Comparing Pragmatic Abilities Across Multiple Languages in Adults with ADHD: Insights from a self-report questionnaire

Franziska Köder[a]*, Cecilie Rummelhoff[a] and 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*

*Franziska Köder
Department of Linguistics and Scandinavian Studies
University of Oslo
f.m.koder@iln.uio.no

Comparing Pragmatic Abilities Across Multiple Languages in Adults with ADHD: Insights from a self-report questionnaire

Attention-Deficit/Hyperactivity Disorder (ADHD) is associated with pragmatic language impairments in children, but less is known about the communicative abilities of adults with ADHD, especially when using a second or third language.

In this study, we developed a questionnaire to collect self-report measures of a set of pragmatic skills in a person's first, second and third language, comparing adults with and without an ADHD diagnosis. One hundred seventy-nine multilingual adults with (N=91) and without ADHD (N=88) completed the survey. As predicted, adults with ADHD reported more pragmatic difficulties than the control group. More specifically, people with ADHD showed pronounced impairments in regulating their behavior in spoken interactions in the form of excessive talking, frequently interrupting others, and speaking without thinking first. Notably, these types of hyperactive and impulsive behaviors were significantly reduced when people with ADHD communicated in a second or third language. For pragmatic difficulties related to inattention such as concentrating on a conversation, both groups tended to be more inattentive in their third language compared to their first and second language. The understanding of non-literal language was only affected by ADHD in the first language and was generally more taxing in a language with lower proficiency levels.

Our study contributes to a more nuanced understanding of how ADHD affects different kinds of communicative abilities in multilingual adults. It also has implications for clinical practice, highlighting the importance of assessing symptoms of inattention, hyperactivity, and impulsivity in a person's dominant language.

Keywords: ADHD, Pragmatics, Multilingualism, Inattention, Hyperactivity, Impulsivity, Non-literal language.

Introduction

Attention-Deficit/Hyperactivity Disorder (ADHD) often leads to communicative challenges. In fact, during diagnostic interviews, examples from language and communication are used to illustrate symptoms of inattention, hyperactivity, and impulsivity. The commonly used "Diagnostic Interview for ADHD in adults" (DIVA-5, Kooij et al., 2019) for instance, lists frequent topic shifts or difficulties focusing on a conversation as indicative of inattention symptoms, and a tendency to talk too much or frequently interrupting others as examples of hyperactivity/impulsivity symptoms. These kinds of communicative behaviors can severely disrupt the establishment and maintenance of social relationships (Kok et al., 2016; Strine et al., 2006).

However, an important aspect of communication difficulties linked with ADHD has been underexplored in prior research: multilingualism. Like the global population at large, a significant proportion of individuals with ADHD are multilingual speakers, using different languages to communicate in different contexts. To our knowledge, it is currently unclear whether communication skills are equally affected by ADHD across all languages of an individual. Potential differences in how pragmatic difficulties manifest in different languages of a multilingual speaker could have important clinical implications. There is evidence that immigrants tend to have a lower prevalence of ADHD compared to the majority population (e.g., Hansen et al., 2023; Schmengler et al., 2021; Slobodin & Masalha, 2020, but see also Lehti et al., 2016). The discussion on why this is the case often centers around factors such as genetic predisposition, differences in pre- and postnatal environment, use of health services as well as cultural factors. However, importantly, many immigrants also have a different mother tongue and are second language speakers of the majority language in which they are assessed. Since the assessment of ADHD is heavily based on interviews with the clients and their family members, the diagnostic process could be affected by lower levels of language proficiency as well as the presence of an interpreter. Another relevant factor, which has not been assessed yet is whether communication-related symptoms of inattention, hyperactivity and impulsivity can be equally well detected in a person's second language than in their first language. In this study, we present first findings of a newly developed questionnaire, assessing the presence of communicative ADHD-related symptoms across multiple languages of an individual.

Pragmatic abilities in ADHD

ADHD can have negative effects on many aspects of a person's life, from their physical and mental health to educational achievements and quality of life (cf. Faraone et al., 2021). ADHD also considerably affects the domains of language and communication, including expressive and receptive language skills, but crucially also pragmatic skills (Carruthers et al., 2021; Green et al., 2014; Korrel et al., 2017). Pragmatic abilities refer to the capacity to use language appropriately in different social settings (e.g., at work or home) and with different groups of people (e.g., friends, colleagues, strangers). These may manifest as conversational turn-taking abilities, i.e., switching smoothly between speaker and listener roles while maintaining the flow and coherence of a conversation (cf.

Sacks et al., 1978). Another set of pragmatic skills is related to understanding what a speaker intends to convey with non-literal uses of language (cf. Grice, 1989). This is for instance required when interpreting ironical utterances (e.g., "*Interesting talk*!" after attending a boring lecture), metaphors (e.g., "John is a *lion*" meaning John is very strong), or indirect requests (e.g., "*It is cold*" to ask someone to close the window).

A recent systematic review summarizing the results of 34 studies reporting on 2845 children concludes that children with ADHD are more likely to exhibit pragmatic communication difficulties than their typically developing peers (Carruthers et al., 2021). Pragmatic difficulties prevailed even when controlling for general language abilities, indicating that pragmatic abilities might be disproportionally affected in ADHD (Hawkins et al., 2016; Staikova et al., 2013). Examples of impaired conversation skills include inappropriate initiations, excessive talking, interrupting others, and lack of coherence (Green et al., 2014). Concerning narrative performance, children with ADHD were found to produce less coherent narratives than typically developing children, more likely omitting significant events, and including more ambiguous referential expressions (e.g., Kuijper et al., 2015; Papaeliou et al., 2015). Furthermore, children with ADHD also seem to have difficulties with understanding certain types of non-literal language uses, including irony (Caillies et al., 2014; Ludlow et al., 2017) and metaphors (Adachi et al., 2004). Interestingly, there is evidence that children with ADHD are explicitly aware of pragmatic rules, but that symptoms of inattention, hyperactivity and impulsivity might interfere with their application in social contexts (Bignell & Cain, 2007; Kim & Kaiser, 2000).

While much is known about pragmatic impairments in children and adolescents with ADHD, research on pragmatic abilities in adults with ADHD is still scarce. We know that adults with ADHD tend to experience more communication difficulties with their partners, especially in taxing situations (Wymbs, 2021). Furthermore, adults with ADHD show more speech disfluencies (Engelhardt et al., 2010) and produce more ungrammatical sequences (Engelhardt et al., 2009), potentially because they start speaking before speech planning has been completed. In the comprehension of metaphors and referential expressions, adults with ADHD manage to arrive at the correct interpretation but seem to do so in a less efficient manner than neurotypical adults (Nilsen et al., 2013; Segal et al., 2015). This hints at the presence of different pathways to achieving the same communicative outcomes. Despite some research in this area, we still lack an in-depth understanding of how symptoms of inattention, hyperactivity and impulsivity affect different aspects of communication. Considering that approximately 2.5 percent of adults are diagnosed with ADHD (Faraone et al., 2021), a better understanding of the communicative abilities of adults with ADHD will improve our knowledge of the developmental trajectory of this common neurodevelopmental disorder and lay the foundation for targeted training and intervention programs for adults.

ADHD and second language learning

Even though ADHD often co-occurs with learning disabilities (DuPaul & Volpe, 2009) and is related to poorer academic performance (e.g., Daley & Birchwood, 2010), individuals with ADHD do not inherently lack the capacity to acquire new skills such as

learning additional languages. In a series of studies, Sparks and colleagues (Sparks et al., 2004, 2005, 2008) found that students with ADHD did not show deficits in language and literacy skills in their first language and successfully passed courses on learning a foreign language. Another study suggests that young bilingual adults with ADHD even have a bigger vocabulary size than their bilingual peers without ADHD (Brouillard & Byers-Heinlein, 2023). This research indicates that individuals with ADHD do not necessarily have a disadvantage in language learning, but they might need to use different learning strategies to achieve the same outcome (Kałdonek-Crnjaković, 2021; Paling, 2020). Furthermore, the evidence to date suggests that for individuals with ADHD learning additional languages does not negatively impact cognitive performance or ADHD-related symptoms (Köder et al. 2022).

To our knowledge, there is currently no research on whether individuals with ADHD also struggle with pragmatics in their second language. However, there has been a substantial amount of research on pragmatic abilities in a second language more generally (cf. e.g., Taguchi, 2019). Pragmatic knowledge in adult second language learners builds on the pragmatic system of the first language and improves with increasing language proficiency (e.g., Taguchi, 2011). Second language learners are for instance slower and less accurate in processing verbal irony, but only with lower levels of language proficiency (e.g., Ellis et al., 2021; Shively et al., 2008). In speech production, cognitive control mechanisms are arguably needed to suppress activation of other languages, especially the more dominant ones (Bialystok, 2017; Green & Abutalebi, 2013). This could be especially challenging for individuals with ADHD who have a higher likelihood of attentional control deficits (Hervey et al., 2004), potentially affecting aspects of their pragmatic performance. As far as we are aware, there are no studies comparing pragmatic abilities of individuals with ADHD in their first and second language(s).

Current study

The main goal of the present study is to investigate pragmatic abilities in adults with ADHD, across multiple languages, using a newly developed self-report questionnaire. We address the following research questions:

(1) Do adults with ADHD show impairments with specific pragmatic skills, compared to a control group of adults without ADHD? And if so, what kinds of pragmatic skills are affected?
(2) Are pragmatic difficulties comparable if a person with ADHD communicates in their first language compared to a second or third language?

Our exploratory study will give new insights into whether the widely attested pragmatic impairments in children with ADHD prevail into adulthood, and if so, what specific areas of communication are particularly affected. Furthermore, it will improve our understanding of how pragmatic difficulties related to inattention, hyperactivity, and impulsivity manifest in a second and third language, in which speakers have lower levels of language proficiency. Our results will also have clinical implications as immigrants are often assessed in a non-native language.

Methods

Materials

We developed a questionnaire to assess pragmatic difficulties across multiple languages. The survey was implemented using a web-based tool for data collection from the University of [blinded for peer review] and could be answered in Norwegian or English. No person-identifying information about the participants was collected, which is why an application to the Norwegian Agency for Shared Services in Education and Research "Sikt" was not required. The questionnaire took participants approximately 10-15 minutes to complete.

The questionnaire consists of three sections. The first section collects background information such as age, gender, country of residence and education level. For participants with ADHD, the section also includes a question asking at what age they received an official ADHD diagnosis. The second section gathers information regarding the language background of participants, while the third and main section involves participants rating statements about pragmatic difficulties in their first, second and potentially third language. The complete survey is accessible in the Appendix, and the corresponding data can be found at https://osf.io/zn9tb/view_only=791144ee7b2d49c8b26c451e1b06dffe. In the following, we will describe sections 2 and 3 in more detail.

Language profile

To assess the language background of the participants, we used several questions from the Bilingual Language Profile (BLP) (Birdsong et al., 2012). The BLP is a self-report questionnaire designed to construct a comprehensive bilingual profile and has been tested for validity (Solís-Barroso & Stefanich, 2019) and reliability (Olson, 2023). We asked participants to list up to three languages in which they are proficient (including their native language(s)), presenting them in order of competence. For each language, we asked a total of 10 questions selected from the BLP tapping into participants' language history, language use, and language proficiency. The language proficiency ratings followed the BLP scoring system with a scale from 0 ("not very well") to 6 ("very well"). For the Norwegian version of the questionnaire, the selected questions from the BLP were translated from English to Norwegian and the translation was checked by two native speakers.

Rating of pragmatic difficulties

In section 3 of the questionnaire, participants needed to assess whether they had difficulties with 18 different pragmatic skills, using a 7-point scale from "strongly agree" to "strongly disagree". Participants rated the same 18 statements for their first, second and potentially third language. Fifteen of these statements were taken from the "Diagnostic Interview for ADHD in adults" (DIVA-5, Kooij et al., 2019), which is available in English and Norwegian. The DIVA-5 is a frequently used diagnostic interview guide for assessing ADHD in adults, exhibiting high validity (e.g., Pettersson et al., 2018). It contains 18 questions about the core symptoms of ADHD, based on the

classification in DSM-5 (American Psychiatric Association, 2013). Under each question, there are several examples of possible answers listed, based on common descriptions provided by adult patients in clinical practice. We selected examples that dealt with a broad range of pragmatic communication skills. This resulted in 15 statements, of which 6 were from the inattention section of the DIVA-5, and 9 from the hyperactivity/impulsivity section. In addition, we included 3 questions on non-literal language, tapping into participants' understanding of irony, jokes, and metaphors. Two open-ended questions at the end of the questionnaire tapped into participants' own experiences on how ADHD has affected their learning and use of additional languages. This qualitative data is reported in Köder, Rummelhoff & Garraffa (under review).

Participants

A total of 181 adults residing in Norway participated in the study. The inclusion criteria for participating were 1) being 18 years of age or older, and 2) speaking two or more languages. All participants were sent to a starting page, where they could choose the language of the questionnaire (English or Norwegian), and if they had officially been diagnosed with ADHD, and then being sent directly to one of four versions of the questionnaire. Two participants with ADHD were excluded, as the pattern of their answers (giving same response to all questions in the second half of the questionnaire) suggested that they had given random responses. Ultimately, there were 91 participants in the ADHD group, and 88 participants in the control group. Of those 179 participants, 147 filled in the questionnaire in Norwegian and 32 in English. Participants with ADHD were recruited via an article on ADHD and multilingualism published in URO (Köder & Rummelhoff, 2023), the members' magazine for the Norwegian ADHD association. In addition, a link to the survey was shared in different Norwegian social media groups, targeting people with and without ADHD. The survey was open for several months in 2023 and took participants about 10-15 minutes to complete. Participation in the study was voluntary and anonymous.

	ADHD **N=91**	**Control** **N=88**
Age (in years)	Mean: 34.1 Range: 18-61	Mean: 29.0 Range: 18-63
Gender	Male (20) Female (65) Non-binary (5) Prefer not to say (1)	Male (20) Female (67) Non-binary (0) Prefer not to say (1)
Level of Education	Primary school (6) Secondary school (24) Bachelor's degree (37) Master's degree (23) PhD (1)	Primary school (0) Secondary school (20) Bachelor's degree (32) Master's degree (30) PhD (6)
Age of ADHD Diagnosis	Mean: 29 Range: 7-57	

(in years)		

Table 1. Background information of study participants.

Table 1 provides an overview of the participant characteristics in the ADHD group and a control group consisting of people who indicated that they had no official ADHD diagnosis. For both groups (with and without ADHD) we did not register whether individuals had additional disorders such as autism spectrum disorder or dyslexia. Both groups are comparable in their distribution of gender, level of education, and age range. Note that in both groups female respondents are overrepresented. Individuals with ADHD were mostly diagnosed as adults (mean age of diagnosis: 29 years).

Table 2 contains information about the proficiency in participants' first (L1), second (L2) and third language (L3) if applicable, divided by language modality (speaking, understanding, and reading) and group (ADHD, Control). Not all participants reported speaking a third language (ADHD: 66, Control: 72). In the ADHD group, 66 respondents listed Norwegian as their L1, and 15 listed Norwegian as their L2. In the control group, 57 respondents listed Norwegian as their L1, and 9 listed it as their L2. For participants who did not report Norwegian or English as their L1, and thus filling out the questionnaire in their L2 or L3, all participants reported good overall proficiency (score of 4 or above out of 6) in the language of the questionnaire.

BLP (score 1-6)		**L1 Means (SD)**	**L2 Means (SD)**	**L3 Means (SD)**
Speaking	**ADHD**	5.83 (0.58)	5.09 (1.06)	3.51 (1.66)
	Control	5.97 (0.95)	5.02 (0.95)	3.63 (1.41)
Understanding	**ADHD**	5.89 (0.50)	5.57 (0.79)	4.30 (1.52)
	Control	5.97 (0.14)	5.45 (0.85)	4.26 (1.50)
Reading	**ADHD**	5.78 (0.74)	5.38 (1.04)	4.12 (1.63)
	Control	5.95 (0.25)	5.28 (1.09)	4.23 (1.46)
Overall proficiency	**ADHD**	5.83 (0.61)	5.35 (0.98)	3.97 (1.63)
	Control	5.96 (0.19)	5.25 (0.98)	4.04 (1.48)

Table 2. Language proficiency in a first (L1), second (L2) and third (L3) language, divided by group (ADHD, Control) and modality (speaking, understanding, reading).

The rating of language proficiency was done on a parametric scale (0-6). To check if there were significant differences in reported proficiency between participants with and without ADHD, we conducted t-tests (with Bonferroni corrections) of the overall proficiency scores, a composite of the speaking, understanding, and reading scores. As expected, we found a significant decrease in proficiency from L1 to L2 to L3 for both groups ($p < .001$), which confirms that participants listed their languages in order of competence, as instructed. While proficiency in L2 and L3 did not differ between the ADHD group and the control group, there was a significant difference in reported proficiency in L1, with participants with ADHD indicating lower proficiency levels than the control group (p=0.005). This potentially reflects self-awareness of the communicative deficits faced by adults with ADHD (cf. Paling, 2020).

Results

Overview of communicative difficulties

Table 3 shows participants' ratings (from "strongly agree" to "strongly disagree") of 18 statements tapping into communicative difficulties related to (a) inattention, (b) hyperactivity/impulsivity, and (c) non-literal language. To be able to compare the ratings between different groups of participants (ADHD and Control) and participants' different languages (L1, L2, L3), we converted the Likert-scale ratings into numeric values from 1 to 7 and calculated means and standard deviations. A rating of 4 means that a participant neither agreed nor disagreed with a certain statement, while ratings below 4 indicate that a participant agreed with a statement, meaning that they have difficulties with this specific aspect of communication. Statements with ratings above 4 on the other hand, indicate that participants did not experience a specific communicative difficulty.

Statement	**Statement type**	**ADHD Means (SD)**			**Control group Means (SD)**		
		L1 (n=91)	**L2 (n=91)**	**L3 (n=66)**	**L1 (n=88)**	**L2 (n=88)**	**L3 (n=72)**
1. I do not read instructions carefully	Inattention	3.94 (2.04)	4.01 (1.87)	3.90 (1.94)	4.39 (1.87)	4.85 (1.73)	4.85 (1.92)
2. I do not like reading due to mental effort	Inattention	5.52 (1.95)	5.04 (1.99)	3.89 (2.01)	6.68 (0.92)	5.50 (1.53)	4.32 (2.14)
3. I have difficulty concentrating on a conversation	Inattention	4.87 (1.90)	4.71 (1.88)	3.90 (1.80)	6.86 (0.51)	5.63 (1.46)	4.46 (2.08)
4. I often change the subject of the conversation	Inattention	3.42 (1.83)	4.09 (1.71)	4.43 (1.61)	5.14 (1.92)	5.42 (1.39)	5.18 (1.43)
5. I easily get distracted by the conversations of others	Inattention	**2.35*** (1.62)	**2.51*** (1.54)	3.47 (1.93)	**2.43*** (2.01)	**3.08*** (1.99)	3.86 (1.93)
6. I have difficulty in filtering and/or selecting information	Inattention	4.53 (1.94)	4.45 (1.81)	3.6 (1.73)	6.53 (0.97)	5.75 (1.23)	4.48 (1.96)
7. I talk during activities when this is not appropriate	Hyperactivity/ Impulsivity	4.03 (1.79)	4.14 (1.72)	4.64 (1.69)	5.59 (1.51)	5.48 (1.36)	5.32 (1.47)
8. I have difficulty in speaking softly	Hyperactivity/ Impulsivity	4.53 (1.97)	4.82 (1.80)	5.10 (1.63)	6.18 (1.42)	5.71 (1.45)	5.76 (1.44)
9. I have a tendency to talk too much	Hyperactivity/ Impulsivity	**3.09*** (1.84)	3.83 (1.83)	4.87 (1.78)	4.43 (1.87)	5.15 (1.68)	5.66 (1.50)
10. I do not give others room to interject during a conversation	Hyperactivity /Impulsivity	4.31 (1.80)	4.50 (1.63)	5.24 (1.56)	5.84 (1.29)	5.93 (1.28)	6.20 (1.23)
11. I need a lot of words to say something	Hyperactivity/ Impulsivity	3.93 (1.97)	3.85 (1.74)	3.95 (1.72)	5.65 (1.52)	4.83 (1.65)	4.20 (1.77)
12. I have difficulty waiting my turn	Hyperactivity/ Impulsivity	**3.13*** (1.67)	3.86 (1.72)	4.76 (1.71)	5.68 (1.58)	5.69 (1.34)	6.13 (1.20)

during conversations							
13. I interrupt others frequently	Hyperactivity/ Impulsivity	**2.84*** (1.52)	3.59 (1.83)	4.72 (1.70)	4.94 (1.76)	5.49 (1.59)	6.01 (1.31)
14. I give people answers before they have finished speaking	Hyperactivity/ Impulsivity	**2.47*** (1.43)	3.67 (1.85)	4.47 (1.86)	4.65 (1.85)	5.28 (1.63)	5.68 (1.50)
15. I say things without thinking first	Hyperactivity/ Impulsivity	**2.64*** (1.40)	3.60 (1.75)	4.53 (1.81)	3.44 (1.79)	4.56 (1.73)	5.41 (1.59)
16. I have difficulties understanding irony or sarcasm	Non-literal language	5.26 (1.81)	5.09 (1.71)	3.86 (1.92)	6.57 (0.78)	5.31 (1.65)	3.99 (2.05)
17. I have difficulties understanding jokes	Non-literal language	5.56 (1.62)	5.03 (1.71)	3.84 (1.90)	6.55 (0.84)	5.20 (1.67)	3.89 (2.03)
18. I have difficulties understanding metaphors	Non-literal language	5.65 (1.72)	4.85 (1.80)	3.80 (1.92)	6.60 (0.72)	5.21 (1.72)	3.72 (2.06)

Table 3. Means and SD for 7-point Likert-scale ratings of 18 statements concerning communicative difficulties, divided by group (ADHD, Control) and languages (L1, L2, L3). Marked in **bold*** are values significantly lower than 4 ("neither agree nor disagree").

To identify communicative difficulties in different groups of participants and different languages, we examined all mean scores below 4 (n=32) to determine their statistical significance compared to the neutral point ("neither agree nor disagree"). To analyze this ordinal data, we used a non-parametric one-sample Wilcoxon signed rank test in R (version 4.3.1) and adjusted the *p*-values for multiple comparisons using Bonferroni corrections. The significant differences are marked in bold in Table 3.

For communicative difficulties related to inattention, only statement 5 ("I easily get distracted by the conversations of others ") was significant in adults with ADHD, in both their first and second language. However, results showed that also neurotypical adults tend to get easily distracted by other people's conversation in their first and second language. For communicative difficulties linked to hyperactivity or impulsivity, participants with ADHD reported significant difficulties with five pragmatic skills: talking too much, difficulty waiting one's turn, interrupting others frequently, giving people answers before they have finished speaking, and speaking before thinking. Importantly, these skills were only impaired in participants with ADHD and not the neurotypical control group. Furthermore, these difficulties were only significant in the first, but not the second or third language. On average, the understanding of irony, jokes and metaphor was not significantly impaired in the ADHD or control group, even though some individuals indicated difficulties with non-literal language.

Effects of ADHD and language

To investigate how Group (ADHD, Control) and Language (L1, L2, L3) influence participants' ratings of communicative difficulties, we analyzed the data with Cumulative Link Mixed Models for ordinal data in R (version 4.3.1). As effects might be different for communicative abilities related to (a) inattention, (b) hyperactivity/impulsivity, and (c) nonliteral language comprehension, we built three separate models, each including as fixed effects Group, Language and their interaction, and random intercepts for items and

random intercepts and slopes per Language for participants. Note that the model for nonliteral language comprehension includes only random intercepts for items and participants as it failed to converge with random slopes. All models were significantly better than the null models, excluding the fixed effects or their interaction. Post hoc comparisons with the "lsmeans" function (Tukey contrasts) were performed to determine which contrasts were significant.

For the inattention statements (Table 3, statements 1-6,), participants with ADHD reported more communicative difficulties than neurotypical participants across all three languages, in the L1 (β = -1.54, *SE* = 0.19, z = -8.28, p <.0001), L2 (β = -0.89, *SE* = 0.17, z = -5.19, p <.0001), and L3 (β = -0.70, *SE* = 0.21, z = -3.37, p = .01). For participants with ADHD, the ratings were not modulated by language (L1, L2, L3). By contrast, neurotypical participants reported to be more inattentive in communication in their L2 compared to their L1 (β = -0.65, *SE* = 0.13, z = -4.89, p <.0001), and their L3 compared to their L2 (β = -0.52, *SE* = 0.14, z = -3.62, p =.004) and L1 (β = -1.17, *SE* = 0.18, z = -6.36, p <.0001).

For the statements concerning hyperactivity and impulsivity in communication (statements 7-15, Table 3), participants with ADHD also had generally lower ratings than control participants. This was the case across all languages, the L1 (β = -2.66, *SE* = 0.28, z = -9.39, p <.0001), L2 (β = -1.95, *SE* = 0.29, z = -6.77, p <.0001), and L3 (β = -1.39, *SE* = 0.33, z = -4.28, p =.0003). For the group with ADHD, ratings were higher in the L2 compared to the L1 (β = 0.90, *SE* = 0.16, z = 5.80, p <.0001) and L3 compared to both L1 (β = 1.98, *SE* = 0.23, z = 8.48, p <.0001) and L2 (β = 1.08, *SE* = 0.19, z = 5.71, p <.0001), meaning that participants with ADHD rated themselves as being less hyperactive and impulsive in conversations conducted in their second and third language. The neurotypical control group showed a similar tendency, but only the difference between the L1 and L3 was significant (β = 0.71, *SE* = 0.23, z = 3.07, p <.0001).

For the statements concerning non-literal language comprehension (statements 16-18, Table 3), participants with ADHD indicated a lower understanding than neurotypical participants only for the L1 (β = -2.30, *SE* = 0.38, z = -6.14, p <.0001), but not the L2 or L3. Within the group of people with ADHD, non-literal language understanding was rated as higher in the L1 than the L2 (β = 1.00, *SE* = 0.17, z = 5.99, p <.0001) and L3 (β = 2.50, *SE* = 0.20, z = 12.74, p <.0001), and higher in the L2 than the L3 (β = 1.50, *SE* = 0.19, z = 8.11, p <.0001). This is similar to the control group whose non-literal language comprehension also decreased from the L1 to the L3.

Discussion

With a newly developed questionnaire, we assessed difficulties with pragmatic communication skills in adults with and without an ADHD diagnosis. Participants had to indicate their agreement with 18 statements on a 7-point scale for each of their (up to three) languages. Being the first study on this topic, our study is exploratory rather than confirmatory in nature.

We found that people with ADHD assessed themselves generally as having more difficulties in communication than a control group of adults who did not have an ADHD diagnosis. Adults with ADHD scored lower on all three types of pragmatic skills:

communicative abilities related to (a) inattention, (b) hyperactivity and impulsivity, and (c) non-literal language understanding. This is in line with previous research showing that ADHD has negative effects on a wide range of pragmatic abilities (Carruthers et al., 2021; Green et al., 2014). The strongest pragmatic difficulties were reported for turn-taking abilities, where hyperactivity and impulsivity symptoms seem to impede successful communicative exchanges with others. Adults with ADHD report for instance that they talk excessively, interrupt others frequently, and speak without thinking first – all potential indicators that they struggle with effectively controlling and coordinating their communicative behavior in relation to both their conversation partner and the topic at hand. This confirms that impairments in conversational abilities attested in children with ADHD (cf. Carruthers et al., 2021; Green et al., 2014) are to some extent also present in adults. As communication plays a pivotal role in building and sustaining social relationships, deviating from conversational norms can have negative social consequences. Other areas of pragmatics such as understanding non-literal language (irony, metaphor, jokes) do not seem to pose difficulties for people with ADHD on a group level, even though ratings in the L1 were significantly lower than those of the control group. This is in line with previous research suggesting that impairments in inferring non-literal meanings are only mild (Caillies et al., 2014; Segal et al., 2015). Based on our results, it appears that pragmatic challenges in adults with ADHD are more pronounced in speech production than speech comprehension. However, to tap into differences in language comprehension, fine-grained measures such as eye-tracking might be needed to capture differences in on-line processing between adults with and without ADHD (see e.g., Köder & Falkum, 2021).

In this study we compared ratings of pragmatic difficulties in individuals' first, second, and potentially third language, ordered by language competence. We found that impairments in communication related to hyperactivity and impulsivity tended to decrease from the L1 to the L3, particularly for the ADHD group. This means that people with ADHD seem to interrupt others less frequently and limit excessive talking when speaking their second language. The gradual decrease in symptom severity between the L1, L2 and L3 suggests that this effect could be caused by a decrease in language proficiency. With lower levels of language proficiency, speech production processes become less automatized and therefore slower and more effortful (Gollan et al., 2008). Note that we also found significant differences in communicative impulsivity and hyperactivity symptoms when comparing speakers with ADHD in their first and second language, even though the sample consisted of very advanced L2 speakers. This raises the question whether speaking a second language by itself might recruit attentional control mechanisms (cf. e.g., Bialystok & Craik, 2022; Green & Abutalebi, 2013). Numerous studies support the existence of a "foreign language effect," indicating that using a foreign language significantly impacts moral judgments and decision-making, possibly due to increased psychological distance and enhanced cognitive control (Circi et al., 2021; Costa et al., 2014; Keysar et al., 2012). In our case, utilizing a second language could potentially foster more regulated and less impulsive behaviors in interactions, particularly beneficial for individuals with ADHD. However, at this point our findings from a self-report measure need to be taken with caution. Future studies using

observational and experimental methods are needed to confirm whether hyperactive/impulsive behaviors are indeed less frequent when a person with ADHD speaks in their second or third language compared to their first language, and whether this effect is modulated by language proficiency, frequency of use, and the contexts of language use. In addition, it would be interesting to compare para- and nonverbal behavior across languages in adults with and without ADHD.

For communicative difficulties related to inattention, we found the opposite effect. All participants tended to be more inattentive in their L3 compared to their L1 and L2. For instance, reading and concentrating on a conversation was rated as more effortful in a third than the first language. A similar result was obtained for irony, metaphor, and jokes, which are generally harder to process in a language, participants are less proficient in (cf. Ellis et al., 2021; Shively et al., 2008). We suggest that processing linguistic input in a language speakers have lower competence in requires allocating additional attentional resources, which might in turn be lacking for other tasks. This could result in seemingly increased inattention symptoms when interacting in a second or third language, for both individuals with and without ADHD.

Clinical implications

Our research has important implications for clinical practice. There is a world-wide trend that people with an immigration background tend to be at risk of being under-diagnosed for ADHD (e.g., Hansen et al., 2023; Schmengler et al., 2021; Slobodin & Masalha, 2020, but see also Lehti et al., 2016). While this could be the result of multiple factors, from genetic predisposition to knowledge of the healthcare system, limited attention has so far been given to language-related factors. A client with an immigration background might get assessed and interviewed in the majority language, which might not be their first language. What impact this has on the validity of the assessment of a multilingual speaker is unclear. The findings from our study indicate that communicative symptoms of hyperactivity and impulsivity are most strongly pronounced in a person's first language, i.e., the language they have the highest competence in. Conducting diagnostic interviews and tests in a person's second or third language might therefore mask communicative hyperactivity and impulsivity symptoms, increasing the risk of underdiagnosing ADHD in multilingual speakers who are not evaluated in their dominant language. Further research is necessary to determine whether the current tools for assessing ADHD are equally valid for multilingual speakers.

Limitations

It is important to acknowledge and address several limitations of the current study. First, the results of this study are based on a self-rating questionnaire, which always entails the risk of a potential self-report bias. Previous research indicates that self-ratings tend to be less reliable in people with ADHD, mainly due to the tendency that people with ADHD underestimate their own impairment (Butzbach et al., 2021; Manor et al., 2012). Also, there is evidence that children with ADHD generally rate their own competence higher than children without ADHD, called the positive illusionary bias (see for example Crisci et al., 2022). However, there is less evidence that this also applies to adults with ADHD

(Abu-Ramadan et. al, 2023), and to our knowledge no indication that this extends to the self-rating of language skills. Nevertheless, we cannot exclude the possibility that individuals with ADHD in our study exhibit a positive illusionary bias. However, the fact that individuals with ADHD reported more pragmatic difficulties than the control group suggests that – despite a potential positive illusionary bias – differences between the groups are present and potentially even more pronounced than our data indicates.

Another limitation is that the ADHD group in our study consisted of mostly female respondents, many of whom received their diagnosis in adulthood. Since ADHD is approximately twice as frequently diagnosed in men than in women (Willcutt, 2012), this raises the question of how generalizable our findings are to the general population of adults with ADHD.

As our main goal was to investigate whether using different languages was different for individuals with and without ADHD, additional measures such as intelligence, executive functions and memory were not evaluated. In addition, we wanted to make sure the questionnaire was short and quick to fill in, to avoid individuals with ADHD losing vigilance or interest and risking them not completing or giving random answers to quickly finish. Therefore, it is important to note that there might be possible confounding variables that we did not account for, such as executive function or theory of mind abilities, that previous studies suggest might have overlapping properties with some pragmatic abilities (cf. Bosco et al, 2018; Matthews et al., 2018).

Moreover, it is important to note that we did not gather information on ADHD-related medication usage or the presence of potential co-occurring conditions like autism spectrum disorder (ASD) or different language disorders, which could potentially influence the ratings provided by individual participants (Bora & Pantelis, 2016; Redmond, 2016). Our deliberate choice to include all individuals with an ADHD diagnosis in our study, regardless of their medication status or comorbidities, was made in recognition of the well-documented heterogeneity within the ADHD population. Similarly, some participants in the control group might have disorders other than ADHD that affect their pragmatic abilities. However, with a substantial sample size of 179 participants, we are confident that the distinctions we observed between groups indeed represent genuine variations in the communicative experiences of individuals with and without ADHD.

Conclusion

Pragmatic difficulties associated with ADHD, such as excessive talking or frequent interruptions, can significantly affect interpersonal relationships. Therefore, it is crucial to gain insight into the prevalence of these communicative challenges in adulthood across all languages a person with ADHD speaks. On a group level, we found the strongest pragmatic impairments in speech production, particularly with respect to inappropriate turn-taking behavior. Crucially, these issues were most pronounced in a person's first (or dominant language) and less so in their second or third language. Future studies could investigate in more detail how individual differences in the ADHD population, such as the clinical presentation of ADHD (primarily inattentive, primarily hyperactive-impulsive, or combined), co-morbidities, executive attention abilities, L2 proficiency and

usage, or gender affect communicative behaviors and outcomes. A more nuanced understanding of how ADHD affects pragmatic abilities across languages would be an important basis for improving diagnostic procedures and developing targeted intervention and training programs for multilingual speakers.

Acknowledgements

We would like to thank ADHD Norway for help with recruitment by letting us publish an article in their members magazine “Uro”; Arun Prakash Singh for his help with preparing the data set for analysis; Ola Eidet for contributing to recruitment and proofreading; and Marianna Kyriacou and Curtis Sharma for feedback on a previous version of this article.

Disclosure statement

No potential competing interest was reported by the authors.

References

Abu-Ramadan, T. M., Lefler, E. K., Knouse, L. E., & Hartung, C. M. (2023). Positive Illusory Bias and Self-Handicapping in Adults with ADHD: A Scoping Review of the Literature and Recommendations for Research and Clinical Practice. *Journal of Psychopathology and Behavioral Assessment, 45*(4), 917–936. https://doi.org/10.1007/s10862-023-10084-2

Adachi, T., Koeda, T., Hirabayashi, S., Maeoka, Y., Shiota, M., Charles Wright, E., & Wada, A. (2004). The metaphor and sarcasm scenario test: A new instrument to help differentiate high functioning pervasive developmental disorder from attention deficit/hyperactivity disorder. *Brain and Development*, *26*(5), 301–306. https://doi.org/10.1016/S0387-7604(03)00170-0

American Psychiatric Association. (2013). *Diagnostic and Statistical Manual of Mental Disorders: Diagnostic and Statistical Manual of Mental Disorders* (Fifth Edit). American Psychiatric Association.

Bialystok, E. (2017). The bilingual adaptation: How minds accommodate experience. *Psychological Bulletin*, *143*(3), 233–262. https://doi.org/10.1037/bul0000099

Bialystok, E., & Craik, F. I. M. (2022). How does bilingualism modify cognitive function? Attention to the mechanism. *Psychonomic Bulletin and Review*, *29*(4), 1246–1269. https://doi.org/10.3758/s13423-022-02057-5

Bignell, S., & Cain, K. (2007). Pragmatic aspects of communication and language comprehension in groups of children differentiated by teacher ratings of inattention and hyperactivity. *British Journal of Developmental Psychology*, *25*(4). https://doi.org/10.1348/026151006X171343

Birdsong, D., Gertken, L. M., & Amengual, M. (2012). *Bilingual Language Profile: An Easy-to-Use Instrument to Assess Bilingualism*. COERLL, University of Texas at Austin.

Bora, E., & Pantelis, C. (2016). Meta-analysis of social cognition in attention-deficit/ hyperactivity disorder (ADHD): comparison with healthy controls and autistic spectrum disorder. *Psychological Medicine*, 46, 699–716. https://doi.org/10.1017/S0033291715002573

Bosco, F. M., Tirassa, M., & Gabbatore, I. (2018). Why pragmatics and Theory of Mind do not (Completely) overlap. *Frontiers in Psychology*, *9*, 1–7. https://doi.org/10.3389/fpsyg.2018.01453

Brouillard, M., & Byers-Heinlein, K. (2023). The ADHD vocabulary size advantage: Monolingual and bilingual young adults with ADHD have larger vocabularies than controls. *Preprint*, 282.

Butzbach, M., Fuermaier, A. B. M., Aschenbrenner, S., Weisbrod, M., Tucha, L., & Tucha, O. (2021). Metacognition in adult ADHD: subjective and objective perspectives on self-awareness of cognitive functioning. *Journal of Neural Transmission*, *128*(7), 939–955. https://doi.org/10.1007/s00702-020-02293-w

Caillies, S., Bertot, V., Motte, J., Raynaud, C., & Abely, M. (2014). Social cognition in ADHD: Irony understanding and recursive theory of mind. *Research in Developmental Disabilities*, *35*(11), 3191–3198.

https://doi.org/10.1016/j.ridd.2014.08.002

Carruthers, S., Taylor, L., Sadiq, H., & Tripp, G. (2021). The profile of pragmatic language impairments in children with ADHD: A systematic review. *Development and Psychopathology*, 1938–1960. https://doi.org/10.1017/S0954579421000328

Circi, R., Gatti, D., Russo, V., & Vecchi, T. (2021). The foreign language effect on decision-making: A meta-analysis. *Psychonomic Bulletin and Review*, *28*(4), 1131–1141. https://doi.org/10.3758/s13423-020-01871-z

Costa, A., Foucart, A., Hayakawa, S., Aparici, M., Apesteguia, J., Heafner, J., & Keysar, B. (2014). Your morals depend on language. *PLoS ONE*, *9*(4). https://doi.org/10.1371/journal.pone.0094842

Crisci, G., Cardillo, R., & Mammarella, I. C. (2022). The Processes Underlying Positive Illusory Bias in ADHD: The Role of Executive Functions and Pragmatic Language Skills. *Journal of Attention Disorders*, *26*(9), 1245–1256. https://doi.org/10.1177/10870547211063646

Daley, D., & Birchwood, J. (2010). ADHD and academic performance: Why does ADHD impact on academic performance and what can be done to support ADHD children in the classroom? *Child: Care, Health and Development*, *36*(4), 455–464. https://doi.org/10.1111/j.1365-2214.2009.01046.x

DuPaul, G. J., & Volpe, R. J. (2009). ADHD and Learning Disabilities: Research Findings and Clinical Implications. *Current Attention Disorders Reports*, *1*, 152–155. https://doi.org/10.4324/9780203766231-9

Ellis, R., Zhu, Y., Shintani, N., & Roever, C. (2021). A study of Chinese learners' ability to comprehend irony. *Journal of Pragmatics*, *172*, 7–20. https://doi.org/10.1016/j.pragma.2020.11.003

Engelhardt, P. E., Corley, M., Nigg, J. T., & Ferreira, F. (2010). The role of inhibition in the production of disfluencies. *Memory and Cognition*, *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. *Journal of Abnormal Child Psychology*, *37*(7), 995–1006. https://doi.org/10.1007/s10802-009-9323-3

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., … Wang, Y. (2021). The World Federation of ADHD International Consensus Statement: 208 Evidence-based conclusions about the disorder. *Neuroscience and Biobehavioral Reviews*, *128*(June 2020), 789–818. https://doi.org/10.1016/j.neubiorev.2021.01.022

Gollan, T. H., Montoya, R. I., Cera, C., & Sandoval, T. C. (2008). More use almost always means a smaller frequency effect: Aging, bilingualism, and the weaker links hypothesis. *Journal of Memory and Language*, *58*(3), 787–814. https://doi.org/10.1016/j.jml.2007.07.001

Green, B. C., Johnson, K. A., & Bretherton, L. (2014). Pragmatic language difficulties

in children with hyperactivity and attention problems: An integrated review. *International Journal of Language and Communication Disorders*, *49*(1), 15–29. https://doi.org/10.1111/1460-6984.12056

Green, D., & Abutalebi, J. (2013). Language control in bilinguals: The adaptive control hypothesis. *Journal of Cognitive Psychology*, *25*(5), 515–530. https://doi.org/10.1080/20445911.2013.796377

Grice, P. (1989). *Studies in the way of words*. Harvard University Press.

Hansen, T. M., Qureshi, S., Gele, A., Hauge, L. J., Biele, G. P., Surén, P., & Kjøllesdal, M. (2023). Developmental disorders among Norwegian-born children with immigrant parents. *Child and Adolescent Psychiatry and Mental Health*, *17*(1), 1–11. https://doi.org/10.1186/s13034-022-00547-x

Hawkins, E., Gathercole, S., Astle, D., & Holmes, J. (2016). Language problems and ADHD symptoms: How specific are the links? *Brain Sciences*, *6*(4), 15–17. https://doi.org/10.3390/brainsci6040050

Hervey, A. S., Epstein, J. N., & Curry, J. F. (2004). Neuropsychology of adults with attention-deficit/hyperactivity disorder: A meta-analytic review. *Neuropsychology*, *18*(3), 485–503. https://doi.org/10.1037/0894-4105.18.3.485

Kałdonek-Crnjaković, A. (2021). Teaching an FL to students with ADHD. *Govor*, *2*, 205–222.

Keysar, B., Hayakawa, S. L., & An, S. G. (2012). The Foreign-Language Effect: Thinking in a Foreign Tongue Reduces Decision Biases. *Psychological Science*, *23*(6), 661–668. https://doi.org/10.1177/0956797611432178

Kim, O. H., & Kaiser, A. P. (2000). Language Characteristics of Children with ADHD. *Communication Disorders Quarterly*, *21*(3), 154–165.

Köder, F., & Falkum, I. L. (2021). Irony and Perspective-Taking in Children: The Roles of Norm Violations and Tone of Voice. *Frontiers in Psychology*, 12. https://doi.org/10.3389/fpsyg.2021.624604

Köder, F., & Rummelhoff, C., & Garraffa, M. (under review): Learning and using multiple languages: Experiences of adults with ADHD.

Köder, F., & Rummelhoff, C. (2023). ADHD og flerspråklighet: En mulighet eller en utfordring? *Uro - Et Medlemsmagasin Fra ADHD Norge*.

Kok, F. M., Groen, Y., Fuermaier, A. B. M., & Tucha, O. (2016). Problematic peer functioning in girls with ADHD: A systematic literature review. *PLoS ONE*, *11*(11), 1–20. https://doi.org/10.1371/journal.pone.0165119

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)*.

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. *Journal of Child Psychology and Psychiatry and Allied Disciplines*, *58*(6), 640–654. https://doi.org/10.1111/jcpp.12688

Kuijper, S. J. M., Hartman, C. A., & Hendriks, P. (2015). Who is he? Children with

ASD and ADHD take the listener into account in their production of ambiguous pronouns. *PLoS ONE*, *10*(7), 1–18. https://doi.org/10.1371/journal.pone.0132408

Lehti, V., Chudal, R., Suominen, A., Gissler, M., & Sourander, A. (2016). Association between immigrant background and ADHD: a nationwide population-based case–control study. *Journal of Child Psychology and Psychiatry and Allied Disciplines*, *57*(8), 967–975. https://doi.org/10.1111/jcpp.12570

Ludlow, A. K., Chadwick, E., Morey, A., Edwards, R., & Gutierrez, R. (2017). An exploration of sarcasm detection in children with attention hyperactivity deficit disorder. *Journal of Communication Disorders*, *70*, 25–34. https://doi.org/10.1016/j.jcomdis.2017.10.003

Matthews, D., Biney, H., & Abbot-Smith, K. (2018). Individual Differences in Children's Pragmatic Ability: A Review of Associations with Formal Language, Social Cognition, and Executive Functions. *Language Learning and Development*, *14*(3), 186–223. https://doi.org/10.1080/15475441.2018.1455584

Manor, I., Vurembrandt, N., Rozen, S., Gevah, D., Weizman, A., & Zalsman, G. (2012). Low self-awareness of ADHD in adults using a self-report screening questionnaire. *European Psychiatry*, *27*(5), 314–320. https://doi.org/1016/j.eurpsy.2010.08.013

Nilsen, E. S., Mewhort Buist, T. A., Gillis, R., & Fugelsang, J. (2013). Communicative Perspective-Taking Performance of Adults With ADHD Symptoms. *Journal of Attention Disorders*, *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. *Language Testing*, *40*(3), 521–547. https://doi.org/10.1177/02655322221139162

Papaeliou, C. F., Maniadaki, K., & Kakouros, E. (2015). Association Between Story Recall and Other Language Abilities in Schoolchildren With ADHD. *Journal of Attention Disorders*, *19*(1), 53–62. https://doi.org/10.1177/1087054712446812

Pettersson, R., Söderström, S., & Nilsson, K. W. (2018). Diagnosing ADHD in Adults: An Examination of the Discriminative Validity of Neuropsychological Tests and Diagnostic Assessment Instruments. *Journal of Attention Disorders, 22*(11), 1019–1031. https://doi.org/10.1177/1087054715618788

Redmond, S. M. (2016). Language Impairment in the Attention- Deficit/Hyperactivity Disorder Context. *Journal of Speech, Language, and Hearing Research*, 59, 133–142. https://doi.org/10.1044/2015_JSLHR-L-15-0038

Sacks, H., Jefferson, E. A., & Schegloff, G. (1978). A Simplest Systematics for the Organization of Turn Taking for Conversation. In J. Schenkein (Ed.), *Studies in the Organization of Conversational Interaction* (pp. 7–55). Academic Press.

Schmengler, H., Cohen, D., Tordjman, S., & Melchior, M. (2021). Autism Spectrum and Other Neurodevelopmental Disorders in Children of Immigrants: A Brief Review of Current Evidence and Implications for Clinical Practice. *Frontiers in Psychiatry*, *12*(March), 1–12. https://doi.org/10.3389/fpsyt.2021.566368

Segal, D., Mashal, N., & Shalev, L. (2015). Semantic conflicts are resolved differently by adults with and without ADHD. *Research in Developmental Disabilities*, *47*, 416–429. https://doi.org/10.1016/j.ridd.2015.09.024

Shively, R. L., Menke, M. R., & Manzón-Omundson, S. M. (2008). Perception of Irony by L2 Learners of Spanish. *Issues in Applied Linguistics*, *16*(2). https://doi.org/10.5070/l4162005096

Slobodin, O., & Masalha, R. (2020). Challenges in ADHD care for ethnic minority children: A review of the current literature. *Transcultural Psychiatry*, *57*(3), 468–483. https://doi.org/10.1177/1363461520902885

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

Sparks, R. L., Humbach, N., & Javorsky, J. (2008). Individual and longitudinal differences among high and low-achieving, LD, and ADHD L2 learners. *Learning and Individual Differences*, *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. *Journal of Learning Disabilities*, *37*(2), 169–178. https://doi.org/10.1177/00222194040370020701

Sparks, R. L., Javorsky, J., & Philips, L. (2005). Comparison of the performance of college students classified as ADHD, LD, and LD/ADHD in foreign language courses. *Language Learning*, *55*(1), 151–177. https://doi.org/10.1111/j.0023-8333.2005.00292.x

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

Strine, T. W., Lesesne, C. A., Okoro, C. A., McGuire, L. C., Chapman, D. P., Balluz, L. S., & Mokdad, A. H. (2006). Emotional and behavioral difficulties and impairments in everyday functioning among children with a history of attention-deficit/hyperactivity disorder. *Preventing Chronic Disease*, *3*(2), 1–10.

Taguchi, N. (2011). Do proficiency and study-abroad experience affect speech act production? Analysis of appropriateness, accuracy, and fluency. *IRAL - International Review of Applied Linguistics in Language Teaching*, *49*(4), 265–293. https://doi.org/10.1515/iral.2011.015

Taguchi, N. (Ed.). (2019). *The Routledge Handbook of Second Language Acquisition and Pragmatics* (1st editio). Routledge.

Willcutt, E. G. (2012). The Prevalence of DSM-IV Attention-Deficit/Hyperactivity Disorder: A Meta-Analytic Review. *Neurotherapeutics*, *9*, 490–499. https://doi.org/10.1007/s13311-012-0135-8

Wymbs, B. T. (2021). Investigating Self-Control Resource Depletion as a Situational Risk Factor for Aversive Interpartner Communication by Young Adults With ADHD. *Journal of Attention Disorders*, *25*(2), 199–208. https://doi.org/10.1177/1087054718779228