Ampersand 13 (2024) 100191

Contents lists available at ScienceDirect

Ampersand

journal homepage: www.elsevier.com/locate/amper

Learning and using multiple languages: Experiences of adults with ADHD

Franziska Köder [a,*], Cecilie Rummelhoff [a], Maria Garraffa [a,b]

[a] Department of Linguistics and Scandinavian Studies, University of Oslo, Oslo, Norway
[b] School of Health Sciences, University of East Anglia, Norwich, UK

ARTICLE INFO

Keywords:
Language learning
L2 acquisition
Multilingualism
ADHD
Neurodiversity

ABSTRACT

Attention-Deficit/Hyperactivity Disorder (ADHD) is a neurodevelopmental disorder that impacts many areas of a person's life. So far little is known on how ADHD affects the learning and usage of additional languages. The present study investigates what potential challenges and benefits adults with ADHD experience in second language (L2) learning, and what strategies they have developed to offset ADHD-related differences in cognition and behaviour. As part of a larger questionnaire, 59 participants with ADHD provided written responses, answering questions on how ADHD has influenced their learning and use of multiple languages. After a multiple-step classification process, three overarching topics were identified: (1) the effects of cognition on language learning and use; (2) how different language components and language modalities are affected by ADHD; and (3) what language learning strategies adults with ADHD apply. In our analysis, we present authentic quotes from individuals with ADHD and place them into the larger context of research on neurodivergence and L2 acquisition. Our results highlight the great heterogeneity in learning experiences and pathways in adults with ADHD. Interestingly, many respondents embrace their neurodiversity and develop individual strategies to enhance L2 proficiency. Our research aims to contribute to a better understanding of multilingualism within neurodiverse populations.

1. Introduction

Attention-Deficit/Hyperactivity Disorder (ADHD) is a neurodevelopmental disorder known to significantly impact various aspects of an individual's life. ADHD affects approximately 5.3–7.2 percent of children and youth, and 2.5 to 6.8 percent of adults worldwide (cf. Polanczyk et al., 2014; Song et al., 2021), often co-occurring with speech and communication disorders such as language disorder, social pragmatic communication disorder, and dyslexia (Tannock, 2018; Willcutt and Pennington, 2000). While the impact of dyslexia on second language acquisition is well studied (e.g., Nijakowska, 2020; Schneider and Crombie, 2003), so far limited attention has been given to exploring the effects that ADHD has on acquiring and using additional languages. The present study aims to address this research gap by featuring the individual experiences and reflections of people diagnosed with ADHD on how their disorder affects the way they learn or use multiple languages. The findings from this study can lay the foundation for more individualized language learning strategies as well as more inclusive instructional programs that are better suited to the specific needs of adult second language learners with ADHD.

1.1. Diversity of ADHD

Despite ADHD being an acknowledged psychiatric diagnostic category (American Psychiatric Association, 2013), it is important to highlight the behavioural and cognitive heterogeneity of people diagnosed with ADHD. First, three different presentations of ADHD can be distinguished: (1) the inattentive presentation, characterized by for instance difficulties to maintain focus, easily getting distracted and making careless mistakes; (2) the hyperactive-impulsive presentation, marked by individuals showing high levels of physical restlessness and difficulties with impulse control; and (3) the combined presentation, where individuals exhibit a combination of inattentive and hyperactive-impulsive symptoms (American Psychiatric Association, 2013).

ADHD significantly interferes with an individual's functioning or development, impacting different aspects of a person's life from academic achievement to personal relationships (Faraone et al., 2021). ADHD is associated with weaknesses in several key executive function domains, i.e., cognitive abilities that allow individuals to plan, organize, and control their actions to achieve goals and adapt to changing

* Corresponding author. Department of Linguistics and Scandinavian Studies, University of Oslo, Norway.
E-mail address: f.m.koder@iln.uio.no (F. Köder).

https://doi.org/10.1016/j.amper.2024.100191
Received 22 March 2024; Received in revised form 3 July 2024; Accepted 27 August 2024
Available online 29 August 2024
2215-0390/© 2024 The Authors. Published by Elsevier Ltd. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).

circumstances (Barkley, 1997; Willcutt et al., 2005). In one commonly used executive function framework, a distinction is made between executive function related to inhibitory control (suppressing inappropriate or irrelevant information or responses), working memory (holding and manipulating information in one's mind), and cognitive flexibility (shifting between different tasks) (cf. Miyake et al., 2000). However, not all individuals with ADHD exhibit impairments in executive function tests, and if they do, they might show impairments in different domains (Kofler et al., 2019; Nigg et al., 2005). In addition, individuals with ADHD are at increased risk of other neurodevelopmental disorders as well as externalizing and internalizing disorders such as depression or conduct disorder respectively (Gnanavel et al., 2019). The sketched diversity with respect to behavioural symptoms, cognitive profiles, and co-occurring conditions illustrates that the group of individuals with ADHD is extremely heterogeneous.

1.2. ADHD and second language learning

A fundamental aspect of social functioning, also affected by ADHD, is language and communication. It is widely recognized that children with ADHD are at higher risk of impairments in different linguistic domains, especially in pragmatics, the use of language in a social context (Carruthers et al., 2022; Korrel et al., 2017). Pragmatic difficulties are also observed in adults with ADHD. Diagnostic instruments, including the DSM-5 (American Psychiatric Association, 2013) and the DIVA-5 (Kooij et al., 2019), enumerate communicative symptoms such as excessive talking or interrupting others as characteristic indicators of ADHD. However, research on language abilities of adults with ADHD is sparse. Evidence to date suggests that macro-level discourse organization is not affected in adults with ADHD, but that they produce more words to perform a task as well as more speech disfluencies and ungrammatical utterances compared to neurotypical adults (Engelhardt et al., 2009, 2010, 2011). This indicates that the speech of adults with ADHD is less efficient and fluent, supporting the idea that issues with language production are at the core of ADHD. Pragmatic language comprehension—such as the understanding of metaphors or verbal irony—seems to be less affected in adulthood (Even-Simkin, 2024; Nilsen et al., 2013; Segal et al., 2015).

Previous research shows that ADHD does not prevent the successful acquisition of a second (L2) or third language (L3). High-school students with ADHD and average or above-average L1 literacy performed like a high-achieving group on most L2 measures (Sparks et al., 2008). Furthermore, ADHD does not seem to negatively affect performance in foreign language courses at college level (Sparks et al., 2004) or self-rated L2 and L3 proficiency in adults (Köder et al., 2024). However, despite seemingly equal proficiency levels, there are noticeable disparities between adults with and without ADHD when it comes to confidence in their foreign language abilities. Adults with ADHD express lower confidence and a more pessimistic view regarding their L2 proficiency in comparison to neurotypical individuals (Paling, 2020). This lack of confidence could be related to individuals with ADHD having different needs and learning strategies than neurotypical adults. According to previous research, second language learners with ADHD tend to favor oral over written input, exhibit a greater need for personalized one-on-one sessions, and prefer multi-sensory learning environments (Kałdonek-Crnjaković, 2018; Paling, 2020).

There is also preliminary evidence that ADHD might affect how adults interact in a foreign language (Köder et al., 2024). Communicative symptoms related to hyperactivity and impulsivity such as interrupting others or talking excessively seem to be less pronounced when a person with ADHD speaks their second or third language compared to their first language. By contrast, maintaining attention and focus as well as understanding non-literal language were reported to be more demanding in a foreign language. The primary focus of the study by Köder et al. (2024) has been on quantitative analyses of pragmatics abilities in adults with and without ADHD. While it is crucial to consider group-level comparisons, this can somewhat obscure the substantial individual variation present in ADHD. To gain a comprehensive understanding of how ADHD affects second language acquisition and usage, it is vital to acknowledge and examine individual differences within the ADHD population. Based on the specific combination of behavioural symptoms, executive function abilities, and possible co-occurring conditions (e.g., autism spectrum disorder, dyslexia), individuals with ADHD might develop different (and highly individualized) strategies on how to best acquire a foreign language.

1.3. Current study

In the current study, we give center stage to the experiences of adults with ADHD as they navigate language acquisition and interactions in multiple languages. This research aims to make a significant contribution to the understanding of language learning in a neurodiverse population. The present study aims to address the research question whether and if so in what respects ADHD influences the learning and usage of second languages. We will employ a mostly qualitative approach, incorporating voices of individuals with ADHD talking about their experiences in learning and using a foreign language, in combination with limited quantitative information on how frequently different topics are mentioned across participants.

2. Methods

2.1. Materials

The data was collected using a newly developed questionnaire (Köder et al., 2024), which participants could answer on a web-based tool for data collection at the University of Oslo. The questionnaire was available in English and Norwegian and took participants approximately 10–15 min to complete. The questionnaire collects information on (1) participants' personal background; (2) their language background; and (3) ratings of pragmatic difficulties across different languages using a 7-point Likert scale. The version for neurotypical adults and adults with ADHD differs slightly, in that the ADHD version also gathers information on the age of ADHD diagnosis and includes additional questions on whether and if so to what extent, ADHD has affected language learning and usage (part (4)). The complete questionnaire and the quantitative analyses of parts (1) to (3) comparing adults with ADHD to neurotypical adults can be found in Köder et al. (2024). In this paper we focus exclusively on the text answers participants with ADHD provided in part (4). Here, they were asked the following questions.

(1) Do you think your ADHD has influenced the way you have learned or are learning languages?
(2) Do you think your ADHD has influenced the way you use different languages?

In both cases, participants had three answer options: "yes", "not sure", and "no". In case they selected "yes", they were asked to specify how they thought ADHD has influenced their language learning or use respectively in an open text field.

2.2. Participants

The main recruitment was done in spring 2023, but the questionnaire was open for 6 months. Participants with ADHD were mainly recruited through an article published in the Norwegian ADHD association's members magazine, which included a QR code to the online questionnaire (Köder and Rummelhoff, 2023). Links to the questionnaire were also distributed on various social media platforms. Participation in the study was voluntary and anonymous.

Ninety-one people with ADHD completed the survey. Fifty-three participants (58.2%) answered that ADHD had influenced the way

they learned languages, 31 (34.1%) were not sure, and 7 (7.7%) said ADHD had not influenced their language learning. On the question of whether ADHD had influenced their usage of languages, 38 (41.8%) responded "yes", 42 (46.1%) responded "not sure", and 11 (12.1%) responded "no". Twenty-eight participants provided written answers for both open questions, 31 only for one open question. This leaves us with a total of 87 text answers from 59 different participants included in the analysis. Of those, 51 participants filled in the questionnaire in Norwegian, 8 in English. The participant characteristics of this subsample of 59 participants are presented in Table 1.

Of these participants, 17 reported to speak 2 languages, 28 3 languages, and 14 4 or more languages. Table 2 gives an overview of participants' self-rated proficiency in their different languages, listed in order of competence. This information was collected using questions from the Bilingual Language Profile (Birdsong et al., 2012), a validated and reliable self-report tool for bilingualism (Olson, 2023; Solís-Barroso and Stefanich, 2019). As can be seen, the sample has a very high overall proficiency in the first (L1) and second language (L2) and a markedly lower proficiency in the third language (L3).

2.3. Coding

The total number of words for all text answers was 3861. The number of words per answer ranged from 5 to 231 words, with a mean of 32.7 words (SD = 42.9). We worked with the data in the original language – translations from Norwegian to English were made for presentation purposes only.

We employed an iterative 3-step procedure to classify the responses into relevant categories. First, we carefully read through the 87 text answers and identified relevant topics and themes, which were consecutively transformed into analytical categories. Since no clear distinction between answers to the first and second question emerged, the responses were analysed together. In a second step, we coded all text answers using this preliminary set of categories and added a few new relevant categories that emerged in the process. After that, we decided on the final set of categories through discussion, and in a third and final step, coded all text answers with respect to the finalized categories. A single response could be labelled with several categories. All categorization and coding steps were conducted by the three authors together, and disagreements were resolved through open discussion. This resulted in the following 9 categories, with the corresponding number of participants mentioning each category in brackets: inattention (12), hyperfocus (12), hyperactivity/impulsivity (8), working memory (14), modality (22), language components (18), switching (16), association (9), and strategies (15).

3. Results and discussion

After coding, the categories were clustered together into bigger superordinate categories to highlight emerging links between categories, and to facilitate a coherent presentation. In the following, we will first discuss how cognitive factors such as inattention, hyperfocus, hyperactivity/impulsivity, and working memory deficits affect language learning in individuals with ADHD (3.1). Afterwards, we will investigate what aspects of language are affected, focusing on language components, different modalities, and language switching (3.2). Finally, we will discuss what language learning mechanisms and strategies our respondents with ADHD employ (3.3). In each section, we will incorporate direct quotes from participants to offer authentic insights into the experiences people with ADHD have when learning and using multiple languages.

Table 1
Demographics for participants with ADHD who provided at least one text answer (N = 59).

Age	Mean: 35 Range: 18-56
Gender	Male (13; 22%) Female (40; 68%) Non-binary (5; 8%) Prefer not to say (1; 2%)
Level of Education	Primary school (3; 5%) Secondary school (15; 25%) Bachelor's degree (26; 44%) Master's degree (14; 24%) PhD (1; 2%)
Age of ADHD Diagnosis (in years)	Mean: 29 Range: 7-53

Table 2
Language proficiency of participants with ADHD (N = 59), rated on a scale from 0 ("not very well") to 6 ("very well").

	L1 Means (SD)	L2 Means (SD)	L3 Means (SD)
Speaking	5.8 (0.7)	5.2 (0.9)	3.7 (1.6)
Understanding	5.9 (0.6)	5.6 (0.6)	4.3 (1.5)
Reading	5.7 (0.9)	5 (1)	4 (2)
Writing	5.4 (1.1)	4.8 (1.3)	3 (2)
Overall proficiency	5.7 (0.7)	5.2 (0.8)	3.9 (1.5)

3.1. Cognitive factors

Executive functions cover a broad range of cognitive abilities such as problem-solving, self-control, behaviour regulation and attentional control (Baron, 2004). Executive function abilities play a crucial role in almost all aspects of our lives, including language acquisition, social interactions, and reading (Follmer, 2018; Moriguchi, 2014; Shokrkon and Nicoladis, 2022). In line with these previous studies, many of our respondents reported that executive functions or specific deficits in this area linked to ADHD had a significant impact on their language learning and use. In the following sections we will explore some of the common struggles and advantages, including aspects related to inattention, hyperfocus, working memory, and hyperactivity/impulsivity.

3.1.1. Inattention

Attention can be described as the ability to sort and prioritize internal and external stimuli. It is essential for any type of learning, including foreign language learning (Kormos and Smith, 2012). Without attention, stimuli remain in working memory for only a few seconds at best and are unlikely to be moved to long-term memory for storage (Schmidt, 1995). An inability to focus attention on the task at hand can be attributed to several factors: distraction, suboptimal levels of arousal (either too low or too high), reduced vigilance, susceptibility to fatigue, or difficulties with orientation (Baron, 2004).

Individuals with ADHD do not inherently lack the ability to concentrate or pay attention, but they occasionally struggle with voluntarily directing their attention to the specific task at hand, such as following conversations in another language (see (1)) or paying attention during classroom instructions (see (2)).

(1) *I often lose focus during a conversation and when it's in another language it's hard to get back into the conversation.* (P01, translated from Norwegian)
(2) *I was unable to pay attention in class or in conversations with more than one person before I started medication.* (P02, translated from Norwegian)

For some, medication improves attention abilities (See (2)). Other adults with ADHD adapt the learning environment to limit the possibilities of distractions, such as in (3).

(3) *I need a lot of repetition and quietness to learn, and I have a limited capacity to concentrate for a longer period of time.* (P03, translated from Norwegian)

3.1.2. Hyperfocus

The counterpart of inattention is hyperfocus, i.e., episodes of prolonged and intense concentration on a specific task, often losing track of time and other relevant tasks (Brown, 2006). More severe ADHD symptomatology is associated with higher likelihood for hyperfocus in several domains including hobbies, screen time, but also academic settings (Hupfeld et al., 2019). In our study, twelve participants mentioned that hyperfocus associated with ADHD affects how they acquire a foreign language. In responses such as (4), hyperfocus was conceptualized as something positive, helping the person with ADHD to sustain attention on language learning for longer periods of time, and leading to fast progress in a short amount of time.

(4) *I think a strength is that I can become very interested in a topic for periods of time and that means I can sit for a very long time learning new words. An example is that I at times have become very hooked on DuoLingo. It is also designed as a game.* (P04, translated from Norwegian)

Several respondents construct a causal link between interest and hyperfocus, as exemplified in (5).

(5) *I have a great interest in languages but tend to be extremely dedicated for a two-week period before I grow tired of it, and then it can take many months before I pick it up again.* (P05, translated from Norwegian)

The important role of interest is in line with the finding that the level of arousal (i.e., heightened physiological and psychological activation) in people with ADHD is often greater when it comes from an internal desire (e.g., an interest in languages) and often much lower when it comes from an external demand (e.g., pressure from school) (Littman, 2017). Quote (5) also illustrates that on the flipside, once the period of hyperfocus has passed, learning activities can come to an abrupt halt, indicating less consistent progress in language learning over time.

Taken together, inattention and hyperfocus in ADHD are both related to not being able to apply the appropriate amount of attention to a task, leading to either too little attention (inattention, with difficulties keeping focus on a learning activity or getting distracted easily), or too much attention (hyperfocus, with the risk of neglecting other relevant tasks or tiring oneself out). People with ADHD might find it particularly difficult to persevere through monotonous or tedious tasks to reach a goal. This can be challenging as traditional foreign language instruction involves many repetitive tasks, such as memorizing irregular verb forms. To ensure consistent progress, it seems important to develop individual strategies on how to best sustain the student's motivation over time. Incorporating elements of gamification (see (4)) or providing frequent rewards or incentives can enhance motivation (cf. Pfiffner et al., 2006). Additionally, selecting topics for reading or writing that align with the student's interests or catering to their linguistic curiosity (e.g., for etymology or cross-linguistic comparisons) can further improve engagement and learning outcomes.

3.1.3. Working memory

Working memory refers to the ability to retain and manipulate specific information needed to complete a task. It is a multi-component construct that relies on attention and an executive control center that oversees manipulation, recall and processing of verbal and non-verbal information (Chai et al., 2018; Cowan, 2008). Working memory capacity has a positive effect on L2 comprehension and production (Linck et al., 2014) and plays for instance an important role in the acquisition of new words (Baddeley et al., 1998). On the other hand, deficits in working memory can present challenges for language learning, as exemplified in (6).

(6) *Challenges with working memory have made it challenging to memorize vocabulary and grammar but I have learned a lot intuitively through speaking and reading instead (must use the language to learn).* (P06, translated from Norwegian)

Some of the respondents also mention that they regularly forget or "lose" words (see (7)).

(7) *Struggle with "losing" words all the time. Words and descriptions I know just disappear into thin air.* (P07, translated from Norwegian)

This again could be due to deficits in working memory as working memory plays an important role in the retrieval of information from long-term memory, including the retrieval of lexical items (Engle, 1996). Particularly when faced with high situational demands that already tax working memory capacity, individuals with ADHD may experience difficulties in efficiently retrieving words.

Working memory capacity is also involved in understanding utterances in a second language. Paying attention to several interlocutors in a conversation, remembering and making sense of what everybody says as well as planning and timing one's own contribution can lead to a high working memory load.

(8) *Understanding or not understanding what Norwegians say makes me perform or not perform at work. I don't always know when I haven't understood something. I then get distracted more easily, because having to focus drains my energy fast. The risk of not understanding gives me anxiety.* (P08)

The quote in (8) illustrates that the person needs to invest a lot of attentional resources to understand what native speakers intend to communicate, which drains their energy. Additionally, participating in conversations in a second language can be anxiety-inducing. This is particularly problematic as anxiety like other internal (e.g. stress) and external (e.g. noise) factors can limit working memory capacity (Lukasik et al., 2019) and thereby negatively affect L2 learning and achievement (cf. Teimouri et al., 2019). It is therefore especially important for people with ADHD to develop effective strategies to manage anxiety, stress, and potential other distractions to optimize their (potentially already limited) working memory resources for language learning and use.

3.1.4. Hyperactivity/impulsivity

Lack of inhibitory control, a key executive function, seems to be the underlying cause of different kinds of impulsive and hyperactive behaviours present in ADHD (Barkley, 1997). Behavioural symptoms based on impaired inhibitory control also manifest in oral communication, significantly impacting interpersonal relations, as described in (9).

(9) *I know it frustrates people that I interrupt them, that I read their cues incorrectly and start talking at the wrong time, that I talk too much, or that I use too many words to say something, because they have told me so to my face. Multiple times over the years.* (P09)

Participant P09 interrupts others frequently, talks excessively and uses a lot of words to express a thought. Even though they are aware of their inappropriate communicative behaviour, they struggle with making the necessary behavioural changes due to deficits in inhibitory control. On a similar note, another person with ADHD (P10) describes that they speak without proper planning or organization, which can result in a disjointed train of thought, frequent topic shifts, restarts, and grammatical errors. This is in line with prior research attesting more disfluencies and ungrammatical utterances in the speech of adults with ADHD (Engelhardt et al., 2009, 2010, 2011).

(10) *Because I always start by saying something before I'm completely certain what it is that I want to say, and there are so many jumps and leaps that happen in my head that what I am about to say changes 827 times before I am finished saying it – and then it is easy to say sentences that maybe do not make entire sense grammatically. This is a bigger problem in language 2 than in language 1, because I am better at taking U-turns that still make sense in language 1. But I guess I mess up more than "most people" in language 1 too. And I know when the things I say are grammatically wrong, so the issue is not the language, but the fact that it is hard to transfer thoughts into words while talking.* (P10, translated from Norwegian)

While communicative impulsivity and hyperactivity symptoms are present in both languages, it appears that recovering from false starts and topic shifts is easier for P10 in the first language compared to the second. This may be attributed to various factors including the higher cognitive load in processing and producing language in a second language, as well as a more limited linguistic repertoire for devising instant recovery strategies.

However, impulsivity and hyperactivity do not necessarily need to create difficulties in learning or using a foreign language. Several of our respondents (see for example (11) and (12)) highlight the positive side effect that because of their impulsivity, they more easily initiate conversations with others and therefore get a lot of practice in speaking a foreign language.

(11) *My impulsivity has led me to take initiative to use foreign languages in different situations, so that I could learn it quicker. Even though I [am] introverted and very afraid of making mistakes in the use of the language.* (P11, translated from Norwegian)

(12) *I use it impulsively, do activities where I practice language because I get very absorbed in it. Talk a lot and think a lot and get a lot of practice.* (P12, translated from Norwegian)

Mental hyperactivity and a vivid imagination and creativity has helped P04 (see (13)) to practise their languages in fictive conversations. Having to take the role of both persons in the conversation doubles the practice.

(13) *I also think that since I have a constant inner dialogue, it leads me to indirectly using the new words I learn, because I can suddenly daydream and imagine that I am talking to a person in another language. In that sense, I involuntarily "practice" because my imagination runs wild. If I'm in such a "conversation" with myself and forget or miss a word, I can't help but look up what it is. I just have to know and I think that this is also a drive for me.* (P04, translated from Norwegian)

Motoric hyperactivity is not mentioned by any if our respondents as affecting them in their language learning or usage. This is not surprising as movement is less central to language learning. Furthermore physical hyperactivity often decreases as individuals with ADHD get older, being replaced with smaller, more "appropriate" hyperactive behaviours such as fidgeting, or an inner feeling of restlessness, impatience, or jitteriness (American Psychiatric Association, 2013).

3.2. Affected language domains

After having discussed the effect of cognitive factors on language learning and usage in section 3.1., we now focus on how specific language components and modalities are affected by ADHD, before turning to language switching between two or more languages.

3.2.1. Language components

We first inspect how frequently and in what contexts different linguistic domains, such as phonetics, phonology, morphology, syntax, semantics, and pragmatics are mentioned. Only two respondents mention aspects related to phonetics and phonology. While P13 (see (14)) has difficulties remembering the pronunciation of words, P14 (see (15)) seems to be able to quickly link phonetic and semantic representations.

(14) *I learnt the language through my job (kindergarten) and had to hear the pronunciation of different words several times before they stuck.* (P13, translated from Norwegian)

(15) *I associate easily and quickly find words, relationships and sounds.* (P14, translated from Norwegian)

As pointed out previously, the learning of vocabulary and morpho-syntactic features can be challenging to some people with ADHD due to executive function impairments (cf. Shokrkon and Nicoladis, 2022). Several respondents including P15 (see (16)) report that they need multiple repetitions until they have memorized lexical items or grammatical features, and that understanding the underlying system or pattern facilitates memorization.

(16) *I have short attention span, so I don't study at a desk for a long time at a time. I don't try to memorize things, but I repeat and repeat the same stuff, trying to memorize the pattern. This leads to me being much better in using grammar correctly than vocabulary, especially in the first years of learning a language.* (P15)

Another commonly mentioned issue is word-finding difficulties, related to difficulties retrieving lexical items from memory in a timely fashion (see (7)). Challenges associated with ADHD also arise in the domain of pragmatics. Several respondents with ADHD describe pragmatic difficulties such as excessive talking, interrupting others, difficulties with turn-taking, and incorrect interpretation of cues or utterances. This is nicely exemplified in (9), here repeated for convenience.

(9) *I know it frustrates people that I interrupt them, that I read their cues incorrectly and start talking at the wrong time, that I talk too much, or that I use too many words to say something, because they have told me so to my face. Multiple times over the years.* (P09)

Pragmatic impairments in ADHD are well attested in previous research on children with ADHD (Carruthers et al., 2022; Green et al., 2014; Korrel et al., 2017), and prevail even when controlling for general language abilities (Staikova et al., 2013). In diagnostic interviews for adults such as the DIVA-5 (Kooij et al., 2019), many examples for hyperactive, impulsive or inattentive behaviour are taken from the domain of language and communication. This indicates that pragmatic impairments are also common among *adults* with ADHD. The presence of symptoms across different languages seems to depend on the level of language proficiency, as illustrated in (17).

(17) *The* few *symptoms I have are present in both of the two languages I speak best. […] my third language does not behave the same. Probably because my knowledge is poorer and the focus is more on grammar and words than on wishing to express my opinions in a conversation.* (P16, translated from Norwegian)

In a previous study (Köder et al., 2024), we suggest that hyperactive-impulsive communicative behaviours such as excessive talking and frequent interruptions are more pronounced in a language with higher levels of proficiency, potentially because linguistic processes such as lexical retrieval and sentence construction are more automatized. Interestingly, while our respondents reported several limitations in key conversational skills, they did not mention challenges in the interpretation of non-literal meanings. This is in line with previous findings indicating that the (explicit) understanding of ironical or

metaphorical utterances, as measured for instance by comprehension questions, does not substantially differ between adults with and without ADHD (Even-Simkin, 2024; Köder et al., 2024; Segal et al., 2015).

3.2.2. Language modality

Next, we take a closer look at how different language modalities are affected by ADHD, including written and spoken uses of language (cf. Chafe and Tannen, 1987). Since writing, reading, listening, and speaking abilities rely on different cognitive and social skills, they are likely to be influenced by ADHD in different ways. With respect to writing, several respondents mention difficulties with careless mistakes, as described in (18).

(18) *Sloppy mistakes regarding mistyping, however, are a big challenge, and there will be a lot of typos on the pc if I don't take the time to go through [the text] and correct afterwards.* (P17, translated from Norwegian)

This point is further underscored by the fact that some written responses in our survey contained several typos. Reading also provides a challenge for some respondents with ADHD due to difficulties with concentration, as exemplified in (19).

(19) *Difficult to read and concentrate!* (P18, translated from Norwegian)

No general preference for one modality over another emerges from the data. Respondents P10 and P15 both describe having difficulties with oral language. P10 because they struggle with the production of coherent speech (see (20)). P15 because spoken interactions require direct social contact with others, which the respondent finds challenging (see (21)). Based on that, P15 (see (21)) has developed a strategy to initially prioritize solitary L2 activities such as reading and writing and, with more language experience, to move on to the spoken modality they feel less comfortable in.

(20) *Better at listening/reading/writing than formulating coherent language orally*. (P10, translated from Norwegian)
(21) *I tend to learn reading and writing first then spesking [sic] and listening, I think because I know I am a bit socially awkward and change the* subject*/interrupt others in a conversation constantly, making me a bad conversation partner. I prefer to learn things I can do alone first, like reading. As years go by, I seem to improve in all areas of language anyway*. (P15)

In contrast to these examples, several other respondents with ADHD such as P19 (see (22)) prefer the spoken over the written modality.

(22) *Fearless. Very talkative and social. I pick up a lot. [ADHD] positively influences oral language. Learning written language has been more difficult. It became easier as my oral skills improved.* (P19, translated from Norwegian)

The presented quotes highlight individual preferences for specific modalities. Based on this data, it seems paramount for foreign language teaching to include all modalities in instruction to account for different learning styles, as suggested by Tedick (2002).

3.2.3. Language switching

A topic mentioned in several responses of multilingual speakers with ADHD is that they switch between two or more languages in spoken interactions. Two different types of code-switching emerge from the data: involuntary and strategic switching.

Quotes (23), (24) and (25) exemplify that some respondents with ADHD frequently and involuntarily switch between languages, potentially due to impaired inhibitory control, as indicated in (23). This does not necessarily have a detrimental impact on communication given that the interlocutor is proficient in all the languages the speaker with ADHD is mixing and is familiar with their particular interaction style (see (24)).

(23) *I often switch between many languages without thinking about it, due to little impulse control and that my brain goes so fast.* (P20, translated from Norwegian)
(24) *I usually mix all three languages I know - both when I speak (especially if it's fast) and when I think. There is often a combination of languages when a conversation flows between me and others.* (P13, translated from Norwegian)

However, it can be problematic to address a person in a language they do not master, as described in (25).

(25) *Can happen that I speak Norwegian to an English-speaking friend without realising it.* (P21, translated from Norwegian)

On the other hand, we find cases of strategic language switching in the data (see (26) and (27)), where individuals with ADHD consciously use parts of speech from other languages than the current language of conversation.

(26) *I often forget words, then I can supplement with words from other languages or start explaining the word I am trying to say*. (P10, translated from Norwegian)
(27) *Often difficult to find the right word in my mother language (Norwegian), where I supplement with English when I forget what to say in* Norwegian*.* (P22, translated from Norwegian)

In these cases, language switches have the function to compensate for potential working memory challenges that can affect the retrieval of lexical items from long-term memory. Incorporating words from another language can prove to be an effective strategy if the conversation partners share two or more of the same languages. However, not all conversation partners might be accepting of code-switching, as previous research indicates that attitudes towards code-switching depend on factors such as personality, gender, language learning history and current linguistic practices (Dewaele and Wei, 2014). Furthermore, in certain contexts with strong monolingual norms, such as certain workplaces or legal settings, code-switching might not be acceptable. This can pose potential challenges for individuals with ADHD, particularly in cases where language switching occurs involuntarily due to a lack of inhibitory control.

3.3. Language learning mechanisms and strategies

In this section, we will explore the overarching language learning mechanisms and strategies employed by individuals with ADHD when acquiring a second language. These strategies encompass a combination of subconscious approaches as well as deliberate, conscious efforts aimed at enhancing the learning process.

A recurring theme in the responses is that ADHD is linked to a specific learning style which has previously been described in the literature (cf. Leer, 2021). Eleven respondents mention that ADHD makes their language learning more "associative", "intuitive" and reliant on "gut feeling". This is without exception conceptualized as a positive feature, as illustrated in (28) and (29).

(28) *I learn languages easily. I have never learned grammar, but I quickly get a gut feeling on what is correct.* (P23, translated from Norwegian)
(29) *I think my diagnosis makes me think very associatively, which also enables me to think of synonyms in other languages. When something reminds me of something else, I think about it, it can be words or expressions that I feel I see connections to in another language. This makes it* easier *to understand and acquire new vocabulary. Have also*

been to language courses, where I received comments from others that I learned the language quickly. (P04, translated from Norwegian)

Following Kahneman's differentiation between system 1 and 2 thinking (Kahneman, 2011), individuals with ADHD may rely more on system 1, involving a language learning approach that depends more heavily on heuristics and intuition. This could serve as a compensatory mechanism for potential deficits in executive control—cognitive abilities that neurotypical individuals may mainly use when learning a foreign language. It is important to stress that despite differences in learning mechanisms and pathways, individuals with ADHD typically achieve similar levels of foreign language proficiency (e.g., Sparks et al., 2004, 2008). However, traditional educational settings such as classroom instructions might not be ideal learning environments, as several participants point out. Classic frontal teaching demands sustained attention and extended periods of sitting still, which can be particularly challenging for individuals with symptoms of inattention, hyperactivity, and impulsivity. Similar issues as in conventional classroom settings can arise in online courses, especially if they provide limited opportunities for interactions between participants (see (30)).

(30) *Was offered a Norwegian course when I moved here. It took place on a computer and very little social contact and language training with other people - I did not have the focus or concentration to learn anything from this.* (P13, translated from Norwegian)

By far the most frequently mentioned language learning strategy was to practice a foreign language by using it in interactions with other people, as described for instance in (31).

(31) *I learn languages best by being in a situation where I need to use it. I have a really hard time learning languages from schoolbooks and grammar books. But when I am in a situation where I need to use it, I can pick up languages really quickly.* (P09)

This includes practicing a language when staying abroad for e.g., studies or holidays, or chatting with others on the internet. For those who have emigrated to another country, socializing with locals, and working in for instance a kindergarten was mentioned as beneficial for practicing the majority language. Based on individual differences in cognition and personality, some individuals with ADHD enjoy practicing a foreign language in conversations with several people, while others prefer one-on-one settings. For this second group, personal sessions with a foreign language teacher or a language learning partner could be a good choice, as they keep distractions to a minimum, while still providing the positive learning effects of interpersonal interactions.

Several respondents also mention language learning strategies related to watching TV. However, interestingly, while P24's goal is to create a situation which reduces cognitive effort (see (32)), P04 purposefully creates a stimulating environment in which aural and written language input diverge (see (33)).

(32) *"Switching" to the language or variant of a language that makes it easiest. The least amount of work for the brain is the first priority. For example, Norwegian subtitles will be worse on a Brazilian movie than English subtitles on an English-speaking movie.* (P24, translated from Norwegian)

(33) *If I'm a little bored while watching a series, I sometimes put on subtitles in a language I'm trying to learn or it's been a long time since I've used. It is not always available though.* (P04, translated from Norwegian)

Overall, the responses indicate that there is no one-size-fits-all language learning method for individuals with ADHD, underscoring the significance of embracing a diversity of strategies. As expressed by one participant, "Through activities - music - lectures - videos and books. Combined solutions". From the perspective of language teaching, it seems crucial to incorporate a wide and diverse range of pedagogical methods. This includes offering opportunities to practice a foreign language in different modalities, using various formats and materials, giving brief and clear instructions for assignments, and providing task-related choices (cf. Pfiffner et al., 2006). Since in classroom settings it is often not feasible to tailor instruction to each individual's needs, using a diverse range of methods increases the likelihood of including some effective approaches for everyone, while also satisfying the novelty-seeking preference often present in individuals with ADHD (Donfrancesco et al., 2015). The encouraging aspect is that multimodal, multi-sensory, and not overly long sessions not only benefit foreign language learners with ADHD but also make the learning environment more engaging for neurotypical learners.

4. Conclusions

The current study investigated how ADHD impacts foreign language learning and usage. The main aim was to present the experiences and reflections of adults with ADHD and situate them within the broader context of existing research on cognitive deficits and second language acquisition. Before we summarize the main findings and present conclusions, we would like to point out several limitations of the current study. First, the group of adults with ADHD consisted of more female than male respondents, mostly situated in Norway, and diagnosed in adulthood. Second, we cannot exclude that there is a sampling bias in the sense that more people with a specific interest in languages completed our survey. Furthermore, it is important to emphasize that the data reflect participants' subjective experiences regarding how they believe ADHD impacts their L2 learning and use. It remains unclear whether these experiences are actually attributable to ADHD, aspects of their personality, or common challenges associated with L2 acquisition. Considering these biases in our sample as well as the qualitative nature of our analysis, it remains to be seen whether our findings are representative of the population of adults with ADHD at large.

While most previous research has focused on the language and communication abilities of children with ADHD (Carruthers et al., 2022; Korrel et al., 2017), our findings provide valuable insights into the inner workings of adults with ADHD. From our data, a diverse picture emerged with lots of individual variation. Depending on their individual cognitive and behavioural symptom profiles as well as personality traits, adults with ADHD experienced different effects of their condition on foreign language learning and use. Difficulties with inattention made it challenging for some respondents to focus during traditional classroom instruction and led them to making careless mistakes in written texts. On the flip side, many respondents with ADHD also experienced periods of hyperfocus, in which they were highly productive. Cognitive deficits related to working memory made it difficult for some adults with ADHD to memorize vocabulary and grammatical forms, and to retrieve already acquired lexical items on demand during real-time interactions. Following and participating in conversations in a second language can also be challenging as it requires paying attention and processing multiple verbal and non-verbal cues simultaneously and deriving correct interpretations on the fly. The linguistic domain that appeared to be most affected by ADHD was pragmatics. Some respondents mentioned impulsive or hyperactive behaviours in communication such as talking excessively, interrupting others, and speaking without thinking first. The latter might result in grammatical errors that are more difficult to recover from in a second language. People with ADHD also exhibited different preferences for written or spoken modality. A learning style mentioned by several respondents was characterized by association, leading to an intuition or gut feeling about correct language use. In sum, our findings provide evidence that for many adults with ADHD, their disorder fundamentally affects the way they learn or use a foreign language, supporting the far-reaching effect of ADHD on different domains of a person's life.

The findings of the current study have several implications for second language teaching. Importantly, L2 teachers should be aware of the large heterogeneity connected to ADHD. In the public, oftentimes a too monolithic picture of ADHD prevails, which conceals the large cognitive and behavioural differences present within the group of adults with ADHD. There is evidence that teachers' knowledge of ADHD, their attitude, in-classroom behaviour, and method of instruction is critical for students' motivation and learning success (Kormos and Smith, 2012; Pfiffner et al., 2006). In the context of L2 teaching in smaller groups or individual sessions, we recommend having regular student-teacher conversations to develop and adjust individual learning plans adapted to the strengths, challenges, and preferences of the specific student with ADHD. A particular focus should be on finding ways how to best sustain the student's motivation, as consistent learning over extended periods of time can be challenging for individuals with ADHD. For larger classroom settings, it seems beneficial to use a wide range of pedagogical methods and learning activities to keep students engaged (cf. Tedick, 2002).

In general, it was striking that numerous respondents expressed that ADHD positively affected their L2 learning and use, for instance by diminishing their fear of initiating conversations or making mistakes in a second language. Adults with ADHD in our sample did not commonly view ADHD as a hindrance or obstacle for L2 acquisition, but rather embraced their neurodiversity and developed individual strategies to boost second language acquisition. Previous studies also support the idea that ADHD does not necessarily impede L2 acquisition, as evidenced by findings that adults with and without ADHD achieve similar levels of proficiency in a second language (Sparks et al., 2004, 2008). However, the cognitive preconditions, pathways, and strategies to achieve similar L2 outcomes seem to be different. Listening to the voices of individuals with ADHD can contribute to providing more suitable learning opportunities and decreasing the risk of adverse effects linked with ADHD such as academic underachievement and decreased work performance.

CRediT authorship contribution statement

Franziska Köder: Writing – review & editing, Writing – original draft, Supervision, Resources, Project administration, Methodology, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Cecilie Rummelhoff:** Writing – original draft, Methodology, Formal analysis, Data curation, Conceptualization. **Maria Garraffa:** Writing – review & editing, Methodology, Formal analysis, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgements

We would like to thank Ola Trondsson Eidet for translations of selected quotations from Norwegian to English, and Marianna Kyriacou for proof-reading a previous version of this article. This work was supported by a FINNUT grant from the Research Council of Norway [grant number: 315368] awarded to the first author.

References

American Psychiatric Association, 2013. Diagnostic and Statistical Manual of Mental Disorders: Diagnostic and Statistical Manual of Mental Disorders, fifth ed. American Psychiatric Association.

Baddeley, A., Gathercole, S., Papagno, C., 1998. The phonological loop as a language learning device. Psychol. Rev. 105 (1), 158–173. https://doi.org/10.1037/0033-295X.105.1.158.

Barkley, Russell A., 1997. Behavioral inhibition, sustained attention, and executive functions: constructing a unifying theory of ADHD. Psychol. Bull. 121 (1), 65–94. https://doi.org/10.1037/0033-2909.121.1.65.

Baron, I.S., 2004. Neuropsychological Evaluation of the Child. Oxford University Press.

Birdsong, D., Gertken, L.M., Amengual, M., 2012. Bilingual Language Profile: an Easy-To-Use Instrument to Assess Bilingualism. University of Texas at Austin, COERLL.

Brown, T.E., 2006. Attention Deficit Disorder: the Unfocused Mind in Children and Adults. Yale University Press.

Carruthers, S., Taylor, L., Sadiq, H., Tripp, G., 2022. The profile of pragmatic language impairments in children with ADHD: a systematic review. Dev. Psychopathol. 34 (5), 1938–1960. https://doi.org/10.1017/S0954579421000328.

Chafe, W., Tannen, D., 1987. The relation between written and spoken language. Annu. Rev. Anthropol. 16 (1), 383–407. https://doi.org/10.1146/annurev.anthro.16.1.383.

Chai, W.J., Abd Hamid, A.I., Abdullah, J.M., 2018. Working memory from the psychological and neurosciences perspectives: a review. Front. Psychol. 9, 1–16. https://doi.org/10.3389/fpsyg.2018.00401.

Cowan, N., 2008. What are the differences between long-term, short-term, and working memory? Prog. Brain Res. 169, 323–338. https://doi.org/10.1016/S0079-6123(07)00020-9.

Dewaele, J.M., Wei, L., 2014. Attitudes towards code-switching among adult mono- and multilingual language users. J. Multiling. Multicult. Dev. 35 (3), 235–251. https://doi.org/10.1080/01434632.2013.859687.

Donfrancesco, R., Di Trani, M., Porfirio, M.C., Giana, G., Miano, S., Andriola, E., 2015. Might the temperament be a bias in clinical study on attention-deficit hyperactivity disorder (ADHD)?: novelty Seeking dimension as a core feature of ADHD. Psychiatr. Res. 227 (2–3), 333–338. https://doi.org/10.1016/j.psychres.2015.02.014.

Engelhardt, P.E., Corley, M., Nigg, J.T., Ferreira, F., 2010. The role of inhibition in the production of disfluencies. Mem. Cognit. 38 (5), 617–628. https://doi.org/10.3758/MC.38.5.617.

Engelhardt, P.E., Ferreira, F., Nigg, J.T., 2009. Priming sentence production in adolescents and adults with attention-deficit/hyper-activity disorder. J. Abnorm. Child Psychol. 37 (7), 995–1006. https://doi.org/10.1007/s10802-009-9323-3.

Engelhardt, P.E., Ferreira, F., Nigg, J.T., 2011. Language production strategies and disfluencies in multi-clause network descriptions: a study of adult attention-deficit/hyperactivity disorder. Neuropsychology 25 (4), 442–453. https://doi.org/10.1037/a0022436.

Engle, R.W., 1996. Working memory and retrieval: an inhibition-resource approach. In: Richardson, R.T. Z. John T.E., Engle, Randall W., Hasher, Lynn, Logie, Robert H., Stoltzfus, Ellen R. (Eds.), Working Memory and Human Cognition. Oxford University Press. https://doi.org/10.1093/acprof:oso/9780195100990.003.0004.

Even-Simkin, E., 2024. Assessment of pragmatic skills in adults with ADHD. Language and Health 66–78.

Faraone, S.V., Banaschewski, T., Coghill, D., Zheng, Y., Biederman, J., Bellgrove, M.A., Newcorn, J.H., Gignac, M., Al Saud, N.M., Manor, I., Rohde, L.A., Yang, L., Cortese, S., Almagor, D., Stein, M.A., Albatti, T.H., Aljoudi, H.F., Alqahtani, M.M.J., Asherson, P., et al., 2021. The world federation of ADHD international consensus statement: 208 evidence-based conclusions about the disorder. Neurosci. Biobehav. Rev. 128 (June 2020), 789–818. https://doi.org/10.1016/j.neubiorev.2021.01.022.

Follmer, D.J., 2018. Executive function and reading comprehension: a meta-analytic review. Educ. Psychol. 53 (1), 42–60. https://doi.org/10.1080/00461520.2017.1309295.

Gnanavel, S., Sharma, P., Kaushal, P., Sharafat, H., 2019. Attention deficit hyperactivity disorder and comorbidity: a review of literature. World Journal of Clinical Cases 7 (17), 2420–2426. https://doi.org/10.3280/PU2021-003009.

Green, B.C., Johnson, K.A., Bretherton, L., 2014. Pragmatic language difficulties in children with hyperactivity and attention problems: an integrated review. Int. J. Lang. Commun. Disord 49 (1), 15–29. https://doi.org/10.1111/1460-6984.12056.

Hupfeld, K.E., Abagis, T.R., Shah, P., 2019. Living "in the zone": hyperfocus in adult ADHD. ADHD Attention Deficit and Hyperactivity Disorders 11 (2), 191–208. https://doi.org/10.1007/s12402-018-0272-y.

Kahneman, D., 2011. Thinking, Fast and Slow. Farrar, Straus and Giroux.

Kałdonek-Crnjaković, A., 2018. The cognitive effects of ADHD on learning an additional language. Govor 35 (2), 215–227. https://doi.org/10.22210/govor.2018.35.12.

Köder, F., Rummelhoff, C., 2023. ADHD og flerspråklighet: En mulighet eller en utfordring? Stå på! - Et Medlemsmagasin Fra ADHD Norge 1, 14–17.

Köder, F., Rummelhoff, C., Garraffa, M., 2024. Comparing pragmatic abilities across multiple languages in adults with ADHD: insights from a self-report questionnaire. Clin. Linguist. Phon. 00 (00), 1–16. https://doi.org/10.1080/02699206.2024.2374909.

Kofler, M.J., Irwin, L.N., Soto, E.F., Groves, N.B., Harmon, S.L., Sarver, D.E., 2019. Executive functioning heterogeneity in pediatric ADHD. J. Abnorm. Child Psychol. 47 (2), 273–286. https://doi.org/10.1007/s10802-018-0438-2.

Kooij, J.J.S., Francken, M.H., Bron, T.I., Wynchank, D., 2019. Diagnostisk Intervju for Utredning Av ADHD Hos Voksne, 3de utgave; DIVA-5).

Kormos, J., Smith, A.M., 2012. Teaching languages to students with specific learning differences. Multilingual Matters, p. 248.

Korrel, H., Mueller, K.L., Silk, T., Anderson, V., Sciberras, E., 2017. Research review: language problems in children with attention-deficit hyperactivity disorder – a systematic meta-analytic review. J. Child Psychol. Psychiatry Allied Discip. 58 (6), 640–654. https://doi.org/10.1111/jcpp.12688.

Leer, K., 2021. ADHD: 7 Veier Til Ny Forståelse. Cappelen Damm.

Linck, J.A., Osthus, P., Koeth, J.T., Bunting, M.F., 2014. Working memory and second language comprehension and production: a meta-analysis. Psychonomic Bull. Rev. 21 (4), 861–883. https://doi.org/10.3758/s13423-013-0565-2.

Littman, E., 2017. Never enough? Why your brain craves stimulation. ADDitude Magazine. Updated online 2024. https://www.additudemag.com/brain-stimulation-and-adhd-cravings-dependency-and-regulation/.

Lukasik, K.M., Waris, O., Soveri, A., Lehtonen, M., Laine, M., 2019. The relationship of anxiety and stress with working memory performance in a large non-depressed sample. Front. Psychol. 10, 1–9. https://doi.org/10.3389/fpsyg.2019.00004.

Miyake, A., Friedman, N.P., Emerson, M.J., Witzki, A.H., Howerter, A., Wager, T.D., 2000. The unity and diversity of executive functions and their contributions to complex "frontal lobe" tasks: a latent variable analysis. Cognit. Psychol. 41 (1), 49–100. https://doi.org/10.1006/cogp.1999.0734.

Moriguchi, Y., 2014. The early development of executive function and its relation to social interaction: a brief review. Front. Psychol. 5 (APR), 1–6. https://doi.org/10.3389/fpsyg.2014.00388.

Nigg, J.T., Willcutt, E.G., Doyle, A.E., Sonuga-Barke, E.J.S., 2005. Causal heterogeneity in attention-deficit/hyperactivity disorder: do we need neuropsychologically impaired subtypes? Biol. Psychiatr. 57 (11), 1224–1230. https://doi.org/10.1016/j.biopsych.2004.08.025.

Nijakowska, J., 2020. Dyslexia in the context of second language learning and teaching. Pragmalinguistica, Monografico 2, 257–271. https://doi.org/10.25267/Pragmalinguistica.2020.iextra2.15.

Nilsen, E.S., Mewhort Buist, T.A., Gillis, R., Fugelsang, J., 2013. Communicative perspective-taking performance of adults with ADHD symptoms. J. Atten. Disord. 17 (7), 589–597. https://doi.org/10.1177/1087054711428947.

Olson, D.J., 2023. Measuring bilingual language dominance: an examination of the reliability of the Bilingual Language Profile. Lang. Test. 40 (3), 521–547. https://doi.org/10.1177/02655322221139162.

Paling, R.M., 2020. An empirical study to determine whether ADHD disorder affects the process of language learning. Journal of Psychology and Neuroscience 2 (1), 1–7. https://doi.org/10.47485/2693-2490.1008.

Pfiffner, L.J., Barkley, R.A., Dupaul, G.J., 2006. Treatment of ADHD in school settings. In: Barkley, Russel A. (Ed.), Attention-Deficit Hyperactivity Disorder. Guilford Press.

Polanczyk, G.V., Willcutt, E.G., Salum, G.A., Kieling, C., Rohde, L.A., 2014. ADHD prevalence estimates across three decades: an updated systematic review and meta-regression analysis. Int. J. Epidemiol. 43 (2), 434–442. https://doi.org/10.1093/ije/dyt261.

Schmidt, R., 1995. Conciousness and foreign language learning: a toturial on the role of attention and awareness in learning. In: Schmidt, R. (Ed.), Attention and Awareness in Foreign Language Learning. University of Hawai'i Press, pp. 1–63.

Schneider, E., Crombie, M., 2003. Dyslexia and Foreign Language Learning. David Fulton.

Segal, D., Mashal, N., Shalev, L., 2015. Semantic conflicts are resolved differently by adults with and without ADHD. Res. Dev. Disabil. 47, 416–429. https://doi.org/10.1016/j.ridd.2015.09.024.

Shokrkon, A., Nicoladis, E., 2022. The directionality of the relationship between executive functions and language skills: a literature review. Front. Psychol. 13 (July) https://doi.org/10.3389/fpsyg.2022.848696.

Solís-Barroso, C., Stefanich, S., 2019. Measuring language dominance in early Spanish/English bilinguals. Language 4 (3), 1–22. https://doi.org/10.3390/languages4030062.

Song, P., Zha, M., Yang, Q., Zhang, Y., Li, X., Rudan, I., 2021. The prevalence of adult attention-deficit hyperactivity disorder: a global systematic review and meta-analysis. Journal of Global Health 11, 1–9. https://doi.org/10.7189/jogh.11.04009.

Sparks, R.L., Humbach, N., Javorsky, J., 2008. Individual and longitudinal differences among high and low-achieving, LD, and ADHD L2 learners. Learn. Indiv Differ 18 (1), 29–43. https://doi.org/10.1016/j.lindif.2007.07.003.

Sparks, R.L., Javorsky, J., Philips, L., 2004. College students classified with ADHD and the foreign language requirement. J. Learn. Disabil. 37 (2), 169–178. https://doi.org/10.1177/00222194040370020701.

Staikova, E., Gomes, H., Tartter, V., McCabe, A., Halperin, J.M., 2013. Pragmatic deficits and social impairment in children with ADHD. J. Child Psychol. Psychiatry Allied Discip. 54 (12), 1275–1283. https://doi.org/10.1111/jcpp.12082.

Tannock, R., 2018. ADHD and communication disorders. In: Banaschewski, T., Coghill, D., Zuddas, A. (Eds.), Oxford Textbook of Attention Deficit Hyperactivity Disorder. Oxford University Press. https://doi.org/10.1093/med/9780198739258.001.0001.

Tedick, D.J., 2002. Proficiency-oriented language instruction and assessment: a curriculum handbook for teachers. CARLA Working Paper Series. University of Minnesota, The Center for Advanced Research on Language Acquisition, Minneapolis, MN.

Teimouri, Y., Goetze, J., Plonsky, L., 2019. Second language anxiety and achievement: a meta-analysis. Stud. Sec. Lang. Acquis. 41 (2), 363–387. https://doi.org/10.1017/S0272263118000311.

Willcutt, E.G., Doyle, A.E., Nigg, J.T., Faraone, S.V., Pennington, B.F., 2005. Validity of the executive function theory of attention-deficit/hyperactivity disorder: a meta-analytic review. Biol. Psychiatr. 57 (11), 1336–1346. https://doi.org/10.1016/j.biopsych.2005.02.006.

Willcutt, E.G., Pennington, B.F., 2000. Comorbidity of reading disability and attention-deficit/hyperactivity disorder: differences by gender and subtype. J. Learn. Disabil. 33 (2), 179–191.