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The cognitive effects of ADHD on learning an additional language

Summary

In recent years Specific Learning Difficulties (SpLDs) in the context of learning and teaching a foreign or second language, or an Additional Language (AL), have been widely discussed. The main focus has been given to dyslexia (e.g., Kormos, 2017; Kormos & Smith, 2012; Łodej, 2016; Nijakowska, 2010) due to its frequent occurrence and evident manifestations in literacy development. *Attention deficit/hyperactivity disorder* (ADHD) has been discussed only to some extent and mainly in the comorbidity with dyslexia. Therefore, the aim of this paper is to discuss potential cognitive effects ADHD may have on the development of specific language skills in AL with a clear distinction between inattention and hyperactivity/impulsivity to direct potential research in the field and to inform AL instruction. This paper also provides substantial information about ADHD in the light of the recent change in its definition and classification.

Key words: ADHD, cognitive effects, learning an additional language

1. DEFINITION AND MANIFESTATIONS OF ADHD

According to the recent version of *Diagnostic and Statistical Manual of Mental Disorders* (DSM-5, American Psychiatric Association [APA], 2013) ADHD falls under the category of learning difficulties, and not under behavioural ones as in the previous version of the manual. This change may lead to earlier recognition of ADHD, a need for more comprehensive assessment of this condition, as well as a new research stream on the effect of inattention in learning difficulties (Tannock, 2013). This change also follows the trend in Europe, where ADHD is referred to as a learning difficulty or difference due to the importance of attention in cognitive functioning in the context of learning, as well as the co-occurrence of ADHD with other SpLDs such as dyslexia (Kormos & Smith, 2012), or language impairment (Mueller & Tomblin, 2012) and autism spectrum disorder (van Steijn et al., 2012). Based on the review of 17 studies, it was concluded that the comorbidity of ADHD and other learning difficulties is slightly above 45% (DuPaul, Gormley, & Laracy, 2013); with dyslexia, as the most common specific learning difficulty, the comorbidity is estimated between 15 and 40% (Pennington et al., 2009).

The occurrence of ADHD worldwide varies between 3 and 7% (Peacock, 2001) with an average of 5% according to recent comparative studies (Smith, 2017). ADHD is hereditary in origin (Barkley, 2006) and not gender-specific, but it is more found in males than females (APA, 2018; Barkley, 1997). This difference in diagnosis may be due to that girls' behaviour may be regarded as less disruptive, and thus not associated with the manifestations typical for ADHD (Barkley, 2006). Although it is a long-life condition, it is manifested less in adults (Biederman, 2011), especially hyperactivity (Schwartz, 2002).

There are three distinct manifestations of ADHD, which are: inattention, hyperactivity, and impulsivity. The DSM-5 (APA, 2013) emphasises the dimensional approaches to ADHD, therefore, subtyping should not be used, but rather 'specifiers' or 'presentations'. Therefore, the individual with ADHD can be either (Tannock, 2013, p. 9):

- restrictively inattentive, with 6 or more inattentive but maximum 2 of hyperactive-impulsive symptoms;
- inattentive, with 6 or more inattentive symptoms but 3-5 hyperactive-impulsive symptoms;

- hyperactive and impulsive, with 6 or more hyperactive-impulsive symptoms but 5 or fewer of inattention; or
- manifests all symptoms at equal intensity.

The symptoms of inattention include low attention to details, making careless mistakes, difficulty to sustain attention for a longer period of time, appearing as not listening, failing to follow instructions, tasks incompletion, poor organisational strategies, avoidance of tasks that require mental effort, forgetfulness, and proneness to be easily distracted by an external stimulus. The impulsiveness is manifested by lack of self-control, impatience, disturbing the others, extensive talking without attention to social conventions, unexpected blurts or answers before the question has been asked, unintentional destruction of material items, whereas hyperactivity is associated with nervous hands and legs movement, fidgeting, unexpected leaving a seated position, walking or running (APA, 2018). In addition, an individual has a difficulty to automatise behavioural rules, emotional oversensitivity, low tolerance, a lower analytical approach to complex tasks and lack of intrinsic motivation for learning (Barkley, 1997, 2006). An individual with the cumulation of symptoms of inattention, hyperactivity, and impulsivity may be regarded as 'aggressive' (Skibska, 2013) and penalised for improper behaviour, which a child cannot control without adequate accommodations of their specific needs.

Attention is an ability to select one stimulus, to redirect the focus on the appropriate stimulus, to focus on many stimuli, to maintain focus in a situation where there is no stimulus present, and to perform a few things simultaneously (Wolańczyk, Kołakowski, & Skotnicka, 1999).

Attention is related to short-term memory, which is an ability to store information, and working memory, an ability to manipulate this information in the mind over a short period of time. An example of how working memory works in AL learning is hearing a new word and trying to repeat it a few seconds later (Gathercole & Alloway, 2008). It is important to recognise individual differences in the capacity of working memory, its effect on understanding and reasoning (Baddeley, 1996), as well as the prime role of *the central executive* or an attentional controller in processing complex short-term visual and verbal information (Baddeley, 1996; Gathercole & Alloway, 2008). The central executive allows inhibiting distractions, directing attention to a task with an intention to complete it avoiding irrelevant information, planning, doing the task in a methodological way, and using effective strategies (Radziwiłłowicz, 2004; Wu, 2014).

2. LEARNING AN ADDITIONAL LANGUAGE

AL learning is a complex cognitive and metacognitive activity that depends on a number of factors. Language proficiency requires the knowledge of syntax, vocabulary, phonology, and orthography (Bachman & Palmer, 1996), as well as strategic competence (Hulstijn, 2011). Following the recent view on the aptitude to learn AL (Wen, Biedroń, & Skehan, 2017), apart from the traditional Carroll's model (Carroll, 1962) that included phonemic coding ability, grammatical sensitivity, inductive and rote learning ability, one's success will depend on L1-L2 language analysis skills and the cross-linguistic phonology/orthography analysis that was proposed by Sparks, Patton, Ganschow, and Humbach (2011). Most importantly, the contemporary view of the aptitude to learn many AL skills emphasises the importance of working memory, especially its phonological component.

As working memory deficit is an underlying cause for SpLD (Kormos, 2017), for some individuals learning AL will not come naturally. Yet, to which extent one will struggle with developing specific AL skills, will all depend on their individual cognitive profile. It is therefore necessary to stress the importance of individual difference in language learning (Ehrman & Oxford, 1995).

3. INATTENTION IN ADDITIONAL LANGUAGE LEARNING

The ability to focus attention on one stimulus (selectivity) is important for incidental learning (Jiang & Chun, 2001), whereas working memory is for incidental and intentional learning (Robinson, 1997, 2002; Williams, 1999). With reference to the *noticing hypothesis* proposed by Schmidt (1990), which assumes that in order to learn a given form of language, a student must notice it, i.e. direct appropriate attention to a given form, selectivity of attention will be important for learning various lexical and grammatical forms. Attention is therefore significantly important in AL learning (Leow & Bowles, 2005; Robinson, 2003; Schmidt, 1995). The weaker working memory and executive control processes, which feature ADHD, will therefore affect verbal and visual information memorisation and processing, and consequently the development of different language skills (Kormos, 2017).

Sparks, Humbach, and Javorsky (2008) conducted a series of studies on university-level students to investigate the cognitive profile of individuals with ADHD, their aptitude and attainment in learning a foreign language. Their findings suggest that the ability of students with ADHD can be compared to one of the

students with other learning difficulties. However, students with ADHD are able to achieve high scores in foreign language classes (Sparks, Javorsky, & Philips, 2004, 2005), and thus it cannot be stated that they have a specific deficit in language skills, which would be a predictor for slower development of specific competencies in a foreign language (Sparks et al., 2005). However, Sparks et al. (2008) emphasise the diverse cognitive and linguistic profile of individuals with ADHD. They found that the individuals with ADHD struggled with spelling tasks but obtained similar results to the high-achievers in the tasks of memorising and analysing grammatical structures and reading comprehension. On the other hand, the recent study in the first language has shown that individuals with ADHD may have difficulty in single-word reading and reading comprehension (Cain & Bignell, 2014). In reading comprehension, working memory and control of cognitive processes play an important role (Cain, 2006), and thus it can be expected that individuals with reduced concentration will have difficulty in solving reading comprehension tasks in the first and second language. As found by Miller et al. (2013), children with ADHD have difficulty in building a coherent mental representation. Yet, considering the results of the research carried out by Sparks et al. (2008), it can be expected that adult individuals with ADHD will develop a number of compensatory strategies that would allow them to perform reading comprehension tasks successfully. In this regard, differences in approaching teaching reading strategies in the first and foreign language may be of importance.

Similar to the ability to comprehend a written text, individuals with ADHD may have difficulty in processing verbal material (Cain & Bignell, 2014). Listening comprehension tasks in the AL learning context require focusing for a longer period of time, selecting specific information, and processing this information in the context of a given task. Therefore, it may be assumed that individuals with lower attention may struggle with completing some types of listening comprehension tasks.

The findings of the studies by Alloway, Gathercole, and Elliot (2010) as well as Martinussen and Tannock (2006) that researched the ability to store information from different stimuli are noteworthy in the context of learning grammar and vocabulary in AL by individuals with ADHD. It was found that these individuals have difficulty in memorising visuospatial information; yet, they did not struggle with memorising this information when it was presented verbally. It can be therefore assumed that teaching grammatical and lexical forms to individuals with ADHD should be predominately based on the oral stimulus, or in a multisensory way, a widely

recommended approach in teaching literacy in the first and second language to individuals with SpLDs (e.g., Kelly & Phillips, 2011; Kormos & Smith, 2012; Nijakowska, 2010).

Attention control is also necessary for writing processes and performing written tasks. Since writing in AL is less automatic than in the first language, there will be a greater load on working memory (Kormos, 2017). Students with ADHD can make spelling mistakes in single-word writing (Sparks et al., 2008), have difficulty in planning their written expressions, maintaining coherence at the sentence level, paragraph and throughout the text, writing in detail, and proofreading their work.

The number of difficulties that stem from inattention suggests that individuals with ADHD have specific writing difficulties, which also feature other SpLDs. Yet, the manifestations of writing difficulties will stem from different underlying causes. This can be exemplified by the type of misspellings, which in individuals with ADHD will most probably take a form of letter insertion, substitution, and omission (Adi-Japha et al., 2007) rather than misspellings that stem from weaker phonological awareness, which is the underlying cause of dyslexic tendencies. On the other hand, handwriting difficulties in ADHD may comorbid with those in dysgraphia, which is characterised by difficulty in motor coordination (Adi-Japha et al., 2007).

Given the results of the study by Alloway et al. (2010) as well as Martinussen and Tannock (2006), that is, storing verbal information in ADHD individuals is unaffected, it can be assumed that individuals with ADHD will not have specific difficulty in retrieving it. However, similarly to writing in AL, they may struggle with maintaining coherence on different levels of spoken expression, which may include inappropriate sentence structure and adding irrelevant information.

4. HYPERACTIVITY AND IMPULSIVITY IN AL LEARNING

Hyperactivity and impulsivity may affect production and social interaction in AL, as well as behaviour for learning with a further detrimental effect on progress in learning and attainment.

Lack of self-control, impatience, extensive talking, and unexpected utterances will impact development of spoken interaction and production especially at proficient levels, where, as according to *the Common European Framework of Reference for Languages: Learning, teaching, assessment* (CEFR), the learner is expected to pay attention to more complex social rules, wait for their turn in a longer spoken

interaction, and respond appropriately (CEFR, 2018, p. 85, 159). Since the individual with ADHD cannot voluntarily control their behaviour, they may struggle to develop effectively these socio-pragmatic aspects of speaking skills, and consequently will have difficulty to attain the advanced and proficient level of the overall language competence.

Impulsivity may also potentially affect written production in the form of extensive writing, the employment of irrelevant information, and little control over the employment of punctuation. As a result, the text will not reflect any planning, will be incoherent on the sentence, paragraph, the whole text level, and inconsistent in spelling, vocabulary and punctuation use.

Similar to speaking skills, the individual with ADHD including the hyperactive-impulsive presentation will struggle with writing at a proficient level, where the individual is expected to express themselves clearly and precisely in the correct tone and style (CEFR, 2018, p. 93). They will also find it difficult to work on complex projects that are referred to in CEFR as collaborative writing and redrafting (CEFR, 2018, p. 99).

The hyperactive-impulsive presentation of ADHD will affect behaviour for learning of the individual. The extensive needs for physical movement and interaction with other people may render impossible to complete complex tasks that require a static position. Overall, the individual with ADHD will lack of intrinsic motivation for learning (Barkley, 1997, 2006), especially when it happens in the absence of kinaesthetic and tactile modalities.

The disrupting behaviour of an individual with ADHD may also have a detrimental effect on the progress of other individuals in the class, especially when there is ineffective classroom management and classroom accommodations are not adequately employed.

5. CONCLUSION

ADHD has a great impact on developing all language skills in AL. Yet, given the so far research findings, it is inconclusive whether individuals with ADHD have specific difficulties in AL learning. Nevertheless, it is necessary to recognise the diverse cognitive and linguistic profile of individuals with ADHD, which stems from the heterogenic nature of ADHD and its comorbidity with other SpLDs. Therefore, progress and attainment in specific language skills will depend on individual

differences, which are, but not exclusively, the presentation of ADHD, the age of the individual, their gender, and motivation for learning. Since ADHD falls under the legal requirement of individualisation of learning and teaching in schools, specific needs of students with ADHD need to be adequately accommodated; in-class teaching approaches should consider each manifestation of ADHD and how they affect the progress in learning of the individual and the whole class. Therefore, teaching and learning should be based on dynamic assessment and the multisensory and structured approach (Kałdonek-Crnjaković, in press). Besides, effective in-class support, students with ADHD may require additional instruction provided by specialist teachers, psychologists, or speech and language therapists.

As there are few empirical studies on ADHD in the context of AL learning, the future research can take different directions. Given the heterogeneity of ADHD as well as its co-occurrence with other SpLDs, the future research should consider the application of mixed methods, both quantitative and qualitative.

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Kognitivni utjecaj ADHD-a na učenje drugog i stranog jezika

Sažetak

Prema najnovijoj verziji *Dijagnostičkog i statističkog priručnika za duševne poremećaje* (APA, 2013), nepažnja i/ili hiperaktivnost-impulzivnost (ADHD) definiran je kao "neurorazvojni poremećaj" koji se ubraja u kategoriju specifičnih poteškoća u učenju zbog njegovog utjecaja na obrazovne i radne aktivnosti, kao i zbog pojavljivanja ADHD-a zajedno s drugim specifičnim poteškoćama u učenju, poput disleksije (Kormos i Smith, 2012). ADHD se javlja kod prosječno 5 % svjetske populacije (Smith, 2017), a zajedno s drugim teškoćama u oko 45 % populacije (DuPaul, Gormley i Laracy, 2013). Kognitivni temeljni uzrok ADHD-a jest slabija radna i kratkotrajna memorija (Baddeley, 1996; Gathercole i Alloway, 2008), a manifestira se nepažnjom, hiperaktivnošću i impulzivnošću. Međutim, ova se tri simptoma ne smiju smatrati potkategorijama ADHD-a jer je potrebno prepoznati zastupljenost određenog broja simptoma (APA, 2013). Simptomi ADHD-a su, između ostalog, neobraćanje pažnje na detalje, teškoće u održavanju pažnje u zadacima i u organiziranju aktivnosti, lako odvlačenje pažnje nebitnim podražajima, nedostatak samokontrole, nestrpljivost, pretjerano pričanje, često ometanje i prekidanje drugih (APA, 2018).

ADHD u kontekstu učenja drugog i stranog jezika relativno je malo istražen. U ovom se radu pokušava napraviti analiza mogućih kognitivnih utjecaja koje ADHD može imati na razvoj jezičnih vještina u drugom i stranom jeziku, uzimajući u obzir da slabija radna memorija i izvršni kontrolni procesi utječu na pamćenje i obradu verbalnih i vizualnih informacija (Kormos, 2017).

Analiza istraživanja prikazana u ovom radu može usmjeriti buduća istraživanja u području specifičnih poteškoća u učenju i poučavanju drugog i stranog jezika kod osoba s ADHD-om. U radu se također pružaju bitne informacije o ADHD-u u svjetlu nedavne promjene njegove definicije i klasifikacije.

Ključne riječi: ADHD, kognitivni utjecaj, učenje drugog i stranog jezika