



Impact of Dynamic Assessment on ADHD L2 Learner's Knowledge of Alphabet and Vocabulary and Selective Attention: A Case Study

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Abstract

Equal educational and language learning chances for ADHD students is an important consideration. While they may require additional support and accommodations to address their specific learning needs, it is necessary to ensure that they have the same opportunities for academic success as non-ADHD learners. The present case study aimed to explore the effects of interactionist dynamic assessment on ADHD L2 learner's knowledge of alphabet, vocabulary knowledge, and selective attention. The participant was a 10-year-old male EFL learner with the combined type of ADHD who willingly participated in the study as a zero beginner. During each DA session, a few alphabet letters and a few new vocabulary items were taught through mediations emerging from the interactions between the mediator and the learner. The required data were collected using the Computerized Stroop and teacher-made alphabet and Vocabulary tests. The microgenetic analysis of DA protocols led to the development of an inventory of mediations consisting of different forms of implicit and explicit prompts. The quantitative analysis of the data demonstrated that DA had contributed to the learner's alphabet and vocabulary knowledge and some congruent parameters of selective attention. The qualitative data analysis also indicated several fluctuations in the participant's performance in specific DA sessions. The findings of the study call for teachers' and materials developers' greater attention to ADHD L2 learners' needs in the process of language learning.

Keywords: *Alphabet; Attention Deficit Hyperactivity Disorder (ADHD); Dynamic Assessment; Selective Attention; Vocabulary Knowledge*

1. Introduction

Within the field of second language learning, it is only recently that research into dynamic assessment (DA) has emerged. Using DA procedures reflect the increasing attention in education, specifically in special education, to instruction-based assessment rather than trying to generate some diagnostic labels for program eligibility [1]. DA is based on the premise that human potentials develop through participation in activities in which learners receive guidance from others with an opportunity to exploit the existing cultural resources. In other words, the development of human knowledge and mental abilities is enhanced through different forms of sociocultural mediation [2].

The notion of DA is widely known in association with Sociocultural Theory (SCT) and Vygotsky's notion of ZPD. The Sociocultural Theory of mind argues that cognitive development or learning takes place first at the intermental or social level and then at the intramental or individual level [3]. Vygotsky maintained that the extent of the move from the social to the cognitive process is determined by the individual's ZPD. In this process, the more knowledgeable individual helps the less able one to achieve self-regulation through dialogic interaction.

Central to Vygotsky's theory of mind and the ZPD is the element of mediation. Higher levels of cognitive functioning are socially and culturally developed, emerging from interacting with other people and physical resources in the learning context, such as written materials, computers, and pictures, created by others in different locations and times [4]. According to Antón and García [5], "mediation in DA refers to the intervention of the assessor in order to select, amplify, and interpret objects and processes to the



learner during the assessment” (p. 172). A learner’s response to mediation demonstrates their abilities in the process of shaping and consequently provides a complete image of their developmental path [2].

DA is also regarded as an efficient approach to identifying learning processes, learning ability, cognitive functions, and the mediational strategies required for the development of different groups’ learning potentials [6]. DA is in fact employed to recognize barriers to learning, identify ways to overcome potential difficulties, and assess the impact of eliminating factors that might block subsequent learning and efficient performance [1]. As one of the most common childhood psychiatric disorders, the Attention-Deficit Hyperactivity Disorder (ADHD), is the latest of a long line of diagnostic labels for children suffering from significant issues regarding attention, impulse control, and over-activity [7]. ADHD students also suffer from some deficits regarding selective attention because they are easily distracted or select irrelevant stimuli [8].

Second language learning usually exposes ADHD individuals to further problems because many of them also suffer from difficulties in speech processing caused by their central nervous system dysfunction [9]. Some of the problems ADHD students face in the course of second language learning originate in their weak language processing skills [10]. For example, when involved in the phonological processing of data, they may be confused by the words that start with the same sound(s) and find it hard to decode written text and pronounce and recall polysyllabic words. They also have problems with understanding parts of speech [11]. Simon [12] reported that ADHD students have some difficulty remembering vocabulary, grammar, and pronunciation rules, which could impede accurate speech. While there is an expanding plethora of scientific research on the problems of L1 individuals with ADHD, research on the remediation of their vocabulary deficits, alphabet learning problems, and selective attention are relatively new within the field of foreign language learning. To bridge this gap, the present study was conducted to investigate the effects of DA on ADHD L2 learner’s knowledge of alphabet and vocabulary and selective attention.

2. Method

2.1 Research Questions

1. To what extent does the employment of DA contribute ADHD L2 learner’s knowledge of the alphabet?
2. To what extent ways does the employment of DA contribute to ADHD L2 learner’s vocabulary knowledge?
3. To what extent does the employment of DA affect ADHD L2 learner’s working memory capacity?
4. In what ways does the employment of DA contribute to ADHD L2 learner’s knowledge of alphabet?
5. In what ways does the employment of DA contribute to ADHD L2 learner’s vocabulary knowledge?

2.2 Instruments

- The Computerized Stroop Test measuring selective attention
- A researcher-made alphabet posttest including seven items that required the participant to circle and color the correct letter, circle the words beginning with specified letter, find and circle the same letter, and complete the missing parts with appropriate letters
- A researcher-made vocabulary posttest including 6 pictorial matching items, coloring and circling the correct answers, counting, writing the correct number, and choosing the correct words

2.3 Participant

This case study was conducted with a single 10-year-old participant with ADHD, called Rayan henceforth, chosen based on a convenience and purposive sampling procedure. He was a fourth grader at an elementary public school in Tehran (Iran) and a monolingual speaker of Persian. As a zero beginner, he attended English classes twice a week, each session lasting 90 minutes. The class continued for 42 sessions for seven months. He had been diagnosed with ADHD when he was eight. He was predominately inattentive and exhibited impulsive/hyperactive symptoms (combined type). He was also receiving psychopharmacological treatment during the study.



2.4 Design

A single-subject research design was used to collect both quantitative and qualitative data on the effects of DA on ADHD L2 learner's knowledge of English alphabet and vocabulary and selective attention. The interactionist DA and a microgenetic methodology were employed to give the treatment to the participant.

2.5 Procedure

Initially, the required data about the participant's medical and educational background, foreign language knowledge, and home life were meticulously collected, and the parents' signed consent as to their child's participation in the study was obtained. Prior to the treatment, the mediator- teacher (one of the researchers) had some sessions with Rayan to develop a friendly relationship and establish rapport with him. Based on the researchers' observations, Rayan was an intelligent, intuitive, spontaneous, and creative student who could learn from both visual and auditory stimuli. He was a highly motivated and hard-working student and took the learning of English seriously; however, he was also moody and frequently acted impulsively in the class. He enjoyed his English class, but it was really difficult for him to learn the alphabet and new vocabulary. His most common behaviors in the English class included standing up with no real purpose, jumping and moving from chair to chair, showing occasional attention-seeking behavior, and fidgeting. All the DA sessions were audio-recorded for later analysis. The teacher also used a diary to record every single detail of the experiment.

The Persian version of the Computerized Stroop Test [13] was administered to measure the participant's selective attention capacity prior to the treatment. Initially, the test was introduced as a computer game, and then the participant was engaged in practice trials. Then Rayan went through 8 exclusive DA sessions focusing on alphabet letters spread over 33 instructional sessions (there were also some practice sessions). Different tasks such as initial sound matching and letter recognition tasks following pictures were selected from the main alphabet book. During the DA sessions, Rayan was asked to identify and match the words that started with the same sound and letter as the words presented. The mediator initially read the instructions and asked him to do the task while offering mediation and providing both implicit and explicit feedback. The mediation typology which emerged out of the dialogic interactions between the mediator and the learner in the alphabet DA sessions is summarized in Table 1. It is worth emphasizing that the mediation typology emerged based on data analysis and did not impose an a priori prescriptive hierarchy of mediational moves upon the mediator. The mediation began with the most implicit moves and moved toward the most explicit moves.

Table 1. Mediation Typology of Alphabet

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1. Request for verification
 2. Repeat the erroneous response with a questioning tone
 3. Request to look at the pictures
 4. Accept the request to help
 5. Provide fun explanations with examples
 6. Cue the learner with air dictation
 7. Provide the correct response
-

Following the alphabet DA sessions, the mediator and Rayan worked cooperatively on some vocabulary items. The mediator provided him with some hints over 11 sessions spread over 33 sessions (there were some additional practice sessions). During each DA session, the vocabulary items in the school textbooks were presented through different tasks such as, initial sound matching and letter recognition tasks following pictures, and it was tried to elicit the meaning of the words from Rayan. During the interactive phase of DA, the mediator tried to draw the learner's attention to errors and asked a general question such as: "Are you sure", or "Really?". If he was not able to answer correctly, his attention was then narrowed toward the error, and the mediator repeated the erroneous item. Moreover, the mediator used other levels of mediation containing an open question such as "What can you see in this picture?". If the learner's response was not correct, the mediator asked him to change it. The mediation strategies used in vocabulary DA sessions are given in Table 2.



Table 2. Mediation Typology of Vocabulary

1. Request for verification
2. Repeat the erroneous response with a questioning tone
3. Request to look at the pictures
4. Use pantomimes
5. Cue the learner with the first letter of the word
6. Provide translations
7. Provide the correct response

At the end of the intervention sessions, the same selective attention test, alphabet and vocabulary tests were given as posttests to the participant to evaluate the extent to which DA had affected his alphabet, vocabulary knowledge and selective attention.

2.6 Data Analysis

Minimal quantitative analysis was also incorporated into the process in the form of descriptive reports of the learner's performance on the WM test and the number of mediations provided by the mediator. Field notes and audio recordings were analyzed qualitatively to check the given mediations and the student's attention focus, behavior, and interest during the treatment. This allowed the researchers to re-live the classroom by focusing on the learner's learning behavior and reaction to the mediations.

3. Results

3.1 Quantitative Analysis

To provide an answer to the first and second questions of the study, an alphabet post-test and a vocabulary post-test (respectively) were given to Rayan. He started as a zero beginner, but he was able to answer 19 out of 20 questions correctly (95%) on both the alphabet and vocabulary posttests, indicating an increase in his knowledge of alphabet and vocabulary.

Then his scores on both the pretest and posttest selective attention test were measured and compared (Table 3).

Table 3. Rayan's Selective Attention Scores on the Pretest and Posttest

		Experiment time	Error number	No response	True response	Response time	Interference number	Interference time
Pretest	Congruent	49	5	0	43	1030		
	Incongruent	56	10	4	34	1071	9	41
Posttest	Congruent	48	0	0	48	1005		
	Incongruent	60	7	6	35	1157	13	152

As displayed in Table 3, the experiment time in the congruent parameter decreased on the pretest while it increased in the incongruent parameter on the posttest. The number of errors in the congruent and incongruent parameters decreased on the posttest. He answered all the pretest and posttest items in the congruent parameter, while the number of no responses increased in the incongruent parameter on the



posttest. The number of true responses in the congruent and incongruent parameters increased on the posttest. The response time decreased in the congruent parameter, while it increased in the incongruent parameter on the posttest. The interference number in the congruent and incongruent parameters on the posttest increased. Finally, the interference time in the congruent and incongruent parameters on the posttest decreased dramatically. The results showed that Rayan had more difficulties in the incongruent tasks. Thus, DA influenced some parameters (congruent tasks) of the selective attention test.

3.2 Qualitative Analysis

A microgenetic perspective as the general methodological framework for data analysis because it allows tracking the learners' development over time [14]. Table 4 presents the analysis of the quality of mediations needed by the learner based on Aljaafreh and Lantolf's regulatory scale [15].

Table 4. Levels of Development

Transitional Levels	Mediational Moves
Level 1	The learner is not able to notice or correct the error, even with intervention from the tutor.
Level 2	The learner is able to notice the error but correct it, even with intervention.
Level 3	The learner is able to notice and correct an error, but only under other-regulation.
Level 4	The learner notices and corrects an error with minimal, or no feedback from the tutor and begins to assume full responsibility for error correction.
Level 5	The learner becomes more consistent in using the target structure correctly in all contexts.

All the DA interaction sessions were coded for the presence of the different mediational moves that constituted the typologies. The learner's performances in different sessions were compared and analyzed, and the mediation typology was created based on the explicitness of each move by the mediator in the alphabet and vocabulary tasks. Comparisons of the learner's performances at different points in time were analyzed, and the mediation typology was developed based on the explicitness of each move by the mediator in the alphabet tasks (Table 5).

Table 5. Level of Explicitness of Mediational Moves (Alphabet)

Learner	DA1	DA2	DA3	DA4	DA5	DA6	DA7	DA8
Rayan	3,4,4	3,3,4	4	3,2,3	3,3,3,3,3	4,3,4,4	3,3,3	3,2,4

As presented in Table 5, Rayan required the fewest forms of explicit mediation in DA1, DA3 and DA6, while he needed more in DA4 and DA5. In comparison to other sessions, he received more explicit mediations in DA6. However, he required the same level of explicitness (other-regulated) in DA3, DA4, DA5, and DA7. He was also partially dependent in DA1 and DA3. Table 6 shows the total and average numbers of mediational moves required by Rayan during each session.

Table 6. Frequency of Mediational Moves (Alphabet)

Mediations	DA1	DA2	DA3	DA4	DA5	DA6	DA7	DA8
1. Request for verification	2	3	2	5	4	0	3	1
2. Repeat the erroneous	1	1	1	3	6	6	4	3



response with a questioning tone

3. Request to look at the picture	1	0	0	2	1	0	0	2
4. Accept the request to help	0	0	0	1	0	0	0	1
5. Provide fun explanation with example	1	1	1	2	1	1	1	1
6. Cue the learner with air dictation	0	0	0	1	3	0	2	0
7. Provide the correct response	0	2	0	1	0	0	0	0
Total number of mediations	5	7	4	15	15	7	10	8
Average number of mediations	0.71	1	0.57	2.14	2.14	1	1.42	1.14

As indicated in Table 6, the number of mediations fluctuated in some DA sessions. Rayan received the fewest number of mediations in DA1 and DA3, while he required a greater number of prompts in DA4 and DA5, which shows his great dependence on other-regulation. Moreover, the number of implicit mediations decreased to three in DA3, while they increased to 11 in DA5. In DA4 (*five requests for verification*) and in DA5 (*four requests for verification*), they fell to zero in DA6 and one in DA8. The number of explicit prompts decreased to one in DA6 and two in DA8. The analysis of sessions revealed that some prompts (*e.g., request for verification and repeat the erroneous response with a questioning tone*) were the most frequent mediations provided by mediator.

A decrease in the number of mediations was observed in DA8, and he showed improvement during the last assessment session. In other words, he performed relatively independently during DA8. Thus, it can be concluded that DA contributed to Rayan's self-regulation of the prompts; however, little changes were observed in DA6, DA7, and DA8.

Moreover, Table 7 shows the changes in the explicitness level of mediations provided by the mediator.

Table 7. Level of Explicitness of Mediation Moves (Vocabulary)

Learner	DA1	DA2	DA3	DA4	DA5	DA6	D7	DA8	DA9	DA10	DA11
Rayan	3,3,3	3,3,4,4	3,2,2,2,3,3	3,2,3,4	3,4,3	3,3,3	4,3	3,4,3	3,2,3,3	3,3,2	3,2,4

Table 7 demonstrates that Rayan required the fewest forms of explicit mediation in DA2, DA4, DA6, DA7, DA8, DA10, and DA11, while he received more of them in DA3 and DA9. He received more implicit prompts in DA3, DA4, and DA6, while he required the fewest implicit mediations in DA11, which highlights more independent performance (self-regulation). He was also highly dependent in DA3. Table 8 represents the total and average number of prompts required by Rayan in each session.

Table 8. Frequency of Mediation Moves (Vocabulary)

Mediations	DA1	DA2	DA3	DA4	DA5	DA6	DA7	DA8	DA9	DA10	DA11
1. Request for verification	2	5	5	8	3	7	4	4	3	4	4
2. Repeat the erroneous response with a questioning	4	2	5	3	2	2	4	2	4	5	2



tone

3. Request to look at the picture	1	0	1	0	1	1	1	0	1	0	0
4. Use pantomime	0	0	0	0	0	0	0	1	0	0	0
5. Cue the learner with the first letter of the word	2	1	4	1	2	0	1	1	3	1	1
6. Provide translation	0	0	0	0	0	0	0	0	0	0	0
7. Provide the correct response	0	0	0	0	0	0	0	0	0	0	0
Total number of mediations	9	8	15	12	8	10	10	8	11	10	7
Average number of mediations	1.28	1.14	2.14	1.71	1.14	1.42	1.42	1.14	1.57	1.42	1

As indicated in Table 8, in DA4, the mediational moves (*eight requests for verification*) fell to three in DA5, and in DA6 (*seven requests for verification*) fell to three in DA9. Rayan showed constant improvement across the last two DA sessions concerning the average number of mediations. The pattern of interactions was different in the last DA session. Rayan relied less on the mediator and needed less assistance to identify and correct his errors. Thus, it was concluded that using the DA procedure had improved Rayan's vocabulary knowledge.

4. Discussion

The results of the study initially demonstrated the efficacy of DA in improving ADHD L2 learner's knowledge of alphabet and vocabulary and some parameters of selective attention. The findings are in line with several studies reporting the contribution of DA to at-risk learners' success in the learning process. For instance, Ebadi and Naderi Farjad [16] reported the positive impact of DA on a schizophrenic L2 learner's cognitive and intellectual functioning over time. Moreover, Camilleri and Law [17] reported that the use of DA could enhance the vocabulary knowledge of preschool children with language impairment. Likewise, the findings are relatively consistent with those of Mann et al. [18] concerning DA implementation in improving deaf children's learning of vocabulary.

The thorough analysis of data demonstrated that the participant performed independently and required fewer mediations in some sessions. According to Poehner [19], "a learner who needs fewer mediations or less explicit mediation at time 2 than at time 1 can be said to have developed". To be more specific, the analysis of the participant's performance showed that his process of knowledge acquisition was not linear but rather "zigzagged" in Vygotsky's terms [20]. This can be explained based on the fact that the participant commonly tended to produce more progressive than regressive moves, particularly during the last two sessions. At the end of the study, Rayan had become a more autonomous learner, taking more responsibility in the learning process in some sessions. The findings also confirm Vygotsky's view concerning the inconsistent nature of development as a process that involves regression and progression.

Another justification for the results of this study can be related to the fact that ADHD students suffer from attention deficit, lack of motivation, and poor school performance; however, a cooperative mediator who creates a fine environment by allowing a rethinking time persuades the learner to discover and correct the errors [16]. Furthermore, ADHD students learn better through interaction with the teacher rather than formal instruction. According to Melago [21], attending private classes can be a valuable experience for ADHD learners. Here, the opportunity to have a one-on-one learning experience with a teacher seems to



have helped the ADHD learner to develop more self-esteem in the process of learning, which could have enhanced his language achievement.

Here, DA contributed to the development of the congruent parameters of selective attention but not to incongruent ones. The most important reason is that ADHD children suffer more specific deficits in incongruent tasks where the ink color of the word is incompatible with its meaning and may require to be inhibited in order to succeed in the task [22]. Moreover, medication, age, sex, and comorbidity, among others, might have played a role in this regard.

5. Conclusions

In tune with the findings of the present study, it can be concluded that DA helped to improve Rayan's knowledge of alphabet and vocabulary. However, it is necessary to mention that the number of mediations the participant received varied during the DA sessions. The learner required little assistance in the last sessions. He experienced some backsliding and required more mediation in some DA sessions. The collected data also illustrated that DA helped the participant to reach self-regulation, particularly towards the end of the study as indicated by the number and forms of the mediational moves. Finally, it is concluded that DA contributed to the learner's selective attention regarding the congruent parameters.

The findings of this research can have some useful practical implications for EFL teachers who work with ADHD learners at different ages and educational levels. Teachers can benefit from the different types of mediation that emerged in the course of this study. The results can also inspire material developers regarding the designing of certain alphabet and vocabulary activities that could be of great benefit to ADHD learners. Furthermore, educational policymakers can use the results of this study in providing special educational services or accommodations for ADHD students at schools.

As with all studies, the present study suffered from some challenges and limitations. It was naturally not concerned with the generalizability of the findings as it focused on a single male ADHD case. Future research could be conducted with a larger mixed-gender sample while extending over a longer period of time focusing on other learning disabilities and cognitive impairments. This study was one of the first few, if any, attempts at investigating the contributions of DA to the process of L2 learning by ADHD learners. If DA is to be employed among ADHD L2 learners, a great number of studies with students of different ages are needed.

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