Cognitive Performance and Executive Ratings in Monolingual and Bilingual Elementary School Children

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Master's Thesis in Psychology

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Faculty of Arts, Psychology and Theology

Åbo Akademi University

2018

ÅBO AKADEMI UNIVERSITY – FACULTY OF ARTS, PSYCHOLGY AND THEOLOGY

Subject: Psychology
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Abstract: The possible bilingual cognitive advantage has been widely studied, but the results have been variable. Most studies so far have used performance-based measures when comparing mono- and bilingual children in their cognitive abilities. The present study compared a total of 221 mono- and bilingual Swedish-Finnish elementary school children on their cognitive performance and executive functions using both performance-based measures and an executive rating scale. The performance-based measures used were subtests from the WISC-IV, and the rating measure was the ATTEX- rating scale. An exploratory factor analysis was also conducted to examine the latent structure of the ATTEX- scale. Three main factors labeled "Attention", "Impulsivity" and "Disorganization" were identified. No differences between mono- and bilingual children were found with the performance-based tasks. Furthermore, according to the teacher ratings, monolingual children had fewer problems with attention, impulsivity and disorganization than the bilingual children. The present results are thus against the idea that bilingualism is associated with a cognitive advantage. Possible explanations as to why bilingual children were rated to have more problems with executive functions and why these differences were not seen in the performance-based tasks are discussed.
Key Words: bilingualism, cognitive advantage, executive functions, performance-based measures, executive ratings

Date: 25.11.2018	**Page count:** 49

ÅBO AKADEMI – FAKULTETEN FÖR HUMANIORA, PSYKOLOGI OCH TEOLOGI

Ämne: Psykologi
Författare: Matilda Derefalk
Arbetets titel: Kognitiva testprestationer och exekutiva bedömningar bland enspråkiga och tvåspråkiga lågstadiebarn
Handledare: Matti Laine, Vesa Närhi
Abstrakt: Den möjliga förekomsten av en kognitiv fördel bland tvåspråkiga barn är väl studerat, men studier har tillsvidare gett upphov till varierande resultat. De flesta studier hittills som jämfört en- och tvåspråkiga barn och deras kognitiva förmåga har använt prestationsbaserade test. I denna studie jämfördes kognitiva och exekutiva funktioner bland totalt 221 en- och tvåspråkiga finlandssvenska lågstadiebarn med både prestationsbaserade test och en skattningsskala. De prestationsbaserade måtten var deltest ur WISC-IV, och skattningsformuläret som användes var Kesky. För att undersöka den latenta strukturen i Kesky genomfördes även en explorativ faktoranalys. Faktoranalysen identifierade tre huvudfaktorer som betecknades ”Uppmärksamhet”, ”Impulsivitet” och ”Desorganisation”. Inga skillnader i prestationerna mellan de en- och tvåspråkiga barnen hittades med de prestationsbaserade måtten. I Kesky-mätningen bedömde lärarna de enspråkiga barnen ha färre svårigheter med uppmärksamhet, impulsivitet och desorganisation jämfört med de tvåspråkiga barnen. Varför tvåspråkiga barn bedömdes ha fler svårigheter med exekutiva funktioner och varför inga skillnader mellan språkgrupperna kom fram med de prestationsbaserade måtten diskuteras.
Nyckelord: tvåspråkighet, exekutiv fördel, exekutiva funktioner, prestationsbaserade mätningar, exekutiva bedömningar

Datum: 25.11. 2018	**Sidoantal:** 49

Acknowledgements

In Helsinki, October 2018

I would like to sincerely thank my supervisor Matti Laine. Thank you for patiently sharing your extensive knowledge on the subject and research methodology with me. Your professional advice has been invaluable. I would also want give a special thank you to my other supervisors Vesa Närhi, at the University of Jyväskylä as well as Susanna Slama and Henrik Husberg from Niilo Mäki Instituutti. Your ideas, encouragement and help have been extremely valuable. I also want to acknowledge the importance of the help I received from everyone who took part in the thesis seminar groups, Mira Karrasch especially. Your feedback helped me greatly.

Furthermore, I would like to express my gratitude towards my fellow student Lea Gädda. Having someone to share the ups and downs of the thesis process with has been very motivating and comforting, and I truly appreciate your assistance and support.

Finally, I would of course want to thank all of my family and friends for your encouraging and kind words throughout this process.

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1 Introduction

During the last decades, considerable research effort has been put on probing the relationships between bilingualism and cognitive functions. The main reason for this interest is that in many studies, bilinguals have been found to outperform monolinguals in a number of cognitive tasks, including metalinguistic awareness, theory of mind, selective attention, inhibition and working memory (e.g. Adesope, Lavin, Thompson & Ungerleider, 2010; Bialystok, 2017; Karlsson et al., 2015; Macnamara & Conway, 2014). While these advantages have been found in both child and adult samples (Bialystok, 2017), contrary evidence has also emerged (Bialystok, Martin, & Viswanathan, 2005; Paap, Johnson & Sawi, 2015). Moreover, the field has been affected by publication bias where studies providing evidence for a bilingual advantage have been favored over studies giving negative or null results (De Bruin, Treccani & Della Sala, 2015; Paap, 2014). In a recent extensive meta-analysis by Lehtonen et al. (2018), no evidence for an executive advantage was found for adults after correcting for this bias.

Despite of the rather conclusive negative meta-analytic findings in adults, the situation is not as clear in children, whose cognition and especially executive functions (EF) are still under development. In most of the studies, mono- and bilingual children are compared on performance-based tests, and only a few studies have conducted these comparisons on ecologically more valid rating measures. Thus, the present study compared general cognitive and executive functions in mono- vs. bilingual elementary school children, by using both performance-based cognitive tests and an EF rating measure.

1.1 The bilingual cognitive advantage

1.1.1 Possible mechanisms underlying the bilingual advantage in children

The bilingual cognitive advantage is thought to stem from the fact that bilinguals need to manage two languages that appear to be activated simultaneously even when only one is in active

use. For example, producing or reading a word in one language will activate the same word in another language (Bialystok, Craik, Green & Gollan, 2009; Bialystok, 2017; Marian & Spivey, 2003). The management of two languages is assumed to require the ability to select relevant information to process and to inhibit information that is irrelevant (Hilchey & Klein, 2011). In order to prevent interference from the other language, bilinguals must effectively inhibit one language and select the appropriate one (Bialystok et al., 2009). In this way, bilinguals would get more experience in cognitive monitoring than monolinguals, and are assumed to attain a cognitive advantage that would extend even to non-verbal cognitive domains (Bialystok, 2017; Macnamara & Conway, 2014; Lehtonen et al., 2018; Kroll, Dussias, Bice & Perrotti, 2015; Jylkkä, 2017).

1.2 Definition of bilingualism

Bilingualism has been defined in a number of ways in previous research, for example according to key bilingualism-related features such as age of acquisition or level of proficiency. The definition of bilingualism can either be based on proficiency, meaning that the level of fluency in both languages matters, or on functionality, which emphasizes the actual need and use of languages in everyday life (Kohnert, 2013). For example, some may have been exposed to two languages since birth and continue using two languages throughout their lives, while others may learn a second language later in life and only use it sporadically. Depending on the age at which the child has adopted the second language (L2) and on the level of proficiency in L2, children can be defined to be either simultaneously bilingual or sequentially bilingual (Kohnert 2013; Peña & Bedore, 2009). Simultaneous bilinguals are most commonly defined as having grasped two languages from birth or before the age of three, while sequential bilinguals begin to learn L2 after the age of three when L1 has already been established (Paradis, 2010; Paradis, Genesee & Crago, 2011).

1.3 Definition of executive functions (EF)

EF, the main cognitive domain in bilingualism-cognition studies, have been described as the general-purpose or superordinate cognitive processes that guide all complex human thought and make purposive goal-oriented behavior possible (Lehtonen et al., 2018; Miyake & Friedman, 2012). Even if consensus on the specific components of EF is still lacking, the most widely used division stems from the unity and diversity model by Miyake, Friedman, Emerson, Witzki, Howerter & Wager (2000). It includes three components: working memory (updating and monitoring), set-shifting (mental flexibility, switching between tasks) and inhibition of prepotent responses (Miyake et. al, 2000; Miyake & Friedman, 2012).

1.4 Performance-based cognitive and executive measures vs. rating measures

Performance-based cognitive measures are standardized tasks designed to tap specific cognitive abilities. The tasks are administered by an experimenter in a controlled situation. Commonly used performance-based cognitive measures in children include the Wecshler Intelligence Scale for Children (WISC) and Developmental Neuropsychological Assessment (NEPSY) (Korkman, Kirk & Kemp, 2008). Concerning EF, commonly used performance-based measures include tasks such as the Flanker, Stroop and Simon task (Klenberg, 2015).

Rating scales are proxy measures involving an informant reporting observations about a participant in everyday life settings, e.g. a teacher evaluating a student's ability to maintain focus in the classroom. Rating measures are considered to be ecologically more valid and are, in contrast to performance-based measures, intended to give more insight of functioning in real-life conditions (Toplak, West & Stanovich, 2013).

When Toplak et al. (2013) examined the association between performance-based measures and rating measures in studies involving clinical and nonclinical samples of both children

and adults, they found only a small correlation between these two types of measurements. This could indicate that they actually tap different underlying mental constructs or activities, with the performance-based measures assessing maximal or optimal performance as compared to rating measures tapping typical real-life performance as seen by an adult informant (often teacher in a class-room setting). The role of cognitive and executive abilities might also actually be rather limited in performance-based tasks as the structure of the task is often given by the experimenter. Both types of measurements are nonetheless valuable in providing information about the efficiency in cognitive processing and ability to use these skills in order to achieve goals in everyday life (Toplak et al., 2013).

1.5 Previous findings on the hypothesized bilingual advantage in children using performance-based measures

The evidence for a bilingual cognitive advantage in children is not consistent. Most of the studies so far have investigated the possible bilingual advantage with performance-based executive tasks, usually tapping working memory or inhibition of prepotent responses. In a review by Baraca, Bialystok, Castrod, & Sancheze (2014) that included 102 articles studying bilingualism and cognitive correlates, bilingual children outperformed their monolingual counterparts in executive tasks such as shifting between rules and keeping the current rule in mind. These conditions require working memory and inhibition of attention to a prepotent response (interference suppression). In a meta-analysis by Adesope et al. (2010) that encompassed 62 studies, bilingual children showed greater attentional skills as well as better performance in other tasks such as problem solving and metacognitive awareness, compared to monolingual children. A meta-analysis by Donnely (2016) examined the bilingual advantage on interference control and task-switching tasks in children and adults. The results showed a significant moderate effect of bilingualism on global response time, but publication bias was assumed to account for these effects. No significant effect of bilingualism was found in interference-cost tasks or in task-switching tasks in children.

Grundy & Timmer (2017) included 27 studies in their meta-analysis on differences in working memory capacity in mono- and bilingual children and adults. The largest significant effect sizes in favor of an enhanced working memory capacity for bilinguals compared to monolinguals were found in the child sample.

However, no bilingual benefit in other inhibition tests, such as gift delay tasks or tests where the child needs to inhibit overlearned responses, has been found. The evidence for a bilingual advantage in working memory is not consistent either, as some studies have found no differences between mono- and bilingual children on such tasks (Baraca et al., 2014). Neither did Duñabeitia et al., (2014) find any bilingual advantage in children on Stroop tasks tapping inhibition.
Paap, Johnson & Sawi (2015), having reviewed studies about bilingualism and executive correlates published after the review by Hilchey & Klein (2011), concluded that if a bilingual advantage exists at all, it is limited to very specific conditions of bilingualism that only, and inconsistently, strengthens very particular EF components. Paap et al. (2015) calculated that only 17% of a total of 165 administered EF tests on non-verbal switching and interference tasks yielded significant bilingual advantages. Even if Hilchey & Klein (2011) concluded that bilinguals might enjoy an advantage in general cognitive processing, it still remains unclear whether this is due to bilingualism alone or other factors such as socioeconomic status or other experiences that are associated with enhanced executive function, but were not taken into account (e.g., exercise, social activity, or musical training) (Paap, Johnson & Sawi, 2015; Valian, 2015).

Only a few studies so far have used other than executive cognitive tasks when comparing mono-and bilingual children, with mixed results. Lachlan, Parisi and Fadda (2012) compared mono- and bilingual children on four subtests from the WISC-IV. In their study, bilingual children significantly outperformed monolingual children in *Block Design* (which measures ability to synthesize abstract visual stimuli and visual-motor coordination) and *Vocabulary* (measuring metalinguistic awareness, concept formation, and word knowledge), but not in *Digit Span*

(measuring auditory short-term memory and working memory) or *Arithmetic* (measuring problem solving ability). When Karlsson et al. (2015) compared mono- and bilingual children's performance on WISC-IV and NEPSY-II tasks, the only significant difference between mono- and bilingual children was found in the *Symbol Search* task, which measures processing speed and short-term visual memory, where actually monolinguals scored better than bilinguals. Garrat & Kelly (2007) compared mono- and bilingual children with NEPSY and found bilingual children scoring lower on tasks requiring verbal information processing, but higher on tasks measuring visuospatial abilities. Low performance in verbal subtests and high performance in visuospatial tasks for bilinguals was also reported by Rosselli, Matute & Ardilla (2010). Bilingual children have also shown poorer performance on several language production tasks such as vocabulary size tests, difficult word recognition and verbal fluency tests compared to monolingual children (Arentoft, Scheiner, Germano & Gollan, 2008). This might be due to bilingual children possibly relying more on visual information (Rosselli et al., 2010), having more restricted vocabularies in both languages or having to inhibit the non-active language (Arentoft et al, 2008; Abutalebi & Green, 2007).

1.6 Previous findings on the hypothesized bilingual advantage in children using rating measures

Very few studies have used rating measures either alone or combined with performance-based measures when comparing mono- and bilingual children and their cognitive abilities. Loe and Feldman (2016) examined differences between pre-term and full-term born bilingual and monolingual preschool children using both performance-based EF measures which tapped response inhibition, working memory and cognitive flexibility, and an EF rating scale measure, the Behavior Rating Inventory of Executive Function Preschool – version (BRIEF-P), filled out by the children's caretakers. Neither the performance-based tasks nor the rating scale showed a significant main effect of language group. Weber, Johnson, Riccio & Liew (2015) studied differences between more and less balanced Spanish-English bilingual children and their EF abilities by using both performance-based measures (assessing working memory, inhibition,

shifting and attentional control) and a rating measure (BRIEF), filled out by the caretakers of the children. They found that the more balanced language skills the children had, the better task initiation abilities they were rated to have.

1.7 Aims of the present study

The main aim of the present study was to compare monolingual and bilingual Swedish-Finnish children's cognitive abilities assessed with performance-based measures, and executive function abilities assessed with a rating measure completed by the teacher.

The performance based cognitive measures used were subtests from the Wecshler Intelligence Scale for Children – Fourth Edition (*WISC-IV*) (Wechsler, 2010). The administered subtests were Vocabulary, Block Design, Digit Span, Letter-Number sequencing and Symbol Search. The EF rating measure used was the Kesky (*Keskittymiskysely*) questionnaire (Klenberg, Jämsä, Häyrinen & Korkman, 2010). The lack of a comprehensive Finnish questionnaire for assessing key EF problems of ADHD in school situations motivated the development of Kesky, which is designed to work as an alternative to the *BRIEF* (*behavior rating inventory of executive functioning*) (Gioia, Isquith, Guy, Kenworthy, 2013) questionnaire. Kesky (or *ATTEX - Attention and Executive Function Rating inventory*) is a rating measure designed for the evaluation of school-aged children's possible difficulties with attention and EF. The teacher performs the rating, and the purpose is to provide more ecologically valid information about the difficulties the teacher observes in the child's behavior in the classroom, and to help plan possible educational support programs or rehabilitation programs for the child. It can also be used as a diagnostic tool in assessing possible ADHD or ADD. One subsidiary aim of the present study was also to explore the latent structure of the Kesky questionnaire by conducting an exploratory factor analysis. In a previous study by Klenberg et al., (2010), Kesky was found to be one-dimensional, despite the fact that it consists of 3 domains designed to tap different aspects of EF.

In the same previous study Klenberg et al., (2010), boys exhibited weaker EF ratings on the Kesky measure compared to girls. Therefore, in addition to comparing the two language groups in the present study, differences between genders were also examined. Although no differences between age groups were found in the previous study by Klenberg et al., (2010), differences between age groups were also examined in order to detect a possible developmental curve in EF abilities measured with Kesky. It was also of interest to see whether a possible bilingual advantage is dependent on gender or age for both WISC-IV and Kesky results.

Despite the fact that the performance-based standardized cognitive measures used in the present study are not aimed to measure EF that has been in spotlight in bilingualism research, performance in all of the tasks requires some level of executive function, especially the Digit span and Letter-number sequencing tasks (working memory). Furthermore, some earlier studies cited above have indicated bilingual advantages also in standardized cognitive tests, prompting further research. Finally, examining possible differences in performance between language groups is relevant for the clinical use of these types of instruments, since putative effects of a child's language background on test performance could have implications to clinical decision making.

2 Materials and methods

In this study, data was gathered as a part of a research project run by Niilo Mäki Institute, a Finnish multidisciplinary research and development center for children with learning disabilities. The aim of the project "*Inlärning och stöd, ILS-projekt 2015-2018. Utvecklingsprojekt om utvärdering av och stödåtgärder vid inlärningssvårigheter i finlandssvenska skolor och daghem"* (*Project for developing and assessment of methods and interventions for children with learning disabilities in Finnish-Swedish schools and daycare centers*) is to evaluate and further develop interventions for children with learning disabilities in Finnish-Swedish daycares and schools.

Data from a total of 1950 Swedish speaking Finnish children and youth between the ages of 4-16 was gathered for the project. To ensure geographical representativeness, stratified sampling was used. The partly Swedish-speaking areas in Finland were divided into four regions, namely Ostrobothnia, the Capital region, Åland isles, and the remaining areas. The sample was not weighted but evenly representative of these different areas due to the otherwise small sample size from the Åland isles. Accordingly, in this sample the Åland isles children are overrepresented and children from Ostrobothnia somewhat underrepresented. A random sample of Swedish-speaking schools was then drawn from these regions. Fifteen municipalities and two private schools were chosen. Ultimately, 28 schools were chosen as the research sample.

The data used in this study consisted of subsamples of two larger, partly overlapping data sets collected for the project during 2015-16. The first larger sample consisted of 1208 children from grades 1, 2 and 3 in the participating schools. All children who were permitted to partake in the study participated in tests of reading proficiency that were under development by the project. A subsample of the children from grades 1 and 3 was also tested with five subtests of the WISC-IV, in order to get information on their basic cognitive abilities. The subsample consisted of randomly selected children, as well as children who belonged to the bottom 15th percentile on the reading tests. Randomization was assured by taking every fourth child in alphabetical order from the participating students in the participating classes, with a maximum of four children per class. The second larger sample consisted of 522 children in grades 1, 3, 5 (elementary school), 7 and 9 (middle school), whose executive and attentional abilities were rated by their teachers in order to collect data on the development of these abilities. The sample was selected from the same schools as the reading proficiency sample, with the addition of two schools from Ostrobothnia to ensure geographic representativeness. However, not all parallel classes that participated in the reading proficiency tests were part of this sample, since a smaller sample size sufficed. Randomization was again ensured by selecting every fourth child in alphabetical order in the participating classes. If the

child, or the caretakers of the child, chose not to participate in the study, the next child from an alphabetical list was selected. The response rate for classes 1, 3, and 5 was 80%, and for classes 7 and 9 60%. For both main samples, the only exclusion criteria were the caretakers' language proficiency not encompassing Finnish or Swedish, or the class teacher's evaluation that the child's participation could be too burdening considering the child's current psychosocial situation. In sum, the two larger samples partly overlapped, meaning that some children had participated only in ratings for executive functions, some had participated in tests of cognitive abilities, and some had participated in both. For this study, only the data from randomly selected children from grades 1 and 3, who had participated in either testing of cognitive abilities or ratings of executive abilities, or both, was analyzed. Furthermore, children who had a diagnosis which could affect the test performance as well as children who had not acquired the second language before the age of three or if essential data was missing, were excluded from the analysis. Thus, the final sample in this study consisted of 221 participants, of which all children had participated in the Kesky measures, and 154 children had participated in both the Kesky and the WISC measures.

To ensure the homogeneity of the bilingual group, only simultaneous bilinguals were included in the analysis. Since there is no legal or linguistic definition of bilingualism in Finland, bilingualism depends on who considers themselves bilingual or not (Strategy for the national languages of Finland, 2012). Parents of bilingual children were asked to state the languages the child has acquired and at what age. The simultaneous bilingual children were assumed to have grown up in families where one parent´s primary language was Swedish and the other parent´s primary language was Finnish or another language. In turn, the monolingual Swedish-speaking children had grown up in monolingual families, where the parent´s primary language was predominantly Swedish. Children with other language backgrounds were not included in the study sample.

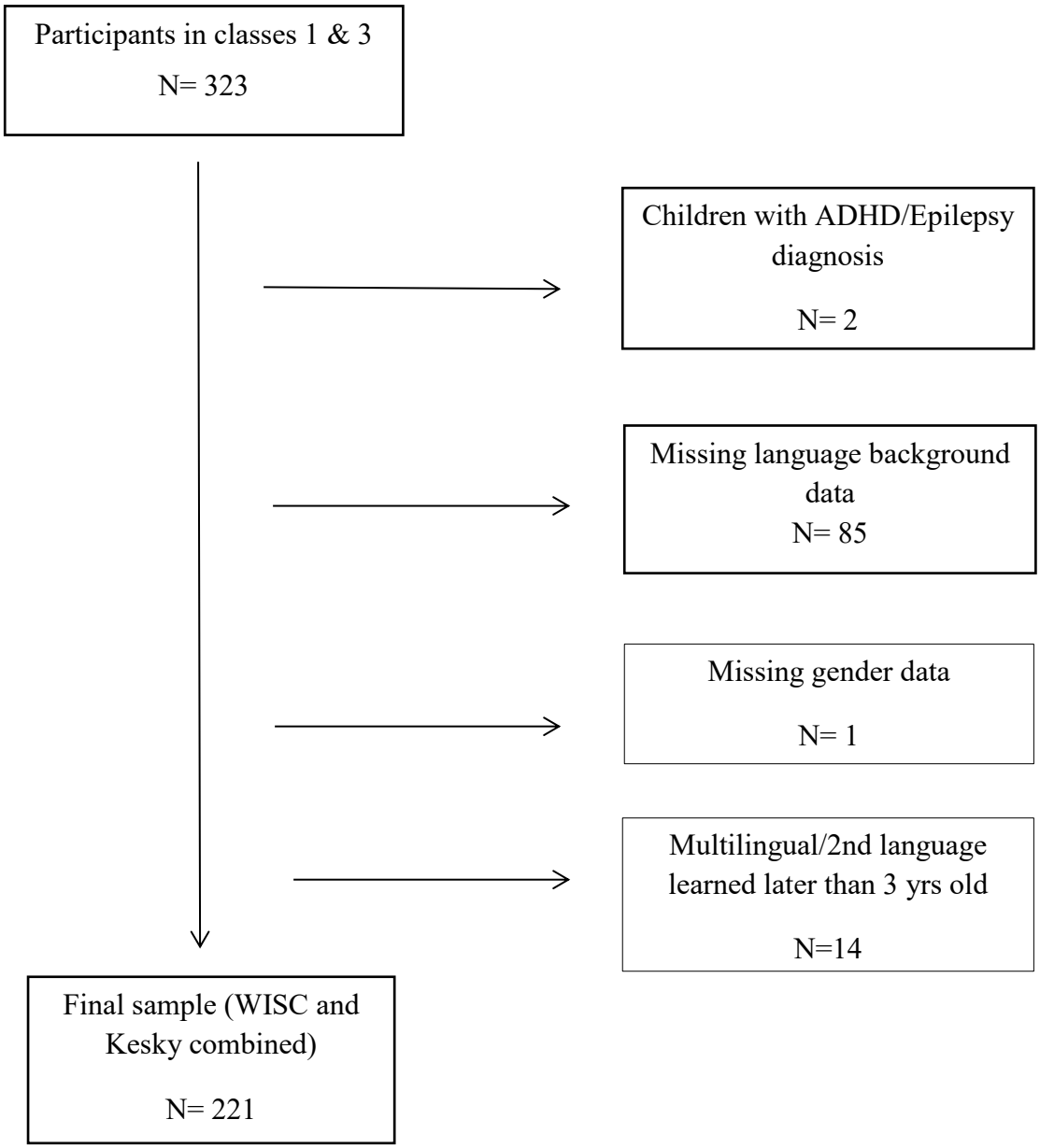

Figure 1. Flowchart of the sample selection process

Table 1. *Demographic Characteristics of the Sample*

Gender (%)	Girls	51 %
	Boys	49 %
Participants per grade (%)	Grade 1	53 %
	Grade 3	47 %
Age	Min	6.03 yrs
	Max	11.0 yrs
	Mean/SD	8.7/1.1 yrs
Language background (%)	Monolingual	56 %
	Bilingual	44 %
Mother's educational level*	Level 1	11.4%
	Level 2	5.3%
	Level 3	35.5%
	Level 4	37.7%
Father's educational level **	Level 1	26,3%
	Level 2	8.8%
	Level 3	30.7%
	Level 4	30.3%

Note: Mother's and Father's educational level was defined as the highest educational level attained by the mother and the father of the child, respectively. 1= Comprehensive school; Level 2 = Upper secondary education or vocational education; Level 3 = Lower-degree level tertiary education; Level 4 = Higher-degree level tertiary education or doctorate.

* Information on this point was not obtained for 12% of the participants

** Information on this point was not obtained for 4% of the participants

Table 2. *The distribution of language background and gender by grade (N=221)*

	Grade 1	**Grade 3**
Monolinguals		
Girls	30	27
Boys	35	32
Bilinguals		
Girls	28	28
Boys	24	17

2.1 Measures and procedures

The performance-based measures used in the present study were subtests in the WISC-IV. The rating measure used in this study was the Kesky questionnaire. The parents of the children were also required to fill out an extensive background questionnaire in order to obtain demographic information of the participants as well as information about the child's language background, language behavior and language environment, possible language-based learning disabilities, medication or neurological developmental disorders as well as media- and reading habits. For WISC-IV, the Swedish version was used since there is no version available for Swedish-speaking Finns. All administered WISC subtests and the cognitive components they are designed to measure are presented in Table 3. The administration of the tests lasted approximately 1-1.5 hours, which also included some tests of working memory, math and reading speed not included in this study. The data collection was carried out by psychology students trained by a legitimized psychologist who also took part in and supervised the data collection. The administrators were not aware of the children's language background prior to or during the administration of the tasks. The children were tested individually in one to two sessions in a private room provided by their own school. After administering the tests, the administrator evaluated the reliability of the results on a scale from 1 (low reliability) to 5 (high reliability) by considering the child's ability to maintain attention during the task and how the child was able to perform during the test session. For example, if the child was easily distracted or was considered not to perform to his or her best ability, the reliability of the test would be considered to be low. One performance with an estimated reliability score of 1 was excluded from the analysis.

Table 3. *The WISC subtests used in the present analyses and the cognitive components they are considered to measure*

Subtest	Cognitive component
Block Design	Ability to analyze and synthesize abstract visual stimuli, nonverbal concept formation, visual perception and organization, visual-motor coordination.
Vocabulary	Word knowledge, verbal concept formation, level of language development
Digit-Span	Auditory short-term memory, working memory.
Letter-number sequencing	Working memory, short-term auditory memory, visuospatial imaging and processing speed.
Symbol Search	Processing speed, short-term visual memory, visual-motor coordination, cognitive flexibility, visual discrimination, and concentration.

2.1.1 Keskittymiskysely (Kesky)

Kesky (ATTEX) consists of three parts. In the first part of the questionnaire, the teacher is asked to evaluate the child's typical behavior in the classroom with the focus on the child's attentional and executive function abilities.[1] In this study, only the first part of the questionnaire is relevant. This part of the questionnaire includes 3 different domains, designed to capture essential functions of attention and EF, and each domain is further divided into subcategories. The teacher is asked to evaluate the child on a total of 55 statements on a three-point

[1] In the second part, the teacher is asked to evaluate the child's strengths, choosing the most appropriate statements from a list of 28 alternatives, such as "imaginative", "brave" or "helpful". In the third part of the questionnaire, the teacher is asked to answer more detailed questions about the child's attentional and executive abilities, possible difficulties in learning or clinical diagnoses the child might have. Already applied educational supportive methods should also be described here. The last two parts of the Kesky aim at providing additional information which can be of use in school or in clinical practice, such as the situational variability in the child's behavior and the child's strengths.

Likert scale: “not a problem”, “sometimes a problem” and “often a problem”. The domains and their subcategories are described in Table 4. The standardization and norms of *Kesky* are based on a large non-clinical child sample (N=704), and samples of children with diagnosed ADHD (N=193) and ADD (N=93). In those data, the correlations between the subcategories varied between .485-.796, and the internal reliability across all age groups for all the measures in both the normative and diagnostic groups was good (αs> .70), with only a few exceptions. This is to be expected from this kind of a rating measure, since the rater is likely to give similar ratings on multiple measures to the same child (halo-effect). The inter-rater reliability has not been tested since the person making the rating should always be the professional working closest to the child, and a second rater would probably not have the same information about the child’s behaviour in order for the measurements to be comparable. A retest has not been conducted either, since the results from the same rating measures were deemed to be usually very similar even on different occasions. Kesky was validated by comparing it to the ADHD Rating Scale IV: School version, which is a commonly used rating measure for assessing difficulties with attention based on the DSM-IV classification. Generally, the correlations between the scales were acceptable for all the subscales and groups, even though the correlations between the measures were slightly higher for the normative group than for the diagnostic groups. The cut-off score for Kesky has been suggested as 29 (sensitivity=.872, specificity=.864). However, due to a gender difference, separate cut-off scores have been put forth for boys and girls. The proposed cut-off score for boys is 35.5 (sensitivity=.857, specificity=.839), and for girls 19.5 (sensitivity=.808, specificity=.858).

Table 4. *Domains, subcategories and total number of items in the Kesky questionnaire*

Domain (number of items)	**Subcategory (number of items)**
Inhibition (20)	1. Distractibility (4)
	2. Impulsivity (9)
	3. Motor hyperactivity (7)
Attention (15)	4. Directing attention (5)
	5. Sustaining attention (6)
	6. Shifting attention (4)
Executive function (20)	7. Initiative (5)
	8. Planning (4)
	9. Execution of Action (8)
	10. Evaluation (3)

Kesky was designed to measure different aspects of EF, attention and inhibition, but it was found to be one-dimensional in a factor analysis (using the non-clinical child sample (N=704) (Klenberg et al., 2010). This motivated an investigation of the latent structure of the Kesky questionnaire. The one-dimensionality is most likely a result of children more often having difficulties in multiple areas of EF and attention rather than just in a single ability. More difficulties with EF and attention are also more noticeable in classroom situations, and it is likely that after noticing one problem related to attention, teachers will spot multiple areas of difficulties in the child's EF abilities. This would then result in high scores on multiple Kesky measures.

2.1.2 Factor analysis

An exploratory factor analysis was conducted on the 55 Kesky items. The sampling was adequate according to the Keyser-Meyer-Olkin-measure, KMO = .920, and Bartlett's test of sphericity was significant ($x^2 = (1485) = 9947.71$, $p < .01$). Principal axis factoring with oblique (Oblimin) rotation was used to determine the appropriate number of factors to retain. The initial analysis resulted in 10 factors having eigenvalues over Kaiser's criterion of 1, which together explained over 70% of the variance. The scree plot justified retaining 2 or 3 factors. Three factors

were ultimately retained since they together explained more than 50% of the variance. Table 6 shows the factor loadings for the final analysis with three factors. The items that cluster on the same factor suggest that factor 1 represents difficulties with directing, sustaining and shifting attention and activity. In turn, factor 2 represents motoric restlessness and impulsivity. Factor 3 represents hurrying, carelessness and restlessness during tasks, resulting in poorer performance. Every item that clustered on one of the three factors with a loading of .300 or more (including items that loaded on multiple factors) was summed up in order to create a new Kesky factor, resulting in three new factors: Attention (factor 1), Impulsivity (factor 2) and Disorganization (factor 3). Five items loaded on both the attention factor and the impulsivity factor (e.g. “activities are interrupted by even the smallest external distracter”; “doesn’t listen to instructions until the end”), and four items loaded both on the attention factor and the sloppiness factor (“does not notice the when tasks changes in respect of type of performance”; “does not pay attention to the order in which tasks should be executed”)[2]. These cross-loadings can be expected considering the close links between various symptoms in attention deficit disorders, and the fact that these problems become visible in overt behavior. The mono- and bilingual children were compared with each other on these 3 executive factors in the analysis

[2] For copyright reasons the reader is referred to the original publication by Klenber, Jämsä, Häyrinen, Lahti-Nuuttila, & Korkman (2010) for a complete description of the ATTEX items.

Table 6. *Factor loadings for the 55 Kesky items according to the pattern matrix (N=221)*

	Factor loadings			Communality
	1	**2**	**3**	
Distractibility item 1	**0,430**	**0,491**	0,017	0,619
DIST_02	**0,480**	**0,447**	0,066	0,665
DIST_03	**0,523**	**0,405**	-0,11	0,550
DIST_04	0,147	0,181	0,04	0,089
Impulsivity item 5	0,068	**0,653**	0,154	0,578
IMP_06	-0,021	**0,507**	0,248	0,403
IMP_07	**0,352**	0,281	**0,311**	0,537
IMP_08	-0,091	**0,663**	0,174	0,503
IMP_09	-0,211	**0,781**	0,115	0,578
IMP_10	**0,482**	0,144	0,085	0,362
IMP_11	0,135	0,002	**0,659**	0,524
IMP_12	0,55	0,088	0,09	0,405
IMP_13	0,088	0,52	**0,312**	0,562
Motoric hyperactivity item 14	0,208	**0,403**	0,134	0,358
MOTO_15	0,268	**0,561**	-0,156	0,438
MOTO_16	0,299	**0,577**	0,019	0,583
MOTO_17	0,025	**0,602**	-0,136	0,328
MOTO_18	0,099	**0,576**	-0,043	0,370
MOTO_19	-0,139	0,72	0,077	0,493
MOTO_20	0,118	0,40	0,169	0,311
Directing attention item 21	**0,689**	0,06	0,12	0,599
RIKT_22	**0,552**	0,292	0,068	0,577
RIKT_23	**0,709**	0,014	0,159	0,628
RIKT_24	**0,761**	-0,083	-0,028	0,518
RIKT_25	**0,755**	-0,079	0,002	0,527
Sustaining attention item 26	**0,757**	0,015	0,007	0,588
UPPR_27	**0,662**	0,254	-0,077	0,596
UPPR_28	**0,566**	**0,396**	-0,002	0,665
UPPR_29	**0,623**	0,146	0,093	0,552
UPPR_30	**0,812**	-0,072	-0,101	0,566
UPPR_31	**0,530**	0,242	0,05	0,481
Shifting attention item 32	**0,616**	-0,063	**0,406**	0,692
SKIF_33	**0,599**	0,097	0,227	0,593
SKIF_34	**0,436**	-0,068	**0,469**	0,526
SKIF_35	**0,653**	0,253	-0,088	0,576
Initiative item 36	**0,772**	0,003	0,068	0,644
EFIG_37	**0,787**	0,11	-0,093	0,648

EFIG_38	**0,718**	0,029	-0,066	0,500
EFIG_39	**0,713**	-0,189	0,02	0,438
EFIG_40	**0,455**	-0,131	0,134	0,226
Planning item 41	0,129	0,171	**0,659**	0,653
EFPL_42	**0,348**	0,157	**0,452**	0,576
EFPL_43	**0,584**	0,108	0,22	0,574
EFPL_44	**0,496**	0,206	0,092	0,434
Execution of action item 45	**0,731**	-0,018	0,125	0,609
EFUTF_46	**0,669**	0,134	0,02	0,555
EFUTF_47	**0,389**	0,203	0,2	0,392
EFUTF_48	-0,142	0,15	**0,743**	0,580
EFUTF_49	0,089	-0,061	**0,706**	0,522
EFUTF_50	**0,854**	-0,267	-0,207	0,553
EFUTF_51	**0,606**	0,121	0,097	0,509
EFUTF_52	**0,535**	0,133	-0,011	0,359
Evaluation item 53	0,238	**0,517**	0,035	0,451
EFUTV_54	0,39	0,182	0,212	0,385
EFUTV_55	**0,593**	-0,04	0,254	0,509

Note: Factor loadings over .30 appear in bold

Table 7. *Descriptive statistics for the three Kesky factors (N = 221)*

	No. of items	M (SD)	Skewness	Kurtosis	α
Attention	35	9.63 (13.08)	1.885	3.185	.970
Impulsivity	14	3.75 (5.09)	1.927	3.657	.918
Disorganization	9	2.6 (3.53)	1.593	2.091	.893

Table 8. *Correlations among the three Kesky factors (N=221)*

	Attention	Impulsivity	Disorganization
Attention	1	.762**	.759**
Impulsivity		1	.685**
Disorganization			1

**Correlation is significant at the .01 level

2.1.3 Data analysis

To investigate the effect of bilingualism as well as age and gender on test performance and rating scores, ANOVAs were conducted. The dependent variable was the standardized score of each

WISC-IV subtest and total scores for the three Kesky factors, and language proficiency (monolingual; bilingual), age group (younger; older) and gender (girls, boys) served as the independent variables. The WISC-IV subtests Digit Span and Letter-Number sequencing were also combined into a Working Memory index in an attempt to yield a more reliable measure of this cognitive domain.

Prior to the main analyses, Fisher's exact tests were conducted separately within both age groups to ensure that the language groups were balanced on gender and parent educational level. In these analyses, no differences in levels of mothers' or fathers' education were found between monolingual or bilingual children in neither age group. However, a difference in gender was found in the older age group, as there were significantly more monolingual than bilingual boys (p = .011). Due to the difference in the number of monolingual vs. bilingual boys in the older age group, only the interaction effect between age group and language proficiency was interpreted

3 Results

The statistics from the Analysis of Variance are presented separately in tables 9-17 for each WISC-IV subtest and Kesky factor. The average scores of the monolinguals and bilinguals on the administered subtests are presented separately for each age group in Tables 18 and 19.

3.1 WISC-IV subtests

No significant main effects of language group was found for the WISC-IV subtests or Working memory index. In the Digit span task, the older age group received significantly higher scores (M= 8.75, SD= 2.68) compared to the younger age group (M= 8.01, SD= 2.44). In the Letter-Number sequencing task**,** girls obtained significantly higher scores (M= 9.48, SD= 2.83) compared to boys (M= 8.43, SD = 2.62). The older age group also got significantly higher scores (M= 10.34,

SD= 2.47) compared to the younger age group (M= 9.83, *SD*= 2.70) in the Letter-Number sequencing task. In the Symbol search tasks, girls received significantly higher scores (M= 10.84, *SD*= 2.53) compared to boys (M= 9.26, *SD*= 2.48). The older age group also got significantly higher scores (M= 10.34, *SD*= 2.47) compared to the younger age group (M= 9.83, *SD*= 2.70) in the Symbol search tasks. The interaction term age x language was not significant for any of the WISC-IV tasks.

3.2 Kesky

For the Attention factor, monolinguals obtained significantly lower scores (*M*=7.51, *SD*= 11.54) compared to bilinguals (*M*= 12.44, *SD*= 14.46). Girls also got significantly lower scores (*M*=6.63, *SD*= 10.64) than boys (*M*= 12.81, *SD* = 14.63).

For the Impulsivity factor, monolinguals exhibited significantly lower scores (*M*=3.24, *SD*= 4.38) compared to bilinguals (*M*= 4.41, *SD*= 5.82), and girls received significantly lower scores as well (*M*= 2.13, *SD*= 3.47) compared to boys (*M*= 5.47, *SD* = 5.90).

Concerning the Disorganization composite score, monolinguals received significantly lower scores (*M*=1.98, *SD*= 2.90) compared to bilinguals (*M*= 3.40, *SD*= 4.07), and again, girls also obtained significantly lower scores (*M*=1.84, *SD*= 3.09) compared to boys (*M*= 4.32, *SD* = 3.79). The older age group also got significantly lower sores (*M*= 1.77, *SD*=2.25) than the younger one (*M*= 1.18, *SD*= 1.92). The main effect of age was not significant for the other Kesky factors, and the interaction term age x language was not significant for any of the Kesky factors.

The correlation between the total score on the Kesky scale and the total score on the the WISC-IV was $r = -.263$, $p < .01$. Better performance on the WISC-IV subtests was associated with lower scores on the Kesky scale.

Table 9. *Analysis of Variance WISC-IV Block design*

	Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	74,266	7	10,609	1,189	0,313	0,054
Intercept	16355,359	1	16355,359	1832,92	0,000	0,927
Gender	3,428	1	3,428	0,384	0,536	0,003
Age	0,685	1	0,685	0,077	0,782	0,001
Language	3,961	1	3,961	0,444	0,506	0,003
Gender*Age	5,651	1	5,651	0,633	0,427	0,004
Gender*Language	41,287	1	41,287	4,627	0,033	0,031
Age*Language	1,352	1	1,352	0,152	0,698	0,001
Gender*Age*Language	9,461	1	9,461	1,06	0,305	0,007
Error	1293,852	145	8,923			
Total	21499	153				
Corrected Total	1368,118	152				

a R Squared = ,054 (Adjusted R Squared = ,009)

Table 10. *Analysis of Variance WISC-IV Vocabulary*

	Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	73,015	7	10,431	1,69	0,116	0,076
Intercept	9361,844	1	9361,844	1516,999	0,000	0,914
Gender	19,11	1	19,11	3,097	0,081	0,021
Age	9,152	1	9,152	1,483	0,225	0,01
Language	10,324	1	10,324	1,673	0,198	0,012
Gender*Age	15,488	1	15,488	2,51	0,115	0,017
Gender*Language	0,207	1	0,207	0,034	0,855	0
Age*Language	10,114	1	10,114	1,639	0,203	0,011
Gender*Age*Language	0,001	1	0,001	0	0,991	0
Error	882,495	143	6,171			
Total	12918	151				
Corrected Total	955,51	150				

a R Squared = ,076 (Adjusted R Squared = ,031)

Table 11. *Analysis of Variance WISC-IV Digit Span*

	Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	66,752	7	9,536	1,492	0,175	0,067
Intercept	8810,826	1	8810,826	1378,158	0,000	0,905
Gender	5,29	1	5,29	0,827	0,365	0,006
Age	27,749	1	27,749	4,34	**0,039**	0,029
Language	2,257	1	2,257	0,353	0,553	0,002
Gender*Age	8,803	1	8,803	1,377	0,243	0,009
Gender*Language	10,989	1	10,989	1,719	0,192	0,012
Age*Language	8,67	1	8,67	1,356	0,246	0,009
Gender*Age*Language	6,136	1	6,136	0,96	0,329	0,007
Error	927,012	145	6,393			
Total	11519	153				
Corrected Total	993,765	152				

a. R Squared = ,067 (Adjusted R Squared = ,022)

Note: significant results are highlighted

Table 12. *Analysis of Variance WISC-IV Letter-Number sequencing*

	Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	60,524	7	8,646	0,961	0,462	0,046
Intercept	9554,261	1	9554,261	1061,546	0,000	0,883
Gender	45,641	1	45,641	5,071	**0,026**	0,035
Age	0,011	1	0,011	0,001	0,972	0
Language	1,792	1	1,792	0,199	0,656	0,001
Gender*Age	4,628	1	4,628	0,514	0,475	0,004
Gender*Language	3,346	1	3,346	0,372	0,543	0,003
Age*Language	8,812	1	8,812	0,979	0,324	0,007
Gender*Age*Language	2,094	1	2,094	0,233	0,63	0,002
Error	1269,047	141	9			
Total	13255	149				
Corrected Total	1329,57	148				

a R Squared = ,046 (Adjusted R Squared = -,002)

Note: significant results are highlighted

Table 13. *Analysis of Variance WISC-IV Working memory index*

	Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	136,023	7	19,432	0,918	0,495	0,044
Intercept	36611,506	1	36611,506	1729,397	0,000	0,925
Gender	71,485	1	71,485	3,377	0,068	0,023
Age	24,044	1	24,044	1,136	0,288	0,008
Language	6,444	1	6,444	0,304	0,582	0,002
Gender*Age	0,044	1	0,044	0,002	0,964	0
Gender*Language	1,877	1	1,877	0,089	0,766	0,001
Age*Language	0,114	1	0,114	0,005	0,942	0
Gender*Age*Language	15,972	1	15,972	0,754	0,387	0,005
Error	2984,984	141	21,17			
Total	47691	149				
Corrected Total	3121,007	148				

a R Squared = ,044 (Adjusted R Squared = -,004)

Table 14. *Analysis of Variance WISC-IV Symbol Search*

	Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	161,814	7	23,116	3,8	0,001	0,156
Intercept	12811,77	1	12811,77	2105,85	0,000	0,936
Gender	56,879	1	56,879	9,349	**0,003**	0,061
Age	27,732	1	27,732	4,558	**0,034**	0,031
Language	5,69	1	5,69	0,935	0,335	0,006
Gender*Age	0,254	1	0,254	0,042	0,838	0
Gender*Language	0,233	1	0,233	0,038	0,845	0
Age*Language	22,885	1	22,885	3,762	0,054	0,025
Gender*Age*Language	27,917	1	27,917	4,589	0,034	0,031
Error	876,081	144	6,084			
Total	16318	152				
Corrected Total	1037,895	151				

a R Squared = ,156
(Adjusted R Squared = ,115)

Table 15. *Analysis of Variance Kesky Attention*

	Sum of Squares	**df**	**Mean Square**	**F**	**Sig.**	**Partial Eta Squared**
Corrected Model	4835,091	7	690,727	4,495	0,000	0,131
Intercept	21511,868	1	21511,868	139,98	0,000	0,402
Gender	2542,445	1	2542,445	16,544	**0,000**	0,074
Age	48,768	1	48,768	0,317	0,574	0,002
Language	1648,91	1	1648,91	10,73	**0,001**	0,049
Gender*Age	365,147	1	365,147	2,376	0,125	0,011
Gender*Language	500,511	1	500,511	3,257	0,073	0,015
Age*Language	148,997	1	148,997	0,97	0,326	0,005
Gender*Age*Language	0,12	1	0,12	0,001	0,978	0
Error	31965,016	208	153,678			
Total	56849	216				
Corrected Total	36800,106	215				

a R Squared = ,131 (Adjusted R Squared = ,102)

Note: significant results are highlighted

Table 16. *Analysis of Variance Kesky Impulsivity*

	Sum of Squares	**df**	**Mean Square**	**F**	**Sig.**	**Partial Eta Squared**
Corrected Model	850,121	7	121,446	5,357	0,000	0,152
Intercept	3201,744	1	3201,744	141,239	0,000	0,402
Gender	662,736	1	662,736	29,235	**0,000**	0,122
Age	19,712	1	19,712	0,87	0,352	0,004
Language	127,19	1	127,19	5,611	**0,019**	0,026
Gender*Age	33,721	1	33,721	1,488	0,224	0,007
Gender*Language	44,984	1	44,984	1,984	0,16	0,009
Age*Language	1,907	1	1,907	0,084	0,772	0
Gender*Age*Language	2,006	1	2,006	0,088	0,766	0
Error	4760,503	210	22,669			
Total	8680	218				
Corrected Total	5610,624	217				

a R Squared = ,152 (Adjusted R Squared = ,123)

Note: significant results are highlighted

Table 17. *Analysis of Variance Kesky Disorganization*

	Sum of Squares	**df**	**Mean Square**	**F**	**Sig.**	**Partial Eta Squared**
Corrected Model	367,721	7	52,532	4,716	0,000	0,136
Intercept	1648,309	1	1648,309	147,967	0,000	0,415
Gender	189,444	1	189,444	17,006	**0,000**	0,075
Age	25,532	1	25,532	2,292	0,132	0,011
Language	147,388	1	147,388	13,231	**0,000**	0,06
Gender*Age	2,018	1	2,018	0,181	0,671	0,001
Gender*Language	60,659	1	60,659	5,445	0,021	0,025
Age*Language	2,381	1	2,381	0,214	0,644	0,001
Gender*Age*Language	0,001	1	0,001	0	0,992	0
Error	2328,196	209	11,14			
Total	4167	217				
Corrected Total	2695,917	216				

a R Squared = ,136 (Adjusted R Squared = ,107)

Note: significant results are highlighted

Table 18. *Scores on the WISC-IV subtests and Kesky factors for the younger age group*

		Monolingual			Bilingual		
		M	**SD**	**range**	**M**	**SD**	**range**
Block Design							
	Girls	11.95	3.12	7-17	11.20	3.08	5-16
	Boys	11.44	3.29	5-17	11.90	3.27	6-18
	All	11.67	3.19		11.51	3.15	
Vocabulary							
	Girls	9.76	2.21	6-15	9.83	2.56	6-17
	Boys	8.33	2.66	1-12	8.25	1.86	5-13
	All	8.96	2.55		9.11	2.38	
Digit Span							
	Girls	8.95	2.45	5-14	8.00	2.61	5-18
	Boys	7.85	2.33	3-15	7.20	2.19	4-12
	All	8.35	2.42		7.63	2.44	
Letter Number Sequencing							
	Girls	8.86	3.00	4-13	9.75	3.09	4-15
	Boys	8.62	3.77	3-15	8.32	2.84	4-12
	All	8.72	3.41		9.12	3.04	
WM							
	Girls	17.71	4.22	14-29	17.79	5.12	12-35
	Boys	16.61	5.24	9-26	15.73	3.96	10-26
	All	17.10	4.80		16.88	4.71	
Symbol Search							
	Girls	10.19	2.20	5-14	10.80	2.84	5-17
	Boys	9.78	2.20	6-13	8.30	3.09	1-13
	All	9.96	2.19		9.69	3.18	
Attention							
	Girls	3.77	5.38	0-23	7.96	11.90	0-44
	Boys	10.29	12.49	0-48	20.83	18.00	0-59
	All	7.23	10.28		13.88	16.21	
Impulsivity							
	Girls	1.53	3.50	0-8	2.56	4.48	0-21
	Boys	5.18	5.65	0-21	7.67	7.50	0-24
	All	3.47	4.79		4.96	6.55	
Disorganization							
	Girls	1.00	1.70	0-7	1.82	3.71	0-17
	Boys	2.03	2.64	0-11	5.00	4.46	0-12
	All	1.55	2.29		3.25	4.33	

Table 19. *Scores on the WISC-IV subtests and Kesky factors for the older age group*

		Monolingual			Bilingual		
		M	**SD**	**range**	**M**	**SD**	**range**
Block Design							
	Girls	13.00	1.88	9-16	10.71	2.86	4-17
	Boys	10.52	2.48	6-15	11.67	3.83	8-18
	All	11.41	2.56		11.00	3.11	
Vocabulary							
	Girls	9.07	2.20	6-13	8.00	2.85	4-13
	Boys	9.08	2.82	3-16	7.83	2.13	6-11
	All	9.08	2.58		7.95	2.60	
Digit Span							
	Girls	9.29	2.43	6-14	8.50	2.10	7-14
	Boys	8.36	2.98	5-15	9.67	3.32	7-16
	All	8.69	2.80		8.85	2.49	
Letter Number Sequencing							
	Girls	10.07	2.30	4-13	9.36	2.67	2-12
	Boys	8.52	2.63	1-13	7.67	2.73	3-12
	All	9.08	2.59		8.85	2.73	
WM							
	Girls	19.35	4.34	10-27	17.85	3.69	9-23
	Boys	16.88	4.52	10-27	17.33	5.24	13-27
	All	17.76	4.56		17.70	4.07	
Symbol Search							
	Girls	11.14	2.95	5-14	11.57	1.86	9-15
	Boys	9.00	2.00	5-13	11.17	2.04	8-14
	All	9.77	2.57		11.45	1.87	
Attention							
	Girls	7.11	14.00	0-59	8.00	9.79	0-32
	Boys	8.41	11.99	0-63	15.44	14.39	5-40
	All	7.81	12.85		10.77	12.10	
Impulsivity							
	Girls	2.11	4.21	0-16	2.36	2.40	0-32
	Boys	3.75	3.55	0-63	6.25	6.80	0-24
	All	3.00	3.92		3.77	4.83	
Disorganization							
	Girls	2.12	3.47	0-13	2.50	3.15	0-12
	Boys	2.74	3.40	0-15	5.29	4.21	0-12
	All	1.98	2.90		3.40	4.07	

4 Discussion

The present study compared bilingual and monolingual Swedish-Finnish children on performance-based cognitive tasks and an EF rating measure. The sample consisted of 221 monolingual and bilingual children in the 1st and 3rd grade of elementary school.

In the performance-based cognitive tasks, there were no differences in the performance between the mono- and bilingual children. In recent research reports, differences in the performance on these tasks have varied. Bilingual children have outperformed monolingual children only in the Block Design and Vocabulary task (Lachlan, Parisi and Fadda, 2012), whereas monolingual children have outperformed bilingual children in the Symbol Search task (Karlsson et al., 2015). The results in the present study does not show evidence of these differences and is in line with emerging evidence that bilingual children may not enjoy a cognitive advantage (Paap, Johnson & Sawi, 2015) and that bilingualism is not needed to take into consideration in the clinical use of these tasks (Karlsson et al., 2015). Age and gender had significant effects on the performance on these tasks, with girls scoring higher on the Letter-Number sequencing task and the Symbol Search task compared to boys, and the older age group scored higher in the Digit Span and the Symbol Search task. However, these effects are not discussed further as the main focus was on language background that did not interact with age or gender.

In the Kesky ratings, bilingual children were rated by their teachers to have more problems in the Kesky factors attention, impulsivity and disorganization compared to the monolingual children. These results not only speak against a possible bilingual executive advantage but might indicate that bilinguals have more trouble with EF compared to monolinguals. Boys were also rated to have more problems in all of the executive abilities rated with Kesky. The differences in ratings between gender was expected since in the previous study by Klenberg et al., (2010), boys also exhibited weaker EF ratings on the Kesky measure compared to girls. Again, no interaction

between age, gender and language group was found, indicating that cognitive consequences of bilingualism are not dependent on gender or age.

The WISC-IV tasks Vocabulary and Letter-Number sequencing had significant but small correlations with attention and disorganization. The Symbol Search task had significant but small correlations with all attention, impulsivity and disorganization. The better performance on these WISC-IV tasks, the fewer problems with EF they were rated to have in the Kesky measure. This might show that children with weaker cognitive abilities also have weaker EF abilities that are observable in the classroom. However, the correlations were only small, and therefore the results could also indicate that the EF rating measure might tap into different aspects of EF abilities that are not seen in the performance-based results. Toplak et al. (2013) also found only a small correlation between these two types of measurements, which could indicate that they measure different underlying mental constructs, with the performance-based measures assessing maximal or optimal performance as compared to rating measures tapping typical real-life performance. Although the WISC-IV tasks administered are not aimed to measure EF abilities, they do acquire some level of EF, especially Digit Span and Letter-Number sequencing which measure working memory, one of the main components of EF (Miyake et. al, 2000; Miyake & Friedman, 2012). This might explain why differences between mono- and bilingual children were not found with the performance-based measures but only in the rating measure.

However, the teachers might also for other unknown reasons rate monolingual and bilingual children differently which is unrelated to actual differences in EF. One speculation as to why bilingual children might be rated as having more difficulties with executive functions in school is that bilingual children might switch languages during class, which might be interpreted as a sign of inattentiveness by the teacher. Nevertheless, as very little is known about if and how bilingualism affects real-life functioning, these results bring up new findings to consider in bilingualism

research. It would be of interest to find out if the present Kesky findings with monolingual vs. bilingual children are replicable, and if so, what the underlying reasons might be.

In sum, the results in the present study show no evidence for a bilingual cognitive or executive advantage. However, the idea of this advantage could still be salvaged by assuming that it concerns only a part of bilinguals. The type of exposure a bilingual person experiences, such as the level of switching between languages, could be an important factor that affects EF skills. Green and Abutalebi (2013) proposed the so-called adaptive control hypothesis, according to which the amount of cognitive control needed in bilingual communication depends on how much switching between languages is required. Thus, the more switching between languages one does, the more practice one obtains in cognitive control. Green and Abutalebi (2013) separate three different bilingual contexts: single-language (each language is used in separate contexts), dual-language (each language used with different conversational partners), and dense code-switching context (switching languages between single utterances). They suggest that the cognitive control demands are highest for the dense code-switching type of bilingual experience. In the present study, the type of bilingual experience the children are involved in is not known, but this hypothesis prompts further research.

4.1 Limitations

Most of the studies on the bilingual executive advantage so far (including the present one) have used a natural group's design, which can only provide correlational evidence. Laine & Lehtonen (2018) discuss in their review whether these types of studies are relevant to conduct anymore since they provide no information on ckvausality: bilingualism may lie behind the (as such inconclusive) group differences concerning EF, or level of EF may affect proneness to learn multiple languages. Possible confounds from a third factor (e.g., socioeconomic status on mono- vs. bilinguals in a society) are also a concern. Other factors that might affect the performance on EF

measures and thereby language group differences/non-differences, such as exercise, social activity, or musical training (Valian, 2015), were not taken into account. The Kesky ratings may be affected by halo effects so that the raters are likely to give similar ratings on multiple measures to the same individual. Thus after noticing one problem related to attention, a teacher might spot multiple areas of difficulties in the child's EF abilities, resulting in high scores on multiple measurements
The results in the WISC-IV Vocabulary task might also have been affected by an administration error (some administrators failed to ask follow-up questions according to the administration guides) and therefore not be completely reliable since a follow-up question in this task gives further information on how to score the child's answer on the question. The results might also be affected by the fact that in the Kesky sample, a few extreme outliers were detected. Since exclusions were made for children with diagnoses that could affect test performance, children who were not simultaneous bilinguals, and those whose performances were rated as unreliable by the test administrators, the outliers detected were assumed to be part of the normal distribution and therefore not excluded from the analysis.

5 Conclusions

The present study compared bilingual and monolingual school-aged Swedish-Finnish children on performance-based cognitive tasks and an EF rating measure. No significant differences between the language groups were found on the performance-based cognitive tasks. In contrast, the teachers rated the bilingual children as having more difficulties with executive functions compared to the monolingual children. Whether these results are due to actual differences in executive functions between mono- and bilingual children that are not caught by typical performance-based measures, or whether other underlying reasons can account for these differing ratings, require replication studies and further investigation.

MATILDA DEREFALK

Swedish summary

Kognitiva testprestationer och exekutiva bedömningar bland enspråkiga och tvåspråkiga lågstadiebarn

Introduktion

Sambandet mellan tvåspråkighet och kognitiva funktioner både bland barn och vuxna har undersökts aktivt under de senaste decennierna. Orsaken bakom intresset ligger främst i att flera studier har visat att tvåspråkiga presterat bättre i ett flertal kognitiva uppgifter, till exempel i test som mäter mentaliseringsförmåga, selektiv uppmärksamhet, inhibering och arbetsminne (t.ex. Adesope, Lavin, Thompson & Ungerleider, 2010; Bialystok, 2017; Karlsson m.fl., 2015; Macnamara & Conway, 2014). Denna kognitiva fördel bland tvåspråkiga antas vara ett resultat av att tvåspråkiga individer är tvungna att hantera två språk parallellt även då bara ett av språken för stunden är i aktivt bruk (Bialystok m. fl., 2009; Bialystok, 2017; Marian & Spivey, 2003). Detta kräver förmågan att selektivt kunna rikta uppmärksamheten mot det språk som är relevant, och aktivt inhibera det språk som är irrelevant i stunden (Hilchey & Klein, 2011; Bialystok m.fl., 2009). Därmed skulle tvåspråkiga individer, jämfört med enspråkiga, få mera träning i kognitiv kontroll vilket även kunde gynna icke-verbala kognitiva förmågor (Bialystok, 2017; Macnamara & Conway, 2014; Lehtonen m. fl., 2018; Kroll, Dussias, Bice & Perrotti, 2015; Jylkkä, 2017). Den kognitiva fördelen har kommit fram både bland tvåspråkig vuxna och barn (Bialystok, 2017), men flera studier har dock påvisat motstridiga resultat och fältet har även drabbats av publiceringsbias där resultat som ger belägg för en kognitiv fördel har föredragits framom motsatta resultat (Bialystok, Martin, & Viswanathan, 2005; Paap, Johnson & Sawi, 2015; Donnely, 2016).I en meta-analys av Lehtonen m.fl. (2018), hittades ingen evidens för kognitiv fördel bland tvåspråkiga vuxna.

Evidensen för en kognitiv fördel bland tvåspråkiga barn, vars kognitiva och exekutiva funktioner (EF) ännu utvecklas, är dock inte lika konsekvent. EF är det kognitiva domänet som möjliggör planering och styrning av målstyrd aktivitet (Lehtonen m.fl., 2018; Miyake & Friedman, 2012). Resultat i litteraturgranskningar och meta-analyser av Baraca, Bialystok, Castrod, & Sancheze (2014), Adesope m. fl.. (2010), Grundy & Timmer (2016) visade att tvåspråkiga presterade bättre i kognitiva uppgifter som kräver arbetsminne, inhibering av störande stimuli, problemlösning, metakognitiv uppmärksamhet jämfört med enspråkiga barn. Lachlan, Parisi and Fadda (2012) rapporterade däremot inga signifikanta skillnader mellan en- och tvåspråkiga barn i WISC-IV (Wechsler, 2010) förutom i enstaka deltest som mäter förmågan att syntetisera abstrakta stimuli och visuomotorisk koordination och språklig medvetenhet. I dessa uppgifter fick tvåspråkiga barn högre poäng jämfört med enspråkiga barn. I en studie av Karlsson m. fl., (2015) påvisades inga signifikanta skillnader mellan en- och tvåspråkiga barns prestationer i WISC-IV och NEPSY-II (Korkman, Kirk & Kemp, 2008), förutom i ett deltest som mäter processeringshastighet och visuellt korttidsminne, i vilken enspråkiga barn fick högre poäng jämfört med tvåspråkiga barn. Paap, Johnson & Sawi (2015) granskade studier publicerade sedan 2011 om tvåspråkighet och samband med kognitiva och exekutiva funktioner. Granskningen visade att evidensen för en tvåspråkighetsfördel är knapp, och om en möjlig fördel finns kan den endast påvisas för en väldigt specifik typ av tvåspråkiga barn i endast specifika exekutiva färdigheter. Även om en tvåspråkighetsfördel skulle existera är det fortsättningsvis oklart om denna fördel beror på tvåspråkighet eller på andra bakgrundsfaktorer såsom socioekonomisk status, fysisk träning eller musikalisk aktivitet, som är förknippade med förbättrad exekutiv förmåga (Paap, Johnson & Sawi, 2015; Valian, 2015).

I alla de ovannämnda studierna har prestationsbaserade mått använts. Prestationsbaserade mått är ofta standardiserade mätningar av specifika kognitiva eller exekutiva komponenter, oftast administrerade av en testledare i en kontrollerad testsituation. Skattningsskalor

används däremot främst med syftet att erhålla mer ekologiskt valid information. Oftast evaluerar en utomstående person en testperson i en vardaglig situation, t.ex. en lärare som evaluerar en elevs beteende i ett klassrum (Klenberg, 2015; Toplak, West & Stanovich, 2013). Prestationsbaserade mått anses alltså mäta maximal eller optimal prestation, medan skattningsskalor kan ge mer ekologiskt valid information genom att mäta prestationen i en vardaglig situation.

Endast enstaka studier har gjorts där man jämfört en- och tvåspråkiga barn med skattningsskalor, i vilka inga noterbara skillnader mellan en- och tvåspråkiga barn kommit fram (Loe & Feldman, 2016; Weber, Johnson, Riccio & Liew, 2015). I en studie av Toplak et.al (2013) var korrelationen liten mellan mätningar utförda med prestationsbaserade mått och skattningsskalor, vilket kan indikera att de två olika mätningssätten egentligen mäter olika aspekter av kognitiv förmåga.

Huvudsyftet i den föreliggande studien var därmed att jämföra en- och tvåspråkiga barns kognitiva färdigheter med prestationsbaserade mått och exekutiva färdigheter med en skattningsskala. Barnen var antingen enspråkigt svenska eller tvåspråkiga barn i årskurserna 1 och 3. De prestationsbaserade måtten som administrerades var deltesten Blockmönster, Ordförråd, Sifferserier, Bokstavs-sifferserier och Symbolletning ur *WISC-IV* (Wechsler, 2010). Skattningsskalan som användes var *Kesky- frågeformulär om koncentrationsförmåga* (Klenberg, Jämsä, Häyrinen & Korkman, 2010), som är utvecklad för att evaluera möjliga exekutiva svårigheter bland barn i skolåldern, där läraren fungerar som evalueraren. I en tidigare studie av Klenberg et al., (2010), visade sig Kesky vara endimensionell, även om den är strukturerad att mäta tre olika aspekter av EF. Därför utfördes även en faktoranalys för att undersöka den latenta strukturen av Kesky. I samma studie av Klenberg m. fl., (2010) bedömdes pojkar ha mera problem i flera av de exekutiva skalorna i Kesky jämfört med flickor. Därför jämfördes även skillnader i kognitiv prestation och exekutiva bedömningar mellan kön. Fastän inga skillnader mellan åldersgrupper hittades i studien av Klenberg m. fl., (2010), jämfördes även åldersgrupperna med

varandra. Det var även av intresse att jämföra möjliga interaktionseffekter mellan språkgrupp, ålder och kön både i WISC-IV prestationerna och i Kesky- bedömningarna.

Även om de prestationsbaserade måtten i den föreliggande studien inte är ämnade för att mäta exekutiva funktioner, kräver prestation i alla de administrerade testen exekutiv förmåga, speciellt deltesten Sifferserier och Bokstavs-sifferserier (som kräver arbetsminne). Därför är det av intresse att jämföra resultaten mellan de prestationsbaserade måtten och skattningsskalan. Eftersom kognitiva fördelar för tvåspråkiga har kommit fram i tidigare undersökningar med standardiserade prestationsbaserade kognitiva mått, och för att möjliga skillnader bland en- och tvåspråkiga barn i dessa mått är relevant att ta i beaktande i klinisk beslutsfattning, finns det skäl att utföra fortsatta studier med dessa mått.

Metod

Insamlingen av datat skedde i samband med forskningsprojektet "*InLärning och Stöd, ILS-projekt 2015-2018. Utvecklingsprojekt om utvärdering av och stödåtgärder vid inlärningssvårigheter i finlandssvenska skolor och daghem"* lett av Niilo Mäki Institutet, en finsk enhet för tvärvetenskaplig forskning och utvecklingsarbete kring inlärningssvårigheter. För projektet insamlades data av totalt 1950 finlandssvenska barn i åldrarna 4-16 från totalt 28 slumpmässigt valda skolor i de svensktalande områden Österbotten, huvudstadsregionen, Åland och övriga områden. För att försäkra geografisk representativitet användes stratifierad sampling. Samplet var jämnt representativt för att undvika ett för litet sampel från Åland, vilket innebär att barnen från Åland blev något överrepresenterade medan barnen från Österbotten blev något underrepresenterade.

Datat som användes i denna studie bestod av ett subsampel från två större, delvis överlappande dataset som insamlades för projektet under åren 2015-2016. Det ena samplet bestod av 1208 barn i klasserna 1, 2 och 3, som tog del av en bistudie i projektet vars huvudsyfte var att testa barnens läsförmåga. Av dessa barn testades en del, slumpmässigt urvalda barn (vart fjärde barn

i alfabetisk ordning samt max fyra barn per klass och de barn som tillhörde den lägsta 15e percentilen i lästesten) i klasserna 1 och 3 med deltest ur WISC-IV. Det andra samplet bestod a 522 barn i årskurserna 1, 3, 5, 7 och 9 vars exekutiva färdigheter bedömdes av lärarna med Kesky-formuläret. Samplet utvaldes ur samma skolor i vilka de barn som deltog i lästesten gick i och från 2 skolor i Österbotten för att försäkra ett geografiskt representativt sampel. Samplet valdes med samma metod som det tidigare samplet (vart fjärde barn i alfabetisk ordning och max fyra barn per klass). Svarsprocenten för klasserna 1, 3, och 5 var 80 % och för klasserna 7 och 9 60 %. Barnens föräldrar ombads även fylla i ett omfattande bakgrundsformulär som innefattade demografisk information samt information om barnets språkbakgrund, språkmiljö, språkbeteende, språkutvecklingssvårigheter, föräldrarnas utbildningsnivå, hälsotillstånd, medicinering, neurologiska utvecklingsavvikelser, media-användning och läsvanor. Om barnet inte kunde svenska eller finska eller om barnet av läraren bedömdes vara olämplig att delta i testningen med tanke på barnets psykosociala situation exkluderades barnet från studien. Eftersom de två samplen överlappade, hade en del av barnen endast varit med i Keskybedömningen, en del hade bara tagit del av WISC-IV- testningen och en del barn hade både tagit del av Keskybedömningen och testats med WISC-IV. I denna studie används endast slumpmässig data insamlat från barn i klasserna 1 och 3 som tagit del av Keskybedömningen, endast WISC-IV testningen eller både Keskybedömningen och WISC-IV testningarna. Om barnen hade diagnoser som kunde påverka testresultaten eller om relevant data saknades exkluderades de från analyserna. För att säkra homogeniteten bland de tvåspråkiga barnen inkluderades endast barn som lärt sig båda språken samtidigt sedan födseln, eller som lärt sig det andra språket innan treårsåldern, s.k. *samtidigt tvåspråkighet* (Kohnert 2013; Peña & Bedore, 2009; Paradis, 2010; Paradis, Genesee & Crago, 2011). De tvåspråkiga barnen bestod av barn som kunde svenska och ett annat språk. De enspråkiga barnens modersmål var svenska. Det ursprungliga samplet bestod av 323 barn av vilka sammanlagt 102 barn exkluderades pga. saknad data, diagnos som kunde påverka testresultaten eller för denna studie opassande språkbakgrund. Det

slutgiltiga samplet bestod av 221 barn av vilka alla tagit del av Kesky bedömningen, och av dessa hade 154 barn även tagit del av den kognitiva testningen. Av dessa var 51 % flickor och 49 % pojkar, och 56 % var tvåspråkiga och 44 % var enspråkiga.

De WISC-IV test som administrerades var Blockmönster, Ordförråd, Sifferserier, Bokstavs-Sifferserier och Symbolletning. Administreringen utfördes av en legitimerad psykolog samt psykologistuderande under leg. psykologens handledning. Administratörerna var inte medvetna om barnens språkbakgrund under testningen. Administratörerna skattade även reliabiliteten av testningen på en skala från 1 (låg reliabilitet) till 5 (hög reliabilitet) genom att bedöma barnets koncentrations- och prestationsförmåga under testningen. Ett barns testprestation skattades ha låg reliabilitet (1) och testresultaten exkluderades därmed från analyserna.
Skattningsskalan som användes var Kesky- formuläret som innefattar tre delar: skattning av EF och bedömning av styrkor och stödåtgärder. I skattningsdelen ska läraren evaluera eleven på sammanlagt 55 påståenden om olika aspekter av exekutiv förmåga på en Likert- skala: 0: ”inte ett problem”, 1: ”ett problem ibland” och 2: ”ofta ett problem”. Desto högre poäng ett barn får på skalan, desto mer problem med EF evalueras barnet ha. Påståenden är indelade i 10 kategorier (distraherbaret, impulsivitet, motorisk oro, riktande, upprätthållande och skiftande av uppmärksamhet samt igångsättning, planering, utförande och utvärdering av aktivitet).
Kesky utvecklades eftersom ett finsk omfattande skattningsformulär för att evaluera barns uppmärksamhet och exekutiva funktioner i skolan saknades, och är ämnat att fungera som ett finskt alternativ till *BRIEF* (*behaviour rating inventory of executive functioning*) (Gioia, Isquith, Guy, Kenworthy, 2013). Formuläret ska även kunna användas i kliniska bedömningar och i planering av stödåtgärder. Fastän Kesky är utvecklad för att mäta olika aspekter av EF, visade en faktoranalys av Klenberg et al., (2015) att den var relativt endimensionell. Detta motiverade vidare undersökning av Keskyenkätens latenta struktur genom att utföra en explorativ faktoranalys. Faktoranalysen resulterade i att tre skilda EF-faktorer identifierades: uppmärksamhet (svårigheter att rikta,

upprätthålla och skifta uppmärksamhet och aktivitet), impulsivitet (motorisk oro och impulsivitet) och desorganisation (barnet skyndar, är slarvig och orolig under utförandet av uppgifter). Faktorerna inkluderades i analysen så att de en- och tvåspråkiga barnen jämfördes på dessa tre faktorer. Endimensionaliteten i studien av Klenberg et al., (2015) kan bero på att barn sällan har svårigheter i endast ett område av EF. Det kan resultera i att en lärare bedömer samma barn har problem i flera exekutiva färdigheter.

För att undersöka om en- och tvåspråkighet hade ett samband med prestationerna i WISC-IV deltesten och den exekutiva skattningen i Kesky utfördes ANOVA- analyser. De beroende variablerna var poängen för varje enskilt deltest i WISC-IV och i Keskyfaktorerna. De oberoende variablerna var språkgrupp (tvåspråkig, enspråkig) kön (flicka, pojke) och åldersgrupp (yngre, äldre). WISC-IV deltesten Sifferserier och Bokstavs-sifferserier kombinerades även till ett arbetsminnesindex för att få mer reliabla resultat på denna kognitiva domän. Fisher's exact- test utfördes separat för båda åldersgrupperna för att försäkra att åldersgrupperna var balanserade enligt kön och föräldrarnas utbildningsnivå. Endast en skillnad i könsfördelningen i den äldre åldersgruppen hittades, i vilken det fanns signifikant mera enspråkiga än tvåspråkiga pojkar (p = .011). På grund av den stora skillnaden i antalet en- och tvåspråkiga pojkar i den äldre åldersgruppen tolkades endast interaktionseffekten mellan åldersgrupp och språkgrupp.

Resultat

I WISC-IV prestationerna hade ålder en signifikant huvudeffekt på prestationen i Sifferserier. De äldre barnen fick signifikant högre poäng jämfört med de yngre barnen. I Bokstavs-Sifferserier fick flickor signifikant högre poäng jämfört med pojkar. I Symbolletning fick den äldre gruppen signifikant högre poäng jämfört med den yngre gruppen. Flickor fick även signifikant högre poäng jämfört med pojkarna i Symbolletning. Inga andra huvudeffekter av språkgrupp, kön eller ålder var signifikanta, och interaktionseffekten mellan åldersgrupp och språkgrupp på prestationerna i WISC deltesten var inte signifikant.

Språk, kön och ålder hade däremot en signifikant huvudeffekt på bedömningen i alla Keskyfaktorer. Enspråkiga barn fick signifikant lägre poäng jämfört med tvåspråkiga barn i uppmärksamhet, impulsivitet och desorganisation. Flickor fick även signifikant lägre poäng jämfört med pojkar på alla dessa faktorer. Ålder hade en signifikant huvudeffekt endast på poängen i desorganisation, i vilken äldre barn fick signifikant lägre poäng jämfört med yngre barn. Interaktionstermen åldersgrupp x språkgrupp var inte signifikant för någon Keskyfaktor. Korrelationen mellan totalpoängen i Kesky och totalpoängen i WISC-IV visade att bättre prestation i WISC-deltesten hade samband med lägre poäng i Keskyskattningen.

Diskussion

Syftet med den föreliggande studien var att jämföra en- och tvåspråkiga finlandssvenska barns kognitiva förmågor med prestationsbaserade test och exekutiva förmågor med en EF skattningsskala. Samplet bestod av 221 barn i klasserna 1 och 3. I de prestationsbaserade testen påvisades ingen skillnad i prestationen mellan en- och tvåspråkiga barn.

I tidigare undersökningar har prestationen i dessa uppgifter varierat. Tvåspråkiga barn har presterat bättre jämfört med enspråkiga barn i Blockmönster och i Ordförråd (Lachlan, Parisi and Fadda, 2012), medan enspråkiga barn har presterat bättre i Symbolletning (Karlsson et al., 2015). Inga andra skillnader mellan en- och tvåspråkiga barn har hittats i dessa test och resultaten i den föreliggande studien är i linje med framträdande evidens som tyder på att en kognitiv fördel bland tvåspråkiga barn inte existerar (Paap, Johnson & Sawi, 2015), och att det inte är nödvändigt att ta tvåspråkighet i beaktande i användningen av dessa test (Karlsson et al., 2015). Skillnaderna i testprestationerna i en del av deltesten mellan kön och ålder diskuteras inte närmare här eftersom endast interaktionseffekterna mellan kön, ålder och språkgrupp var av intresse i den föreliggande studien. Den icke-signifikanta interaktionstermen i alla deltest visar att effekten av språkkunnande på testprestationerna var oberoende av barnets kön och ålder.

I Keskyskattningarna bedömdes däremot de tvåspråkiga barnen ha fler problem med uppmärksamhet, impulsivitet och desorganisation jämfört med de enspråkiga barnen. Dessa resultat talar inte endast emot en tvåspråkighetsfördel men indikerar att tvåspråkiga barn kan ha mera problem med exekutiva funktioner jämfört med enspråkiga barn. Pojkarna skattades även ha flera problem i exekutiva färdigheter jämfört med flickorna. Skillnaden mellan könen var förväntade eftersom även i den tidigare studien av Klenberg m. fl. (2010), bedömdes pojkar ha flera problem med exekutiva funktioner mätta med Kesky jämfört med flickor. Interaktionen mellan språk, kön och ålder var inte signifikant, vilket betyder att effekten av språkkunnande på bedömningarna var oberoende av barnets kön och ålder.

Bättre prestation i WISC-IV deltesten korrelerade med färre problem med exekutiva funktioner mätta med Kesky. Det kan tyda på att barn med starkare kognitiva färdigheter även har starkare exekutiva färdigheter, men i likhet med tidigare undersökningar var korrelationen mellan dessa två mätinstrument endast svag (Toplak et.al, 2013). En alternativ förklaring till skillnaderna mellan resultaten i prestationsbaserade måtten och skattningsskalan kan därför även vara att dessa två typer av test egentligen mäter två olika aspekter av exekutiv prestation. Skattningsskalan fångar möjligtvis aspekter av exekutiva funktioner som inte de prestationsbaserade uppgifterna gör. Även om WISC-IV deltesten inte primärt är avsedda för att mäta just EF, kräver prestationen en viss nivå av exekutiva färdigheter, speciellt i deltesten Sifferserier och Bokstavs-sifferserier som mäter arbetsminne, en av huvudkomponenterna av EF (Miyake et. al, 2000; Miyake & Friedman, 2012). Det kan förklara varför skillnader mellan en- och tvåspråkiga barn endast kom fram med skattningsskalan men inte med de prestatinsbaserade måtten.

Tills vidare är det oklart om det finns en faktisk skillnad mellan en- och tvåspråkigas exekutiva förmågor som inte kommer fram i situationer som kräver maximal prestation eller om lärarna av en annan, för tillfället oklar orsak skattar barnen i språkgrupperna olika. En spekulering är att tvåspråkiga barn möjligtvis byter språk i klassrummet, vilket av en lärare kan tolkas som

ouppmärksamt eller impulsivt beteende. Det vore av intresse att se om dessa resultat går att replikera, och undersöka vidare varför en- och tvåspråkiga barn möjligtvis evalueras olika. I denna studie togs en möjlig skillnad i dagligt språkbyte inte heller i beaktande, vilket kan ha påverkat resultaten. Green och Abutalebi (2013) har lyft fram hypotesen att typen av tvåspråkighetsmiljö ett barn lever i kan ha kan ha betydelse för ifall en kognitiv fördel utvecklas. Green och Abutalebi (2013) menar att desto oftare ett barn är tvunget att byta språk, desto mer intensiv kognitiv kontroll krävs. Därmed kan det vara att en kognitiv fördel endast kunde identifieras bland de barn som mest frekvent måste byta språk. Vidare studier som tar frekvensen av språkbyte i beaktande behövs.

Begränsningar

De flesta studier hittills har likt den föreliggande studien använt kvasiexperimentell design där grupperna inte indelas slumpmässigt utan matchas enligt redan ”naturligt” förekommande grupper, t.ex. språk eller kön. Dessa studier kan endast ge korrelationell evidens eftersom vi inte kan dra slutsatser om huruvida det är tvåspråkighet som orsakar förändringar i barnets kognitiva förmågor, eller om nivån av kognitiva förmågor påverkar färdigheter att lära sig flera språk (Laine & Lehtonen (2018). Andra brister i den föreliggande studien är att inga andra bakgrundsfaktorer som påverkar utvecklingen av exekutiv förmåga, såsom fysisk eller musikalisk träning, togs i beaktande, förutom socioekonomisk status (Valian, 2015). Resultaten i Keskyskattningen kan även ha påverkats av den så kallade ”halo-effekten”, eftersom en person som utför en evaluering tenderar att ge liknande skattningar på flera skalor till en och samma person. I praktiken innebär att en lärare som märker ett problem hos ett barn sannolikt kommer att lägga märke till flera problem vilket kan resultera i höga poäng på flera skalor. Även en del extrema avvikande värden identifierades, men eftersom testdeltagare med diagnoser, och testresultat som inte ansågs vara reliabla redan exkluderats, ansågs de avvikande värden vara en del av normalfördelningen och exkluderades inte.

Slutsatser

En- och tvåspråkiga, svensk-finska lågstadiebarns kognitiva och exekutiva förmågor jämfördes med både prestationsbaserade test och en skattningsskala, där läraren fungerade som evalueraren. Inga signifikanta skillnader mellan en- och tvåspråkiga barns prestationer i de prestationsbaserade måtten hittades. Lärarna hade däremot bedömt de tvåspråkiga barnen ha mera svårigheter med exekutiva funktioner jämfört med de enspråkiga barnen. Huruvida dessa resultat tyder på en faktisk skillnad mellan en- och tvåspråkiga barns kognitiva färdigheter, som inte fångas med prestatinsbaserade mått, eller om skillnaderna har sin grund i andra faktorer är oklart. Replikeringsstudier med skattningsskalor och vidare utredning av varför evalueringen av en- och tvåspråkiga barns exekutiva förmågor i klassrummet skiljer sig åt krävs.

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PRESSMEDDELANDE

Kognitiva testprestationer och exekutiva bedömningar bland enspråkiga och tvåspråkiga lågstadiebarn
Pro gradu avhandling i psykologi
Fakulteten för humaniora, psykologi och teologi, Åbo Akademi

En pro gradu avhandling vid Åbo Akademi har visat att en- och tvåspråkiga barns prestationer i prestationsbaserade kognitiva test inte skiljer sig åt. Däremot bedöms enspråkiga barn ha mindre svårigheter med exekutiva färdigheter jämfört med tvåspråkiga barn enligt lärares bedömningar på en skattningsskala som mäter exekutiva funktioner.

Möjliga skillnader mellan en- och tvåspråkiga barns kognitiva färdigheter har studerats länge med olika prestationsbaserade mått. Tvåspråkiga barn har i vissa studier visat sig prestera bättre jämfört med enspråkiga barn vilket gett upphov till en hypotes om att tvåspråkighet kan vara till fördel vid utveckling av kognitiva färdigheter. Senare forskning har däremot gett motsägande resultat, och evidensen för en kognitiv fördel bland tvåspråkiga barn är därmed inte konsekvent. Endast ett fåtal studier har jämfört en- och tvåspråkiga barn med skattningsskalor, som kan ge mer ekologisk valid information.

I den föreliggande studien jämfördes en- och tvåspråkiga barn med både kognitiva prestationsbaserade test samt med en skattningsskala där läraren ombads evaluera elevernas exekutiva förmågor. Resultaten i de prestationsbaserade måtten stämmer överens med senare forskningsresultat som tyder på att tvåspråkiga barn inte har en kognitiv fördel jämfört med enspråkiga barn. Resultaten av lärarnas evaluering av eleverna visade däremot att de tvåspråkiga eleverna skattades ha mera svårigheter i exekutiva färdigheter jämfört med enspråkiga eleverna. Replikeringsstudier och fortsatt utredning krävs för att bekräfta och förklara resultaten.

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