FACULTY OF MEDICINE AND HEALTH SCIENCES

THE EFFECT OF A HANDWRITING CO-TEACHING PROGRAM "SAMEN AAN DE SLAG MET SCHRIJVEN (SASS)": A CONTROLLED STUDY

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Promotor: Prof. dr. Lynn Bar-On
Copromotor: Msc. Barbara De Mey

A dissertation submitted to Ghent University in partial fulfillment of the requirements for the degree of Master of Science in Rehabilitation Sciences and Physiotherapy

Academic year: 2023 - 2024

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LIST OF ABBREVIATIONS

SASS	Samen Aan de Slag met Schrijven	**SOS-2-VL**	Systematische Opsporing Schrijfproblemen
EC	Ethics Committee	**ICC**	Intraclass correlation coefficient
ICF	Informed Consent Form	**SEM**	Standard error of measurement
DCD	Developmental Coordination Disorder	**MDC**	Minimal detectable change
ASD	Autism Spectrum Disorder	**SQT**	School Questionnaire for Teachers
ADHD	Attention Deficit Hyperactivity Disorder	**ADD**	Attention Deficit Disorder

ABSTRACT (ENGLISH)

Background: Writing remains an important skill despite overall digitalization. The spelling of simple words and recognition of letters is found to be better when learning while writing than while typing on a computer. With the increasing number of students struggling to write and the increasingly diverse learning needs, different handwriting programs have been developed to address handwriting difficulties with a focus on improving legibility, speed and writing fluency.

Objective: This study examined the effect of the co-teaching handwriting program "Samen Aan de Slag met Schrijven" (SASS) on the legibility of handwriting in typically developing children in the second grade in Belgium.

Study design: Non-randomized controlled trial.

Methods: Four second-grade classes (n=58 children, aged 7.2 to 8.4 years old) from two different schools, and their corresponding teachers (n=5) participated in the study. Per school, one class was assigned to the intervention and one to the control group. Two pediatric physiotherapists were recruited as co-teachers after receiving a 37-hour training session on the SASS-program. The co-teachers provided handwriting support in the intervention group once a week for six weeks and provided extra support to a subgroup of 4-6 children. No co-teaching was given in the control group. Writing legibility and writing experience were assessed from all children two weeks pre-intervention and immediately post-intervention using the modified Systematische Opsporing Schrijfproblemen (SOS-2-VL), and a Smileyometer, respectively. The selection of the children for the subgroup was based on the Quickscan and the School Questionnaire for Teachers (SQT). The Quickscan and SOS-2-VL were also assessed post-intervention.

Results: Writing legibility improved significantly more in the intervention group compared to the control group (average SD-change intervention = ± 2.17, average SD-change control = ± 2, $p = 0.01$). This was generally due to great improvement in the subgroup receiving extra support (pre = 8.09 versus post = 6.18, $p < 0.01$) rather than change in the non-subgroup children of the intervention group (pre = 6.47 versus post = 5.63, $p = 0.18$). While at baseline, the children in the subgroup and intervention non-subgroup showed a significant difference in writing legibility, ($p = 0.02$), after the intervention, the children of the subgroup were able to catch up to their non-subgroup peers ($p = 0.48$). Children in the intervention group also improved significantly ($p = 0.03$) on the categorization of the Quickscan while the children in the control group did not ($p = 0.48$). Based on the Smileyometer, children in the control group experienced more pain and fatigue while writing after six weeks ($p = 0.01$), while the children in the intervention group remained the same ($p = 0.41$). Subjectively, teachers reported greater motivation in the intervention group.

Conclusions: The SASS program appeared to benefit second-grade students by increasing handwriting legibility. Teachers also noted improvement in the writing of children participating in the intervention group who were not a part of the subgroup. This effect is likely to be attributed to better writing instruction from the teacher after receiving tips and tricks from the co-teacher during the SASS-program.

Keywords: Co-teaching, Handwriting program, Children, School, Writing.

ABSTRACT (DUTCH)

Achtergrond: Schrijven blijft een cruciale vaardigheid ondanks de toenemende digitalisering. Uit onderzoek blijkt dat schrijvend leren effectiever is voor het aanleren van spelling en letterherkenning dan typend leren. Omdat steeds meer leerlingen moeite hebben met schrijven en leerbehoeften steeds diverser worden, zijn er verschillende handschriftoefenprogramma's ontwikkeld om schrijfproblemen aan te pakken, waarbij de focus ligt op het verbeteren van de leesbaarheid, snelheid en schrijfvaardigheid.

Doel: Deze studie onderzocht de impact van het co-teaching handschriftprogramma "Samen Aan de Slag met Schrijven" (SASS) op de leesbaarheid van het handschrift bij typisch ontwikkelende Belgische kinderen uit het tweede leerjaar.

Onderzoeksdesign: Niet-gerandomiseerd gecontroleerd onderzoek.

Methode: Vier klassen van het tweede leerjaar (n = 58 leerlingen, leeftijd 7.2 tot 8.4 jaar), van twee scholen en bijhorende leerkrachten (n=5), namen deel aan het onderzoek. Per school werd één klas toegewezen aan de interventie- en één klas aan de controlegroep. Twee kinderkinesitherapeuten werden gerekruteerd als co-teachers nadat ze 37 uur training hadden gekregen over het SASS-programma. De co-teachers gaven gedurende zes weken eenmaal per week schrijfondersteuning in de interventieklassen, waarbij ze extra aandacht besteedden aan een subgroep van 4-6 kinderen. De controlegroep ontving geen co-teaching. De leesbaarheid en schrijfervaring werden bij alle kinderen twee weken pre-interventie en onmiddellijk post-interventie beoordeeld met respectievelijk de aangepaste Systematische Opsporing Schrijfproblemen (SOS-2-VL) en een Smileyometer. De selectie van de kinderen voor de subgroep was gebaseerd op de Quickscan en de Schoolvragenlijst voor Leerkrachten (SQT). De Quickscan en SOS-2-VL werden ook post-interventie beoordeeld.

Resultaten: De schrijfleesbaarheid verbeterde significant meer in de interventiegroep vergeleken met de controlegroep (gemiddelde SD-verandering interventie = ±2.17, gemiddelde SD-verandering controle = ±2, $p = 0.01$). Dit was globaal gezien te danken aan een grote verbetering in de subgroep die extra ondersteuning kreeg (pre = 8.09 versus post = 6.18, $p < 0.01$) en niet aan verandering bij de niet-subgroep van de interventiegroep (pre = 6.47 versus post = 5.63, $p = 0.18$). Terwijl er bij aanvang een significant verschil in leesbaarheid was tussen de subgroep en de niet-subgroep van de interventiegroep ($p = 0.02$), konden de kinderen in de subgroep na de interventie hun niet-subgroep klasgenoten bijbenen ($p = 0.48$). Kinderen in de interventiegroep verbeterden ook significant ($p = 0.03$) in de categorisatie van de Quickscan, terwijl de kinderen in de controlegroep dat niet deden ($p = 0.48$). Volgens de Smileyometer ervaarden de kinderen in de controlegroep meer pijn en vermoeidheid tijdens het schrijven post-interventie ($p = 0.01$), terwijl de kinderen in de interventiegroep gelijk bleven ($p = 0,41$). Leerkrachten rapporteerden subjectief meer motivatie in de interventiegroep.

Conclusies: Het SASS-programma bleek een gunstig effect te hebben op de leesbaarheid van het handschrift van leerlingen in het tweede leerjaar. Leerkrachten merkten ook verbetering in het schrijven van kinderen in de interventiegroep maar niet tot de subgroep behoorden. Dit effect kan waarschijnlijk worden toegeschreven aan verbeterde schrijfinstructie door de leerkracht na implementatie van tips en tricks van de co-teacher.

Trefwoorden: Co-teaching, handschriftprogramma, kinderen, school, schrijven.

1. INTRODUCTION

Is it still necessary for children to learn how to write in the year 2024? Yes! Despite digitalization, developing one's handwriting remains an important skill. Research indicates that children recognize letters better when they learn them while writing than while typing on a computer (James & Engelhardt, 2012; Longcamp et al., 2005). The spelling of simple words was also found to be better when children practiced the words by writing them, than when they practiced the words with cards or with the help of a computer (Cunningham & Stanovich, 1990). Practicing improves basic writing skills, making working memory capacity available for higher-order thinking processes such as spelling a word or setting up a storyline (Peverly et al., 2007). Different systems such as the sensorimotor, cognitive, perceptual, visual and sensory systems are integrated to fulfill a writing task (Hoy et al., 2011). Impairments in handwriting can lead to various problems such as a lower verbal IQ, underperforming in mathematics, lower reading and spelling scores and more attention difficulties (Engel et al., 2018). Even greater implications such as reduced working memory capacity and decreased ability to interact and engage in classroom settings may occur (Engel et al., 2018). In conclusion, especially early in life, poor handwriting skills may negatively affect learning and academic performance later on (Engel et al., 2018; Kadar et al., 2020).

In preschool, children learn the basics of writing while in elementary school, they develop their writing skills (Kadar et al., 2020). When looking at recent literature on handwriting problems among children, it is difficult to find accurate data for typically developing children. Handwriting problems, or dysgraphia, indicates that there are difficulties with handwriting legibility and/or that the writing speed is too slow according to the child's age and intellectual abilities (Van Waelvelde et al., 2012).

Guzman (2021) estimated that 5-25% of typically developing children encounter handwriting problems, while Hoy et al. (2011) found numbers ranging from 10-30% of typically developing children exhibiting handwriting difficulties. In the age group 7-9 years old, this percentage is the highest, between 30-40%. These high percentages can be explained as this is an important stage in terms of motor learning, so students will automatically have more writing problems once they fall behind during this phase. At the age of 6-7 years, the quality of handwriting develops quickly and stabilizes during the following two years (Guzman, 2021). Verbal and visual prompting of special features of the letterforms are important at this age for the development of children's handwriting (Karlsdottir & Stefansson, 2002). As handwriting develops further by the age of 8-9 years, it becomes more automatic and organized (Guzman, 2021), and instructional methods, such as demonstration of motion patterns and verbal explanations, stimulate perceiving and understanding the letterforms. In the first grade, visual and perceptual abilities are essential. As the children grow older, cognitive abilities are substantial in the development of handwriting. (Karlsdottir & Stefansson, 2002).

Since the prolonged lockdowns in 2020-2021 when schools were closed and alternative methods of online schooling were introduced, the number of students struggling to write seems to have increased significantly (*SchrijvenNL*, n.d.). Skar et al. (2021) compared scores on writing quality, handwriting fluency and attitude towards writing between first graders who attended school during the pandemic and first-grade peers tested a year before the COVID-19 outbreak. Students attending the first grade during the pandemic had lower scores on the earlier mentioned outcomes. The absence of in-person

instruction could be a reason as many students were deprived of learning opportunities (Reimers, 2021). The most effects were seen on lower handwriting legibility and fluency and the attitude towards writing changed negatively (Skar et al., 2021).

Different handwriting programs have been developed to try to address these handwriting problems resulting in beneficial effects on elementary-age students with handwriting difficulties (Case-Smith et al., 2012). These programs provide additional support with a focus on underlying causes and improve legibility, speed and writing fluency (Case-Smith et al., 2012; Hoy et al., 2011; Kadar et al., 2020). Occupational therapists, other professionals such as a speech-language pathologist or a collaboration between both, provide these interventions as handwriting impairments are one of the main causes for referral to private practice therapy (Case-Smith et al., 2012; Hoy et al., 2011).

A handwriting program investigated by Graham & Harris (2005) found that first-grade children at risk for handwriting problems who received supplemental handwriting instruction, benefited and improved more than the control group in both handwriting and composition skills. Correspondingly, there is a similar program called "Samen Aan de Slag met Schrijven" (SASS). It's a 6-8 week group intervention based on the current literature of motor learning and motivating children with typical development (Van Bommel-Rutgers et al., 2022). The principles of motor learning and its application to learning to write come from two interventions initially developed for children with Developmental Coordination Disorder (DCD). These are Neuromotor Task Training (NTT) (Schoemaker et al., 2003) and Cognitive Orientation to daily Occupational Performance (CO-OP) (Thornton et al., 2016). NTT is a therapist-driven intervention where children learn skills they need for daily activities while CO-OP utilizes collaborative goal setting with the child to motivate learning (Ziviani & Poylsen, 2007).

A unique feature of the SASS-program is that it implements co-teaching, where the co-teacher is often a pediatric physiotherapist or an occupational therapist (*SchrijvenNL*, n.d.). This group intervention was developed specifically for children in the first (6-7 years old) and second (7-8 years old) grades because, as mentioned earlier, handwriting difficulties are most common in this age group (30-40%) (Guzman, 2021). This handwriting program offers opportunities to quickly catch up with the handwriting level of the rest of the class (SchrijvenNL, n.d.). The role performed by the co-teacher during the program is based on the self-determination theory. Co-teaching refers to the collaboration between teachers and special educators such as occupational therapists to handle diversity among students. Co-teaching is an instrumental and pedagogical model that gained interest over the last decades as inclusive education became legitimate (Fluijt et al., 2016).

Co-teaching is possible as the SASS intervention takes place in the classroom. Tutoring outside the classroom may have negative consequences such as distraction from students' work in other academic areas (Case-Smith et al., 2012). Co-teaching also supports inclusive education as every child will benefit through teacher professionalization. In the SASS program, tiered models are used. Collaborative consultation which stands for the sharing of expertise between co-teacher and teacher is a core feature of tiered education (Lynch et al., 2023). Therefore, the teacher also gains knowledge and experience that will lift the writing lessons to a higher level (*SchrijvenNL*, n.d.).

As mentioned above, inclusive education and tiered learning are two concepts that are addressed in the SASS program. Inclusive education stands for full engagement in school and curriculum alongside similar aged peers. Attendance, access and participation in school are key components (Cinar et al., 2022) School therapists primarily provide services to children in a direct, one-on-one and non-inclusive context (Bolton & Plattner, 2020). Different approaches to promote inclusiveness have been found valuable, as research has shown that children with disabilities gain competence in enriched learning environments with typically developing peers (Case-Smith & Holland, 2009; Sayers, 2008). One of these approaches is the Partnering for Change model (P4C), in which the collaboration of therapists, educators and parents is highlighted to enhance children's successful participation (Missiuna et al., 2012). The P4C model focuses on 4 goals: (1) Early identification of children with special needs, (2) empowering educators and therapists to understand and manage children's needs, (3) improving children's participation levels and (4) facilitating self- and family-management. The collaboration occurs in the context of the school environment to support as many children as possible. To level up the intensity, therapists can coach teachers and/or parents when students have more complex needs (Campbell et al., 2016). The PC4 model is partially based on the principles of tiered learning. Relationship building and knowledge sharing between the different partners form the basis for creating environments to nurture motor skill development in all children (tier 1). Differentiated instruction is given to children who are experiencing challenges to fill gaps of knowledge (tier 2) and to accommodate for students with individualized needs (tier 3) (Campbell et al., 2016.; Cinar et al., 2022; Lynch et al., 2023; Witzel & Clarke, 2015).

Tiered models can be seen as early intervention as difficulties may be corrected and special services are not needed (Witzel & Clarke, 2015). In order that struggling students get the appropriate level of assistance they need, some elementary schools invest in tiered interventions to provide more appropriate academic, social and behavioral support (Duffy, n.d.). In SASS, tier 2 is used. Children who struggle to write are put together in a small group and receive extra support. To conclude, rather than pulling out students for instruction in separate classrooms, SASS aims for inclusive education by using tier 2 where students receive collaborative instruction by a co-teacher while remaining in the general education classroom (Chitiyo, 2017).

Classrooms are made up of students with increasingly diverse learning needs as inclusive education has become standard over the past decade. Individuals with Disabilities Education Improvement Act (IDEIA) states that students with disabilities should be educated with their nondisabled peers thus teachers need to identify effective approaches that can meet the needs of all students (Chitiyo, 2017). Co-teaching is ideal and widely used to meet the needs for inclusion of students with special learning needs and benefits both students with and without disabilities (Pratt, 2014). Nevertheless, challenges may occur. Insufficient time for planning, lack of administrative support and attention will complicate the implementation of co-teaching (Hamdan et al., 2016; Pratt, 2014). Interpersonal differences, incompatibility and an imbalance in the use of expertise and skills between co-teachers are commonly reported challenges and greatly hinder effective instruction (Pratt, 2014). Administrative support, co-planning strategy and similar teaching philosophies are needed for effective co-teaching (Hamdan et al., 2016; Pratt, 2014).

1.1 Research question, purpose and hypothesis of the study

While the SASS program is currently being implemented in practice in the Netherlands, no formal scientific studies as to its effectiveness have been carried out. Therefore, the central research question used for this study is: What is the effect of the co-teaching handwriting program "Samen Aan de Slag met Schrijven" (SASS) on the legibility of handwriting in typically developing children in the second grade in Belgium?

This question will be answered by examining the immediate (after 6 weeks) and long-term (after 3 months) effects of the 6-week SASS co-teaching handwriting program on a class of children with typical development in the second grade compared to a control class that did not receive co-teaching. Legibility (letter shapes, letter connections) of writing is chosen as the primary outcome measure. It is hypothesized that children in the intervention class, irrespective of their handwriting level, would have better results on appropriate tests after 6 weeks and after 3 months compared to the control class.

2. METHODS

2.1 Study design

A semi-blinded, non-randomized controlled study was conducted in children attending the 2nd grade of the regular education system.

The study was approved by the university's ethics committee (EC ONZ-2023-0371). Informed consent forms (ICF) were collected from the parents/guardians of all participating children in both the intervention and control group. Separate ICFs were collected from the participating teachers.

2.2 Participants

2.2.1 Co-teaching therapists

At a continuing education workshop focused on writing skills, led by Barbara De Mey and Ingrid Van Bommel, informational flyers regarding this research were disseminated. Two interested pediatric physiotherapists subsequently reached out and expressed their willingness to participate in this study. Both therapists participated in 37-hour training sessions on writing motor skills, including the SASS-program. In one of these training sessions, the therapists learned how the SASS-program is structured and how both teachers and children can be supported in the classroom (*SchrijvenNL*, n.d.). The physiotherapists had 11 years and 25 years of professional experience, while the latter combined her work as a physiotherapist with school-based practices for 5 years.

2.2.2 Teachers & Children

In two schools, a total of five teachers were recruited via a recruitment flyer. The teachers represented a total of four second-grade classes, two per school. Per school, one class was assigned to receive the intervention while the other class acted as a control group.

Children were not eligible to participate in the study when the following criteria were met: (1) cognitive level on academic tests <70%, (2) learning disabilities (dyscalculia, dyslexia), Developmental Coordination Disorder (DCD), Autism Spectrum Disorder (ASD), Attention Deficit Hyperactivity Disorder (ADHD), Cerebral Palsy or any other diagnosis that may affect children's writing or learning such as visual or auditory disorders, (3) repeated first or second grade or skipped a grade. Children who did not meet these criteria or whose parents did not provide consent to participate were not excluded from classroom activities. However, their data was not included in the data analysis.

2.3 Procedures

2.3.1 Outcome Measures

The children were evaluated with the modified Systematische Opsporing Schrijfproblemen (SOS-2-VL) and a Smileyometer three times: two weeks before the start of the intervention, at the end of the intervention and three months post intervention (the results of the latter are not included in the current analysis which was performed before the collection of the third dataset). These testing moments took place in the classroom. The instructions were given by three master students from Ghent University. Conducting the test took five minutes. An example of the administration of the tests is illustrated in Figure 1.

2.3.1.1 Modified Systematische Opsporing Schrijfproblemen (SOS-2-VL)

The SOS-2-VL is a test used to objectively determine writing problems by assessing handwriting quality and speed (Appendix 1). For this test, the child has to copy a standardized text within 5 minutes. For the current study, the test was modified by using the text of the Quickscan (Van Bommel-Rutgers et al., 2022) (Appendix 2). In this way, the children only needed to copy a text once. For writing quality, seven items can be distinguished with a score of 0–2. By adding up all scores, a raw score can be calculated and can be converted into percentile scores. A high raw score converts into a low percentile score. Due to the 2nd-grade children being in a cognitive-associative phase of the writing-skill acquisition, writing speed is deemed as less important and was not calculated in this study (Fitts & Posner, 1967; Schmidt & Donald Lee, 2018).

2.3.1.1.1 Inter-rater reliability, standard error of measurement and minimal detectable change

A total of 20 SOS-2-VL tests were assessed double-blindly by three evaluators as a training dataset. This dataset was used to calculate the intraclass correlation coefficient (ICC), standard error of measurement (SEM) and minimal detectable change (MDC). All data was calculated using SPSS version 29. ICC estimates between the three evaluators were calculated based on a mean-rating (k=3) absolute-agreement, 2-way mixed-effects model (r = 0.914). The SEM value calculated from ANOVA was 0.782. The MDC at a 95% confidence interval was 2.17.

2.3.1.2 Quickscan

The Quickscan (Van Bommel-Rutgers et al., 2022) is used to identify which children need more support in their handwriting development, specifically determined by a teacher. Teachers received the previously performed SOS-2-VL texts to conduct the Quickscan on. To avoid teachers recognizing the handwriting of the children they teach, the texts of children in the

intervention class were assessed by the teacher of the control class and vice versa. Based on the results, the children's texts were categorized as green, orange or red. Code green means no writing problems are noticeable. Code red means obvious writing problems are present. When it is not clear whether a child belongs in the red or green group, code orange is used (Van Bommel-Rutgers et al., 2022). Criteria as a guideline for the assessment are illustrated in Appendix 3.

2.3.1.3 Pain and fatigue of writing

Self-reported pain and fatigue following the writing tests were assessed using a three-point Smileyometer (Appendix 4). After conducting the SOS-2-VL, the children were prompted to color the smiley that best corresponds to their experience regarding pain and fatigue in the hand and/or arm. Following the 5-minute text transcription, coloring the happy smiley face indicates no pain or fatigue, a sad face signals present pain or fatigue and a neutral face is for uncertainty about pain or fatigue.

2.3.1.4 School Questionnaire for Teachers (SQT)

The SQT is a questionnaire for teachers surveying writing skills, overall motor skills, school progress and spelling (Appendix 5). The questionnaire consists of ten questions, six of which are handwriting items. Handwriting difficulties can be identified when a student scores below average on at least four out of six items. Handwriting items include letter form, cleanliness of writing, the effort for the child to write, fluency of writing, handwriting comparison to peers and subjective judgment as to whether the child has handwriting difficulties. The SQT was conducted for children who scored in the orange or red color code on the Quickscan. This test was only conducted in the pre-intervention testing period.

2.3.1.5 Questionnaires for parents

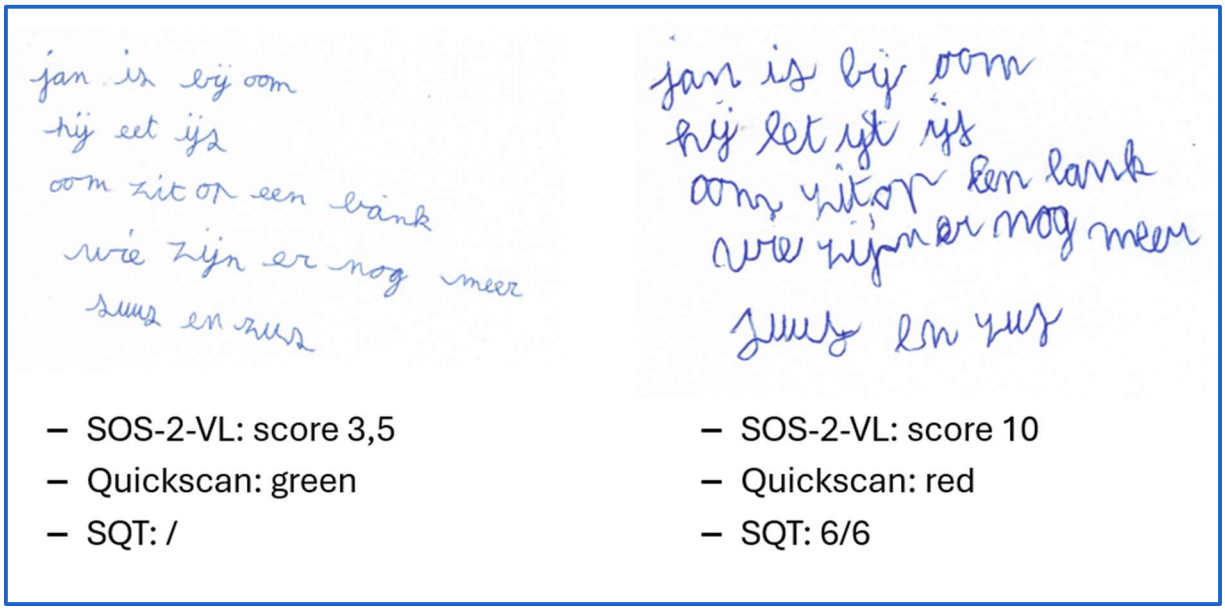
A custom-made questionnaire was administered to the parents as a screening tool for demographic and socio-economic data. Questions include, but were not limited to, native language, repeat of a grade, diploma of the parents and marital status of the parents. It took parents 10 minutes to fill in the questionnaire. The full questionnaire can be found in Appendix 6.

2.3.1.6 Intervention class and subgroup

The class with the higher number of orange and red Quickscan tests along with higher scores on the SOS-2-VL, received the intervention. In the intervention class, a subgroup of 4-6 children was assembled, which is a group size recommended in the SASS program. Subgroup children were determined based on the following criteria, in order of priority: (1) Quickscan, (2) SOS-2-VL and (3) SQT. Children were required to have an orange or red Quickscan to be eligible for the subgroup. Afterwards, the scores on the SOS-2-VL were compared between these children. If no consensus could be met, scores of the SQT were used to determine the final subgroup of children.

Figure 1

Example of administration of tests



Both texts were made by children from the same class. Left: The scores on the tests are excellent. The child does not qualify to enroll in the intervention subgroup. Right: the scores on the tests are not very good. Having a high score on the SOS-2-VL, a red Quickscan and dropping out on all six items on the SQT, this child was enrolled in the intervention subgroup.

2.3.2 SASS-intervention

The two physiotherapists attended one handwriting lesson of 30 minutes at school each week for six weeks and fulfilled the role of co-teacher. In these lessons, the co-teachers not only offered support to the intervention subgroup, but also supported the teachers by imparting knowledge and skills.

The SASS-intervention includes the following steps: The co-teacher assisted the teacher and supported the subgroup 1x30 minutes per week for six weeks. The children in the intervention class who were not in the subgroup received regular writing lessons from the teacher. However, these children were still likely to improve their handwriting skills as a result of the interaction of the co-teacher and the teacher, which provides that they were part of the intervention group. The co-teacher offered additional help to the subgroup during the writing lessons, however, no separate exercises or lessons were provided outside the class hours. During the first lesson, the children in the subgroup determined which writing goals they were trying to achieve. These goals were given extra attention during the intervention period. Goals might be for example, "I want to hold my pen properly during the writing lesson" or "I want to be able to form the letter 'a' properly". In addition to the co-teaching lessons, the children of the subgroup practiced their handwriting skills during 'writingBuddy'-lessons. These lessons took place 2x30 minutes per week without the co-teacher during the regular curriculum and together with the rest of the subgroup. Importantly, these exercises were not perceived as extra homework, but could be done during defined times in the class. Each child worked independently and worked on individual goals. The purpose of these lessons was to promote organizing and planning of independent practice. Moreover, peer feedback played a crucial role in this. For questions, the teacher offered help. Finally, all the children of the intervention class, co-teacher and teacher celebrated the accomplishments.

Teachers of the SASS-intervention classes were asked not to communicate the tips given by the co-teacher to the teachers of the control classes to avoid bias in the learning effect of the control classes. Parents were instructed not to give the child any additional writing tasks at home. Instead, parents of children in the intervention subgroup were instructed to take on the role of supporters. When learning a complex skill such as writing, motivation is crucial in achieving improvements in performance (Ericsson et al., 1993). By encouraging their child, parents can meet children's need for relatedness (Deci & Ryan, 2008). A few support tips for parents were made to easily start the conversation with their child: (1) choose a quiet moment to start the conversation, (2) ask open-ended questions starting with how, who, what, where and which, (3) listen carefully, (4) no judgement, (5) show that you value your child's opinion and (6) always give positive feedback.

2.4 Statistical analysis

Normality tests for the SOS-2-VL scores were performed for each group using the Shapiro-Wilk test. All data of all groups were normally distributed. Paired student's t-tests were performed for each group to compare SOS-2-VL within-group differences before and after the intervention. Between-group comparisons of the SOS-2-VL were analyzed using independent student's t-tests. A p-value of <0.05 was considered statistically significant. Effect sizes were established utilizing Cohen's D. According to Cohen (Cohen, 1988) levels for effect sizes are set at 0.2 (small), 0.5 (moderate) and 0.8 (large). For the Quickscan and Smileyometer analyses, frequency tables were made and Wilcoxon's signed-rank tests were performed to compare categorization before and after the intervention. Spearman correlation coefficients (ρ) were calculated to compare whether the results of the SOS-2-VL and the teachers' Quickscan are related to each other. SPSS version 29 was used for statistical testing.

3. RESULTS

3.1 Participant characteristics

Of the 71 children recruited from the four classes, a total of 58 children were eligible to participate in the study. Of the excluded children, five children had a specific diagnosis (four children having an ADHD diagnosis, one child having a fine-motor impairment of the hands) and two children repeated their first grade. In addition, a total of six children were absent during one out of two testing moments and were therefore excluded from the statistical analysis. The intervention classes therefore consisted of 11 (6 ♂, 5 ♀) children in one school and 16 (8 ♂, 8 ♀) children in the other school. The classes had a subgroup of six and five children respectively who received extra support. The control classes consisted of 14 (9 ♂, 5 ♀) and 17 (8 ♂, 9 ♀) children who received standard instruction. The questionnaire for parents had a response rate of 77.5% (45/58). All parents of the children of the subgroup filled in the questionnaire except one (10/11). Characteristics of the participating children are described in Table 1. The languages spoken by the multilingual children included the following languages: French (2), Polish, Bulgarian, Armenian and Romanian. The three multilingual subgroup children were fluent in Bulgarian, Armenian and Romanian. Following developmental disorders were present in the immediate family of the children: ADHD (5), ASD (3), DCD (2), ADD, dyslexia (2), dyscalculia and language disorder. Of these children, three subgroup

children had a developmental disorder in the immediate family. These disorders included ADHD, dyslexia and ASD with DCD.

Table 1

Characteristics of the participating children from both schools.

Characteristic	Control	SASS-intervention	Intervention subgroup
Total children	31	27	11
Sex	17 ♂ – 14 ♀	14 ♂ – 13 ♀	7 ♂ - 4 ♀
# of questionnaires	23	22	10
Mean age (SD)	7.67 (0.39)	7.66 (0.38)	7.68 (0.42)
Multilingual	1	5	3
Developmental disorders in immediate family	6	7	3

3.2 The Quickscan

The results of the Quickscan are shown in Figure 2. Pre-test scores show a total of 62.1% green, 31% orange and 6.9% red Quickscans. Post-test scores showed a total of 65.5% green, 32.8% orange and 1.7% red Quickscans. In Table 2, classes are presented separately to illustrate the difference in pre-post measures of teachers, writing methods and learning effect of the SASS-intervention. Based on the Wilcoxon signed rank test, a significant difference was present with fewer children scoring in the red and orange categories post-intervention in the total intervention class.

Figure 2

Visual representation of the pre- and posttest results of the Quickscan

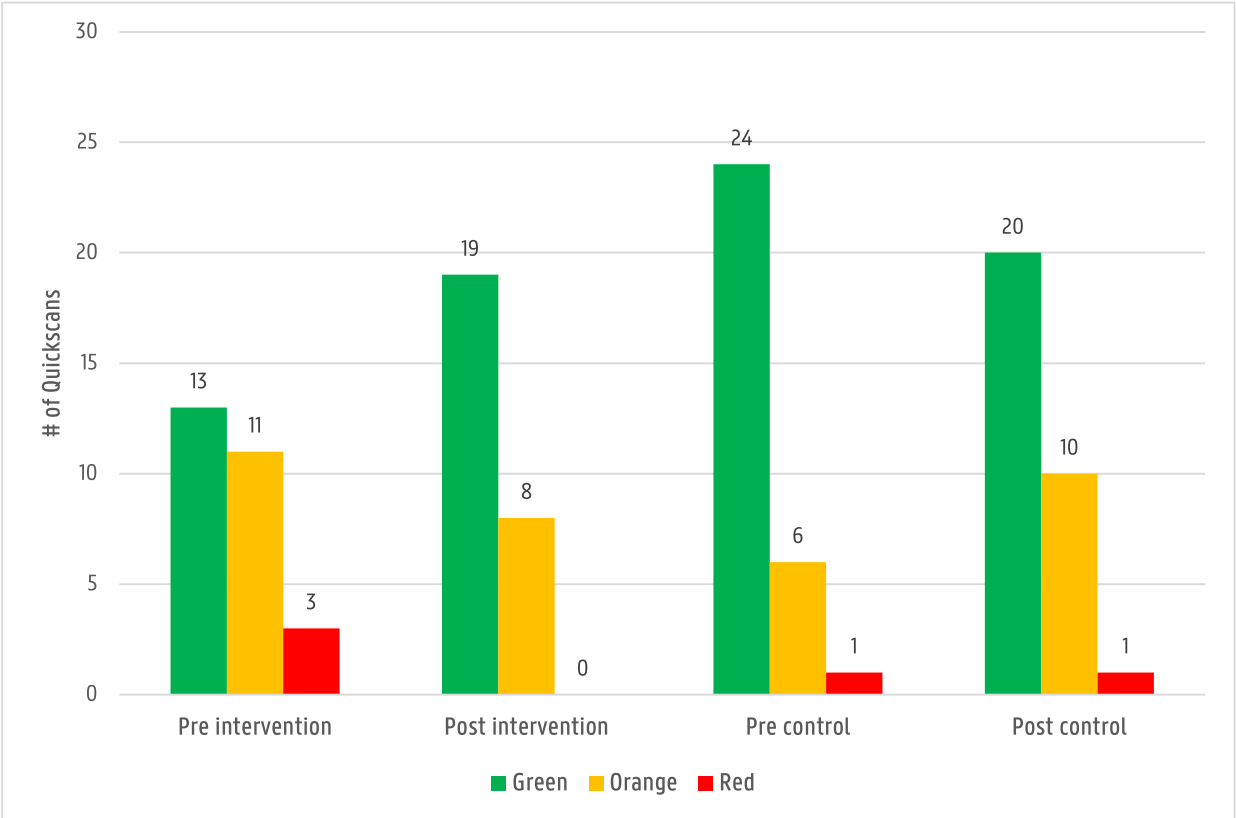


Table 2

Descriptive statistics and statistical within-groups comparison of the Quickscan

	Pre-intervention test scores			Post-intervention test scores				
	Green	Orange	Red	Green	Orange	Red	Z	p
School 1 (n=25)								
Intervention class	3	7	1	7	4	0	-1.89	0.06
Control class	9	4	1	8	5	1	-0.26	0.79
School 2 (n=33)								
Intervention class	10	4	2	12	4	0	-1.27	0.21
Control class	15	2	0	12	5	0	-1	0.32
Total (n=58)								
Intervention classes	13	11	3	19	8	0	-2.18	0.03
Control classes	24	6	1	20	10	1	-0.71	0.48

3.3 Three-point Smileyometer

Results of the three-point Smileyometer are shown in Figure 3 and Table 3. Comparing the happy smileys between the intervention and control group, a decrease of 6.6% in the intervention group and a decrease of 22.6% happy smileys in the control group is present. Respectively for the neutral smileys, an increase of 3.7% and 19.4% was found. For each group, the total number of sad smileys increased from 0 before to 1 after the intervention, increasing by 3.7% and 3.2% respectively. Based on the Wilcoxon signed-rank test, a significant difference was observed in the control classes, but no significant difference was observed in the intervention classes.

Figure 3

Visual representation of the pre- and post-test results of the Smileyometer

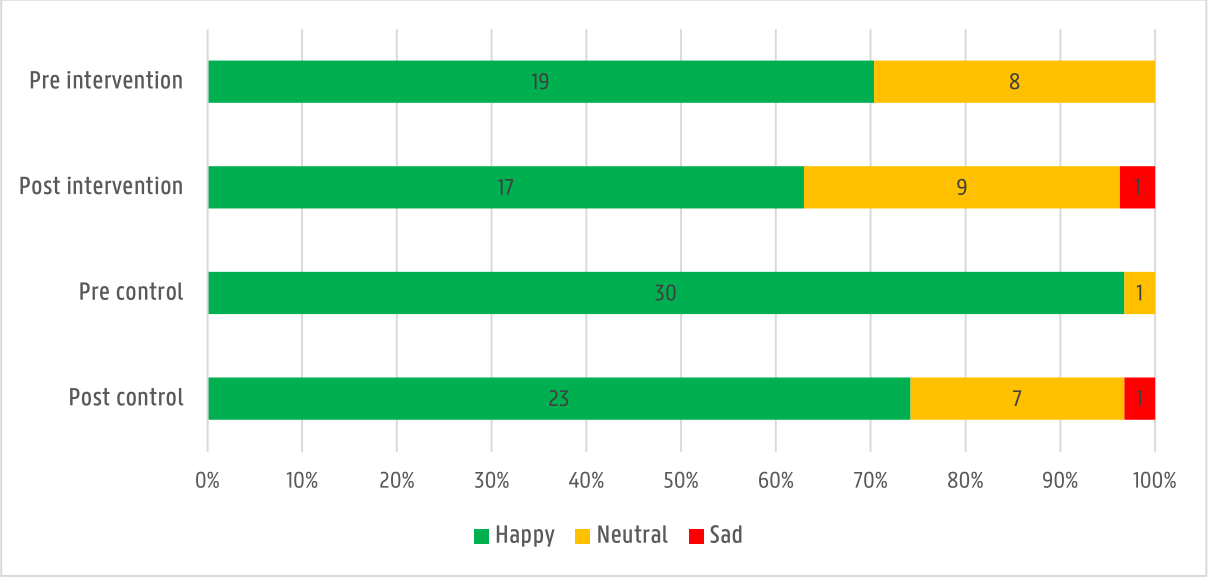


Table 3

Descriptive statistics and statistical within-groups comparison of the Smileyometer

	Happy	Neutral	Sad	Z	p
Intervention classes (n=27)					
Pre intervention	19 (70,4%)	8 (29,6%)	0 (0%)	-0.832	0.41
Post intervention	17 (63,0%)	9 (33,3%)	1 (3,7%)		
Control classes (n=31)					
Pre intervention	30 (96,8%)	1 (3,2%)	0 (0%)	-2.53	0.01
Post intervention	23 (74,2%)	7 (22,6%)	1 (3,2%)		

3.4 Comparison of results based on the modified SOS-2-VL

Within-group comparison

Descriptive statistics of within-group differences on the modified SOS-2-VL are presented in Table 4 and Figure 3. The analysis showed that children in the control group ($t = 0.41$, $p = 0.69$, $d = -0.07$) as well as children in the intervention group that were not included in the subgroup did not improve in writing legibility ($t = -1.48$, $p = 0.18$, $d = 0.37$). However, results show that the total intervention group did improve ($t = -3.06$, $p < 0.01$, $d = 0.59$), while the children in the subgroup improved as well ($t = -3.32$, $p < 0.01$, $d = 1$).

Between-group comparison

Descriptive statistics of the change of SOS-2-VL scores between children in the SASS-intervention and control group are presented in Table 5. The analysis showed a statistically significant difference between the groups in favor of the SASS-intervention group ($t = 2.60$, $p = 0.01$, $d = 0.69$). Comparison of the pre- and post-scores between the subgroup children and the non-subgroup children of the SASS-intervention group are presented in Table 6. In the SASS-intervention group, the subgroup differed significantly from the non-subgroup children pre-intervention ($t = -2.537$, $p = 0.02$, $d = 0.99$). However, the subgroup children were able to catch up post-intervention, where the subgroup did not significantly differ from the non-subgroup ($t = -0.72$, $p = 0.48$, $d = 0.28$).

Figure 4

Visual representation of the means of pre- and post-scores per group on the SOS-2-VL

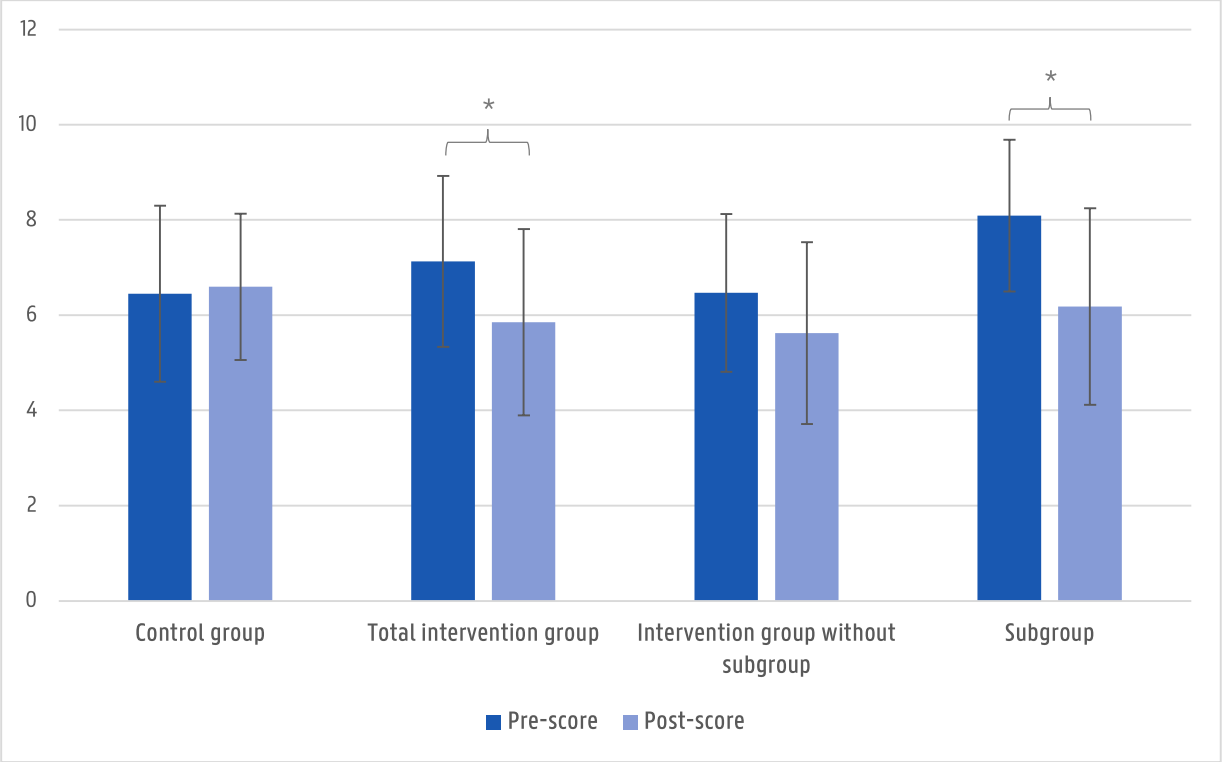


Table 4

Descriptive statistics and within-groups statistical comparison of each group of the SOS-2-VL

Group	n	Pre-test mean (SD)	Post-test mean (SD)	t (p)	d
Control	31	6.45 (1.85)	6.60 (1.54)	0.41 (0.69)	0.07
Total intervention	27	7.13 (1.80)	5.85 (1.96)	-3.06 (<0.01)	0.59
Intervention without subgroup	16	6.47 (1.66)	5.63 (1.91)	-1.48 (0.18)	0.37
Subgroup	11	8.09 (1.59)	6.18 (2.06)	-3.32 (<0.01)	1

Table 5

Descriptive statistics of the change and statistical comparison of the modified SOS-2-VL between children in the SASS-intervention and control group

	SASS-intervention Difference pre-post			Control Difference pre-post				
SOS-2-VL	n	Mean	SD	n	Mean	SD	t (p)	d
Total	27	-1.28	2.17	31	0.15	2	2.60 (0.01)	0.69

Table 6

Descriptive statistics and statistical comparison of the modified SOS-2-VL between the SASS-intervention subgroup and the SASS-intervention non-subgroup

	SASS-intervention Subgroup (n = 11)		SASS-intervention Non-subgroup (n = 16)			
SOS-2-VL	Mean	SD	Mean	SD	t (p)	d
Pre-score	8.09	1.66	6.47	1.59	-2.54 (0.02)	0.99
Post-score	6.18	2.06	5.63	1.91	-0.72 (0.48)	0.28

3.5 Correlation of scores between the SOS-2-VL and the Quickscan

Pre-intervention tests showed a positive correlation between the SOS-2-Vl and the Quickscan ($\rho = 0.409$, $p = 0.001$). Post-intervention tests showed a positive correlation as well ($\rho = 0.425$, $p < 0.001$).

4. DISCUSSION

The 6-week SASS-intervention program was implemented in two second-grade classrooms divided over two schools. The program focused on instruction, practice, fine motor skills and teacher involvement to deal with the growing number of children struggling to write (Sülzenbrück et al., 2011). A total of 58 children were eligible to participate in the study and completed two series of testing. It was hypothesized that children in the SASS-intervention classes would improve more in legibility than the children in the control classes on the appropriate tests.

Based on the SOS-2-VL results, a significant improvement was found in both the total SASS-intervention group as well as the subgroup, having a moderate and large effect size respectively ($d = 0.59$, $d = 1$). No significant improvement was found in the control group, but nor in the children of the SASS-intervention group that did not belong to the subgroup. When comparing the children in the SASS-intervention group and the children in the control group, a moderate effect size was demonstrated in favor of the SASS-intervention group ($d = 0.69$), considering the change in scores on the SOS-2-VL. The improvements in the total SASS-intervention group are likely attributable to the improvements of the subgroup, which received adequate instruction and feedback from the co-teacher. The change score on the SOS-2-VL for the full intervention group was 1.28, while that for the subgroup was 1.91. Both of these scores exceed the calculated SEM score (=0.782). This indicates that these values are clinically significant, as the scores cannot be attributed to random variation. However, to speak of a truly significant improvement, the difference in the SOS-2-VL must be greater than the MDC (=2.17), which is not the case anywhere. However, the effect of the interaction between teacher and co-teacher on the non-subgroup children must not be neglected. The teacher and non-subgroup children could have benefited from sufficient tips, knowledge of writing and motivational factors (Kison, 2012; Scruggs et al., 2007). Results showed that children in the subgroup did not differ significantly from the non-subgroup children, suggesting that the SASS-intervention affected the whole class.

Using the Quickscan, a significant improvement was observed in the SASS-intervention classes while the control classes did not change significantly. Differences in these groups can be multifactorial, but the most important factor might be the

learning effect of the teachers. Teachers receiving the SASS-intervention in their class might be more aware of writing errors due to the support and tips given by the co-teacher. For following studies, engaging a third independent teacher to enhance the post-intervention Quickscan is recommended to exclude potential bias.

When comparing the results of the SOS-2-VL and the teachers' Quickscan, both pre-intervention tests and post-intervention tests showed a positive correlation (pre $\rho = 0.409$, post $\rho = 0.425$). This indicated that a worse score on the SOS-2-VL correlates moderately with a worse color code on the Quickscan (Schober & Schwarte, 2018).

When comparing the pre-test to post-test results of the Smileyometer, no significant difference was present in the SASS-intervention group while the control group decreased significantly. These results can be interpreted as that the SASS-intervention helps children remain pain-free and energetic while writing, while the natural course during the school year results in an increase in fatigue and pain during writing. Subjectively, a motivational difference was present in the intervention classes compared to the control classes. The children of the intervention classes seemed more motivated and happier during the administration of the 2nd test, while the children of the control classes expressed less interest and appeal to write. Writing creates unique motivational challenges as the autonomous motivation to write declines over the years (Camacho et al., 2021). The model of Hayes suggests that motivation plays a dual role, enhancing both immediate responses to short-term writing goals and fostering a sustained inclination towards writing activities in the long run (Hayes, 1996). Self-efficacy and attitude towards writing are two important constructs for writing motivation. When combined, they significantly influenced the quality of the text in a statistically meaningful manner (Camacho et al., 2021). Teachers' confidence in students' writing abilities exerts a positive and enduring influence on their writing performance and growth. Additionally, creating a nurturing and inclusive learning atmosphere further enhances this impact. The motivation to write and the teacher's beliefs can have a positive impact on students' performances and experienced success in writing tasks (Wang & Troia, 2023). Since no motivational test or questionnaire had been administered, no objective results could be obtained. Although the Smileyometer assessed pain and fatigue, it could be considered similar to a motivational test. In future research, we advise to include motivational interviewing for both teachers and children.

Similar results can be found in other articles. The implementation of handwriting programs has shown various benefits for children from preschool to 2nd grade (Kadar et al., 2020). Improvements have been observed in areas such as legibility (Engel et al., 2018) and fine motor skills (Kadar et al., 2020). The study by Case-Smith et al. (2012) is most closely aligned with this research. In both studies, students who had the lowest scores at the start showed the most significant improvement in legibility.

Follow-up results were not included in the current analysis which was performed before the collection of the third dataset. However, it is hypothesized that the results on the SOS-2-VL and the Quickscan at follow-up will not differ significantly from the post-test results. It is expected that the results in legibility will be maintained, similar to other studies that included follow-up in their studies (Case-Smith et al., 2011, 2014). As for the Smileyometer, it is hypothesized that a small yet not significant decrease in results will be present. The tips and tricks given to the teacher by the co-teacher are

expected to counteract the natural decrease in motivation over time. However, performing the tests at the end of the school year may bias these results.

4.1 Strengths and limitations

The opinion of the co-teachers is crucial, given that they conducted the intervention. Firstly, they noted that the teacher had a significant influence on the execution of the intervention. Motivation, flexibility, and experience were identified as three major factors that could positively or negatively influence the program and thus the results of the research. Additionally, it was challenging to provide individualized guidance to children in a crowded classroom setting. As a result, SASS sometimes became a whole-class intervention, which should not be viewed negatively. This approach facilitated overall progress in writing skills for the entire class. Finally, it was indicated that starting SASS in the 2nd grade is too late. By this age, many automatized behaviors are already established, making it difficult to improve and/or change them. In the first grade, SASS is available as an 8-week during program. Starting in the 1st grade, along with learning to write, seems more appropriate according to the co-teachers.

As mentioned above, the class with the higher number of orange and red Quickscan tests along with higher scores on the SOS-2-VL, received the intervention. Children were required to have an orange or red code given by the teacher to be eligible for the subgroup. However, when the results of the Quickscan were put aside and the subgroup was made based on the highest scores on the SOS-2-VL, a total of 4 out of 12 children would not have been included in the current subgroup. This raises the question whether teacher involvement through the Quickscan was really necessary in the screening process and if better results could have been achieved with the alternative subgroup. For example, a child with an orange Quickscan and a score of 5 on the SOS-2-VL was included in the current subgroup, while a child with a green Quickscan and a score of 10 was not included. The child with a score of 10 on the SOS-2-VL might have been able to benefit more from the guidance of the co-teachers, since it has more improvement margin than the child with a score of 5. While the SASS-intervention aims to involve the class teacher by identifying children with handwriting difficulties based on the teacher's experience, it is recommended to prioritize standardized tests in scientific research.

A few limitations can be described following the intervention. First, the use of a convenience sample and lack of randomization are factors that can introduce a risk of bias. However, having a random population of children and dividing them into groups regardless of their classes would defeat the purpose of the intervention to support children in their natural environment. Similar studies have used convenience samples as well (Case-Smith et al., 2012; Lee & Lape, 2020; Martino & Lape, 2021). Thus, the use of a convenience sample was deemed necessary. The lack of randomization in assigning the intervention to specific classes implies that the study results may not be generalizable to all classroom settings, indicating a potential selection bias. Evaluating the reliability of the SOS-2-VL reduced the likelihood that score discrepancies were due to variations in the scoring process. Additionally, having the teacher from the other class assessing the Quickscan mitigated the possibility of subjective bias when assessing children with whom the original teacher was familiar.

Another limitation was the use of a rather small sample size. The sample size was dependent on the amount of co-teaching therapists recruited, having 1 co-teacher per school be responsible for approximately 30 children over 2 classes. Initially, the aim was to recruit 3 co-teachers, resulting in a sample size of approximately 100 children. Due to the time-consuming nature of the training sessions and intervention, many potential co-teachers hesitated to participate in the study.

4.2 Clinical implications

This study argues for the overall implementation of co-teaching in education through the following implications:

- The 6-week SASS program, which focused on instruction, practice and fine motor skills, under the guidance of a co-teacher once a week, resulted in objective improvement in handwriting legibility.
- The SASS program focused on teacher involvement. Experiences and tips were exchanged, enhancing the teacher's ability to provide writing instruction. Consequently, SASS targets long-term effects and maintains the writing progress made during the program. Collaboration between the co-teacher and teacher is key and provides relief for the latter.
- Co-teaching ensures that children with handwriting difficulties can remain in their familiar learning environment and do not feel excluded. Above all, it promotes the overall handwriting performance and motivation of the entire class.

5. CONCLUSION

The second-grade children who participated in the 6-week co-teaching handwriting program SASS showed significant improvements in handwriting legibility. There was no longer a significant difference in legibility post-intervention between the subgroup children, who scored lowest at baseline and thus received the SASS intervention, and the non-subgroup children. Additionally, the motivation to write was noticeably greater among all intervention children compared to the control group. SASS aims for inclusive and classroom-embedded therapy through co-teaching, allowing children to remain in their familiar learning environment. Teachers also benefit from the presence of a trained pediatric physiotherapist. They receive tips and tricks and become more proficient/experienced in delivering handwriting lessons. The findings of this study may serve as a catalyst to assist schools and teachers in identifying when their classroom needs support. In this way, writing problems are addressed through an intervention that straddles the intersection of education and healthcare.

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ABSTRACT IN LEKENTAAL

Achtergrond: Het blijft belangrijk om goed te kunnen schrijven, zelfs nu alles steeds meer digitaal wordt. Onderzoek toont aan dat leren door te schrijven een betere manier is voor het onthouden van spelling en het herkennen van letters dan leren door te typen. Omdat steeds meer leerlingen moeite hebben met schrijven en er steeds meer verschillende individuele leernoden zijn bij de leerlingen, zijn er verschillende programma's ontwikkeld om schrijfproblemen aan te pakken. De focus ligt hierbij op het verbeteren van de leesbaarheid, snelheid en schrijfvaardigheid.

Doel: Deze studie keek naar hoe goed het handschriftprogramma "Samen Aan de Slag met Schrijven" (SASS) werkt om het handschrift van Belgische kinderen uit het tweede leerjaar beter leesbaar te maken.

Onderzoeksdesign: Niet-gerandomiseerd gecontroleerd onderzoek.

Methode: Vier klassen van het tweede leerjaar van twee scholen namen deel aan het onderzoek. In het totaal waren er vijf leerkrachten betrokken bij de studie. Per school werd er één klas toegewezen aan de interventiegroep en één klas aan de controlegroep. Twee kinderkinesitherapeuten werden geselecteerd als co-teachers nadat ze 37 uur training hadden gekregen over het SASS-programma. De co-teachers kwamen zes weken lang, eenmaal per week schrijfondersteuning geven in de interventieklas. Hierbij gaven ze extra aandacht aan een subgroep van 4-6 leerlingen. In de controlegroep kregen de leerlingen gewoon les zoals gewoonlijk, zonder dat er een co-teacher langskwam. Zowel de leesbaarheid als het gevoel dat de kinderen hebben bij het schrijven werden twee keer beoordeeld a.d.h.v. verschillende testen. Eenmaal voor het begin van de interventie en eenmaal aan het einde van de interventie. De selectie van de kinderen voor de subgroep was gebaseerd op twee testen die beoordeeld werden door de leerkrachten.

Resultaten: De leesbaarheid verbeterde aanzienlijk meer in de interventiegroep vergeleken met de controlegroep. Dit kwam doordat er een grote verbetering was bij de subgroep, die extra ondersteuning kreeg. Terwijl er bij de start een belangrijk verschil in leesbaarheid was tussen de subgroep en de niet-subgroep van de interventiegroep, konden de kinderen in de subgroep na de interventie hun niet-subgroep klasgenoten bijbenen. De kinderen in de interventiegroep verbetereden aanzienlijk in een van de testen die beoordeeld werden door de leerkrachten, terwijl de kinderen in de controlegroep dat niet deden. De kinderen in de controlegroep gaven aan meer pijn en vermoeidheid te ervaren tijdens het schrijven na de interventie, terwijl de kinderen in de interventiegroep op dit gebied gelijk bleven. De leerkrachten vonden dat de leerlingen in de interventiegroep meer gemotiveerd waren na de interventie.

Conclusies: Uit het onderzoek blijkt dat het SASS-programma een goed effect heeft op de leesbaarheid van het handschrift van leerlingen in het tweede leerjaar. Leerkrachten merkten ook verbetering in het schrijven bij kinderen in de interventiegroep maar niet tot de subgroep behoorden. Dit effect komt waarschijnlijk doordat de leerkracht verbeterde schrijfinstructie gaf na het toepassen van tips en tricks van de co-teacher.

Trefwoorden: Co-teaching, handschriftprogramma, kinderen, school, schrijven.

POPULARISERENDE SAMENVATTING

UNIVERSITEIT GENT

SAMEN AAN DE SLAG MET SCHRIJVEN: EEN HANDSCHRIFTPROGRAMMA

WAT IS "SASS"?

- 6-weken durende groepsinterventie voor handschriftontwikkeling **in de klas**
- Ontwikkeld voor kinderen uit het eerste en **tweede leerjaar**
- Key concept: **co-teaching**

= Samenwerking tussen leerkrachten en kindertherapeuten om aan de diverse leerbehoeften van de leerlingen te kunnen voldoen

WAAROM SASS?

Niet alleen door COVID-19, maar ook door de toenemende digitalisering wordt er achteruitgang in de fijne motoriek vastgesteld, waaronder schrijfmotoriek.

Het is belangrijk om deze schrijfmotoriek te stimuleren, want wie niet goed schrijft kan later moeilijkheden ervaren bij het lezen en/of studeren.

SASS streeft ernaar zowel kinderen met schrijfproblemen als leerkrachten te ondersteunen, met als doel een positieve invloed te hebben op de gehele klas.

HOE ZAT HET IN ELKAAR?

- *: Twee scholen (vier klassen van het tweede leerjaar) namen deel aan het onderzoek, het schema hierboven beschrijft één school
- Een interventieklas wordt verdeeld in een subgroep met vijf tot zes leerlingen, overige leerlingen vormen de niet-subgroep
- De SASS-interventie wordt gegeven aan de subgroep-leerlingen door een co-teacher
- Pijn tijdens het schrijven en kwaliteit van schrijven werden beoordeeld

WAT ZIJN DE RESULTATEN?

Op vlak van leesbaarheid met de SOS-2-VL:

- De totale interventieklas (inclusief de leerlingen in de subgroep) verbeterde significant ($p < 0.01$)
- De leerlingen van de interventiegroep verbeterden sterk vergeleken met de controlegroep ($p = 0.01$)
- Er was vooraf een duidelijk verschil tussen de subgroep en niet-subgroep leerlingen ($p = 0.02$), maar deze achterstand werd na de interventie ingehaald waardoor de subgroep weer kon aansluiten bij het niveau van de klas ($p = 0.48$)

"De kinderen hebben nu veel meer plezier in het schrijven"

QR-code naar de nieuwsreportage (VRTnws)

CONCLUSIE

De bevindingen van dit onderzoek wijzen uit dat het SASS-programma een **gunstig effect** heeft op de **leesbaarheid** van het handschrift van leerlingen in het tweede leerjaar. Bovendien bleven de kinderen **gemotiveerd** om te schrijven binnen de interventiegroep. Niet enkel de leerlingen in de subgroep, maar **ook de leerlingen in de niet-subgroep van de SASS-interventie vertoonden verbeteringen**. Deze positieve effecten kunnen worden toegeschreven aan de verbeterde schrijfinstructie van de leerkracht na de **implementatie van tips en tricks van de co-teacher** tijdens het SASS-programma.

MAATSCHAPPELIJKE IMPACT EN MEERWAARDE

Schrijven is en blijft een belangrijke fijn motorische vaardigheid voor kinderen. Voor leerkrachten is het een uitdaging om alle kinderen van de klas soepel en leesbaar te leren schrijven. Door maatschappelijke veranderingen (zoals de toenemende digitalisering) gaan deze schrijfvaardigheden echter achteruit, waardoor steeds meer en meer kinderen met een schrijfachterstand worden aangemeld bij kindertherapeuten. “Samen Aan de Slag met Schrijven” (SASS) oogt de schrijfvaardigheid bij de beginnende schrijver te stimuleren, want wie niet goed schrijft gaat vaak minder goed lezen en studeren.

Aangezien de leerkracht geen expert kan zijn in alle vakken, brengt SASS een schrijftherapeut naar de klas om ondersteuning voor de leerlingen en de leerkracht te realiseren. Door de samenwerking tussen leerkracht en therapeut wordt er niet alleen ingezet op het voorkomen van de ontwikkeling van hardnekkige schrijfproblemen, maar leert de leerkracht ook hoe de schrijfles beter te structureren en het herkennen van leerlingen die at risk zijn voor een schrijfachterstand.

Uit het onderzoek is gebleken dat deze kortdurende en gerichte interventie effectief is om deze kinderen weer te laten aansluiten bij de rest van de klas. De resultaten kunnen een aanzet zijn om scholen en leerkrachten uit de nood te helpen, door zelf aan te geven wanneer een klas nood heeft aan ondersteuning. Op deze manier worden schrijfproblemen aangepakt door middel van een interventie die op de grens ligt tussen onderwijs en zorg.

BEWIJS VAN INDIENING BIJ ETHISCH COMITÉ

Afzender : Commissie voor medische ethiek

Prof. Dr. Lynn Bar-On
Vakgroep Revalidatiewetenschappen
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Lynn Bar-On	30/10/2023	1/6
Onze referentie:	**EudraCT-nr:**	**Belg. Regnr:**
ONZ-2023-0371		B6702023000681

Betreft:
Samen Aan de Slag met Schrijven - Een trapsgewijs coteaching handschriftprogramma voor eerste- en tweede leerjaar
A tiered coteaching handwriting program for first and second graders

Positief advies conform de wet van 7 mei 2004 betreffende experimenten op de menselijke persoon

Beste collega

De Commissie Medische Ethiek (CME) verbonden aan de Universiteit Gent (Ugent) en het Universitair Ziekenhuis Gent (UZ Gent) heeft het bovenvermelde dossier onderzocht en besproken op haar vergadering van 12/09/2023.

Na raadpleging van de bijkomende informatie en/of aangepaste documenten met betrekking tot dit dossier, is de CME van oordeel dat de voorgestelde studie, zoals beschreven in het protocol, wetenschappelijk relevant en ethisch verantwoord is.

EC geeft daarom op 26/10/2023 een gunstig advies over deze studie.

Ingediende documenten: zie bijlage 1
Ledenlijst: zie Bijlage 2
Aandachtspunten: zie Bijlage 3a

ALGEMENE DIRECTIE
Commissie voor Medische Ethiek

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Prof. dr. R. Peleman

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Met vriendelijke groeten,
Prof. dr. Renaat Peleman
Voorzitter
Commissie voor Medische Ethiek U(Z) Gent

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APPENDIX

Appendix 1: SOS-2-VL score form

SOS-2-VL SCOREFORMULIER

Naam kind: ..... Jongen / Meisje*

Geboortedatum: .....

School: ..... Leerjaar: .....

Schrijfhand: Rechts / Links / Wisselend*

Naam testleider: ..... Testdatum: .....

Bereken de leeftijd van het kind

	Jaar	Maand	Dag
Testdatum			
Geboortedatum			
Leeftijd			

Scoor de items regel per regel met 0 (afwezig) of 1 (afwijking aanwezig) en bepaal op deze basis de score voor elk item (met uitzondering van item 4)

Item	regel 1	regel 2	regel 3	regel 4	regel 5	score
1 lettervorm						
2 vloeiendheid						
3 overgangen						
4 gemiddelde grootte ..... mm over 5 regels	mm	mm	mm	mm	mm	
5 regelmatigheid lettergrootte						
6 woordspaties						
7 regelverloop						
Totaal kwaliteit						

	Ruvve score	Zone waarin percentielscore valt**				
Totale score SOS - Kwaliteit		≤ Pc 3	Pc 4-5	Pc 6-15	Pc 16-50	> Pc 50
Aantal letters - Snelheid		≤ Pc 3	Pc 4-5	Pc 6-15	Pc 16-50	> Pc 50

* doorstrepen wat niet van toepassing is — ** plaats een kruisje in de gepaste kolom

Appendix 2: Text of the Quickscan

jan is bij oom
hij eet ijs
oom zit op een bank
wie zijn er nog meer
suus en zus

Zus kruipt op de grond, maar Suus springt rond.
Suus heeft haar ijsje al op. Wat smaakt dat lekker.
Mmm! Dat is nog eens smullen.

Dan schreeuwt Jan: ''O, kijk eens oom. Daar varen schepen, . . . wel drie achter elkaar.'' Jan holt naar de kant van het water. Suus draaft met hem mee en buigt zich over de kademuur om beter te kunnen kijken. Zus waggelt hen achterna. Oom houdt een oogje in het zeil.

In de haven drijft allerlei rommel: kisten, kratten, planken, een grote plastic zak, een boomtak met bladeren en zelfs . . . een kapotte matras! Een grijs-witte meeuw scheert over hen heen.

De kinderen zwaaien met hun zakdoek naar het voorste schip. Tot hun verrukking laat de boot zijn stoomfluit horen. ''Hij zegt ook dag'', lacht Suus en danst van plezier.

Maar dan klapt oom in zijn handen. Hij roept: ''We moeten naar huis, hoor!'' Jan en Suus zijn gehoorzaam, ze komen direkt. Zus stribbelt echter tegen en begint te zeuren. Oom glimlacht en zegt: ''Je bent een kleine schavuit.'' Met een reuzenzwaai tilt hij haar op zijn schouders. ''Kom jongens, niet treuzelen, in galop naar huis, anders wordt tante ongerust.''

De kinderen lopen op een sukkeldrafje met oom mee langs enorme pakhuizen, kantoren, opslagplaatsen met containers, parkeerterreinen vol met vrachtwagen. Oom puft ervan. ''Ik word oud, mijn gewrichten kraken helemaal''. ''Daar ligt die mammoettanker nog'', wijst Suus. Ze is trots op dat moeilijke woord. ''Gaan we weer met de metro?'', vraagt Jan. Oom grinnikt bevestigend, hij grabbelt naar zijn portemonnee en vist alvast tussen munten en verkreukelde briefjes het kaartje tevoorschijn. Daar zijn ze al bij het metrostation. ''Goed uitkijken hoor'', zegt oom, ''en op de zebra oversteken''.

SchrijvenNL.nl / QuickScan-Handschrift / Overschrijftekst uit Beknopte Beoordelingsmethode voor Kinderhandschriften (BHK) / 01-2023

Appendix 3: Criteria as a guideline for the assessment of the Quickscan

Zeefmethode voor groep 3-4

Jan is bij oom	Voldoende	Twijfel	Onvoldoende
Leesbaarheid	- Tekst is leesbaar - Letters en cijfers zijn op de juiste manier gemaakt - Letterverbindingen zijn op de juiste manier gemaakt	- Tekst is twijfelachtig leesbaar - Een aantal letters en/of cijfers zijn niet op de juiste manier gemaakt - Een aantal letterverbindingen is niet op de juiste manier gemaakt	- Tekst is slecht of niet leesbaar - Veel letters en/of cijfers zijn niet op de juiste manier gemaakt - Veel letterverbindingen zijn niet op de juiste manier gemaakt

Appendix 4: Three-point Smileyometer

Appendix 5: School Questionnaire for Teachers

Schoolvragenlijst voor leerkrachten voor het opsporen van schrijfproblemen
School Questionnaire for Teachers*

Naam leerling: Jongen/meisje
Geboortedatum: Groep:
Rapportcijfer voor schrijven? Doublure: Nee/ja, groep ....
Extra begeleiding:

Wilt u onderstaande vragen invullen?
Kruis het hokje aan dat van toepassing is op deze leerling

1	De vorm van de letters geschreven door dit kind is:	Goed						Slecht
2	De verzorging van dit schrijfwerk is:	Netjes						Slordig
3	De regelmaat (qua grootte en hellingshoek) van het handschrift van dit kind is:	Regelmatig						Onregelmatig
4	De mate van inspanning die het schrijven dit kind kost is:	Laag						Hoog
5	De vloeiendheid (als tegenstelling tot onderbroken of stotend schrift) van het handschrift van dit kind is:	Hoog						Laag
6	Als u dit kind vergelijkt met de eisen die aan leerlingen in deze groep worden gesteld qua schrijven, waar zit dit kind dan ten opzichte van de norm:	Boven						Onder
7	Als u dit kind vergelijkt met de eisen die aan leerlingen in deze groep worden gesteld qua spelling, waar zit dit kind dan ten opzichte van de norm:	Boven						Onder
8	Als u dit kind vergelijkt met de eisen die aan leerlingen in deze groep worden gesteld qua motorische vaardigheden, waar zit dit kind dan ten opzichte van de norm:	Boven						Onder
9	Als u dit kind vergelijkt met de eisen die aan leerlingen in deze groep worden gesteld qua algemene leerprestaties, waar zit dit kind dan ten opzichte van de norm:	Boven						Onder
10	Vindt u dat dit kind schrijfproblemen heeft?	Nee						Zeker

**In deze lijst staan de goede scores links van het midden, in de originele lijst is dit wisselend.*
Bron: Overvelde A & Nijhuis- van der Sanden R. Aan de slag met handschriftonderwijs. Over het belang van leren schrijven met de hand. Bijlage 6. Amsterdam: Boom Uitgevers. 2019.

Appendix 6: Questionnaire for parents

Vragenlijst ouders/voogd SASS studie

Beste ouders/voogd,

Alvast bedankt voor het invullen van deze vragenlijst. Zoals meegedeeld in de informatiebrief, vragen wij u deze vragenlijst in te vullen. Deze vragenlijst bevat vragen waarmee we de omgeving van het kind in kaart willen brengen en nagaan of deze factoren invloed hebben op het schrijfgedrag van het kind.

De vragenlijst bevat 26 vragen en zal ongeveer 5 minuten van uw tijd in beslag nemen. De eerste 14 vragen zijn algemene vragen gerelateerd aan het kind. Daarna volgen er (2x) 6 vragen die door iedere ouder/voogd apart wordt ingevuld.

Alle antwoorden worden uitsluitend door medewerkers van de studie gelezen.

Alvast bedankt voor de medewerking!

Vragenlijst kind	
Wat is de voor- en achternaam van het kind dat participeert in de studie?	_____
In onze studie zal de ouder/voogd enkele vragenlijsten invullen. Hiervoor is een goede kennis van Nederlands nodig. Kan de ouder/voogd goed Nederlands lezen, spreken, begrijpen en schrijven?	○ Ja ○ Neen
Wat is de geboortedatum van het kind?	_____
Wat is het geslacht van het kind?	○ Mannelijk ○ Vrouwelijk
Wat is de moedertaal/wat zijn de moedertalen van het kind?	☐ Nederlands ☐ Engels ☐ Frans ☐ Duits ☐ Turks ☐ Andere
Specifeer welke taal	_____
Welke taal wordt/talen worden er thuis gesproken?	☐ Nederlands ☐ Engels ☐ Frans ☐ Duits ☐ Turks ☐ Andere
Specifieer welke taal er thuis wordt gesproken	_____
Hoeveel broers/zussen heeft het kind en hoe oud zijn ze?	_____
Heeft uw kind het 1ste leerjaar en de kleuterschool in België gevolgd?	○ Ja ○ Neen ○ Deels in België, deels in het buitenland

Vragenlijst ouder 1	
U bent	○ De biologische moeder ○ De biologische vader ○ De partner van de moeder ○ De partner van de vader ○ De voogd
Wat is/zijn uw nationaliteit(en)?	_____
Wat is uw moedertaal?	_____
Wat is uw hoogst behaalde diploma?	○ Geen diploma, lager onderwijs niet afgewerkt ○ Lager onderwijs ○ Lager secundair onderwijs ○ Hoger secundair onderwijs: beroepsonderwijs ○ Hoger secundair onderwijs: technisch onderwijs ○ Hoger secundair onderwijs: algemeen onderwijs ○ Specialisatieopleiding na secundair onderwijs (1 of 2 jaar) ○ Specialisatieopleiding na secundair onderwijs (1 of 2 jaar) ○ Hoger niet-universitair onderwijs korte type (3 jaar) ○ Hoger niet-universitair onderwijs lange type (4 jaar) ○ Hoger universitair onderwijs ○ Post-universitair onderwijs
Wat is uw huidige beroep?	_____
Wat is uw burgerlijke staat?	○ Gehuwd ○ Gescheiden ○ Ongehuwd ○ Partnerschap ○ Verweduwd ○ Geregistreerd partnerschap