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The Impact of the Montessori Education on Pupils Diagnosed with ADHD: the Analysis of the Perceived Level of Academic Performance, Behaviour, Reactivity, Self-Eficacity, and Social Integration by Reference to Traditional Education Programs

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Abstract

The research investigates the impact that Montessori alternative education programs have on alleviating the effects of the ADHD symptomatology in the classroom and globally.As a cross-sectional study aimed at the comparative analysis of the academic performance, behavior, reactivity, self-efficacy and social integration, the research intends to provide a deep understanding of how this pedagogical method can contribute to the academic and social development of these pupils, while emphasizing their specific needs. The detailed analysis of the results brings to light the practical implications and the theoretical implications of using the Montessori method in the context of education for children with ADHD nationwide. Data were collected from a group of parents (N=104) who have children enrolled in eithe Montessori or traditional education programs and the analysis was aimed at assessing the significant differences between the two groups, as they were perceived by the respondents.

The overall results indicated that in the Montessori reference classroom, parents reported children's better academic performance, a satisfactory classroom behavior, positive social interactions and greater overall improvement compared to respondents associated with the traditional type of educational program. However, no significant differences were identified in terms of emotional self-regulation and reported self-efficacy between the two types of programs. The interpretation of these results suggests that the Montessori programs can provide a beneficial educational environment for the children's global development, improving important matters of their school and social life.

Keywords:

Montessori; traditional education; academic performance; classroom behavior; emotional self-regulation; self-efficacy; social interactions.

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Introduction

The education as a social function is a field in permanent dynamic, oscillating between traditional and alternative methods, between diversity in the curriculum and its adaptation to the needs of students, between ways of accessibility, integration and adaptation to the social desideratum. In this study, however, we will analyze the premises of the choice between a traditional education system and a Montessori education system, depending on the impact of the way in which children develop and, implicitly, the conditions of development of neurodivergent pupils, more precisely the pupils diagnosed with ADHD.

The raditional education systems are often based on face-to-face teaching, rigid structure and standardized assessments, whereas the Montessori approach promotes autonomy, individual exploration and experiential learning, which is why we believe that such an environment can have a positive impact on symptomatology outcomes in the formative process. (Anghel, 2017).

In the context of these differences, it is important to examine how each methodology impacts children and adolescents, especially those experiencing attention deficit hyperactivity disorder (ADHD). Given that ADHD is defined as a neurodevelopmental disorder that negatively impacts a person's ability to focus, control impulses, and regulate their behavior according to the context (Hinshaw, 2018; Barkley, 2006), it becomes imperative for parents and educators to understand how the educational environment can influence the manifestation of ADHD and how different educational approaches can alleviate the associated symptoms.

Given that international studies have suggested that an adapted educational environment, such as that provided by the Montessori schools, could be beneficial for children and adolescents with ADHD (Gkeka, et.al., 2018; Murphy-Ryan, 2017), we directed the purpose of this study to examine the specificity and differences between Montessori and traditional approaches in terms of their impact on

ADHD symptomatology and academic and social functioning of children and adolescents with suffering from this disorder. By investigating these issues, we intend to identify ways in which education can be adapted to support the unique needs of this group of pupils and improve their academic and social adjustment outcomes.

By bringing research in this field to the fore, we hope to contribute to the development of more effective and inclusive educational practices for all children and adolescents. (Anghel & Anghel, 2022). The relevance of this study type is supported by the degree of novelty and topicality of the subject, in the context of the advance of research in the psycho-pedagogical and educational field in Romania. Also, the scientific importance of this approach is justified by the need to identify the most useful programs and tools to improve the gaps of people with special needs.

The theoretical substantation

As the main indicator of the study, the Montessori approach in education is characterized by a child-centered learning environment, autonomy and experiential learning (Marshal, 2017), promoting active learning and the individual exploration of materials (Gentaz & Richard, 2022), thus so that children have the opportunity to develop their interests and skills at their own pace (Lillard, 2013). Moreover, previous research has highlighted the benefits of the Montessori approach in a variety of fields, including children's cognitive, social, and emotional development (Lillard, 2013; Dohrmann et al., 2007).

In the context of the attention deficit hyperactivity disorder (ADHD), the Montessori approach is considered to provide a more suitable environment for children facing these issues, as it promotes autonomy, concentration and active learning (Garg et al., 2018). For example, school-age children in Montessori schools benefit from a more balanced development resulting from self-directed creative execution, with a focus on the three core executive measures of cognitive flexibility, working memory updating and selective attention (Solange, Knebel, Gentaz, 2019).

Also, the Montessori schools, in partnership with physicians, provide behavioral interventions and treatment options to help children with ADHD improve not only their focus but also their learning experience (Murphy-Ryan, 2016). For example, Barbabra Luborsky connects the medical field with Montessori pedagogy to address atypical attention in children through the lens of the occupational therapist and provides easy-to-incorporate supplements and environmental adaptations along with practical tools that can be used in any classroom by any practitioner (Luborsky, 2016).The Montessori method, combined with information and communication technologies, offers effective intervention strategies for children with ADHD, promoting focusing, sensory involvement and socio-emotional adjustment both in the domestic and school environments (Gkeka et al., 2018).

In contrast, the traditional education system is often based on face-to-face teaching, rigid structure and standardized assessments (Rao et al., 2015). For children with ADHD, this environment can be problematic because it does not offer them enough flexibility and it does not respond to their individual needs for learning and behavior regulation (Rao et al., 2015). Studies have shown that pupils with ADHD often experience difficulties in the traditional educational environment, including issues related to focus, hyperactivity and behavior regulation (Frazier et al., 2007).However, further investigation is needed to fully understand how the Montessori approach may influence the manifestation of ADHD and the academic and social functioning of children and adolescents with this disorder.

The methodology

Research problem, purpose and objectives of the study

The research problem of the study relates to correlating the type of educational program (Montessori vs. Traditional methods) and the well-being, the performance, and the level of adaptation of pupils diagnosed with ADHD: "Is there a significant impact of the Montessori education in improving the results, the social and

academic outcomes of children diagnosed with ADHD, compared to traditional education?"

The purpose of the research is to evaluate if and to what extent the Montessori programs are different from the traditional programs in order to improve the interference between the specific ADHD symptoms and the school adaptation, following the reporting of parents/guardians regarding the visible details related to the academic performance, well-being, adaptation, socialization and so forth.

The objectives of the study:

O1. Assessing the impact of the Montessori educational programs on children's academic performance compared to the traditional programs.

O2. Investigating differences in classroom behavior between children following Montessori programs and those following traditional programs.

O3. Examining children's level of emotional self-regulation in the Montessori and the traditional educational programs.

O4. Assessing children's self-efficacy level according to the type of educational program followed.

O5. Investigating children's social interactions in Montessori and traditional programs.

O6. Examining the impact of Montessori and traditional programs on children's overall improvement.

O7. Identifying the differences and similarities between Montessori and traditional programs in terms of child development.

These objectives intend to provide a deeper understanding of how Montessori educational programs impact various aspects of children's development compared to the traditional educational programs and to highlight the benefits and the possible differences between the two types of education.

The hypotheses

In order to verify the effects of the participation of children and young people in the Montessori educational framework, the following hypotheses were proposed:

- Hypothesis H1: Children who follow Montessori educational programs will have higher academic performance than those who follow traditional educational programs.
- Hypothesis H2: Children who follow Montessori programs will behave better in the classroom compared to those who follow traditional programs.
- Hypothesis H3: Children who follow Montessori programs will display a higher level of emotional self-regulation compared to those who follow traditional programs.
- Hypothesis H4: Children who follow Montessori programs will experience a higher level of self-efficacy than those who follow traditional programs.
- Hypothesis H5: Children who follow Montessori programs will experience more positive social interactions compared to those who follow traditional programs.
- Hypothesis H6: Children who follow Montessori programs will experience a greater global improvement compared to those who follow traditional programs.
- H1(0)-H(6) will be considered null hypotheses.

The tools

In order to collect data, we created an independent assessment/self-report scale comprising 9 research items, scored on a Likert-5 scale (Items 1-7) and binary scale (Items 8-9). The Alpha Cronbach coefficient α=0.7833 indicates a satisfactory internal consistency at the level of the entire tool (*Table 1*).

Table 1. Alpha Cronbach coefficient of the instrument used

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based On Standardized Items	N of Items
.783	.783	7

Source: elaboration authors

The variables

Vi: The type of program in which the pupil is registered, with two levels: traditional education program and Montessori educational program;

Vd:

- Academic performance: it assesses the academic performance of children and youth with ADHD in the context of a Montessori school, as reported by parents/guardians, according to 5 levels of satisfaction;
- Classroom behavior: it includes the frequency of inattention, hyperactivity and impulsivity during school activities, as well as the ability to follow rules and integrate into the learning environment, as reported by parents/guardians, according to 5 levels of satisfaction;
- Emotional self-regulation: it measures the emotional self-regulation of children and youth with ADHD may include the ability to manage emotions, resistance to frustration and the level of stress and anxiety in the school environment, as reported by parents/guardians, according to 5 satisfaction levels;
- Self-efficacy: it assesses the self-efficacy and self-confidence of children and young people with ADHD in a Montessori school and it may include feelings of competence and personal achievement,

as well as their perceptions of their ability to manage their behavior and to learn successfully, so as reported by parents/guardians, according to 5 levels of satisfaction;

- Social interactions: it assesses social interactions and it can include the ability to collaborate with peers, to have relationships with teachers and other adults in the school environment, and the involvement in social and extracurricular activities, as reported by parents/guardians, according to 5 levels of satisfaction;
- Adaptation to the school environment, as a variable measuring the level of integration, assimilation and belonging, as reported by parents/guardians, according to 5 levels of satisfaction;

The attendees

The questionnaire was distributed to groups of parents with children diagnosed with ADHD and to Montessori school units, with the aim of being handed to parents of children with ADHD. The respondents (N=104) filled-in the questionnaire via GForms voluntarily and anonymously and they signed the informed consent. Among the respondents, 52 confirm that they have their child fully enrolled in a traditional form of education, while an equal number of respondents have their child included in a form of Montessori education.

Data collection period: 20.03.2024 – 13.04.2024.

The analysis and interpretation of recorded results

The recorded data were processed in IBM SPSS Statistics 20, following a regression analysis related to the two levels of the "type of program" variable:

- A positive beta regression coefficient indicates a positive association between the independent variable (program type) and the dependent variable (academic performance). Thus, children following a Montessori program tend to perform better academically than those following a traditional program, by

approximately 0.265 units on the academic performance scale. This result suggests that there is a positive association between the program type and the academic performance.

- Following the calculation, the beta regression coefficient for the relationship between program type (Montessori vs. traditional) and classroom behavior is approximately 0.153. A positive beta regression coefficient indicates a positive association between the independent variable (program type) and the dependent variable (classroom behavior). Thus, children following a Montessori program tend to have better classroom behavior than those following a traditional program, by approximately 0.153 units on the classroom behavior scale.
- According to the recorded results, the beta regression coefficient for the relationship between the type of program (Montessori vs. traditional) and emotional self-regulation is approximately 0.007. A beta regression coefficient close to zero indicates a very weak or no association between the independent variable (program type) and the dependent variable (emotional self-regulation). This result suggests that there is no significant difference in emotional self-regulation between children following a Montessori program and those following a traditional program. This weak association may suggest that program type may have a limited effect on children's emotional self-regulation or that other factors may be more influential in this regard.
- Following the analysis, the beta regression coefficient for the relationship between program type (Montessori vs. traditional) and self-efficacy is approximately 0.013. A beta regression coefficient close to zero indicates a very weak or no association between the independent variable (program type) and the dependent variable (self-efficacy). This result suggests that there is no significant difference in self-efficacy between children following a Montessori program and those following a traditional program.
- According to the results of the analysis, the beta regression coefficient for the relationship between program type (Montessori vs. traditional) and social interactions is approximately 0.115,

indicating a positive association between the independent variable (program type) and the dependent variable (social interactions). Thus, children following a Montessori program tend to have better social interactions than those following a traditional program, by approximately 0.115 units on the social interactions scale.

- The beta regression coefficient for the relationship between program type (Montessori vs. traditional) and global improvement in the effects of ADHD symptoms is approximately 0.172 and indicates a positive association between the independent variable (program type) and the dependent variable (global improvement). Thus, children following a Montessori program tend to have greater global improvement than those following a traditional program, by approximately 0.172 units on the global improvement scale.
- According to the results of the analysis, the beta regression coefficient for the relationship between program type (Montessori vs. traditional) and adaptation to the school environment is approximately 0.153, indicating a positive association between the independent variable (program type) and the dependent variable. Thus, it can be argued that pupils who follow a Montessori program tend to have a higher degree of adaptation to the school environment.

Certainly, these results cannot verify a causal relationship *per se*, since other factors can also influence the results: the socio-economic situation of the environment of belonging, the children's participation in therapy, the type of therapy used, the pharmacological treatment (as a mediator), the degree of subjectivity of the respondents etc. (*Table 2*)

The relationship between variables	Results
Program type – academic performance	X predicted Y, $\beta = 0.265$, $p < .001$
Program type – classroom behavior	X predicted Y, $\beta = 0.153$, $p < .001$

Program type of program – emotional self-regulation	X predicted Y, $\beta = 0{,}007$, $p < .001$
Program type of program – self-efficacy	X predicted Y, $\beta = 0{,}013$, $p < .001$
Program type – social interactions	X predicted Y, $\beta = 0{,}115$, $p < .001$
Program Type – Overall improvement	X predicted Y, $\beta = 0.172$, $p < .001$
Program type of program – adaptation to the school environment	X predicted Y, $\beta = 0.153$, $p < .001$

Table 2. Results of the statistical analysis
Source: elaboration authors

Preliminary conclusions

By summarizing the obtained results, we believe that there are significant differences between children diagnosed with ADHD who follow a Montessori program and those who follow a traditional program in terms of academic performance, classroom behavior, social interactions and global improvement (Appendix 1). More specifically, the pupils who follow a Montessori program generally experience:

- better academic performance;
- satisfactory behavior in class;
- better social interactions;
- satisfactory adaptation to the school environment;
- overall improvement of the effects of greater sympromatology.

In contrast, no significant differences were identified between the two types of programs in terms of emotional self-regulation and self-efficacy.

The limits and directions of development

One of the main limitations of the research consists in the size of the investigated group and the difficulty of establishing its degree of heterogeneity, limiting the generalization of the results to other populations or educational contexts. Also, the recorded results are subjective reports, generating statistical errors in certain contexts. Another limitation is related to the control of other variables, as there is the possibility that some factors, such as the family environment, the access to therapeutic support, the educational resources, the parents/guardians' expectations, as well as other parasitic variables influence the results.

As to the future developments, we can mention the following milestones:

- changing the specificity of the study from cross-sectional to longitudinal, in order to be able to clarify the causal relationships between the type of program and the measured variables. An experimental or longitudinal design could provide more information about the causes and effects of the observed relationships;
- to improve the potential for generalization, future studies could involve a larger and more diverse sample of participants representing a wider range of demographics and educational contexts;
- the use of objective measurements, such as standardized tests or independent observations could help reduce subjectivity and obtain more reliable and less context-tainted data;

Conclusions

Confirming some of the theorizing and empirical studies, this study highlighted the fact that a Montessori educational program can have a positive impact on various aspects of children's development, such as the academic performance, the classroom behavior, the social interactions, and the overall improvement. However, it is important to keep in mind that the results are not uniform for all measured variables, and certain details, such as the emotional self-regulation and the self-efficacy, may not show significant differences between Montessori and traditional programs. *However, it is important to consider other factors that may impact these outcomes and to address*

specific issues, such as the needs of children with ADHD in future research and educational procedures.

As to the children with ADHD and the impact of Montessori programs upon them, we must bear in mind that they may have specific learning and behavior management needs, and therefore the results obtained are part of a preliminary, indicative study. More nationwide research is needed to specifically assess the impact of Montessori programs on children with ADHD and to understand how these programs can be adapted to meet their individual needs.

Overall, these results emphasize the importance of carefully assessing various aspects of an educational program and understanding the complexity of its impact upon children's development, especially when dealing with neurodivergent categories. It is key to continue to research and explore ways to improve both traditional and alternative educational interventions to encourage and facilitate the optimal development of all children, including those with special needs.

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