en el grupo de intervención en comparación con el grupo de control.

Palabras-clave: Metodología; naturaleza; desarrollo; TDAH; niño.