

Response to Intervention (RTI) Tier 2 Executive Functions Program for 1st Grade Level Brazilian Schoolchildren: Pilot Study

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Abstract

This study was developed in two phases, Phase 1 being the elaboration of the Response to Intervention Model (RTI) Tier 2 executive functions program for Brazilian schoolchildren and Phase 2 the analysis the significance clinical of RTI Tier 2 executive functions program for Brazilian schoolchildren at 1st grade level of Elementary School I in a pilot study. The study aimed to develop and analyze the clinical significance of an RTI Tier 2 executive functions program for 1st grade level Brazilian schoolchildren in a pilot study. The RTI Tier 2 executive functions program for schoolchildren in the 1st grade level of Elementary School was designed based on the theoretical model, considering the three main components of executive functions: inhibition, working memory and switching. The analysis of the clinical significance of the performance of schoolchildren in the 1st year of Elementary School I in the program developed in phase 1 of the study was carried out in a pilot study with eight students who submitted the application of the Attention Test for Cancellation (TAC); Five Digits Test—FDT; Wechsler Children’s Intelligence Scale Digits Subtest, Trail Making Test (TT)—Parts A and B; and the Protocol for Early Identification of Reading Problems—IPPL in a situation of pre- and post-application of the program. Results: The results of this study were analyzed using the JT Method for single-case analysis and showed that there was a reliable improvement in the components of executive functions inhibition, working memory and switching for some schoolchildren in this study. In tasks of rhyme identification, production from the phoneme, phonological working memory, the results also showed that there was a reliable improvement, although the program did not focus on its development. The program developed in this study proved to be applicable and can be used as an intervention instrument based on scientific evidence that helps the development of executive functions and learning in RTI tier 2.

Keywords

Executive Functions, Response to Intervention, Reading, Learning

1. Introduction

Executive functions (EF) are considered higher-order cognitive resources that command lower-level processes. They are directly related to the ability to learn, since for the student to be able to acquire reading and writing skills, it is essential that there is planning, attention, behavior regulation and motivation (Diamond & Lee, 2011).

Executive functions have been studied from perspectives that aim to define their components for classification and evaluation purposes, and the term executive functions are used to designate a wide variety of cognitive functions (Diamond, 2013).

Its course of neurobiological development is progressive, through which its components are consolidated at different stages, with environmental factors acting together. Thus, in addition to the ontogenetic development of executive functions, from around 12 months of age to early adulthood (Romine & Reynolds, 2005), studies show that there is a difference between the development of its different components, that is, some would consolidate before others (Dawson & Guare, 2012; Diamond & Lee, 2011; Miyake, Friedman, Emerson, Witzki, Howerter, & Wager, 2000).

This model, proposed by Miyake et al. (2000), which has recently received acceptance in the literature (Diamond & Lee, 2011; Diamond, 2013; Sullivan, Davis, & Koh, 2022), considers three components essential related to executive functions: inhibition, working memory and shifting demonstrating that, from their integration, they allow other skills to emerge, such as planning, decision making, problem solving, among others.

Knowing the milestones of ontogenetic development, as well as the evolutionary course of the components of executive functions, allows us not only to evaluate but also to develop strategies for early interventions for their development. Studies have shown that executive functions have been implicated as an important predictor of school readiness, exerting a great influence on academic performance as they are associated with adjustment and cognitive, emotional, behavioral and social development (Diamond, 2013; Blair & Ursache, 2011).

Thus, authors have advocated a combined approach that includes assessment and intervention addressing the areas of cognitive processing, which may underlie learning processes in the different areas of reading, writing and mathematics (Yassin & Khateb, 2022; Howard, Johnson, & Pascual-Leone, 2014). Authors defend the relationship between executive functions and academic skills in assessment and intervention situations (Willoughby, Hudson, Hong, & Wylie, 2021) contributing to individualized instruction projects fundamental to special edu-

cation (Rodríguez, Areces, García, Cueli, & Gonzalez-Castro, 2021).

Studies have been published both nationally (Cardoso, Dias, Seabra, & Fonseca, 2017; Gonçalves, Viapiana, Sartori, Giacomoni, Stein, & Fonseca, 2017) and internationally (Shuai, Daley, Wang, Zhang, Kong, Tan, & Ji, 2017; Van der Ven, Kroesbergen, Boom, & Leseman, 2012; Rudasill, Acar, & Xu, 2022), on the use of early interventions for the development of executive functions and problems of learning, as well as the performance of skills involved, however, there are still few studies that focus on the development of executive functions in students at risk for learning difficulties through the Response to Intervention (RTI) (Dvorsky, Becker, Tamm, & Willoughby, 2021; Grosche & Volpe, 2013; Reynolds & Shaywitz, 2009; Rodríguez, Areces, García, Cueli, Gonzalez-Castro, 2021).

The Response to Intervention (RTI) is a multi-level educational and behavioral model where the activities are developed to seek the identification and early intervention in schoolchildren at risk for learning and behavioral difficulties, as well as diagnostic models of learning and behavior disorders (Andrade, Andrade, & Capellini, 2014; Fuchs & Fuchs, 2006; Fletcher & Vaughn, 2009).

It is a model designed with resources that allow more efficient care programs to provide faster responses to the needs of schoolchildren with learning and behavioral problems (Andrade, Andrade, & Capellini, 2014; Jiménez, de León, & Gutiérrez, 2021, 2020), widely used in international and national literature (Andrade, Andrade, & Capellini, 2014; Berkeley, Scanlon, Bailey, & Sutton, 2020; Fuchs & Fuchs, 2006; Fukuda, 2016; Grosche & Volpe, 2013; Jiménez, Gutiérrez, & León, 2020; Marino & Beecher, 2010; Miranda, Piza, Assençõ, Villachan-Lyra, Pires, Chaves et al., 2019; Vellutino et al., 1996).

The RTI Model is composed of three-tier: 1) universal screening of academic and behavioral problems in all schoolchildren through collective content and strategies, scientifically proven to be the most effective, and their progress systematically monitored by teachers; 2) application of specific and progressive interventions in smaller groups, based on the response to progress monitoring assessments (Fletcher & Vaughn, 2009), that is, the responsiveness to preventive interventions, of those schoolchildren who did not respond positively to universal screening and therefore are identified as at risk for learning problems, elected to the second tier; 3) evaluation and specific intervention with the objective of excluding the possibilities of learning and/or behavior disorders in schoolchildren who do not make progress in the previous stages (Al Otaiba et al., 2019; Fletcher & Vaughn, 2009; Fuchs & Fuchs, 2006).

The term ‘responsiveness’ refers to the responsiveness to preventive interventions. Therefore, the RTI is a model focused on prevention, carried out in layers (several phases of model implementation), where the monitoring of a student’s “responsiveness” or “non-responsiveness” to early intervention programs will determine whether he or she will be referred, for specialists who will carry out the individualized remedial intervention and diagnosis (Andrade, Andrade, & Capellini, 2014; Fuchs & Fuchs, 2006; Wixson, 2011).

Corroborating this, the current edition of the DSM-5 included in the diagnostic criteria for learning disorders a proposal for a response to the intervention, based on the premise that existing environmental variables, as well as the time and mode of response to the intervention, can generate a false positive diagnosis for the dyslexia diagnosis. Therefore, this manual established that initially a diagnostic hypothesis is established, which will be confirmed or refuted after a minimum period of six months of scientifically based intervention (APA, 2013).

Based on the hypothesis that an RTI tier 2 intervention program with executive functions in schoolchildren of 1st grade level of Elementary School, I can help to identify students at risk for executive function and learning difficulties.

The study aimed to develop and analyze the clinical significance of an RTI Tier 2 executive function program for 1st grade level Brazilian schoolchildren in a pilot study.

2. Method

This study was carried out after approval by the Research Ethics Committee of São Paulo State University “Júlio de Mesquita Filho” (UNESP), Marília, São Paulo, Brazil, under protocol number 81064117.5.000.5406.

Research design

This is a quasi-experimental study developed in two phases, Phase 1 being the elaboration of the RTI Tier 2 executive functions program for Brazilian schoolchildren and Phase 2 the analysis the significance clinical of RTI Tier 2 executive function program for Brazilian schoolchildren at 1st grade level of Elementary School I in a pilot study.

The theoretical bases for the elaboration of the RTI Tier 2 intervention program, called RTI-FEx were based on the theoretical model proposed by Miyake et al. (2000), considering the three main components of executive functions: inhibition of prepotent responses “inhibition”; updating and monitoring of working memory representations “working memory” and shifting between tasks or mental sets “shifting”.

Each of the components of executive functions was considered as an objective of the program, developed for application in a school environment, in the group modality. For each objective, strategies were developed, developed for this study, based on gold standard instruments existing in the national and international literature, intended for the assessment of executive functions (Strauss, Sherman, & Spreen, 2006; Zimmermann, Cardoso, Kristensen, & Fonseca, 2017), in addition to intervention programs in executive functions existing in the national literature (Cardoso, Dias, Seabra, & Fonseca, 2017; Dias & Seabra, 2013).

In this way, RTI-FEx was composed of 10 strategies, distributed over 9 sessions with an average duration of 40 minutes each, to be carried out weekly over 2 months and 1 week, progressively considering the 3 main ones, components of executive functions: inhibition, working memory and, shifting.

Phase 2 of this study was the realization of the applicability of the program

developed in phase 1 of this study through the pilot study. The pilot study was composed of 71 schoolchildren from the 1st grade level of Elementary School I, of both genders, aged between 6 years and 6 years and 11 months, from two public schools in the city of Marília, São Paulo, Brazil.

The 71 schoolchildren authorized to participate in the research submitted an assessment to identify risk for difficulties in executive function, of which only 37 schoolchildren completed the pre-assessment procedures. Of these 37 schoolchildren, only 18 were identified as being at risk for difficulties in executive functions and learning and met the inclusion criteria for the second-tier intervention.

The criterion used to identify the student at risk was to achieve performance classified as below average in all instruments applied in pre-testing situations.

The following instruments were used as evaluation procedures in pre- and post-testing situations: collective assessment Attention Test for Cancellation (TAC), Trail Making Test—Parts A and B (Seabra & Dias, 2012), and individual—Protocol for Early Identification of Reading Problems—IPPL (Capellini, Cerqueira Cesar, & Germano, 2017), Five Digits Test—FDT (Sedó, 2015), Wechsler Scale Digits Subtest—WISC IV (Wechsler, 2014, 2012).

Of the 18 schoolchildren who completed the pre-testing assessment and referred to the intervention program developed in phase 1 of this study, only eight schoolchildren completed the program and underwent the application of post-assessment procedures.

Therefore, the pilot study of phase 2 of this study was composed of eight schoolchildren from the 1st year of Elementary School I, aged between 6 years and 6 years and 11 months, of both sexes, from two public schools in the city of Marília, São Paulo, Brazil.

3. Results

The results of this study were analyzed using the JT Method (Jacobson, Truax, 1991; Del Prette & Del Prette, 2008) for single-case analysis. This method provides a comparative analysis between pre- and post-intervention scores and aims to decide whether the differences between them represent reliable changes and whether they are clinically relevant. The JT Method results in two complementary processes: calculation of the reliability of changes that occurred between the pre- and post-intervention assessment, described in terms of a Reliable Change Index (RCI), and analysis of the clinical significance of these changes. The difference is calculated based on the difference between pre- and post-test divided by the standard error of the difference. In this way, the change from pre- to post-testing can be a reliable positive (when there is improvement); reliable negative (when there is worsening); with clinical significance (which makes or will make a difference in the clinical scope); and there may also be no change.

To analyze the results of the clinical significance of the performance of schoolchildren in pre- and post-testing situations after application of the intervention response program RTI-FEx, they were named S1 to S8.

Table 1 and **Table 2** show the reliable change index (RCI) of each student in this study based on their performance based on the instruments used in pre- and post-testing situations.

4. Discussion

The inhibition component was evaluated using the Five-Digit Test (FDT) and the Attention Test Cancellation (TAC). During the application of the FDT, all the schoolchildren were unable to perform the task in a pre-testing situation, although the instrument is intended for the evaluation of this component for the age group of this study (Sedó, 2015), presenting difficulty in understanding the instructions of the procedure required to perform the task. The same task was proposed in a post-assessment situation, where S1, S2, S4, S5 and S7 were able to perform it despite showing a performance suggestive of clinical deficit.

Although it is not possible to say that the gains in inhibition can be attributed to the intervention from the application of the FDT, as the schoolchildren were not able to perform the task in the pre-testing, there is a second test used to evaluate the inhibition component, the cancellation attention test, an instrument that assesses selective attention, which according to the literature is one of the skills involved in executive functions, fundamental to adaptive and purpose-oriented functioning (Friedman & Miyake, 2017). Also, according to the literature, the inhibition component includes the concept of selective attention, as it allows for the inhibition of overbearing responses and attention to irrelevant stimuli (Dawson & Guare, 2012).

In this task performance improvement was observed in part 1 of the test designed to assess selective attention (S1, S2, S3, S4, S5, S6 and S7) and in part 3 of the test, also intended for the evaluation of selective attention, but with a

Table 1. Performance of schoolchildren in pre- and post-testing situations.

Schoolchildren	Instruments used in the pre- and post-assessment protocol					
	FDT	TAC1	TAC2	TAC3	DIG	TTB
1	RPC	RPC	-	RPC	RPC	RPC
2	RPC	RPC	-	RPC	-	-
3	-	RPC	-	RPC	-	-
4	RPC	RPC	-	RPC	-	RPC
5	RPC	RPC	-	-	-	-
6	-	RPC	-	-	-	-
7	RPC	RPC	-	RPC	-	-
8	-	RNC	-	-	-	-

Subtitles: RPC = reliable positive change; RNC = reliable negative change; FDT = five digit test; TAC1 = attention test cancellation part 1; TAC2 = attention test cancellation part 2; TAC3 = cancellation attention test part 3; DIG = digits subtest; and TTB = trail test part B.

Table 2. Performance of schoolchildren in the tests of the early identification protocol for reading problems used in pre- and post-testing situations.

Evidence of the Protocol for Early Identification of Reading Problems—PEIRP													
Schoolchildren	AK	RP	RI	SS	PWF	PS	PA	IPI	PWM	FAN	SR	WPWR	LCP
1	-	-	-	-	-	-	-	-	RPC	-	-	-	-
2	-	-	-	-	RPC	-	-	-	-	RNC	-	-	-
3	-	-	-	-	-	-	-	-	-	-	-	-	-
4	-	-	-	-	-	-	-	-	-	-	-	-	-
5	-	-	-	-	-	-	-	-	-	-	-	-	-
6	RNC	-	RPC	-	-	-	-	-	-	-	RNC	-	-
7	-	-	-	-	-	-	-	-	-	-	-	-	-
8	-	-	-	-	RNC	-	-	-	RNC	-	-	-	-

Subtitles: RPC = reliable positive change; RNC = reliable negative change; AK = alphabet knowledge; RP = rhyme production; RI = rhyme identification; SS = syllabic segmentation; PWF = production of words from the given phoneme; PS = phonemic synthesis; PA = phonemic analysis; IPI = initial phoneme identification; PWM = phonological working memory; FAN = fast automatic naming; SR = silent reading; WPWR = words and pseudowords reading; and LCP = listening comprehension of sentences from pictures.

demand for alternation (S1, S2, S3, S4 and S7), being necessary to change the focus of attention in each line (Seabra & Dias, 2012).

As the data are preliminary, as it is a pilot study, although it cannot be said that the gains in this component are due to the intervention and not only to the schooling process to which the schoolchildren in this study continued to be exposed during the academic year, it is worth noting, according to the literature, that, in addition to the ontogenetic development of executive functions, from around 12 months of age to early adulthood (Romine & Reynolds, 2005), there is a difference between the development of their different components, that is, some would consolidate before others (Miyake et al., 2000; Dawson & Guare, 2012; Diamond & Lee, 2011). Based on the theory proposed by Miyake et al. (2000), inhibition is the first component to be consolidated.

The working memory component was evaluated using the digits subtest, which is an integral part of the Weschlers Assessment Scale, which is divided into two parts, designed to assess different skills: direct order digits, specifically involving learning by memorization, attention, coding and auditory processing, and reverse order digits, involving working memory, information transformation, mental agility and visual and spatial images (Groth-Marnat, 1997; Hale, Hoepfner, & Fiorello, 2002; Wechsler, 2012).

Although the results presented, from the comparison between pre- and post-testing through the described subtest, have revealed an indicative of reliable change for an S1 student, it is important to emphasize that the student was not able to perform the second part of the task during the pre-test situation. testing, thus presenting a raw score for only the first part of the subtest. In the post-testing situation, the same student, in addition to presenting a better score in the first part of the test, not only managed to perform the second part, but al-

so presented a performance classified as preserved from the score and classification of the instrument itself, suggesting a gain in the test. Performance in tasks involves working memory, information transformation, mental agility, and visual and spatial images.

The alternation component was evaluated through the trail making test: parts A and B (Seabra & Dias, 2012). Regarding the indicator of reliable change, there was a reliable change for two schoolchildren, S1 and S4, and in relation to S4, it is not possible to say that the gains in alternation can be attributed to the intervention from the application of the test, since the school was unable to perform the task in the pre-test, due to not mastering the alphabetical order evaluated in part A of the test, making it impossible to measure their performance in alternation. During post-testing, the same student was able to perform both parts of the test (A and B), which in turn may reflect a gain from schooling.

According to literature, studies carried out on early identification of schoolchildren at risk for reading difficulties, using the phonological basis and the grapheme-phoneme mechanism (Fadini & Capellini, 2011; Hulme & Snowling, 2014), revealing, however, that metaphonological skills, phonological working memory, rapid automatic naming and reading are predictive skills for reading development, which must be taught in an instructional in the first two years of literacy, justifying the absence of indications of gains from the pre and post-test in the tests knowledge of the alphabet, rhyme production, syllabic segmentation, phonemic synthesis, phonemic analysis, identification of the initial phoneme, rapid automatic naming, silent reading, reading words and pseudowords, as well as listening comprehension of diseases from figures, since the intervention program did not focus on specific instruction aimed at these skills.

In the rhyme identification test, there was an indicative of reliable change for the student S6, an indication of reliable change, as well as in the test of word production from given phoneme, presenting an indication of reliable change for the student S2. Knowledge of major phonological units such as onset-rhyme develops independently of reading instruction, and can be observed in children aged between three and five years (Capellini, Cerqueira Cesar, & Germano, 2017; Badian, 2001), when developing skill categorizing words, involving the act of attending to their constituent sounds, can have a considerable effect on their future success in learning to read and write (Bradley & Bryant, 1983). Thus, considering selective attention as the ability to select only what will be important for a given task at a given moment, focusing attention and not being distracted by various stimuli in the environment (Van Moorselaar & Slagter, 2020), we can relate this finding to the gains shown.

In the phonological working memory test, there was an indication of reliable change for the student from S1, the same student who showed an indication of reliable change in the comparison of pre- and post-testing from an instrument that aims to assess working memory from of verbal stimulus. According to the literature, the phonological working memory system is considered responsible for the temporary storage of information (Baddeley, 2017), occurring through

working memory the storage and manipulation of information for a short period, a skill necessary for the cognitive and effective functioning of activities. everyday activities, such as school performance. Thus, the results suggest a relationship between the development of executive functions, promoting reading skills, according to the literature (Meltzer, 2010; Diamond, 2013; Diamond & Lee, 2011), which has emphasized the importance of promotion of early development of executive functions and its relationship with school readiness, as well as its important predictive power on reading performance during the schooling process.

Although it cannot be said, from the preliminary data, that the gains presented are due to the intervention, since the improvement evidenced may be related to the neurodevelopment and schooling of the schoolchildren, as it is a pilot study, there was no comparison of the group studied with a control group. Therefore, an effectiveness analysis study will be carried out.

Regarding the analysis of the clinical significance of the program in a pilot study, there is an indication of improvement in the components of executive functions and in the predictive skills for reading acquisition; however, as there was no control group, it is not possible to attribute the gain exclusively to the intervention program.

Regarding the aim of elaborating an RTI tier 2 intervention program for the development of executive functions in schoolchildren from the 1st grade level of Elementary School I, it can be said that the objective was partially completed, as it was verified the need to include ecological tests to facilitate the generalization of cognitive gains in the performance of tasks by schoolchildren.

As for the hypothesis of this study, that an RTI tier 2 intervention program for the development of executive functions in schoolchildren from the 1st grade level of Elementary School, I can help in the identification and early intervention in schoolchildren at risk for learning difficulties was partially confirmed, because in the pilot study there was an indication of improvement in the performance of rhyme identification skills, word production from given phoneme and phonological working memory. However, the limitation in the sample size of the pilot study did not allow us to attribute clinical significance only to the effects generated by the program, as there is still the educational and neurodevelopmental effect. Thus, future studies will be conducted to expand the sample in order to verify the effectiveness of this intervention.

The results showed that there was a reliable improvement in the components of executive function inhibition, working memory and cognitive flexibility for some schoolchildren in this study. In tasks of rhyme identification, production from the phoneme, phonological working memory, the results also showed that there was a reliable improvement, although the program did not focus on its development.

5. Conclusion

The program in this study proved to be applicable and, can be used as an inter-

vention instrument based on scientific evidence that helps the development of executive functions and learning in RTI tier 2.

It was also possible to conclude that from the analysis of the clinical significance carried out to analyze the results of the program developed for this study, it showed an indication of improvement in the components of executive functions and in the predictive skills for reading acquisition, as there were positive changes in the response of the schoolchildren, when comparing the performance in pre- and post-testing situations.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References

- Al Otaiba, S., Baker, K., Lan, P., Allor, J., Rivas, B., Yovanoff, P., & Kamata, A. (2019). Elementary Teacher's Knowledge of Response to Intervention Implementation: A Preliminary Factor Analysis. *Annals of Dyslexia*, *69*, 34-53.
- American Psychiatric Association (APA) (2013). *DSM-5: Manual diagnóstico e estatístico de transtornos mentais*. Artmed Editora.
- Andrade, O. V. C., Andrade, P. E., & Capellini, S. A. (2014). Cognitive-Linguistic Profile in Students with Reading and Writing Difficulties. *Psicologia, Reflexão e Crítica*, *27*, 358.
- Baddeley, A. (2017). *Exploring Working Memory: Selected Works of Alan Baddeley*. Routledge.
- Badian, N. A. (2001). Phonological and Orthographic Processing: Their Roles in Reading Prediction. *Annals of Dyslexia*, *51*, 177-202.
- Berkeley, S., Scanlon, D., Bailey, T. R., Sutton, J. C., & Sacco, D. M. (2020) A Snapshot of RTI Implementation a Decade Later: New Picture, Same Story. *Journal of Learning Disabilities*, *53*, 332-342.
- Blair, C., & Ursache, A. (2011). *A Bidirectional Model of Executive Functions and Self-Regulation*.
- Bradley, L., & Bryant, P. E. (1983). Categorizing Sounds and Learning to Read—A Causal Connection. *Nature*, *301*, 419-421.
- Capellini, S. A., César, A. B. P. C., & Germano, G. D. (2017). *Protocolo de identificação precoce dos problemas de leitura—IPPL*. Ribeirão Preto, SP. Booktoy.
- Cardoso, C. D. O., Dias, N. M., Seabra, A. G., & Fonseca, R. P. (2017). Program of Neuropsychological Stimulation of Cognition in Students: Emphasis on Executive Functions-Development and Evidence of Content Validity. *Dementia & Neuropsychologia*, *11*, 88-99.
- Dawson, P., & Guare, R. (2012). *Coaching Students with Executive Skills Deficits*. Guilford Press.
- Del Prette, Z. A. P., & Del Prette, A. (2008). Significância clínica e mudança confiável na avaliação de intervenções psicológicas. *Psicologia: Teoria e pesquisa*, *24*, 497-505.
- Diamond, A. (2013). Executive Functions. *Annual Review of Psychology*, *64*, 135.
- Diamond, A., & Lee, K. (2011). Interventions Shown to Aid Executive Function Development in Children 4 to 12 Years Old. *Science*, *333*, 959-964.

- Dias, N. M., & Seabra, A. G. (2013). Funções executivas: Desenvolvimento e intervenção. *Temas sobre desenvolvimento, 19*, 206-212.
- Dvorsky, M. R., Becker, S. P., Tamm, L., & Willoughby, M. T. (2021). Testing the Longitudinal Structure and Change in Sluggish Cognitive Tempo and Inattentive Behaviors from Early through Middle Childhood. *Assessment, 28*, 380-394.
- Fadini, C. C., & Capellini, S. A. (2011). Treinamento de habilidades fonológicas em escolares de risco para dislexia. *Revista Psicopedagogia, 28*, 3-13.
- Fletcher, J. M., & Vaughn, S. (2009). Response to Intervention: Preventing and Remediating Academic Difficulties. *Child Development Perspectives, 3*, 30-37.
- Friedman, N. P., & Miyake, A. (2017). Unity and Diversity of Executive Functions: Individual Differences as a Window on Cognitive Structure. *Cortex, 86*, 186-204.
- Fuchs, D., & Fuchs, L. S. (2006). Introduction to Response to Intervention: What, Why and How Valid Is It? *Reading Research Quarterly, 41*, 93-99.
<http://www.jstor.org/stable/4151803>
- Fukuda, M. T. M. (2016). *Modelo de Resposta à Intervenção (RTI) para desenvolvimento das habilidades fonológicas com tutoria instrucional em contexto escolar: Elaboração e controle de eficácia*. <http://hdl.handle.net/11449/138143>
- Gonçalves, H. A., Viapiana, V. F., Sartori, M. S., Giacomoni, C. H., Stein, L. M., & Fonseca, R. P. (2017). Funções executivas predizem o processamento de habilidades básicas de leitura, escrita e matemática? *Neuropsicologia Latinoamericana, 9*, .
- Grosche, M., & Volpe, R. J. (2013). Response-to-Intervention (RTI) as a Model to Facilitate Inclusion for Students with Learning and Behaviour Problems. *European Journal of Special Needs Education, 28*, 254-269.
- Groth-Marnat, G. (1997). *Handbook of Psychological Assessment* (pp. 499-533). Wiley.
- Hale, J. B., Hoepfner, J. A. B., & Fiorello, C. A. (2002). Analyzing Digit Span Components for Assessment of Attention Processes. *Journal of Psychoeducational Assessment, 20*, 128-143.
- Howard, S. J., Johnson, J., & Pascual-Leone, J. (2014). Clarifying Inhibitory Control: Diversity and Development of Attentional Inhibition. *Cognitive Development, 31*, 1-21.
- Hulme, C., & Snowling, M. J. (2014). The Interface between Spoken and Written Language: Developmental Disorders. *Philosophical Transactions of the Royal Society B: Biological Sciences, 369*, Article ID: 20120395.
- Jacobson, N. S., & Truax, P. (1991). Clinical Significance: A Statistical Approach to Defining Meaningful Change in Psychotherapy Research. *J Consult Clin Psychol., 59*, 12-19.
- Jiménez, J. E., de León, S. C., & Gutiérrez, N. (2021). Piloting the Response to Intervention Model in the Canary Islands: Prevention of Reading and Math Learning Disabilities. *Span J Psychol., 24*, e30.
- Jiménez, J. E., Gutiérrez, N., & de León, S. C. (2020). Universal Screening for Prevention of Reading, Writing, and Math Disabilities in Spanish. *J Vis Exp.* (161).
- Marino, M. T., & Beecher, C. C. (2010). Conceptualizing RTI in 21st-Century Secondary Science Classrooms: Video Games' Potential to Provide Tiered Support and Progress Monitoring for Students with Learning Disabilities. *Learning Disability Quarterly, 33*, 299-311.
- Meltzer, L. (2010). *Promoting Executive Function in the Classroom*. Guilford Press.
- Miranda, M. C., Piza, C. T., Assençõ, A. M. C., Villachan-Lyra, P., Pires, I. A., Chaves, E. C., Bueno, O. F. A. et al. (2019). Adaptação do Modelo Pre-K RTI ao contexto brasileiro da educação infantil: Desafios e perspectivas. *Neuropsicologia Latinoamericana, 11*.

- Miyake, A., Friedman, N. P., Emerson, M. J., Witzki, A. H., Howerter, A., & Wager, T. D. (2000). The Unity and Diversity of Executive Functions and Their Contributions to Complex “Frontal Lobe” Tasks: A Latent Variable Analysis. *Cognitive Psychology, 41*, 49-100.
- Reynolds, C. R., & Shaywitz, S. E. (2009). Response to Intervention: Prevention and Remediation, Perhaps. *Diagnosis, No. Child Development Perspectives, 3*, 44-47.
- Rodríguez, C., Areces, D., García, T., Cueli, M., & Gonzalez-Castro, P. (2021). Neurodevelopmental Disorders: An Innovative Perspective via the Response to Intervention Model. *World Journal of Psychiatry, 11*, 1017.
- Romine, C. B., & Reynolds, C. R. (2005). A Model of the Development of Frontal Lobe Functioning: Findings from a Meta-Analysis. *Applied Neuropsychology, 12*, 190-201.
- Rudasill, K. M., Acar, I., & Xu, Y. (2022). Early Teacher-Child Relationships Promote Self-Regulation Development in Prekindergarten. *Int J Environ Res Public Health, 19*, 8802.
- Seabra, A. G., & Dias, N. M. (2012). *Avaliação neuropsicológica cognitiva: Atenção e funções executivas* (Vol. 1). Memnon.
- Sedó, M. (2015). *O Teste dos cinco dígitos, versão brasileira Jonas Jardim de Paula, Leandro Malloy-diniz*. Hologrefe CETEPP.
- Shuai, L., Daley, D., Wang, Y. F., Zhang, J. S., Kong, Y. T., Tan, X., & Ji, N. (2017). Executive Function Training for Children with Attention Deficit Hyperactivity Disorder. *Chin Med J (Engl.)*, *130*, 549-558.
- Strauss, E., Sherman, E. M., & Spreen, O. (2006). *A Compendium of Neuropsychological Tests: Administration, Norms, and Commentary*. American Chemical Society.
- Sullivan, Y. W., Davis, F. D., & Koh, C. E. (2022). Executive Functions and Information Systems Learning. *MIS Quarterly, 46*, .
- Van der Ven, S. H., Kroesbergen, E. H., Boom, J., & Leseman, P. P. (2012). The Development of Executive Functions and Early Mathematics: A Dynamic Relationship. *Br J Educ Psychol.*, *82*, 100-119.
- Van Moorselaar, D., & Slagter, H. A. (2020). Inhibition in Selective Attention. *Ann N Y Acad Sci.*, *1464*, 204-221.
- Vellutino, F. R., Scanlon, D. M., Sipay, E. R., Small, S. G., Pratt, A., Chen, R., & Denckla, M. B. (1996). Cognitive Profiles of Difficult-to-Remediate and Readily Remediated Poor Readers: Early Intervention as a Vehicle for Distinguishing between Cognitive and Experiential Deficits as Basic Causes of Specific Reading Disability. *Journal of Educational Psychology, 88*, 601.
- Wechsler, D. (2012). *Wechsler Preschool and Primary Scale of Intelligence* (4th Ed.). The Psychological Corporation.
- Wechsler, D. (2014). *WISC-V: Administration and Scoring Manual*. NCS Pearson, Incorporated.
- Willoughby, M., Hudson, K., Hong, Y., & Wylie, A. (2021). Improvements in Motor Competence Skills Are Associated with Improvements in Executive Function and Math Problem-Solving Skills in Early Childhood. *Developmental Psychology, 57*, 1463.
- Wixson, K. (2011). A Systemic View of RTI Research: Introduction to the Special Issue. *The Elementary School Journal, 111*, 503-510.
- Yassin, K., & Khateb, A. (2022) The Contribution of Executive Functions, Visual Processing and Reading Skills to the Performance in the Colored Raven Progressive Matrices Test: A Predictive Study among First-to-Fourth Grade Arabic-Speaking Children. *Creative Education, 13*, 1067-1097.

Zimmermann, N., Cardoso, C. D. O., Kristensen, C. H., & Fonseca, R. P. (2017). Brazilian Norms and Effects of Age and Education on the Hayling and Trail Making Tests. *Trends in Psychiatry and Psychotherapy*, *39*, 188-195.