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Design and Validation of a Deep Processing-Based Cognitive Rehabilitation Package for Students with Attention-Deficit/Hyperactivity Disorder

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ABSTRACT

Purpose: This study aimed to identify the theoretical foundations, content components, and implementation principles required to develop and validate a deep processing-based cognitive rehabilitation package for students with attention-deficit/hyperactivity disorder (ADHD).

Methods and Materials: This qualitative study employed a documentary analysis design. Persian- and English-language scientific sources related to ADHD, executive functions, meta-learning, and deep processing were systematically and purposively searched. Following identification, screening, and full-text assessment, 36 eligible sources were included in the analysis. Extracted data were analyzed using thematic network analysis. Based on the resulting thematic framework, an initial intervention package consisting of one introductory session and 12 main sessions was developed. The package was subsequently evaluated by 10 experts for content validity, and the Content Validity Ratio (CVR) and Content Validity Index (CVI) were calculated. Expert feedback was also incorporated into the final revision of the intervention.

Findings: The thematic analysis yielded 32 basic themes, six organizing themes, and three global themes: cognitive and meta-learning components, deep processing strategies, and principles of intervention design and implementation. Working memory, response inhibition, cognitive shifting, and meta-learning constituted the four principal intervention domains, while deep processing strategies were integrated across all modules. Of the 24 evaluated components, 23 achieved the minimum acceptable CVR criterion. The mean CVR for the package components was 0.81, and the overall mean content validity index was 0.91, indicating satisfactory expert agreement regarding the necessity, relevance, and appropriateness of the developed package. Expert review additionally resulted in refinement of session content, exercise difficulty levels, progression criteria, implementation instructions, and parental involvement.

Conclusion: The developed deep processing-based cognitive rehabilitation package demonstrated satisfactory theoretical coherence and content validity for students with ADHD; however, its educational and clinical effectiveness should be established through controlled empirical studies.

Keywords: Cognitive Rehabilitation; Deep Processing; Attention-Deficit/Hyperactivity Disorder; Executive Functions; Meta-Learning

1. Introduction

Attention-deficit/hyperactivity disorder (ADHD) is one of the most extensively studied neurodevelopmental disorders of childhood and adolescence and is characterized by developmentally inappropriate patterns of inattention, hyperactivity, and impulsivity that interfere with academic, behavioral, and social functioning. Beyond its core behavioral manifestations, ADHD is frequently associated with impairments in higher-order cognitive processes that support purposeful, organized, and adaptive behavior. These impairments are especially evident in executive functions, including working memory, inhibitory control, cognitive flexibility, planning, monitoring, and the regulation of goal-directed activity. Because these cognitive processes play a central role in classroom learning, task completion, problem solving, and self-regulation, executive dysfunction can substantially magnify the educational difficulties experienced by students with ADHD. Contemporary research increasingly emphasizes that intervention for ADHD should not be limited to reducing observable symptoms but should also target the underlying cognitive processes that enable children to regulate attention, retain and manipulate information, inhibit ineffective responses, shift strategies, and monitor their own learning (Ramos-Galarza et al., 2024; Sadozai et al., 2024).

Executive functions are particularly important in understanding the cognitive profile of children with ADHD. Working memory enables the temporary maintenance and manipulation of information needed for ongoing cognitive activity, while inhibitory control supports the suppression of dominant, premature, or irrelevant responses. Cognitive shifting or flexibility allows individuals to move between rules, perspectives, strategies, or task demands when circumstances change. Deficits in these domains may lead to forgetfulness, difficulty following multistep instructions, incomplete schoolwork, impulsive responding, perseveration, reduced problem-solving efficiency, and poor adaptation to changing academic requirements. Experimental evidence has highlighted the importance of both working memory and inhibitory control deficits in children with ADHD and has shown that these mechanisms should be considered central targets of cognitive intervention rather than merely secondary correlates of

behavioral symptoms (Kofler et al., 2024). Broader evidence from children with neurodevelopmental conditions has likewise demonstrated that executive-function impairments are common and clinically meaningful across disorders, reinforcing the need for interventions that address executive processes directly and systematically (Sadozai et al., 2024).

The educational consequences of executive dysfunction are especially important because effective learning requires much more than the passive reception of information. Students must sustain attention, encode relevant information, hold instructions in mind, inhibit distractions, evaluate whether a chosen strategy is working, and modify their approach when necessary. In students with ADHD, weaknesses in these functions may disrupt both the quantity and quality of information processing. Difficulties in maintaining information can interfere with comprehension and task continuity, whereas poor inhibitory control may increase susceptibility to irrelevant stimuli and impulsive responses. Similarly, limited cognitive flexibility may make it difficult to shift from an ineffective strategy to a more appropriate one. These difficulties suggest that cognitive rehabilitation for ADHD should ideally address multiple interrelated executive functions rather than rely on narrowly focused practice of a single skill (Najari Almuti et al., 2023; Ramos-Galarza et al., 2024).

Cognitive rehabilitation has consequently emerged as an important intervention approach for strengthening impaired or inefficient cognitive processes in children and adolescents with ADHD. In this context, cognitive rehabilitation generally involves structured, repeated, and progressively challenging activities designed to improve functions such as attention, working memory, inhibitory control, response regulation, and cognitive flexibility. Evidence from intervention studies indicates that cognitive rehabilitation can improve several cognitive outcomes in individuals with ADHD. For example, comparative research on established cognitive rehabilitation packages has shown improvements in working memory and sustained attention among children with ADHD (Esmaeili et al., 2022). Similarly, interventions specifically designed to rehabilitate executive functions have demonstrated beneficial effects on attention and working memory (Behboudi et al., 2024), while inhibitory-control-based cognitive rehabilitation has been associated with improvements in cold executive functions, working

memory, and cognitive flexibility (Najari Almuti et al., 2023). These findings provide support for structured cognitive interventions while also underscoring the importance of clearly defining the target processes and mechanisms through which rehabilitation activities are expected to exert their effects.

Different formats of cognitive rehabilitation have been examined in the ADHD literature. Computerized cognitive rehabilitation has been used to target attentional processes and response control, with findings suggesting improvement in attention as well as visual and auditory response regulation (Pourmohseni Kalvari et al., 2023). Cognitive computer games and rehabilitation-based play therapy have also been compared as methods for strengthening working memory in children with ADHD, reflecting increasing interest in developmentally engaging and task-based formats (Nazeriyeh & Niknam, 2023). Remote interventions combining cognitive and balance-related tasks have further extended cognitive rehabilitation beyond conventional face-to-face settings and have been associated with improvements in executive functioning and reductions in behavioral symptoms (Rahnama et al., 2023). More recent work with adolescents has similarly indicated that cognitive rehabilitation may improve working memory, attentional difficulties, and cognitive emotion regulation (Mehranizadeh & Khoshlahjeh Sedgh, 2025). Taken together, this literature suggests that cognitive rehabilitation is a promising approach, but the diversity of intervention formats also raises the question of which theoretical principles and instructional processes should guide the design of a coherent and developmentally appropriate package.

A systematic perspective on intervention methods is therefore necessary. Reviews of executive-function stimulation in ADHD populations indicate that a wide range of cognitive, behavioral, computerized, physical, and multimodal approaches have been applied, with considerable variation in the functions targeted, training intensity, activity structure, and outcome measures (Ramos-Galarza et al., 2024). Exercise-based interventions have also been examined as a means of improving executive function in school-aged children with ADHD, and recent systematic review and meta-analytic evidence indicates that executive processes can be responsive to structured intervention beyond traditional cognitive training formats (Liu et al., 2025). This breadth of intervention research strengthens the view that executive functions are modifiable, but it also suggests that intervention effectiveness may depend not

merely on repeated practice but on how training activities engage cognitive processing, strategy use, self-monitoring, transfer, and meaningful learning.

One limitation of some cognitive training approaches is that repeated task performance does not automatically guarantee deep understanding, flexible strategy use, or transfer to untrained academic and everyday situations. A student may become more efficient at a specific computerized task without necessarily learning how to apply the underlying cognitive strategy when reading a text, solving a problem, organizing schoolwork, or controlling an impulsive response in the classroom. For rehabilitation to have broader educational value, training may need to promote active engagement with information, semantic organization, elaboration, self-explanation, comparison, retrieval, and application across contexts. This distinction is theoretically important because the depth with which information is processed has long been considered a major determinant of learning and memory, and contemporary experimental research continues to demonstrate that deeper processing affects memory performance and the persistence of encoded information over time (Dubravac et al., 2025; Peng et al., 2025).

The levels-of-processing perspective is particularly relevant to the development of cognitive rehabilitation activities. Deep processing refers to meaningful, elaborative, and semantically oriented engagement with information rather than superficial attention to perceptual or structural features. When learners connect new information with prior knowledge, generate examples, compare concepts, explain relationships, categorize material, or use information in a novel context, they create richer and more differentiated memory representations. Evidence on levels-of-processing effects demonstrates that the manner in which information is encoded can influence subsequent retention and forgetting (Peng et al., 2025). Research on memory for associations has also shown that processing depth can affect the encoding of relationships between elements, supporting the broader proposition that elaborative and meaningful processing contributes to stronger memory representations (Dubravac et al., 2025). These findings provide an important theoretical foundation for integrating deep processing strategies into interventions designed to improve working memory and executive functioning.

Integrating deep processing into cognitive rehabilitation may be particularly useful for students with ADHD because their difficulties often involve both maintaining information and using it strategically. For example, a working-memory

task can be designed simply as repetitive recall, or it can require the student to organize information, explain the relationship among items, identify a pattern, or link the material to a familiar context. Likewise, an inhibition task can move beyond response suppression by asking the student to verbalize the rule, identify interfering cues, explain why a response should be withheld, and reflect on how the same strategy might be used in classroom or social situations. A cognitive-shifting exercise can similarly be enriched by requiring comparison between alternative rules, explanation of why a strategy change is necessary, and transfer to a novel problem. Such features may increase the likelihood that cognitive training becomes not only repetitive practice but also a meaningful learning experience.

The role of meta-learning and self-regulation is closely connected with this perspective. Meta-learning can be understood as learning how to learn, including awareness of one's strategies, monitoring of performance, evaluation of errors, selection of appropriate approaches, and adjustment of behavior in response to feedback. Self-regulated learning similarly involves active goal setting, monitoring, strategy use, self-evaluation, and adaptive control of cognition and behavior. A systematic review of the relationship between executive functions and self-regulated learning has shown that these domains are strongly interconnected, as successful self-regulation depends on executive processes such as working memory, inhibition, shifting, and monitoring (Dörrenbächer-Ulrich & Bregulla, 2024). This relationship is highly relevant to ADHD, because deficits in executive control may undermine the student's ability to plan, monitor, and regulate learning even when basic academic knowledge is available.

Educational interventions targeting metacognitive and self-regulatory processes provide further support for including these components in cognitive rehabilitation. Training in cognitive, metacognitive, and emotion-regulation strategies has been shown to influence goal orientation in students with low academic performance, suggesting that strategic instruction can modify not only task performance but also the motivational and regulatory processes that organize learning (Aslani et al., 2023). Likewise, integrated motivational-metacognitive intervention based on a self-regulated learning framework has been associated with improvement in academic self-regulation among secondary-school students (Talehpasand & Taghipour, 2025). Although these studies were not limited to ADHD, they demonstrate the educational value of explicitly teaching students to set goals, monitor

performance, evaluate strategies, and regulate their learning behavior. Such processes may be particularly beneficial when incorporated into rehabilitation for students whose difficulties include poor monitoring, inconsistent strategy use, and weak persistence.

Evidence from related learning-disorder research also supports attention to processing strategies rather than relying exclusively on isolated cognitive drills. Training focused on brain processing skills has been used to improve cognitive functions in students with reading learning disorder, illustrating the potential value of interventions that organize activities around how information is processed rather than around symptom reduction alone (Moeini et al., 2023). This is conceptually consistent with the idea that cognitive rehabilitation can be strengthened by embedding tasks within a broader framework of information processing, strategy acquisition, and transfer. For students with ADHD, such an approach may help bridge the gap between improved performance during intervention sessions and improved functioning in authentic educational contexts.

The need for transfer is especially important in school-based rehabilitation. Improvements that remain limited to the practiced exercise may have relatively little practical impact if they do not generalize to classroom attention, homework completion, reading comprehension, problem solving, or behavioral self-control. Deep processing strategies may facilitate transfer because they require the learner to understand, explain, reorganize, and reapply information rather than merely repeat a response. Meta-learning may further strengthen transfer by helping students identify when a strategy is useful, monitor whether it is working, and deliberately apply it in new situations. In this sense, deep processing and meta-learning can function as mechanisms that connect executive-function training with real-world learning demands. This integrated perspective may be especially appropriate for ADHD, where cognitive deficits are often most impairing when they interfere with the coordinated use of strategies across changing situations.

Another important issue in intervention design is developmental appropriateness. Cognitive rehabilitation for school-aged children should be sufficiently structured to support attention and task completion while also being engaging enough to maintain motivation. Progressive difficulty, repetition, immediate feedback, game-like elements, concrete examples, and opportunities for successful performance may increase adherence and reduce frustration. Existing rehabilitation research with children with ADHD indicates that cognitive games, play-based

activities, computerized tasks, and structured executive-function exercises can all be used successfully when activities are adapted to children's developmental characteristics (Behboudi et al., 2024; Nazeriyeh & Niknam, 2023; Pourmohseni Kalvari et al., 2023). The challenge, however, is to integrate such activities within a theoretically coherent package rather than simply assembling a collection of exercises.

A further consideration is that executive functions should not necessarily be treated as completely independent skills. Working memory, inhibition, shifting, and self-monitoring interact during complex behavior. A student solving a multistep problem must maintain relevant information, inhibit an immediate but incorrect response, shift to a new approach when necessary, and monitor progress toward the goal. Intervention packages may therefore benefit from targeting these processes within an integrated framework. Research on working memory and inhibitory control in ADHD has emphasized the importance of considering competing and interacting executive mechanisms (Kofler et al., 2024), while studies of executive-function rehabilitation have shown that intervention targeting one domain may also influence related functions such as cognitive flexibility and working memory (Najari Almuti et al., 2023). An integrated package may therefore better reflect the interdependent nature of executive control.

Despite the growing evidence supporting cognitive rehabilitation, several gaps remain relevant to package development. First, many existing interventions emphasize cognitive performance but give less explicit attention to the depth of information processing during training. Second, transfer to academic and everyday contexts is not always directly embedded in the intervention structure. Third, metacognitive and meta-learning processes may be underrepresented even though self-regulated learning is closely related to executive functions (Dörrenbächer-Ulrich & Bregulla, 2024). Fourth, the theoretical rationale, session sequence, progression criteria, and mechanisms for integrating deep processing with executive-function exercises are not always made explicit. These limitations suggest the need for a package that combines evidence-based executive-function targets with elaborative processing strategies, self-monitoring, goal setting, feedback, and planned generalization.

The available Iranian literature further supports the relevance of developing such an intervention. Studies conducted with children and adolescents with ADHD have reported beneficial effects of cognitive rehabilitation on

working memory, sustained attention, response control, executive functioning, cognitive flexibility, and attention deficits (Behboudi et al., 2024; Esmaeili et al., 2022; Mehranizadeh & Khoshlahjeh Sedgh, 2025; Najari Almuti et al., 2023; Nazeriyeh & Niknam, 2023; Pourmohseni Kalvari et al., 2023; Rahnema et al., 2023). At the same time, educational studies have emphasized the value of cognitive, metacognitive, and self-regulatory strategy instruction for improving students' learning-related functioning (Aslani et al., 2023; Talehpasand & Taghipour, 2025). Together, these findings provide a strong empirical rationale for moving toward an intervention model that combines cognitive rehabilitation with deeper learning and self-regulatory mechanisms rather than treating these domains separately.

Accordingly, the theoretical logic of a deep processing-based cognitive rehabilitation package rests on several complementary assumptions: executive functions are core cognitive mechanisms that are frequently impaired in ADHD; these functions can be strengthened through systematic practice; the quality of cognitive engagement matters for learning and retention; elaborative and semantic processing can support more durable representations; self-monitoring and meta-learning can facilitate strategic control; and transfer is more likely when learners are explicitly required to apply strategies across tasks and contexts. The convergence of findings from executive-function research, cognitive rehabilitation studies, self-regulated learning, and levels-of-processing research therefore provides a coherent basis for developing a structured intervention that integrates working memory, response inhibition, cognitive shifting, and meta-learning with deep processing strategies (Dörrenbächer-Ulrich & Bregulla, 2024; Dubravac et al., 2025; Kofler et al., 2024; Peng et al., 2025).

The aim of the present study was to identify the theoretical foundations, content components, and implementation principles required to develop and validate a deep processing-based cognitive rehabilitation package for students with attention-deficit/hyperactivity disorder.

2. Methods and Materials

The present study employed a qualitative research design and was conducted using documentary analysis. The purpose of this stage was to identify the theoretical foundations, content components, and implementation elements required for developing a deep processing-based cognitive rehabilitation package. Data at this stage were collected from theoretical sources, empirical studies, and

intervention packages related to attention-deficit/hyperactivity disorder, executive functions, meta-learning, and deep processing and were examined through thematic analysis based on the thematic network approach. To identify sources relevant to the development of the deep processing-based cognitive rehabilitation package, Persian- and English-language sources were searched systematically and purposively. The electronic search covered the period from the inception of database indexing through December 31, 2025. English-language sources were searched in PubMed, Scopus, Web of Science, and ScienceDirect, while Google Scholar was used as a supplementary source for retrieving studies and citation tracking. Persian-language sources were searched in the Scientific Information Database (SID), Magiran, and the Iranian Research Institute for Information Science and Technology (IranDoc) Ganj database. In addition to the electronic search, the reference lists of relevant studies, books, and intervention packages were manually examined. The search strategy was developed in accordance with the PRISMA-S reporting principles.

The search was conducted across four conceptual domains: (1) attention-deficit/hyperactivity disorder and cognitive rehabilitation; (2) executive functions, including working memory, response inhibition, and cognitive shifting; (3) meta-learning, self-monitoring, and self-regulated learning; and (4) deep processing, levels of processing, and semantic elaboration strategies. Within each domain, synonymous and related terms were combined using the Boolean operator OR, while the AND operator was used to connect conceptual domains. Multiword phrases were placed within quotation marks, and in databases supporting truncation, the asterisk (*) was used to retrieve different word forms; examples included *executive function*, *working memor**, *rehabilitat**, and *self-regulat**. The NOT operator was not used in the primary search strings because it could result in the unintended exclusion of relevant sources; instead, irrelevant studies were excluded during screening according to the inclusion and exclusion criteria. Parentheses were used to group synonyms and logically combine conceptual blocks, and search fields were adapted to the structure of each database.

The English-language search included the terms and phrases “Attention-Deficit/Hyperactivity Disorder,” “ADHD,” “Cognitive Rehabilitation,” “Cognitive Training,” “Executive Functions,” “Response Inhibition,” “Inhibitory Control,” “Working Memory,” “Updating,”

“Cognitive Shifting,” “Task Switching,” “Set Shifting,” “Meta-learning,” “Learning to Learn,” “Self-monitoring,” “Self-regulated Learning,” “Deep Processing,” “Levels of Processing,” “Elaborative Processing,” and “Semantic Elaboration.” For Persian-language sources, the corresponding Persian equivalents of attention-deficit/hyperactivity disorder, cognitive rehabilitation, cognitive training, executive functions, response inhibition, inhibitory control, working memory, updating, cognitive shifting, set shifting, meta-learning, learning to learn, self-monitoring, self-regulated learning, deep processing, levels of processing, elaborative processing, semantic elaboration, and information organization were used. The basic search string was structured as follows:

("Attention-Deficit/Hyperactivity Disorder" OR ADHD) AND ("Cognitive Rehabilitation" OR "Cognitive Training") AND ("Executive Function*" OR "Response Inhibition" OR "Inhibitory Control" OR "Working Memor*" OR Updating OR "Cognitive Shifting" OR "Task Switching" OR "Set Shifting")

For the meta-learning domain, the following combination was implemented independently and in combination with the attention-deficit/hyperactivity disorder domain:

("Meta-learning" OR "Learning to Learn" OR "Self-monitoring" OR "Self-regulat* Learning") AND ("Executive Function*" OR Learning OR Cognition)

For the deep processing domain, the following combination was used:

("Deep Processing" OR "Levels of Processing" OR "Elaborative Processing" OR "Semantic Elaboration") AND (Learning OR Memory OR Cognition)

The above search strings were modified according to the structure of each database. In PubMed, terms were primarily searched in the title and abstract fields using the [Title/Abstract] tag, and relevant subject headings were also examined where available. In Scopus, the TITLE-ABS-KEY structure was used; in Web of Science, the TS= topic field was used; and in ScienceDirect, searches were conducted in titles, abstracts, and keywords. Google Scholar was used for supplementary searching, retrieval of relevant gray literature, and backward and forward citation tracking. In Persian-language databases, the Persian equivalents of the terms were searched using corresponding combinations of AND and OR. To enhance the comprehensiveness of retrieval, variant spellings, synonyms, and commonly used equivalents of each concept were also examined.

Table 1

Main Search Domains and Keywords Used for Source Retrieval

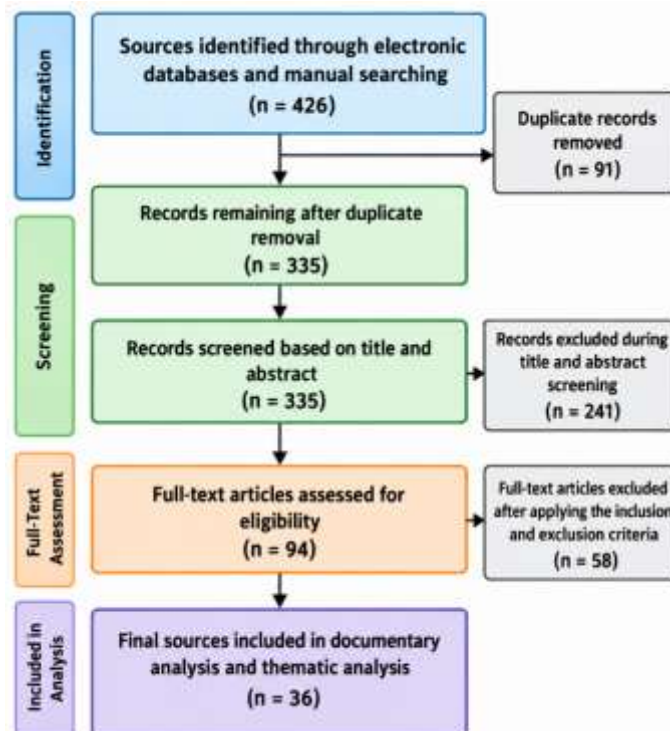
Search Domain	Persian Keywords	English Keywords
Disorder and intervention	Attention-deficit/hyperactivity disorder, cognitive rehabilitation, cognitive training	ADHD, Attention-Deficit/Hyperactivity Disorder, Cognitive Rehabilitation, Cognitive Training
Executive functions	Executive functions, response inhibition, working memory, updating, cognitive shifting	Executive Functions, Response Inhibition, Working Memory, Updating, Cognitive Shifting, Set Shifting
Meta-learning	Meta-learning, learning to learn, self-monitoring, self-regulated learning	Meta-learning, Learning to Learn, Self-monitoring, Self-regulated Learning
Deep processing	Deep processing, levels of processing, semantic elaboration, information organization	Deep Processing, Levels of Processing, Elaborative Processing, Semantic Elaboration

The inclusion criteria consisted of Persian- or English-language sources related to at least one of the major domains of the study, namely attention-deficit/hyperactivity disorder and cognitive rehabilitation; executive functions, including working memory, response inhibition, and cognitive shifting; meta-learning and self-regulatory processes; and deep processing and its associated strategies. Theoretical sources, empirical studies, and intervention packages or programs were included if they contained extractable information regarding theoretical foundations, cognitive

components, instructional strategies, or principles for intervention design and implementation relevant to the study objective. Sources with insufficient relevance to the conceptual domains of the study, studies that did not provide extractable information regarding the intended components or intervention design, and sources that, after full-text review, were found to be inconsistent with the purpose of developing the present package were excluded from the analysis.

Figure 1

PRISMA flow diagram of the identification, screening, and selection of research sources.



The retrieved records were imported into Mendeley reference management software. After duplicate records were removed, the titles and abstracts of the remaining sources were reviewed based on the inclusion and exclusion

criteria and their relevance to the study objectives. The full texts of sources considered potentially eligible during the initial stage were then assessed. Of the 426 records initially identified, 91 duplicates were removed, leaving 335 records

for title and abstract screening. At this stage, 241 records were excluded because they did not correspond to the study topic and conceptual domains, and the full texts of 94 sources were assessed. Following application of the inclusion and exclusion criteria during full-text review, 58 sources were excluded from further analysis, and 36 eligible sources were ultimately selected for data extraction and thematic analysis. The processes of identification, screening, full-text assessment, and final source selection were reported using the PRISMA 2020 flow diagram (Page et al., 2021) and are presented in Figure 1.

As shown in Figure 1, the largest reduction in the number of sources occurred during title and abstract screening, during which 241 of the 335 screened records were excluded. Subsequently, the full texts of 94 sources were evaluated, and 58 sources were excluded after the inclusion and exclusion criteria were applied. Ultimately, 36 sources consistent with the study objectives and the domains under investigation were included in the data extraction and thematic network analysis stage.

Information from the 36 selected sources was extracted using a researcher-developed form and recorded in

Microsoft Excel, and the full texts were imported into MAXQDA for coding. Meaning units relevant to the study objectives were coded, and semantically similar codes were classified into basic, organizing, and global themes (Attride-Stirling, 2001). To ensure the trustworthiness of the qualitative analysis, the codes and themes were checked against the original documents and reviewed by two experts in cognitive psychology and qualitative research methodology (Lincoln & Guba, 1985). Based on the extracted themes, the objectives, instructional content, cognitive exercises, assignments, and sequence of sessions were organized, and the preliminary version of the deep processing-based cognitive rehabilitation package was developed. Considering the appropriateness of the activities for the cognitive and developmental characteristics of students with attention-deficit/hyperactivity disorder, this version was submitted to 10 experts in cognitive psychology, educational psychology, psychology of exceptional children, and cognitive rehabilitation for assessment of face and content validity. The characteristics of the experts who evaluated the package are presented in Table 2.

Table 2

Characteristics of Experts Evaluating the Package

Expert Code	Area of Expertise	Academic Qualification	Role in the Study
Expert 1	Cognitive rehabilitation and neurodevelopmental disorders	PhD	Evaluation of the necessity and quality of package components
Expert 2	Educational psychology and positive psychology	PhD/Postdoctoral	Assessment of the educational and developmental appropriateness of the package
Expert 3	Child and adolescent psychology	PhD	Assessment of the package's appropriateness for students' characteristics
Expert 4	Counseling	PhD	Evaluation of the feasibility of implementing the package in educational and counseling settings
Expert 5	Psychology	PhD	Assessment of face and content validity and provision of revision recommendations
Expert 6	Cognitive psychology and cognitive sciences	PhD	Assessment of the consistency of exercises with executive function components and deep processing principles
Expert 7	Psychology and education of exceptional children	PhD	Evaluation of the appropriateness of package content for the characteristics and needs of students with attention-deficit/hyperactivity disorder
Expert 8	Neuropsychology	PhD	Assessment of the cognitive foundations of working memory, response inhibition, and cognitive shifting exercises
Expert 9	Educational technology and instructional design	PhD	Evaluation of session sequencing, activity presentation methods, and the appropriateness of the instructional structure of the package
Expert 10	Clinical child and adolescent psychology	PhD	Assessment of clinical appropriateness, feasibility, and safety of package activities for the target group

The experts evaluated the package components in terms of necessity, consistency with the study objectives, relevance, content clarity, simplicity and feasibility of instructions, session sequencing, appropriateness of exercises for the target group, duration of activities, and overall feasibility. The face validity of the package was

examined based on the experts' qualitative views and recommendations for revision. To assess content validity, the Content Validity Ratio (CVR) was calculated according to Lawshe's (1975) method, and content validity indices were calculated on the basis of expert agreement regarding the relevance, clarity, and simplicity/feasibility of package

components. Given the panel of 10 experts, the minimum acceptable CVR was set at 0.62. Values of 0.78 or higher for the content validity indices were considered indicative of an acceptable level of agreement (Polit et al., 2007).

3. Findings and Results

Information from the 36 selected sources was extracted using a researcher-developed form and recorded in Microsoft Excel, and the full texts of the sources were imported into MAXQDA for coding. Data analysis was conducted using the thematic network method; accordingly, meaning units relevant to the study objectives were coded, similar and overlapping codes were merged, and the final codes were organized into basic, organizing, and global themes. For example, from a statement in one of the selected

sources indicating that exercises involving the simultaneous maintenance and updating of several pieces of information improve memory performance, the code “simultaneous information maintenance and updating practice” was extracted. Together with similar codes, such as “sequential recall” and “gradual increase in memory load,” this code was classified under the basic theme “information maintenance” and ultimately under the organizing theme “working memory.” Applying this process to the 36 sources resulted in the extraction of 248 initial codes, which were reduced to 73 final codes after synonymous and overlapping codes were merged. The final codes were organized into 32 basic themes, six organizing themes, and three global themes. Overall, 532 coded segments were classified into the six organizing themes, the distribution of which is presented in Table 3.

Table 3

Distribution of Coded Segments Across Organizing and Global Themes

No.	Global Theme	Organizing Theme	Frequency	Percentage
1	Cognitive and meta-learning components	Working memory	74	13.9
2	Cognitive and meta-learning components	Response inhibition	60	11.3
3	Cognitive and meta-learning components	Cognitive shifting	55	10.3
4	Cognitive and meta-learning components	Meta-learning	66	12.4
5	Deep processing strategies	Deep processing strategies	151	28.4
6	Principles of intervention design and implementation	Principles of intervention design and implementation	126	23.7
Total			532	100

The three global themes derived from the analysis were as follows: first, “cognitive and meta-learning components,” comprising working memory, response inhibition, cognitive shifting, and meta-learning, with a total of 255 coded segments (47.9%); second, “deep processing strategies,” comprising activation of prior knowledge, semantic elaboration, organization, comparison, example generation, self-explanation, and application in novel situations, with 151 coded segments (28.4%); and third, “principles of intervention design and implementation,” including gradual difficulty progression, repetition, feedback, attractiveness, generalization, homework, and developmental appropriateness, with 126 coded segments (23.7%).

Deep processing strategies were not conceptualized as a separate module; rather, they were integrated into the exercises of the four main domains of the package. In other words, in addition to performing each exercise, students engaged in activities such as explaining relationships among information, generating examples, and applying the learned strategy in novel situations. The principles of intervention

design and implementation also provided a basis for translating the extracted cognitive components and processing strategies into structured, feasible activities appropriate for the characteristics of the target group. Based on these findings, the organizing themes served as the foundation for designing the package components. For example, the organizing theme “working memory,” which encompassed basic themes such as information maintenance, updating, and manipulation, led to the development of exercises such as progressively demanding sequential recall and N-back tasks. The “response inhibition” theme provided the basis for developing exercises based on the Stroop task and response stopping, while the “meta-learning” theme led to the development of goal-setting and self-monitoring activities and forms. Accordingly, the preliminary package consisted of one introductory session and 12 main sessions organized into four modules: working memory, response inhibition, cognitive shifting, and meta-learning. Deep processing strategies were integrated into the activities of all four



modules. The process through which the extracted themes were translated into the package structure is presented in Table 4.

Table 4

Translation of Extracted Themes Into the Package Structure

Design Stage	Underlying Themes	Action Taken	Stage Output
Identification of target domains	Working memory, response inhibition, cognitive shifting, meta-learning, and deep processing	Extraction of cognitive and learning domains from thematic analysis	Identification of the main package domains
Development of performance objectives	Information maintenance and manipulation, response inhibition, strategy shifting, goal setting, and monitoring	Translation of themes into trainable behavioral and cognitive objectives	Development of general and specific objectives
Selection of foundations and strategies	Semantic processing, elaboration, self-explanation, example generation, and generalization	Integration of cognitive exercises with deep processing strategies	Determination of the theoretical rationale and activity procedures
Design of intervention activities	Basic themes and principles of intervention implementation	Development of exercises for working memory, inhibition, rule shifting, and meta-learning	Development of session activities
Implementation planning	Gradual difficulty progression, repetition, feedback, attractiveness, homework, and developmental appropriateness	Organization of 13 group sessions of 45 minutes each across four main modules	Development of session structure and sequence
Preliminary evaluation of the package	Necessity, appropriateness, simplicity, clarity, and feasibility	Submission of the preliminary version to experts and assessment of face and content validity	Identification of required revisions and development of the revised package

Examination of the experts' views regarding the qualitative face validity of the package indicated that the theoretical structure, sequence of modules, and core exercises were generally considered appropriate; however, recommendations were offered to improve the clarity, appropriateness, and feasibility of the package. The most important recommendations included replacing the term

“deep learning” with “deep processing,” expanding the exercise instructions, specifying progression criteria and difficulty levels, adding academic and everyday examples, developing self-monitoring and goal-setting forms, and preparing a therapist manual. A summary of the experts' recommendations and the revisions made is presented in Table 5.

Table 5

Summary of Expert Recommendations and Revisions Made

No.	Expert Recommendation	Revision Made
1	Ambiguity of the term “deep learning”	Replaced with “deep processing” throughout the package
2	Exercise instructions were too brief	Added detailed steps, duration, and delivery procedures
3	Progression criterion was unclear	Defined a mastery criterion for advancing to the next level
4	Need to grade N-back exercises by difficulty	Defined easy, moderate, and difficult levels
5	Insufficient examples for cognitive shifting	Added rule-shifting and multiple-solution problem-solving examples
6	Insufficient academic/everyday examples	Added academic and social situations
7	Complexity of meta-learning concepts	Simplified the language and added concrete examples
8	Absence of an operational meta-learning form	Added goal-setting, self-monitoring, and self-evaluation forms
9	Insufficient feedback guidelines	Added sample statements and a feedback framework
10	Need for greater attractiveness	Increased game-based and varied stimuli
11	Insufficient consideration of individual differences	Made the pace and difficulty level more flexible
12	Need for feasibility indicators	Added indicators of attendance, participation, and adherence
13	Unclear parental role	Defined supportive and supervisory roles for parents
14	Excessive density of some sessions	Transferred supplementary exercises to homework assignments

After the experts' recommended revisions were applied, the main structure of the package, consisting of the four

modules of working memory, response inhibition, cognitive shifting, and meta-learning, was retained; however, the

instructions were clarified, the exercises were made more gradual, and the examples were better adapted to students' academic and everyday situations. To assess the necessity of the package components, responses from the 10 experts were analyzed using Lawshe's method, and the Content Validity Ratio (CVR) was calculated for each component. Given the number of experts, 0.62 was considered the minimum acceptable CVR. The results indicated that 23 of the 24 evaluated components met the required threshold, and the mean CVR of the package components was 0.81. The highest level of expert agreement (CVR = 1.00) was observed for the response inhibition and cognitive shifting modules and for the theoretical foundation of the package. The only component below the acceptance threshold was "holding separate parent training sessions" (CVR = 0.60). Accordingly, separate parent sessions were removed and replaced with a brief guideline for parental support and supervision of homework assignments within the package.

Table 6

Results of the Content Validity Evaluation of Package Components

Package Component	Relevance	Clarity	Simplicity/Feasibility	Mean Component CVI	Result
Introductory session	1.00	0.90	0.90	0.93	Approved
Working memory module	1.00	0.90	0.80	0.90	Approved
Response inhibition module	1.00	1.00	0.90	0.97	Approved
Cognitive shifting module	1.00	0.80	0.80	0.87	Approved
Meta-learning module	1.00	0.80	0.80	0.87	Approved
Homework assignments	1.00	0.90	0.90	0.93	Approved
Overall Mean				0.91	Acceptable

Overall, the findings of the documentary analysis led to the identification of the components and principles required for developing the deep processing-based cognitive rehabilitation package, and the expert evaluation results supported the face and content adequacy of the developed version.

4. Discussion and Conclusion

The present study was conducted to identify the theoretical foundations, content components, and implementation principles required for developing and validating a deep processing-based cognitive rehabilitation package for students with attention-deficit/hyperactivity disorder (ADHD). The documentary analysis resulted in 248 initial codes, which were reduced to 73 final codes and organized into 32 basic themes, six organizing themes, and three global themes. The three global themes were cognitive and meta-learning components, deep processing strategies,

To assess content validity, the level of expert agreement regarding the three criteria of "relevance," "clarity," and "simplicity/feasibility" was calculated for the package components. Values of 0.78 or higher were considered indicative of an acceptable level of agreement. To describe the overall status of each component, the mean values obtained for the three criteria were calculated and reported as the "mean component CVI." The results indicated that expert agreement regarding the relevance of all package components was 1.00. The highest mean component CVI was obtained for the response inhibition module (0.97), whereas the lowest values were obtained for the cognitive shifting and meta-learning modules, each with a value of 0.87. All values exceeded the predefined acceptance threshold, and the overall mean CVI of the package components was 0.91.

and principles of intervention design and implementation. Within the first global theme, working memory, response inhibition, cognitive shifting, and meta-learning emerged as the four principal domains around which the intervention package was structured. Deep processing strategies were not developed as a separate module but were incorporated across these four domains. On this basis, the preliminary intervention comprised one introductory session and 12 main sessions organized into four modules. Expert evaluation further supported the content adequacy of the package: 23 of the 24 evaluated components reached the acceptable Content Validity Ratio (CVR) threshold, the mean CVR was 0.81, and the overall mean Content Validity Index (CVI) was 0.91. Collectively, these findings indicate that the proposed package possesses a coherent theoretical structure and satisfactory face and content validity, while also identifying areas that required refinement before empirical evaluation.

One of the principal findings was the central position of working memory in the proposed rehabilitation package. Working memory constituted one of the major organizing themes and included elements such as maintaining, updating, and manipulating information. This finding is consistent with evidence indicating that working-memory impairment represents an important component of the cognitive difficulties associated with ADHD. Experimental research has demonstrated that working memory and inhibitory control deficits are both highly relevant to the cognitive profile of children with ADHD and can contribute to difficulties in sustained goal-directed behavior (Kofler et al., 2024). The present package therefore included progressively challenging working-memory activities, such as sequential recall and N-back tasks. This decision is also supported by intervention studies showing that cognitive rehabilitation can improve working memory in children with ADHD (Behboudi et al., 2024; Esmaeili et al., 2022; Nazeriyeh & Niknam, 2023). More recent findings among adolescents have similarly indicated that cognitive rehabilitation may improve working memory and attentional functioning (Mehranzadeh & Khoshlahjeh Sedgh, 2025). Thus, the identification of working memory as a principal rehabilitation target is consistent with both theoretical accounts of ADHD and empirical intervention evidence.

Response inhibition emerged as a second major organizing theme and was incorporated into the package through activities based on response suppression, interference control, and tasks such as the Stroop paradigm. This result is also consistent with the literature emphasizing inhibitory dysfunction as a central executive-control difficulty in ADHD. Kofler et al. reported evidence supporting significant inhibitory-control difficulties among children with ADHD and demonstrated the importance of distinguishing and evaluating the contribution of executive mechanisms to ADHD-related impairment (Kofler et al., 2024). Furthermore, cognitive rehabilitation specifically focused on inhibitory control has been shown to improve not only inhibitory functioning but also related executive abilities such as working memory and cognitive flexibility (Najari Almuti et al., 2023). Computerized cognitive rehabilitation has likewise been associated with improvements in visual and auditory response control, suggesting that systematic practice can strengthen the regulation of behavioral responses in children with ADHD (Pourmohseni Kalvari et al., 2023). The strong expert agreement regarding the response inhibition module in the present study, reflected in a CVR of 1.00 and the highest

mean component CVI of 0.97, further supports the theoretical and practical relevance of including this domain in the package.

Cognitive shifting constituted the third major executive-function component identified through thematic analysis. The inclusion of cognitive shifting reflects the need for students with ADHD to move flexibly between rules, strategies, perspectives, and task demands. Such flexibility is particularly important in academic environments, where students are required to alternate between different cognitive operations, modify ineffective strategies, and respond adaptively to changing instructions. Evidence from previous cognitive rehabilitation research supports this component. Inhibitory-control rehabilitation has been associated with improvements in cognitive flexibility among children with ADHD (Najari Almuti et al., 2023), while systematic reviews of executive-function stimulation methods indicate that cognitive flexibility is an important intervention target in ADHD populations (Ramos-Galarza et al., 2024). The broader literature on neurodevelopmental conditions also identifies executive flexibility as part of the complex pattern of executive-function difficulties observed in affected children (Sadozai et al., 2024). Accordingly, incorporating rule-shifting, multiple-solution problem solving, and strategy-switching activities into the package appears theoretically justified.

Another important finding was the emergence of meta-learning as a distinct organizing theme. Unlike conventional cognitive rehabilitation programs that may concentrate primarily on task performance, the present package explicitly incorporated goal setting, self-monitoring, self-evaluation, and awareness of learning strategies. This finding is important because improvement in an isolated cognitive task does not necessarily ensure that students will recognize when, why, and how to use the trained strategy in academic or everyday situations. The systematic review by Dörrenbächer-Ulrich and Bregulla demonstrated a close relationship between executive functions and self-regulated learning, indicating that working memory, inhibition, shifting, and monitoring processes contribute substantially to effective regulation of learning (Dörrenbächer-Ulrich & Bregulla, 2024). Educational intervention research similarly shows that cognitive and metacognitive strategy training can influence students' goal orientation and learning-related functioning (Aslani et al., 2023). Moreover, an integrated motivational-metacognitive intervention based on Pintrich's model was found to improve academic self-regulation in secondary-school students (Talehpasand & Taghipour,

2025). These findings support the present study's decision to treat meta-learning as a core rehabilitation domain rather than a secondary educational supplement.

The identification of deep processing strategies as a global theme was another central result. The analysis yielded strategies such as linking new information to prior knowledge, semantic elaboration, organization, comparison, example generation, self-explanation, and application in new situations. Importantly, these strategies were not structured as an independent module but were integrated across working-memory, response-inhibition, cognitive-shifting, and meta-learning activities. This approach is theoretically consistent with research on levels of processing, which demonstrates that the depth and quality of encoding influence subsequent memory and retention. Peng et al. showed that levels of processing affect memory performance and patterns of forgetting, providing contemporary support for the importance of processing depth in durable learning (Peng et al., 2025). Similarly, Dubravac et al. demonstrated levels-of-processing effects on memory for color-object associations, indicating that deeper processing can influence the encoding and later retrieval of associative information (Dubravac et al., 2025). Therefore, incorporating semantic elaboration, explanation, comparison, and application into cognitive exercises may provide a mechanism for moving rehabilitation beyond repetitive task practice toward more meaningful cognitive engagement.

The integration of deep processing across modules may also address an important challenge in cognitive rehabilitation: the transfer of training effects. Repeated performance on a specific working-memory or inhibition task may improve performance on that task without necessarily producing broad improvements in classroom learning or daily self-regulation. By asking students to explain strategies, generate examples, connect tasks to prior knowledge, and apply learned procedures in novel situations, the present package was designed to increase the likelihood of generalization. This orientation is compatible with research emphasizing structured cognitive interventions while also suggesting that rehabilitation should engage broader cognitive and strategic processes (Ramos-Galarza et al., 2024). Studies of cognitive rehabilitation in ADHD have documented improvements in attention, executive functions, and behavioral symptoms across computerized, face-to-face, and remote formats (Behboudi et al., 2024; Pourmohseni Kalvari et al., 2023; Rahnama et al., 2023). The present package extends this line of work by

explicitly embedding processing-depth strategies into the exercises rather than treating cognitive training and meaningful learning as separate processes.

The global theme of principles of intervention design and implementation further demonstrated that the effectiveness and feasibility of cognitive rehabilitation depend not only on the cognitive targets selected but also on how intervention activities are structured. The extracted principles included gradual increases in difficulty, repetition, feedback, attractiveness, generalization, homework, and developmental appropriateness. These characteristics are consistent with the diversity of methods identified in reviews of executive-function interventions for ADHD, which include computerized training, cognitive exercises, physical activity, and multimodal approaches (Ramos-Galarza et al., 2024). Meta-analytic findings concerning exercise interventions also demonstrate that executive functions in school-aged children with ADHD can respond to systematically designed interventions, further reinforcing the broader principle that repeated and structured engagement can promote executive functioning (Liu et al., 2025). The present study therefore treated implementation characteristics as part of the theoretical architecture of the package rather than merely logistical details.

The emphasis on developmental appropriateness and engagement is particularly relevant because rehabilitation exercises may be difficult for students with ADHD to sustain if they are excessively repetitive, complex, or insufficiently motivating. Previous studies have employed cognitive games, play-based therapy, computerized exercises, and remote rehabilitation formats to increase accessibility and engagement (Nazeriyeh & Niknam, 2023; Pourmohseni Kalvari et al., 2023; Rahnama et al., 2023). The findings of the present expert review similarly led to the introduction of more game-based stimuli, greater flexibility in difficulty levels, clearer progression criteria, and additional academic and everyday examples. These revisions strengthen the ecological and developmental appropriateness of the package and may help maintain engagement while avoiding either underchallenge or excessive cognitive load.

The use of meta-learning and processing strategies also aligns with findings from populations with learning difficulties. Training in brain processing skills has been reported to improve cognitive functions among students with reading learning disorder, suggesting that interventions directed toward patterns of information processing can contribute to cognitive performance (Moeini et al., 2023). Although the population in that study differs from students

with ADHD, the findings support the broader proposition that cognitive intervention can be enhanced when learners are explicitly taught how to process, organize, monitor, and apply information. The present package incorporates these principles through self-monitoring forms, goal-setting activities, strategy explanations, semantic elaboration, and generalization exercises.

The expert-validation findings provide additional support for the content adequacy of the intervention. Of the 24 components assessed for necessity, 23 met the required CVR threshold, with an overall mean CVR of 0.81. Moreover, all evaluated package components exceeded the predefined acceptable threshold for content validity indices, and the overall mean CVI reached 0.91. Particularly strong agreement was obtained regarding relevance, which received a value of 1.00 for all major components. These findings suggest that the selected objectives, modules, exercises, and implementation principles were regarded by specialists as closely aligned with the intended purpose of the intervention. The response-inhibition module received the highest mean component CVI, whereas the cognitive-shifting and meta-learning modules received comparatively lower, though still acceptable, values. This pattern may reflect the greater complexity involved in translating flexible shifting and meta-learning processes into standardized, developmentally appropriate intervention activities. The qualitative feedback provided by the experts was therefore important for improving the operational clarity of these components.

The only element that did not meet the designated CVR threshold was the inclusion of separate parent-training sessions. Consequently, this component was removed and replaced with a concise guideline defining parents' supportive and supervisory role in homework activities. This modification reflects an important distinction between the core cognitive rehabilitation delivered directly to students and ancillary supports that may facilitate implementation but are not necessarily essential components of the intervention itself. The revision also helped preserve the focus and feasibility of the package while maintaining parental involvement at a practical level. Similar attention to feasibility is relevant given that previous cognitive rehabilitation interventions have been delivered through diverse formats, including computerized, remote, and child-focused training approaches (Esmaeili et al., 2022; Mehranizadeh & Khoshlahjeh Sedgh, 2025; Rahnama et al., 2023).

Overall, the findings support a conceptual model in which cognitive rehabilitation for ADHD should integrate core executive functions with metacognitive regulation and meaningful information processing. Working memory, inhibitory control, and cognitive shifting provide the executive architecture necessary for maintaining goals and controlling behavior, while meta-learning enables students to monitor and deliberately regulate the use of those cognitive resources. Deep processing strategies may further strengthen learning by encouraging semantic elaboration, organization, self-explanation, and transfer. This integrated framework is consistent with evidence showing that executive functions are modifiable through intervention (Behboudi et al., 2024; Liu et al., 2025), that executive functions are linked to self-regulated learning (Dörrenbächer-Ulrich & Bregulla, 2024), and that deeper processing influences memory and retention (Dubravac et al., 2025; Peng et al., 2025). The package developed in the present study therefore represents an attempt to connect these previously related but often separately applied lines of evidence within a single structured intervention for students with ADHD.

The present study has several limitations that should be considered when interpreting its findings. First, the study focused on package development and content validation rather than experimental evaluation; therefore, the reported findings demonstrate theoretical coherence and expert-supported content adequacy but do not establish the effectiveness of the intervention in improving executive functions, academic performance, ADHD symptoms, or everyday functioning. Second, although the documentary analysis included Persian- and English-language sources from several major databases, potentially relevant studies indexed elsewhere or published in other languages may not have been captured. Third, thematic coding necessarily involved interpretive judgment despite the use of expert review and comparison with original documents. Fourth, content validation was conducted with a relatively small panel of 10 experts, and a larger or more internationally diverse panel might have generated additional perspectives. Finally, the package was developed specifically for students with ADHD, and its applicability to different age groups, clinical profiles, severity levels, comorbid conditions, or cultural contexts cannot be assumed without further investigation.

Future studies should evaluate the efficacy of the developed package through well-designed randomized controlled trials using appropriate active or treatment-as-

usual comparison groups. Research should examine both proximal outcomes, such as working memory, response inhibition, cognitive shifting, and meta-learning, and distal outcomes, including classroom behavior, academic achievement, homework management, self-regulation, and ADHD symptom severity. Follow-up assessments are needed to determine whether any improvements are maintained over time and whether deep processing increases the transfer of training effects to untrained tasks and everyday settings. Future studies may also compare the present integrated package with conventional cognitive rehabilitation to determine the incremental contribution of deep processing and meta-learning components. Investigation of potential moderators, including age, ADHD presentation, baseline executive-function impairment, medication status, motivation, and comorbid learning difficulties, would further clarify for whom the intervention is most effective. Qualitative studies involving students, parents, teachers, and therapists could additionally provide evidence regarding acceptability, feasibility, perceived usefulness, and barriers to implementation.

For practical implementation, the package should be delivered by professionals familiar with ADHD, executive functions, cognitive rehabilitation, and child development, with close adherence to the progression criteria and session structure while allowing reasonable adjustment to individual performance. Exercise difficulty should be increased gradually and only after students demonstrate adequate mastery, and feedback should be immediate, specific, supportive, and focused on strategy use rather than merely correct or incorrect responses. Therapists should consistently connect cognitive exercises to academic and everyday situations so that students understand where and how the trained strategies can be applied. Self-monitoring and goal-setting forms should be used routinely to strengthen students' awareness of their learning processes. Homework should remain brief, structured, and feasible, with parents providing support and supervision without completing tasks for the child. In educational settings, collaboration with teachers may further facilitate the generalization of trained skills to classroom tasks, and fidelity checklists should be used to ensure consistent implementation across practitioners and settings.

Authors' Contributions

All authors significantly contributed to this study.

Declaration

In order to correct and improve the academic writing of our paper, we have used the language model ChatGPT.

Transparency Statement

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Declaration of Interest

The authors report no conflict of interest.

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Ethical Considerations

In this study, to observe ethical considerations, participants were informed about the goals and importance of the research before the start of the study and participated in the research with informed consent.

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