THE INFLUENCE OF COLD AND HOT EXECUTIVE FUNCTIONS ON THE ADAPTIVE BEHAVIOURS OF CHILDREN DIAGNOSED WITH INTELLECTUAL DEVELOPMENT DISORDERS

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Resumo

A Perturbação do Desenvolvimento Intelectual (PDI) caracteriza-se pela presença de défices no funcionamento intelectual e nas habilidades adaptativas. Este estudo procurou investigar de que forma o funcionamento executivo pode estar relacionado com o critério adaptativo da PDI, a partir de uma amostra de 40 crianças de 8 a 12 anos. Foram utilizadas a Bateria de Avaliação de Funções Executivas em Crianças (TI-BAFEC) e a Vineland - Escala de Comportamento Adaptativo, para avaliar o desempenho das crianças com PDI e explorar esta relação. Foram encontradas correlações positivas entre as pontuações totais de ambos os instrumentos, bem como entre os seus domínios. A análise de regressão revelou que as Funções Executivas (FEs) frias contribuem significativamente para os domínios de Comunicação e Autonomia, enquanto as Funções Executivas emocionais têm um papel importante no domínio de Socialização. Esses resultados destacam a importância de avaliar separadamente cada domínio dos Comportamentos Adaptativos (CA) na PDI. Conclui-se que as funções executivas frias e emocionais têm um impacto significativo nos comportamentos adaptativos das crianças com PDI, o que pode orientar o desenvolvimento de intervenções e estratégias de apoio mais eficazes para melhorar o funcionamento adaptativo dessas crianças.

Abstract

Intellectual Developmental Disorder (IDD) is characterized by the presence of deficits in intellectual functioning and adaptive skills. This study aimed to investigate how executive functioning may be related to the adaptive criterion of IDD, based on a sample of 40 children aged 8 to 12 years. The Executive Functions Assessment Battery for Children (TI-BAFEC) and the Vineland Adaptive Behavior Scale were used to assess the performance of children with IDD and to explore this relationship. Positive correlations were found between the total scores of both instruments, as well as between their respective domains. Regression analysis revealed that cold Executive Functions (EFs) contribute significantly to the Communication and Autonomy domains, whereas emotional Executive Functions play an important role in the Socialization domain. These results highlight the importance of assessing each domain of Adaptive Behaviors (AB) in IDD separately. It is concluded that cold and emotional executive functions have a significant impact on the adaptive behaviors of children with IDD, which may guide the development of more effective interventions and support strategies to improve their adaptive functioning.

Keywords: cold and hot executive functions, adaptive behaviors, intellectual developmental disorder, neurodevelopment.

Introduction

In the 1980s, Lezak defined Executive Functions (EFs) as the capacity for goal formation, planning, execution of goal-directed plans, and effective performance. In subsequent years, multiple definitions of the EF construct and its subcomponents emerged. Despite their differences, these definitions converge in recognizing the complexity and importance of executive functioning for human behavior and its dependence on sociocultural factors (Jurado & Rosselli, 2007).

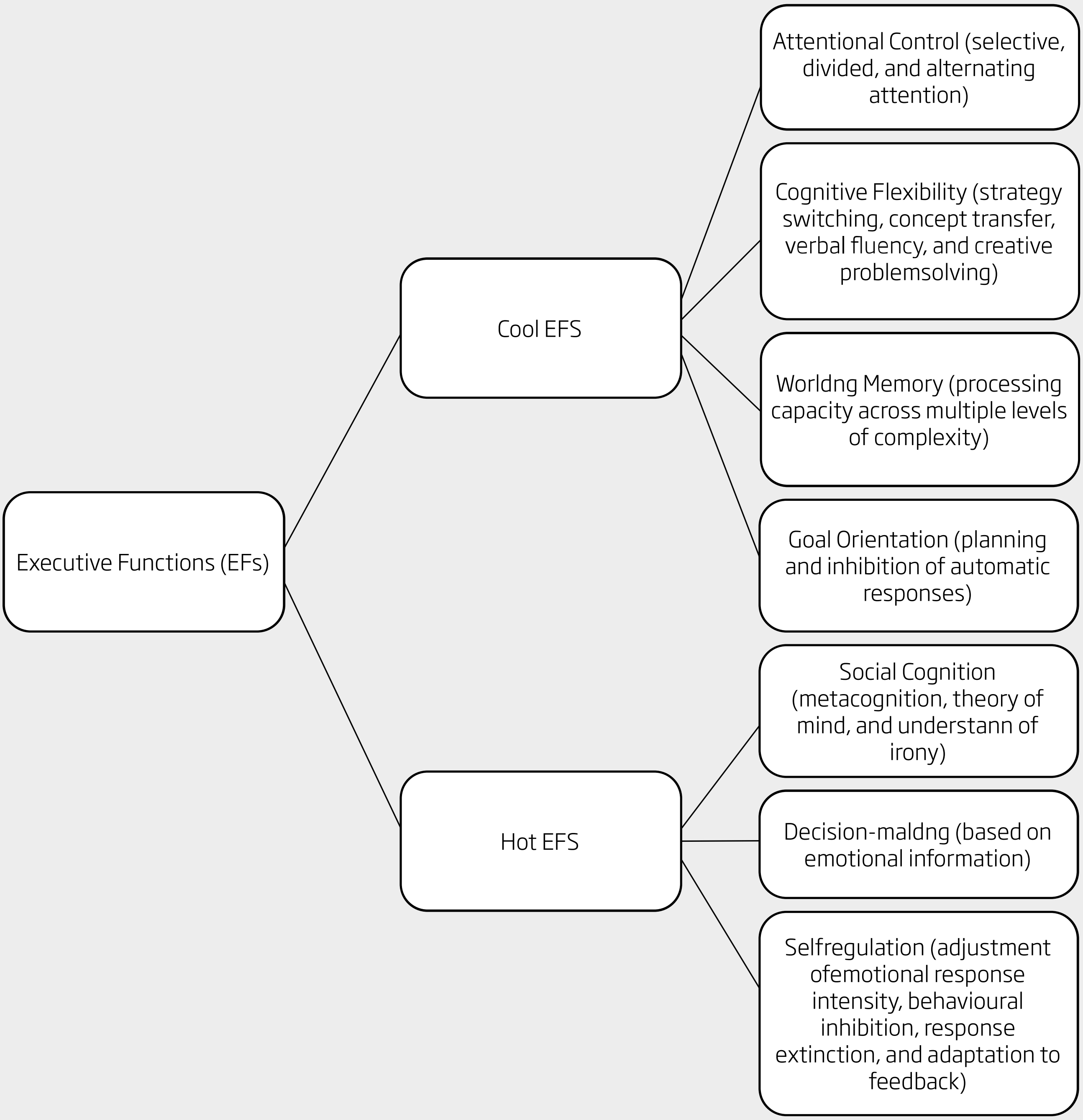
The EFs comprise a set of higher-order cognitive abilities that play an essential role in daily functioning, enabling individuals to control their behaviors, manage complex demands, and make effective decision-making (Raver et al., 2013; Ellefson et al., 2017; Al-Jawahiri e Nielsen, 2021; Kusi-Mensah et al., 2021). Executive functioning is also responsible for implementing performance strategies and discontinuing actions, allowing inhibition of habitual responses that may be associated not only with cognitive processing but also with personal decisions and social interactions, encompassing aspects of desire and motivation (Lezak et al., 2004). In everyday life, EFs play an important role in academic performance, professional success, interpersonal relationships, and problem solving (Gomes et al., 2018; Fuentes et al., 2014; Cypel, 2006; Castellanos et al., 2006; Miyake et al., 2000).

Some authors suggest that EFs may be divided into “cold” and “hot” components (Chan et al., 2008; Séguin, Arseneault, & Tremblay, 2007; cit. In Núñez Carvalho et al., 2012). Cold EFs consist of abilities that enable planning, organization, monitoring, problem solving, and behavioral control and direction, being more logic-based components (Chan et al., 2008). They are elicited by relatively abstract and decontextualized problems and focus on suppressing automatic processes or impulsive responses and maintaining task instructions or representations in working memory (Castellanos et al., 2006). Conversely, hot EFs involve the regulation of social behaviors, resolution of conflicts requiring emotional and interpersonal factors, and situations in which reinforcement and punishment are salient. They play a fundamental role in emotion management and adaptation, enabling appropriate emotional responses to different situations (Chan et al., 2008). Castellanos and colleagues (2006) argue that hot EFs are necessary for solving problems characterized by high affective involvement or requiring flexible evaluations of the affective value of stimuli. Figure 1 summarizes the main components of EFs, considering the distinction between cold and hot abilities.

This distinction between cold and hot EFs appears to correspond to differences in neuronal activity within the frontal cortices. Purely cognitive (“cold”) aspects are associated with the dorsolateral regions of the prefrontal cortex, whereas more emotional (“hot”) aspects are associated with the ventromedial prefrontal cortex, encompassing the medial and orbitofrontal cortices and limbic structures (Zelazo e Müller, 2002). These authors further report that, in terms of brain maturation, areas involved in hot EFs may mature earlier than those involved in cold EFs. According to Osório and colleagues (2021), although cold and hot EFs can be conceptualized as distinct activities, they typically operate together as part of an adaptive function in interaction with the world.

During the cognitive processing required to regulate thoughts, emotions, and actions aimed at directing adaptive and socially appropriate behavior, EFs are recruited (Miller & Cohen, 2001; Zelazo et al., 2008; Bertollo e Yerys, 2019). They facilitate behavioral modification and adaptation across life situations and contribute to sociocognitive integration with successful functional

FIGURE 1
Characterization of FEs, based on the division between cold FEs and hot FEs (Zelazo and Carlson, 2012).



outcomes (Kochanska et al., 2000; Lezak et al., 2004; Corso et al., 2013; Carlson, 2016; Anderson & Beauchamp, 2012; Bertollo e Yerys, 2019). Kochanska et al. (2000) and Carlson (2016) argue that behavioral adaptation depends on the ability to inhibit undesirable or inappropriate behaviors. Carlson et al. (2002) propose that a certain level of executive proficiency must develop before children can construct more complex concepts of mental life.

Research on the stability of executive function and predictions of adaptive behavior from middle childhood to preadolescence showed that stronger executive abilities may act as a protective factor reducing risk behaviors in adolescence (Harms et al., 2014). Specific aspects of childhood executive function and neural sensitivity to reward and punishment predicted individual differences in sensation seeking and adaptive behavior in children entering adolescence.

Pinto et al. (2006) state that children's behaviors assume increasing levels of cognitive complexity through participation in play and learning activities. Greater engagement in activities that stimulate creativity and divergent thinking increases the likelihood of higher levels of cognitive and adaptive functioning. Understanding how adaptive behaviors develop in childhood is essential for identifying modifiable factors and critical barriers for targeted interventions.

The present study was conducted with a sample of children diagnosed with IDD, a neurodevelopmental disorder with onset during childhood (from birth to 18 years), characterized by a broad spectrum of functional deficits manifested as significantly below-average intellectual efficiency and adaptive limitations in daily functioning, including communication, self-care, socialization, and academic learning (Évora, 2019, Antunes, 2012, Mecca et al., 2015, Santos, 2020, Firmino, 2022). These limitations reflect restricted functional performance and represent a substantial disadvantage influenced by contextual variables, which may be mitigated through interventions, supports, or the reduction of barriers to opportunity, equity, and inclusion (Hallberg e Bandeira, 2021).

Interest in studying EFs within IDD stems not only from their contribution to intellectual functioning but also from evidence that executive dysfunction in childhood may lead to deficits in emotional self-regulation and behavioral self-control, directly affecting the ability to generate appropriate responses to environmental demands, which is fundamental for adaptive functioning (Godoy, 2012; Segamarchi et al., 2021).

Almeida and da Silva (2020) conducted an integrative literature review on current perspectives regarding the teaching of EFs in children with IDD. They confirmed that immaturity of frontal brain structures is a key characteristic in this population. Since these regions underlie EFs, such immaturity explains increased difficulty in planning, organizing, executing tasks, decision-making, maintaining attention, controlling emotions, anticipating consequences, and demonstrating cognitive and behavioral flexibility.

This study examines the relationship between cold and hot EFs and adaptive behaviors in children with IDD from low socioeconomic backgrounds and limited social integration due to cultural contingencies.

The Present Study

This study aimed to assess aspects of children's learning and adjustment to everyday activities in domestic, school, and personal contexts. Cold EFs were assessed based on measures of cognitive flexibility, working memory, and goal orientation, whereas hot EFs were based on measures of social thinking, decision-making, and self-regulation.

The following objectives were defined:

I. To assess the performance of the sample regarding cold and hot EFs, as well as adaptive behaviors (AB);

II. To examine whether cold and hot EFs are related to AB;

III. To examine the influence of cold and hot EFs on the different domains of AB (Communication, Autonomy, and Socialization).

Based on the literature review conducted, the following research hypotheses were formulated:

H1: Children with IDD present overall performance below the normative average on the AB assessment instrument.
H2: Regarding AB, the Socialization domain presents higher scores compared to the other domains.
H3: Children with IDD present overall performance below the normative average on the EF assessment instrument.
H4: Performance in hot EFs is superior to performance in cold EFs.
H5: There is a positive relationship between EFs (cold and hot) and AB.
H6: Cold EFs show a positive correlation with the Communication and Autonomy domains of AB.
H7: Hot EFs show a positive correlation with the Socialization domain of AB.
H8: Cold EFs significantly influence the Communication and Autonomy domains of AB.
H9: Hot EFs significantly influence the Socialization domain of AB.

Methodology

Participants

Forty children aged between 8 and 12 years were selected to participate in the study (mean age ± standard deviation [SD] = 10.03 ± 1.33 years), with schooling ranging from the 1st to the 6th grade of primary education (mean years of schooling ± SD = 3.40 ± 1.21), including both sexes (45% female and 55% male), and from low socioeconomic backgrounds.

The inclusion criteria were: (1) having a diagnosis of IDD within the previous 12 months; (2) children attendanding in primary education; and (3) regular participation in multidisciplinary sessions conducted at the clinical institution. Exclusion criteria were: (1) presence of other neurological and/or psychiatric disorders; (2) motor limitations; (3) low visual and/or auditory acuity; and (4) a percentile greater than or equal to 15 on the Raven's Colored Progressive Matrices.

Two psychological instruments were selected to assess children's EFs and AB, respectively: the Tartaruga da Ilha – Executive Functions Assessment Battery for Children (TI-BAFEC) (de Mesquita, 2011) and the Vineland Adaptive Behavior Scale (Sparrow et al., 1984; Sparrow & Cicchetti, 1985; Sparrow & Cicchetti, 1989).

Description of Instruments

To estimate EFs, the Tartaruga da Ilha – Executive Functions Assessment Battery for Children (TI-BAFEC) (de Mesquita, 2011) was used. This instrument is designed to assess EFs in children aged 6 to 10 years and includes both cold and hot EF components.

The instrument is organized into three main domains: the first concerns cold EFs and comprises eight tasks; the second concerns hot EFs and comprises five tasks; and the third examines the interaction between the two previous areas and includes two tasks assessing the simultaneous use of cold and hot EFs, totaling 15 tasks (de Mesquita, 2011).

Calculation of total EF scores requires administration of the complete TI-BAFEC battery. Total EF scores are calculated as the mean of composite test results. Scores may be converted into percentiles to determine each child's executive functioning level within the following categories: "Superior" (92–100), "High Average" (76–91), "Average" (26–75), "Low Average" (10–25), and "Inferior" (0–9).

To assess AB, the Vineland Adaptive Behavior Scale (Sparrow et al., 1984; Sparrow & Cicchetti, 1985; Sparrow & Cicchetti, 1989) was used. This tool evaluates individual functioning from birth to adulthood (up to 90 years) and consists of a semi-structured interview in questionnaire format with five possible domains divided into 11 subdomains. The first three domains were administered: Communication (Receptive, Expressive, and Written), Autonomy (Personal, Domestic, and Community), and Socialization (Interpersonal Relationships, Leisure, and Social Rules), as these domains have been shown to be directly related to AB (Tomaszewski et al., 2020; Santos, 2007; Perry e Factor, 1989).

The Vineland produces standard scores for domains and subdomains, as well as a single overall score, the Adaptive Behavior Composite. Derived scores are also available, including percentiles, adaptive levels, and age equivalence. Norms are age-based from 0 to 18 years or older. During the assessment period, some questions were answered not only by the participant but also by their legal guardian and primary therapist.

Vineland results are interpreted across five adaptive levels: "High" (131–160), "Moderately High" (116–130), "Adequate" (85–115), "Moderately Low" (70–84), and "Low" (0–69). Scores classified as "Low" are further subdivided into "Low with Mild Deficit" (51–69), "Low with Moderate Deficit" (36–50), "Low with Severe Deficit" (21–35), and "Low with Profound Deficit" (below 20).

Procedures

Data were collected after obtaining informed consent from legal guardians. Participant anonymity and confidentiality were ensured in accordance with ethical principles and research procedures involving children as established in Decree-Law No. 67/98 concerning personal data protection.

Instrument administration occurred between March and July 2022 and was conducted by a trained psychology researcher following the respective manuals rigorously. Prior to assessment, children received a brief age-appropriate explanation of the tasks to ensure comprehension of instructions. Individual sessions lasted approximately 45 minutes and were conducted in one or two meetings to prevent cognitive or emotional fatigue. Breaks were provided whenever necessary. Children were receiving multidisciplinary follow-up (neuropsychology, speech therapy, or occupational therapy).

Results were recorded immediately after each task according to instrument protocols and were subsequently coded and digitally stored in secure systems accessible only to the research team.

Statistical Analysis

Statistical analysis was conducted using IBM SPSS Statistics (IBM Corp.). Assumption testing for parametric statistics included the Shapiro–Wilk test, inspection of skewness and kurtosis, and graphical distribution analysis to verify normality. Homogeneity of variances was assessed using Levene's test. No significant assumption violations were identified.

Descriptive analyses were then conducted to characterize sample performance on EF and AB instruments. Comparative tests appropriate to data characteristics were used to examine differences between domains and between cold and hot EFs.

Relationships between EFs and AB were investigated using Pearson correlation. Finally, multiple regression analyses were conducted to identify the specific contributions of cold and hot EFs to variability in the Communication, Autonomy, and Socialization domains of AB. This analytical sequence was structured to address the research hypotheses directly and coherently.

Results

Regarding participants' total scores on the BAFEC, the EF assessment instrument, an overall mean performance of M = 26.02 (SD = 12.08) was observed, classified as "Average." When cold and hot EFs were analyzed separately, participants showed a mean value of M = 25.41 (SD = 14.19) in cold EFs, corresponding to a "Low Average" level, and M = 26.62 (SD = 15.55) in hot EFs, classified as "Average." Comparison between the means of cold and hot EFs revealed no statistically significant differences, $t(39) = -0.44$, $p = .66$, $d = -0.07$.

With respect to performance on the Vineland, the AB assessment instrument, results indicated a total mean value of M = 59.97 (SD = 11.44), corresponding to a "Low with Mild Deficit" adaptive level. When the three specific domains were analyzed, participants presented means of M = 51.65 (SD = 16.86) in the Communication domain, M = 68.40 (SD = 15.21) in the Autonomy domain, and M = 74.63 (SD = 12.62) in the Socialization domain. These values correspond, respectively, to the adaptive levels "Low with Mild Deficit," "Low with Mild Deficit," and "Moderately Low."

Comparison of the three Vineland domains revealed statistically significant differences, $F(2,78) = 47.48$, $p < .01$, $\eta^2_p = .55$, indicating a large effect size. Post hoc analyses conducted using the Bonferroni procedure showed that scores in the Socialization domain were significantly higher than those in the remaining domains, followed by the Autonomy domain. The Communication domain presented significantly lower scores in all comparisons ($p < .01$).

Table 1 presents Pearson correlation values between EFs (total, cold, and hot) and the different AB domains (Communication, Autonomy, and Socialization).

TABLE 1.
Pearson correlation (r) between cold and hot EFs and the different AB domains (Communication, Autonomy, and Socialization), (N = 40).

	Total Executive Functions (BAFEC)	Cold Executive Functions (BAFEC)	Hot Executive Functions (BAFEC)
Total Adaptive Behaviors (Vineland)	.52**	.51**	.34*
AB Communication (Vineland)	.45**	.42**	.31
AB Autonomy (Vineland)	.32*	.44**	.10
AB Socialization (Vineland)	.50**	.38*	.43**

Note: p < .05; ** p < .01

Overall, significant positive correlations were found between total EF scores and total AB scores (r = .52, p < .001), as well as with cold EFs (r = .51, p < .001) and hot EFs (r = .34, p = .034). A significant positive association was also observed between total EF scores and the Vineland domains of Communication (r = .45, p = .004), Autonomy (r = .32, p = .04), and Socialization (r = .50, p < .001).

Cold EFs showed significant positive correlations with the Communication (r = .42, p = .007), Autonomy (r = .44, p = .004), and Socialization (r = .38, p = .016) domains. In contrast, hot EFs showed a significant correlation only with the Socialization domain (r = .43, p = .005), with no statistically significant correlations observed with the Communication (r = .31, p = .050) and Autonomy (r = .10, p = .55) domains.

To identify which EF components most contributed to explaining variability in adaptive levels of Communication, Autonomy, and Socialization, three multiple regression analyses were conducted using cold and hot EFs as predictor variables.

In the Communication domain, the regression model explained 21.3% of the variance, R^2 = .21, F(2, 37) = 4.99, p = .012. Only cold EFs contributed significantly, β = .36, p = .026, whereas hot EFs did not show a significant contribution, β = .20, p = .21.

For the Autonomy domain, the regression model explained 19.9% of the variance, R^2 = .20, F(2, 37) = 4.6, p = .016. Again, only cold EFs made a significant contribution, β = .46, p = .005, while hot EFs showed no relevant contribution, β = -.05, p = .76.

Finally, the regression model for the Socialization domain explained 25.3% of the variance, R^2 = .25, F(2, 37) = 6.28, p = .004. In this case, hot EFs made a significant contribution, β = .35, p = .026, whereas cold EFs showed a marginal trend, β = .27, p = .08.

Discussion

The present study explored the relationship between executive functions (EFs) and adaptive behaviors (AB) in children with IDD, considering the domains of Communication, Autonomy, and Socialization. Regarding EF performance, it was expected that the sample would present alterations in executive functioning, as previous studies indicate immaturity of frontal brain structures in this population, resulting in difficulties in managing EFs (Almeida e Da Silva, 2020). Analysis of the participants' EFs in the present study revealed performance considered to be average. This finding may be explained by the limited sensitivity of the instrument used, which may hinder the detection of small developmental progressions in these functions during childhood (De Mesquita, 2011).

No significant differences were found between cold and hot EFs, in contrast to the literature suggesting relatively greater development of brain areas involved in hot EFs, as these tend to mature earlier than areas associated with cold EFs (Hongwanishkul et al., 2016). The limited size and representativeness of the sample, as well as the inclusion of some children older than the recommended age range for the instrument, may have influenced these results. The inclusion of these children was justified by the possibility of extending the instrument's use to older ages in cases of intellectual impairment, as occurs in IDD.

It should also be considered that the instrument used may not have been sufficient to detect subtle differences between colder and hotter abilities, possibly due to limited ecological correspondence between the proposed activities and each child's real-life context. Assessment of hot EFs required high levels of motivation because of the duration of certain tasks and the need for reinforcement strategies appropriate in magnitude and relevance to participants' realities.

With regard to AB, the overall sample mean falls below the adaptive level expected for neurotypical children of the same age, corresponding to a mild deficit. The Communication and Autonomy domains showed lower performance, whereas the Socialization domain was within the average range, although moderately low. Most interventions and support programs for children with IDD, including those in the present study, tend to focus primarily on developing social skills and interaction, given that socialization plays a crucial role in children's daily lives regardless of cognitive ability and is essential in school, family, and community contexts. At the same time, the environment in which the child is embedded may influence these learning processes: frequent social interaction provides more opportunities to practice and refine social skills, whereas autonomy and communication skills tend to depend more on family or structured contexts (De Mesquita, 2011).

These findings reinforce the importance of analyzing each domain separately when assessing AB in children with IDD. According to Évora (2019), below-expected performance in the conceptual (Communication) and practical (Autonomy) domains may be explained by their greater dependence on intellectual functioning. In the present study, all participants demonstrated IQ levels below what is expected for their age, suggesting that children with lower intellectual functioning may experience cognitive difficulties that compromise the acquisition and application of Communication and Autonomy skills. These difficulties may include problems in understanding instructions, language acquisition and expression, working memory, mental organization, generalization capacity, and fine motor skills, all of which are essential for the development of these adaptive behaviors.

Correlational analyses suggest a significant positive relationship between EFs and AB. Similar findings were reported by Gligorović e Đurović (2014), who assessed children with mild IDD and found significant correlations between aspects of inhibitory control and most adaptive domains. Studies involving children with other clinical conditions, such as autism spectrum disorder (Gardiner e Iarocci, 2018), conduct disorder and ADHD (Bonilla-Santos et al., 2019), prenatal alcohol exposure (Ware et al., 2012), Down syndrome (Sabat et al., 2020), Muenke syndrome (Yarnell et al., 2015), and mental disorders (Halvorsen et al., 2019), also indicate the relevance of EFs as predictors of AB.

Regression analyses were conducted to determine how cold and hot EFs influence the Communication, Autonomy, and Socialization domains of AB. The results showed that cold EFs influence the Communication and Autonomy domains, whereas hot EFs influence only the Socialization domain.

Cold EFs—linked to memory processes, inhibitory control, goal setting and maintenance, and cognitive flexibility—contribute significantly to AB across domains, demonstrating their central role in behavioral regulation. Difficulties in attentional control, adaptation of strategies in response to new information, maintenance and monitoring of relevant elements, and initiative in planning actions reflect limitations in cold EFs and particularly affect the conceptual domain (Communication), which involves academic competencies and daily task performance, and the practical domain (Autonomy), which relates to personal care, health management, financial management, and independent well-being (De Mesquita, 2011).

Hot EFs appear to influence exclusively the Socialization domain. The ability to understand and regulate one's own thinking, make decisions, and self-regulate emotions and behaviors predicts social competencies such as empathy, interpersonal communication, friendship formation, and social judgment.

Although several findings reached statistical significance, they are not highly robust, and the small sample size must be considered. Children with IDD present considerable variability in cold and hot abilities that may not have been fully captured in this study, complicating the identification of consistent patterns. Factors such as diagnostic severity and social context should also be taken into account.

Future studies should include larger samples, encompassing children with and without IDD diagnoses, and employ additional instruments to assess cold and hot EFs, ideally using ecologically valid approaches to increase correspondence between test performance and real-life functioning, given the complex and multifaceted nature of these constructs.

Conclusions

The present study contributes to a better understanding of the relationship between executive functions and adaptive behaviors in children with IDD, highlighting the differentiated roles of cold and hot executive processes in everyday functioning.

The findings suggest that executive functioning is positively associated with adaptive performance, reinforcing the importance of considering EFs as a central component in the assessment and intervention of children with IDD. In particular, cold EFs appear to play a more prominent role in the development of Communication and Autonomy skills, whereas hot EFs are especially relevant to Socialization. These results underscore the need for targeted intervention strategies that address specific executive components in order to promote more effective adaptive functioning.

From a practical perspective, the study emphasizes the importance of integrating executive function training into educational and clinical programs designed for children with IDD. Interventions that simultaneously stimulate cognitive regulation, emotional control, and social decision-making may foster improvements not only in academic performance but also in independence and interpersonal relationships.

Despite its contributions, the study presents limitations, particularly the reduced sample size and the restricted generalizability of the findings. Future research should expand the scope of investigation by including more diverse and representative samples and by employing multiple assessment methods with greater ecological validity. Longitudinal designs would also be valuable in clarifying how executive and adaptive skills evolve over time and influence each other throughout development.

In summary, understanding the interaction between executive functions and adaptive behaviors is essential for designing comprehensive support strategies that enhance the quality of life and social inclusion of children with IDD.

The results of the present study demonstrate that effective executive functioning contributes significantly to adaptive performance in IDD, enabling the child to better manage the constant demands and changes of the surrounding environment, assume a more active role in the learning process, and respond adaptively to daily challenges, both in school settings and across broader life contexts. Almeida and Da Silva (2020) emphasize that even when EFs manifest in a manner appropriate to age and gender, they can still be enhanced, highlighting the influence of environmental factors on the development of executive functioning. Therefore, it is essential to provide children with enriching experiences that foster the development of these competencies, given that early EFs predict academic achievement, health outcomes, social skills, and overall well-being across the lifespan (Gomes et al., 2018; Carlson, 2016; Harms et al., 2014).

In summary, understanding EF performance and its relationship with adaptive behavior allows for a more precise assessment of the individual needs of children with IDD and supports the implementation of targeted intervention strategies that promote overall development and functional autonomy, thereby enhancing academic, social, and personal success throughout life.

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