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**Vocabulary intervention protocol for preschoolers
with specific language impairment**

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Abstract

Purpose: This study investigated whether a uniform vocabulary intervention protocol enhances the number of new words learned by preschoolers with SLI within 4 weeks. A vocabulary intervention protocol was developed.

Method: For this study the developed vocabulary intervention protocol was implemented at the *Dutch Foundation for the Deaf and Hard of Hearing Child (NSDSK)*. Children in the age of 2 to 4 years with SLI ($n = 22$) of 3 different young intervention groups from the *NSDSK* were randomly assigned to vocabulary intervention according to the protocol ($n = 12$) or a control condition ($n = 10$). The speech and language therapists ($n = 3$) executed the vocabulary intervention protocol for 4 weeks, 3 times a week and 15 minutes sessions. Expressive word knowledge was tested by illustrations of a set of 50 words at pre- and posttest.

Results: The children in the experimental group produced more target words provided with the protocol than the matching words, not provided by the protocol. The control group did not show a difference in the number of these target words and matching words learned. On average 6 new theme words out of 50, were learned by the participating children. The number of verbs learned out of 14, was on average 2.

Conclusions: The results suggest that this vocabulary intervention protocol enhances the number of new words learned in preschoolers with SLI. This vocabulary intervention protocol showed not to be as evidently beneficiary for children with SLI with a language level below 1;11 years. In this study learning new verbs were not enhanced by the vocabulary intervention protocol. Thus, vocabulary intervention according to this protocol is improving the number of expressive words in preschoolers with SLI. However, a revision of this protocol is recommended, because the children with a young language level, i.e. under the 1;11 years, do not benefit as clearly as the rest of the children in word learning. Splitting the group into subgroups (children with a language level below 1;11 years and children with a language level above 1;11 years) during vocabulary intervention is to be considered in further research.

Keywords: vocabulary intervention, specific language impairment, preschool children, lexical-semantic, protocol

Note: Due to sensitive nature of the developed intervention protocol this is not included in this thesis. One could contact the author when interested in this protocol.

1. Introduction

1.1. Intervention for preschoolers with SLI: focus on lexical-semantic development

Language competence at a young age is a predictor for later school achievement (Bushir & Scavuzzo, 1992; Hohm, Jennen-Steinmetz, Schmidt & Laucht, 2007; Nelson, Nygren, Walker & Panoscha, 2006; Reilly, Wake, Ukoumunne, Bavin, Prior, Cini, Conway, Eadie & Bretherton, 2010; van Weerdenburg, Verhoeven, Bosman & van Balkom, 2010). The relation between vocabulary competence and psychiatric, academic and psychosocial outcomes is well known (Beitchman, Jiang, Koyama, Johnson, Escobar, Atkinsin, Brownlie & Vida, 2008). A large amount of vocabulary is necessary for school children to participate successfully in education. Vocabulary is not only essential in success of the school subject language, but also for success of the school subjects such as biology, geography and science. In particular, vocabulary acquisition and vocabulary size are strong predictors for reading skills (Marinellie & Johnson, 2002; Muter, Hulme, Snowling & Stevenson, 2004). Outcomes from longitudinal studies support that vocabulary has a strong relation with later reading skills (Poe, Burchinal & Roberts, 2004). The basics for learning to read are formed at the preschool age. Among these basics, knowledge of words is a crucial aspect in learning to read (Mulder, Timman & Verhallen, 2009). Therefore a sufficient vocabulary is necessary in learning to read. Mulder et al. (2009) state that knowledge of a minimum of 2000 words is necessary in order learning to read successfully. A typically developing Dutch four-year-old entering elementary school has a vocabulary of approximately 1000 to a maximum of 5000 words. Monolingual typically developed school children expand their vocabulary with 1000 to 2000 words a year. Therefore, typically developing children learn 3 to 7 words every day (Verhallen & Verhallen, 1994).

Words play a central role in language acquisition and language competence; they are like the construction blocks of a language. The core in language acquisition is the acquisition of vocabulary. Words play a role in the acquisition of sounds, i.e. sounds combine to a word; and in the acquisition of sentences and text level; i.e. by combining words to each other sentences are created (Verhallen & Verhallen, 1994).

Ruizeveld de Winter & Leijenaar (2006) report in their article that early intervention causes a decrease in referral to special education of approximately 30 percent. Early intervention for children with specific language impairment (SLI) is necessary and intervention should already start before school age. The language difficulties of school-aged children with SLI are more reduced if intervention would start at preschool age. Because of the close relationship between vocabulary competence and behavioral, social-emotional and academic skills, intervention focused on expanding the vocabulary is essential, i.e. vocabulary is a strong predictor in school success. Furthermore the

fact vocabulary plays a central role in language acquisition advocates for early vocabulary intervention for children with SLI.

1.2. Lexical-semantic organization in children with SLI

In typically developing children the mental lexicon develops in 3 stadia: the referential, denotational and the sense period (Elbers & Van Loon-Vervoorn, 2000). The referential period of the developing mental lexicon starts around the age of 1 year. In this period a word form is connected with one concrete object or one concrete occasion. Next, in the denotational period the child connects a word form to a concept, instead of one object. The senso-motor experience of the child contributes to forming concepts around words. The denotational period begins at approximately the age of 2 years. At the end of the denotational period, around the age of 4 years, the child has formed his or her basic lexicon. In the sense period from the age of 4 years, the superstructure lexicon is formed. In this period the child reorganizes the basic lexicon. The words are connected in a taxonomic way, e.g., the words are categorized. According to Elbers and Van Loon-Vervoorn (2000) this reorganization of the lexicon begins around the age of 3 or 4 years. In addition to the reorganization in the sense period, the child learns a large amount of new words in this period, these are abstract words based on known words (Elbers & Van Loon-Vervoorn, 2000).

A network model may be used to describe the lexical-semantic organization in children (Sheng & McGregor, 2010). The conceptual nodes in the network model are the words. Each node is connected to other nodes with a semantic link. The more links connecting the nodes, the richer the semantic network (Sheng & McGregor, 2010). Using a network model Bock and Levelt (1994) distinguish 3 levels of representation in knowledge of words: the conceptual level, the lemma level and the lexeme level. The first level, the conceptual level represents the concepts of words. Second, the lemma contains the syntactic information of a lexical item. Third, the lexeme contains phonological and morphological information of the lexical item (Bock & Levelt, 1994). In order to use the lexicon efficiently the conceptual, lemma and lexeme level need to contain adequate information separately, but also adequate communication between the 3 levels must occur (Brackenbury & Pye, 2005).

Evidence suggests that the lexical-semantic organization in children with SLI is organized differently than in typically developing children. Children with SLI are a heterogeneous group (Bishop, 2006). Bishop (2006) lists characteristics for the majority of children with SLI. Characteristics involving the lexical-semantic development by Bishop (2006) are: delay in the expressive vocabulary, the use of first words start at the age of 2 years or later and a restricted vocabulary, both receptive and expressive. In addition, the lexicon of children with SLI is less diverse than their typically developing peers (Leonard & Deevy, 2004). Vocabularies of typically developing children are primarily formed by

incidental word learning. However, children with SLI are not as competent in incidental word learning as their typical language developing peers (Steele & Mills, 2011). Furthermore, learning new words is more difficult for children with SLI (Brackenbury & Pye, 2005; Sheng & McGregor, 2010). Particularly, learning new verbs is difficult for children with SLI (Leonard & Deevy, 2004). Leonard and Deevy (2004) mention the position of verbs in sentences (medial position versus final position for nouns) and the wider variety in inflections compared to nouns as possible causes in the difficulties children with SLI have in learning new verbs.

Word learning, storing and organizing the word's lexical information in the mental lexicon are following steps of the acquisition process of new words (Brackenbury & Pye, 2005). In word learning children with SLI do not seem to have deficits in perceiving and isolating the phonological form of words affecting word learning (Brackenbury & Pye, 2005). However, children with SLI find it difficult to hold phonological forms of words in their short-term memory, especially words longer than 2 syllables. Children with SLI do not show deficits in the ability in using syntactic cues for word learning. Finally, children with SLI do have difficulties connecting new phonological forms of words to correct meanings, the lexeme storage in the long-term memory (Brackenbury & Pye, 2005). Children with SLI have deficits in both phonological representations of words (lexemes) as in semantic representations of words (lemmas) (Gray, 2005). Furthermore, children with SLI have difficulty with storing, organizing and accessing lexical knowledge (Brackenbury & Pye, 2005). The lexical networks in children with SLI are less extensive and the links between lexical entries are weaker compared to the networks of their typically developing peers (Leonard & Deevy, 2004).

1.3. Current vocabulary therapy for children with SLI in the age of 2-4 years

The *Dutch Foundation for the Deaf and Hard of Hearing Child (NSDSK)* provides treatment for young children in the age of 2 to 4 years with SLI. There are currently 12 early intervention groups for preschoolers with SLI (www.nsdsk.nl). In 2010 the *NSDSK* developed a method for the multidisciplinary intervention for all intervention groups for preschoolers with SLI (Wiefferink, Dorren, Okma, Veentjer, Wobo, Zandvliet & Zorzi, 2010). The multidisciplinary team consists of an orthopedagogue/team leader, a speech and language therapist and 2 pedagogical staff. The method is directed at children in the age of 2 to 4 years, whose language development lags behind the overall development. The effectiveness of the current interventions for young children with SLI is hardly proven in empirical research (Wiefferink et al., 2010). Therefore, in developing the method for preschoolers with SLI, the authors used theoretically well-based interventions. The main purpose of the intervention groups for preschoolers with SLI is to reduce or catch up the delay in speech and language development. The method focuses on providing an adequate language input for children with SLI, where adjusting the language input enhances the children's ability in learning language. The

adequate language input for children with SLI is created using the following didactic principles: Hanen 'Observe Wait Listen' principle (OWL principle), working thematically, interactive storybook reading and basic communication. Gestures and signs supporting keywords are provided at the children. Furthermore, parent involvement is included in the method. The intervention groups provide a parent program in strategies how to stimulate the speech and language development of their child. The theories and treatment suggestions described in the book *Taaltherapie voor kinderen met taalontwikkelingsstoornissen* by Leen van den Dungen form the principle for the speech and language therapy (Wiefferink et al., 2010).

The *NSDSK* method for children with SLI enhances the uniformity between the 12 intervention groups. However, in the *NSDSK* method no specific guidelines for vocabulary intervention are explicitly described yet. Recently, the *NSDSK* constructed theme target wordlists for the intervention groups suitable for preschoolers with SLI (Kruythoff & Diender, 2011). The themes are derived from the Dutch language method *Peuterpraat*. The method *Peuterpraat* is meant for stimulating the speech and language development of children, with emphasis on communication and interaction, the joy in talking, vocabulary and receptive language skills. Furthermore the *NSDSK* developed a database of the first, on average, 3.000 words acquired by children (Kruythoff & Diender, 2011). In developing the database, the authors consulted the first 400 words included in the CD-ROM belonging to the book *Taaltherapie voor kinderen met taalontwikkelingsstoornissen* (Van den Dungen, 2006) and the first 3000 words in the wordlist developed by Liesbeth Schlichting. Per *Peuterpraat* theme, 3 wordlists are developed corresponding to 3 language levels. The language levels are labeled by color: green is for children with a language age of 1;3 to 1;10 years; red is for children with a language age of 1;11 to 3;0 years and purple is for children with a language age of 3;0 to 5;0 years (Kruythoff & Diender, 2011).

In 2010 Marulis and Neuman carried out a meta-analysis examining the effects of vocabulary interventions on young English speaking children's word learning. The authors calculated the overall effect size of vocabulary intervention and of several intervention characteristics: the adult who conducted the intervention, group size, dosage of the intervention and type of training. The authors concluded that young children's language development benefited from vocabulary intervention, an overall effect size of 0.88 was found. The interventions provided by experimenters or teachers had larger effects than provided by parents or childcare providers. There were no differences found in effect size for individual, small groups (5 or fewer children) and large groups (6 children or more). For the dosage of the intervention the effect sizes of intervention duration (how many days), intervention frequency (how many sessions) and the intensity (the length of the session in minutes) were calculated. The effect sizes in duration did not differ significantly for 42 days or less than interventions with a duration of 42 days or more. Interventions of less than 18 sessions had

significant higher effect sizes than interventions with more than 18 sessions. For intensity, higher intensities (more than 20 minutes) of treatment did not have larger effects on vocabulary than smaller intensities (less than 20 minutes). Also, the authors examined the effect sizes of type of training, i.e. explicit instruction, implicit instruction and a combination of both. The explicit instruction and the combination of both instructions were significantly more effective than the implicit instruction alone (Marulis & Neuman, 2010). In their article, Steele and Mills (2011) outlined evidence in supporting direct vocabulary intervention for school-aged children with SLI. In order for the direct vocabulary intervention to be functional, different aspects need to be considered. Steele and Mills (2011) point out to consider the following aspects in direct vocabulary intervention: choosing meaningful target words, considering appropriate instructional strategies, introducing word meanings, increasing depth of word meaning, expanding words to new contexts, providing prompts and supports, using keyword strategy and visual organizers.

1.4. Vocabulary intervention protocol for preschoolers with SLI

One of the aspects of enhancing the quality of health care is achieved by developing guidelines. For the decision making in intervention in speech and language disorders or delay no universal guidelines are available. For this reason speech and language therapists are forced to make intervention decisions individually (Law, Garret & Nye, 2010). The research group Speech and Language Therapy, part of the Research Centre for innovation in health care by the *Hogeschool Utrecht*, has the aim to advance the knowledge and provide new insights in assessment and interventions for children with communication disorders (www.innovationsinhealthcare.research.hu.nl). In the Netherlands the Institute for quality in Health named *Centraal BegeleidingsOrgaan (CBO)* focuses on enhancement on the quality of health care of medics and other healthcare professionals (www.cbo.nl). Since 2000 the CBO uses a fixed format in developing guidelines (www.cbo.nl). These guidelines consist of national and professional recommendations to optimize the health care for a patient. In developing guidelines the following aspects are taken into account: scientific evidence, preferences of patients, costs, availability and organizational aspects. A manual in constructing an evidence-based guideline is available for professionals (Institute for quality in Health CBO, 2007). In the present study the focus is on protocols instead of guidelines. The manual in constructing an evidence-based guideline by the Institute for quality in Health CBO (2007) states the following definition for a protocol: "A protocol is a prescription or instruction which is derived from a guideline and used by professionals in health care practice. A protocol mainly focuses on the organizational context in the workplace and shows how something should be done. Thus, protocols are often developed locally in order to look at possibilities and limitations of the local situation" (paragraph 1.5, own translation).

Because vocabulary size is not only correlated with, but also causally connected with academic achievement, an adequate vocabulary size at school age for children is inevitable. Children with SLI have restricted vocabularies and do not benefit sufficiently from incidental word learning. Direct vocabulary intervention improves word learning competence in children with SLI. Thus, direct intervention focused on vocabulary for children with SLI is needed. In order to optimize evidence-based practice in the intervention of the lexical-semantic abilities (in particular vocabulary) of preschoolers with SLI, it is preferable to develop a vocabulary intervention protocol for speech and language therapists.

1.5. Present study

The main purpose of the present study is to investigate the effect of vocabulary intervention on expressive word learning in preschoolers with SLI by implementing a uniform vocabulary intervention protocol. This protocol aims to facilitate the speech and language therapist in decision making according to vocabulary intervention for preschoolers with SLI and to reach uniformity within the vocabulary intervention between the intervention groups by providing scripts for the speech and language therapists.

For this study a vocabulary intervention protocol for preschoolers with SLI was developed for 3 intervention groups of the *NSDSK*. Marulis and Neuman (2000) found support that smaller dosages of intervention could enhance the vocabularies of children. The vocabulary intervention protocol was developed for a period one theme was treated at the intervention group. Normally at the *NSDSK*, the themes are treated for a period of 4 to 6 weeks. For this protocol a 4-week period was chosen, because of practical reasons. The children visit the young intervention groups 3 days a week, either in the morning or in the afternoon. Thus, 12 sessions were included in the protocol. As described above, shorter sessions (less than 20 minutes) do not differ in effect size compared to longer sessions (more than 20 minutes). Therefore, the sessions took 15 minutes in the protocol.

In the present study the purpose is to provide an answer to the main research question: "Will a 180 minutes uniform group intervention focusing on vocabulary enhance word learning in children with specific language impairment in the age of 2-4 years?" The following sub-questions derived from this question are:

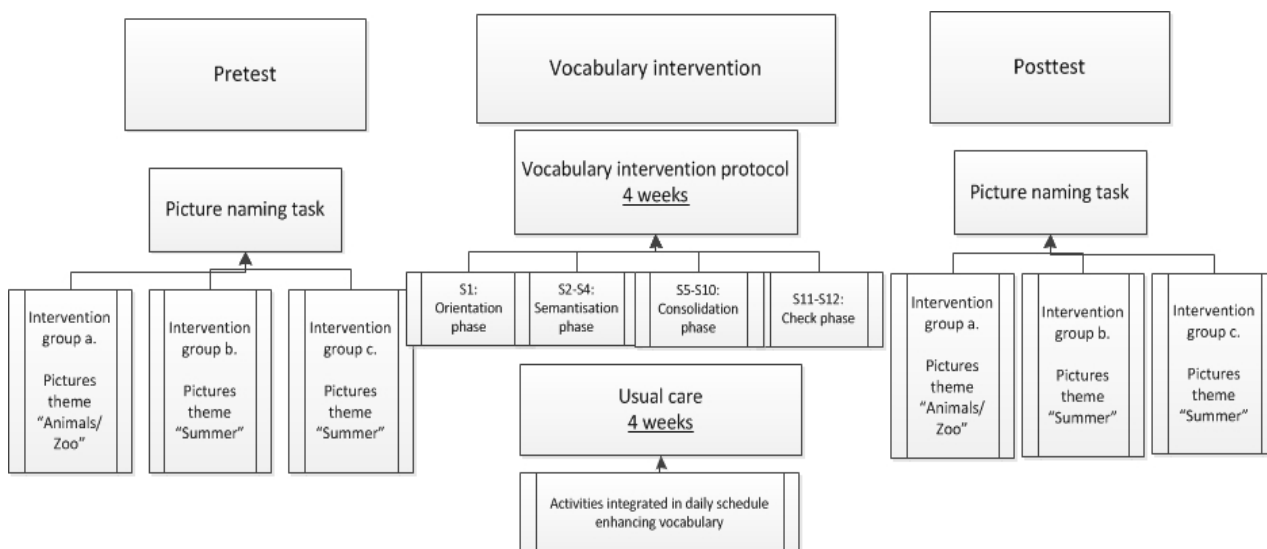
1. How many new words do children with specific language impairment in the age of 2-4 years learn in 4 weeks out of a set of 50 words?
2. How many new verbs do children with specific language impairment in the age of 2-4 years learn in 4 weeks out of a set of 14 verbs?
3. What is the clinical opinion of 3 speech and language therapists about working with a uniform group intervention focusing on vocabulary during 4 weeks?

2. Method

2.1. Research design

For the present study a pretest-posttest control design is used. The study design contains 3 components as shown in Figure 2.1: the pretest, the vocabulary intervention phase and the posttest.

Figure 2.1. Experimental design.



2.2. Participants

The speech language therapists ($n = 3$) of intervention groups for preschoolers with SLI within the *NSDSK* agreed to participate in this study. In this study 22 children participated, 7 female and 15 male, with a mean age of 3.3 years (range 2.6-4.0 years; SD 4 months). Placement at one of the early intervention groups for preschoolers with SLI at the *NSDSK* was the inclusion criterion for this study. The indirect inclusion criteria for this study were the required admission criteria for a child's placement at the SLI intervention groups of the *NSDSK*. These admission criteria consist of speech-language pathology assessment of the native language, preferably performed at an Audiological Centre, which shows:

- Problems in language production as evidenced by a score lower than -1.5 standard deviation of the average on a standardized, norm-referenced language test, *and / or*
- Problems in language comprehension as evidenced by a score lower than -1.5 standard deviation of the average on a standardized, norm-referenced language test. If this is noted, preferably the developmental functioning of the child is assessed before placement.
- The hearing needs to be sufficient in order for speech and language to develop (Aarts, 2011) internal document *NSDSK*).

Before placement at one of the *NSDSK* intervention groups for preschoolers with SLI, the children's language skills and intelligence had been assessed. In 21 participating children language comprehension had previously been assessed using either the *Reynell Test voor Taalbegrip* (van Eldik, Schlichting, Iutje Spelberg, van der Meulen & van der Meulen, 1995) or the *Schlichting Test voor Taalbegrip* (Schlichting & Iutje Spelberg, 2010). Language production had been assessed in 9 children using the *Schlichting Test voor Taalproductie* (Schlichting, van Eldik, Iutje Spelberg, Van der Meulen & van der Meulen, 1995) or the *Schlichting Test voor Taalproductie-II* (Schlichting & Iutje Spelberg, 2010). Developmental functioning had been assessed in 16 children using the *Bayley Scales of Infant Development-II-NL* (Van der Meulen, Ruiter, Iutje Spelberg & Smrkovsky, 2002) or the *SON-R 2½-7* (Tellegen, Winkel, Wijnberg-Williams & Laros, 1998). Bi- or multilingual children were included in this study; 27% of the 3 intervention groups included in this study were bi- or multilingual. Ideally, bi- or multilingualism would have been an exclusion criterion for this study to exclude the possibility bi- or multilingualism is a confounding variable. However, with bi- or multilingualism as an exclusion criterion, the number of participating children would have been too low ($n = 16$) to perform the experiment.

In total 28 children visited the 3 intervention groups in the pretest phase. Prior to the pretest, children were excluded for several reasons: final placement was not certain yet ($n = 1$), visiting the intervention group 2 instead of 3 days ($n = 1$), placement was to be terminated during the vocabulary intervention phase ($n = 2$). At the beginning of the study 24 children were tested at pretest; 22 children were tested at posttest. Participation of 2 children was no longer possible, because placement at the intervention group was terminated ($n = 1$) and long absence from the intervention group ($n = 1$).

A letter containing information about this study with a consent form was distributed to the parents of the children. All of the children obtained parental permission to participate.

2.2.1. Random assignment

The children were categorized by language level. The different language levels used, are: a language age of 1;3 to 1;10 years; a language age of 1;11 to 3;0 years or a language age of 3;0 to 5;0 years. These language levels are based on the classification in language age used in constructing the *NSDSK Peuterpraat* theme wordlists (Kruythoff & Diender, 2011). The language level was determined per child individually by consulting the pretest results in combination with consultation with the treating group speech and language therapist. The distribution of language levels among the children per intervention group is shown in Table 2.1.

Table 2.1. Distribution language levels children.

	Experimental group			Control group		
	Language level GREEN (language age 1;3 – 1;10 years)	Language level RED (language age 1;11 - 3;0 years)	Language level PURPLE (language age 3;0 -5;0 years)	Language level GREEN (language age 1;3 – 1;10 years)	Language level RED (language age 1;11 - 3;0 years)	Language level PURPLE (language age 3;0 -5;0 years)
<i>Intervention group a</i>	<i>n</i> =0	<i>n</i> =2	<i>n</i> =2	<i>n</i> =1	<i>n</i> =1	<i>n</i> =2
<i>Intervention group b</i>	<i>n</i> =2	<i>n</i> =1	<i>n</i> =1	<i>n</i> =1	<i>n</i> =1	<i>n</i> =1
<i>Intervention group c</i>	<i>n</i> =1	<i>n</i> =1	<i>n</i> =2	<i>n</i> =0	<i>n</i> =2	<i>n</i> =1
Total	<i>n</i>=3	<i>n</i>=4	<i>n</i>=5	<i>n</i>=2	<i>n</i>=4	<i>n</i>=4

Every intervention group was randomly divided into 2 subgroups to form an experimental and a control group within the intervention groups. The children were randomly assigned to either participating in the experimental or the control group. In order to obtain the distribution of the language levels between the experimental and control group as equally as possible, the group of children was stratified by language level. The single children classified in language level green in the intervention groups 'a' and 'c', were added to the group of children with a language level red. In the program SPSS 18.0 a random sample of the children per language level was derived, with n = half of the total number of children in the concerning language level. The random samples per language level were combined together and this resulted in the experimental group ($n = 4$ per intervention group). The remaining children, not randomly selected by SPSS 18.0, participated in the control group (group a: $n = 4$; group b: $n = 3$; group c: $n = 3$). Between the experimental and the control group, the children did not differ significantly in age ($t(20) = .515, p = .612$); with in the experimental group ($n = 12$) a mean age of 3.4 years (SD of 5 months) and a mean age of 3.3 years (SD of 4 months) in the control group ($n = 10$).

2.3. Materials

2.3.1. Development vocabulary intervention protocol

The vocabulary intervention protocol is written in Dutch, as Dutch is the spoken language in the intervention groups. The format of the vocabulary intervention protocol is based on the professional product "7 Therapy plan" constructed by the Dutch *Studierichtingsleidersoverleg - Logopedie (SRO-L)* in 2005 (www.nvlf.nl). The content of the protocol is drawn according to the systematics of *International Classification of Functioning, Disability and Health (ICF)* or *International Classification of Impairments, Disabilities and Handicaps (ICIDH)*. Per session the sections initial situation, short-term goal, method, materials, outcome and points of interest are elaborated for the speech and language

therapist. In the method section, a script is written per session. The speech and language therapist is instructed to follow the scripts as literally as possible. The four-phase model for teaching new words by Verhallen and Verhallen (1994) forms the basis for the direct vocabulary intervention described in this protocol. The four-phase model consists of: the orientation, semantisation, consolidation and checking phase as shown in Table 2.2. In developing the protocol, the approach "Met Woorden in de Weer" by Van den Nulft and Verhallen (2009) based on the four-phase model has been consulted.

Table 2.3. The four-phase model according to Verhallen & Verhallen (1994).

Four-phase model	Purpose of the phase
1. Orientation	Creating a favorable starting position: the right context, activating pre-knowledge, involvement of the children.
2. Semantisation	Providing the new words contextually. Explaining word meaning.
3. Consolidation	Words and treated meanings are practiced; the words need to be embedded in the mental lexicon.
4. Checking	Every new word is reclaimed, passively and actively.

The four-phase model (Verhallen & Verhallen, 1994) is meant for children with a typical language development. The content of this protocol is aimed at children with SLI. Therefore, some specific aspects in learning new words for children with SLI are taken into account in this vocabulary intervention protocol. First, repetition is an important aspect in vocabulary intervention for children with SLI. According to Gray (2003) children with SLI need to be exposed to a new word twice as many than children with typical language development, to understand, imitate and produce a new word. In order to secure the aspect repetition in the vocabulary intervention protocol sufficiently, the number of sessions within the consolidation phase is large, namely 6 out of 12. Beside the emphasis on the consolidation phase, all the target words are included in the script in every session. The target words are at least repeated 12 times over the whole the intervention period. Second, semantic and phonological cues are included in the protocol. In the vocabulary intervention for children with SLI providing phonological as well as semantic cues help children learning new words (Owens, 2010). In the protocol script, phonological and semantic cues are formulated for each target word. In choosing the activities and materials for the sessions, the experiences of the children are taken into account. The vocabulary protocol consists of 12 treatment sessions in 4 weeks. The phases of the four-phase model are spread over the 12 sessions: the orientation phase in session 1; the semantisation phase in the sessions 2, 3 and 4; the consolidation phase in session 5, 6, 7, 8, 9 and 10 and the checking phase in the sessions 11 and 12.

Two versions of the vocabulary intervention protocol were developed. The fundamentals of the vocabulary intervention protocol are equal for both versions. The target words, method and materials are customized to the relevant theme. One version contains a custom script for the theme "Animals and Zoo", the other version contains a custom script for the theme "Summer". The chosen activities and materials are comparable between the two versions.

2.3.2. Selection target words for intervention protocol and matching test words

For the intervention protocol 25 target words were selected, 18 nouns and 7 verbs. The selection of the target words was derived from the *NSDSK* constructed *Peuterpraat* theme wordlists. The alphabetical *NSDSK* wordlists contain words from 3 different word classes (nouns, verbs and other). In the present study only words from the word classes nouns and verbs were selected. The words in the word class other were not testable; no suitable pictures were found to test these words reliably. A random sample of 6 nouns was selected per wordlist, 18 nouns in total. From the green and the purple wordlist 2 verbs were selected randomly. From the red wordlist 3 verbs were randomly selected, because it was expected most children had a language level of 1;11 to 3;0 years. In total 7 verbs were selected. These selected 25 words formed the target wordlist for the vocabulary intervention protocol.

In addition, 25 matching words were selected, also consisting of 18 nouns and 7 verbs. Primary, in selecting the matching words the *NSDSK* wordlists were consulted. If the number of the words on the *NSDSK* wordlists was insufficient to provide matching words, other wordlists were consulted. In the following order these consulted wordlists and databases were:

1. The *NSDSK* constructed (internal) database of words (Kruythoff & Diender, 2011).
2. The first 400 words added to the book *Taaltherapie voor kinderen met taalontwikkelingsstoornissen* (Van den Dungen, 2006). These words are based on the frequencies from the norm research ($n = 809$, from 1;3 to 2;3 years old) performed by Schlichting and Iutje Spelberg in 2002 executed for the *Lexilijst Nederlands*.
3. The *Basiswoordenlijst Amsterdamse Kleuters (BAK)* constructed by Mulder, Timman and Verhallen (2009).

These 25 words were matched to the target words considering the aspects frequency, word form and word length of the words as closely as possible. The selected target words and matching words per theme, i.e. 2 sets of 50 words were selected, are shown in the Appendix I.

2.4. Measures

The expressive vocabulary knowledge of the children ($n = 22$) of the set of 50 theme words in total (target + matching words) was tested before the intervention and after the intervention period. For the pre- and posttest illustrations corresponding the set of 50 words were selected via symbols from

Widgit software made in the computer program *Communicatie InPrint*® (www.eelkeverschuur.nl). Colored illustrations were selected and adjusted to one size: 6,5 to 8,5 centimeters. The researcher carried out the pre- and posttest. The pre- and posttest took place at the location of the respective intervention group; each child was tested individually in a quiet setting. The procedure of the pre- and posttest was equal. Before the actual test items were presented, the researcher started with two introduction items. These introduction items (nouns) were non-target words and high frequently short words: a CVC word: consonant-vowel-consonant. The researcher asked the child to name the illustration one by one. A complement phrase per illustration was presented, when the child did not give a response while the illustration was shown. Per word an appropriate complement phrase was constructed.

The words did not have to be pronounced correctly by the child, for example an illustration of a ball is shown and the child says: /ba/ instead of *bal* ('ball') this item is scored correct.

One week after ending the vocabulary intervention of 4 weeks, the posttest was performed. The researcher tested the expressive vocabulary with the same set of 50 words of the children ($n = 15$). The children who were absent the day the posttest was performed ($n = 7$), were tested by the group speech and language therapist the following day or week. The test forms were collected by the researcher or sent by mail.

2.5. Procedure

After the pretest was performed, the researcher instructed the group speech and language therapist in executing the protocol. The experimental group received vocabulary group intervention provided by the group speech and language therapist 3 times a week 15 minutes for 4 weeks long according to the protocol. In addition the experimental group ($n = 12$) received the usual care described in the *NSDSK* method for children with SLI provided by the 2 pedagogical staff and the speech and language therapist integrated during the day. The control group ($n = 10$) only received the usual care. The usual care provided at the intervention groups aimed at vocabulary consisted of daily activities in line with the current theme and interactive storybook reading. Prior to the beginning of a new theme, the pedagogical staff and the speech and language therapist have worked out the activities using the language method *Peuterpraat*. The activities become more difficult and more abstract during the theme period and in approaching the children the practitioners adapt to the children's own level. In addition, the practitioners offer gestures in supporting spoken words.

Two groups treated the theme 'Summer' and one group treated the theme 'Animals/Zoo'. During the intervention phase contact was maintained with the group speech language therapists by e-mail and telephone.

2.5.1. Clinical opinion practitioners

After the intervention period, the group speech and language therapists were asked to evaluate statements according to their experience with the vocabulary intervention protocol in an online questionnaire. The questionnaire is constructed with the answer options 'agree' and 'disagree'. The questionnaire was distributed by e-mail.

2.6. Analysis of the data

2.6.1. Test for normality

For this study the variables T1T: number of produced target words at pretest; T1M: number of produced matching words at pretest; T2T: number of produced target words at posttest and T2M: number of produced matching words at posttest were analyzed. In order to perform a statistic parametric test, the data must be normal distributed. The sample size is smaller than 30 ($n = 22$), therefore the data was explored and tested for normality. The small sample size is due to practical and organizational restrictions. Furthermore, the data is originally derived from binominal values, i.e. the vocabulary was tested with a score 1 (word produced) and a score 0 (word not produced). Thus, a normal approximation of the binominal distribution is assumed to analyze the data. According to Moore and McCabe (2005) a normal approximation of the binominal data could be used if the amount of successes (1) and failures (0) are larger than 5 in both samples. In this study, the amount for success or failure is 25, i.e. 25 target words and 25 matching words. Therefore, the data is analyzed with a normal approximation. Supporting the assumption of a normal approximation of the data the Shapiro-Wilk test was performed. The Shapiro-Wilk test showed a non-significant value ($p > .05$) for the variables T1T, T1M, T2T and T2M for both groups (experimental group and control group). This outcome implies a normal distribution of the data. Also, the test statistics W are close tot 0.90, i.e. from $W = .843$ tot $W = .981$. The Shapiro-Wilk test statistic W is ranged from 0 to 1, where the value 1 means a perfect normal distribution. If the test statistic W is 0.90 or higher, the data could be assumed to be normal distributed (os1.amc.nl).

Because of these findings, it was assumed the data is normally distributed and a repeated measures analyses of variance was used to analyze the data.

2.6.2. Experience clinical practitioners

The data obtained from the questionnaire is shown in a bar graph, which can be found in Appendix II. Per statement the responses, either 'agree' or 'disagree', from the three speech and language therapists are visualized.

3. Results

In the present study the aim is to provide an answer to the main research question:

“Will a 180 minutes uniform group intervention focusing on vocabulary enhance word learning in children with specific language impairment in the age of 2-4 years?” In this section, the results are reported attempting to answer this question and the following sub questions.

3.1. Results effects vocabulary intervention protocol on word learning

One of the participants scored 0 at both pre- and posttest, i.e. this participant did not produce any words. Therefore, this participant was defined as an outlier and removed from the data analysis.

Hence, the data of 21 participants in total were included in the analysis. The pre- and posttest scores were analyzed by conducting a repeated measures analysis of variance (ANOVA), with group (experimental-control) and language level as the between-subjects factors and time (pretest-posttest) and target versus matching words as the within-subjects factors. The alpha level was set at .05 (two-tailed).

The mean scores and standard deviations of the number of words produced at pre- and posttest are shown in table 3.1. As expected the children with a language level of 3;0 to 5;0 years produced more words than children with lower language levels. Also, children with a language level of 1;11 to 3;0 years produced more words than the children with a language level of 1;3 to 1;10 years. At pretest, the mean scores appear to be similar between the experimental and control group within the language levels. However, at posttest the means scores between the experimental and control groups seem to differ.

Table 3.1. Descriptive information for experimental and control groups.

		N	T1 (pretest)				T2 (posttest)				
			Target words		Matching words		Target words		Matching words		
			Mean	SD	Mean	SD	Mean	SD	Mean	SD	
Language level	Experimental group	3	1.3	1.5	1.7	1.5	5.0	2.0	4.0	1.0	
	Control group	1	1.0	0	0	0	3.0	0	3.0	0	
1;3-1;10 years	Experimental group	4	7.8	3.3	6.3	3.5	12.8	4.0	9.5	4.4	
	Control group	4	9.3	1.9	7.5	3.1	10.3	1.3	12.3	2.1	
Language level	Experimental group	5	14.0	2.5	14.8	1.3	21.6	2.3	17.2	2.6	
	Control group	4	13.0	0.8	14.3	3.6	14.5	2.4	16.9	2.3	
3;0-5;0 years		4	13.0	0.8	14.3	3.6	14.5	2.4	16.9	2.3	
Total		21									

The main effects of the factors group [$F(1,15) = .864$; $p = .367$; $\eta_p^2 = .054$] and target versus matching words [$F(1,15) = 1.041$; $p = .324$; $\eta_p^2 = .065$] were not significant. However, the main effects of time [$F(1,15) = 41.403$; $p < .05$; $\eta_p^2 = .734$] and language level [$F(2,15) = 54.030$; $p < .05$; $\eta_p^2 = .878$] were significant. Hence, there was an increase in produced words from pretest to posttest and the three language level groups differed significantly from each other in the number of produced words. Next, the results from the interaction effects of interest for the present study are shown in table 3.2.

Table 3.2. Summary of results of analysis of variance.

Effect	df	F	Prob	Partial Eta Squared
Interaction				
Time × group	1	2.621	.126	.149
Time × langlevel	2	.167	.848	.022
Time × group × langlevel	2	.708	.508	.086
Time × targmatch	1	.375	.549	.024
Time × group × targmatch	1	9.196	.008	.380
Time × langlevel × targmatch	2	2.460	.119	.247

There was only one interaction significant; the interaction between the factors time, group and target versus matching words [$F(1,15) = 9.196$; $p < .05$; $\eta_p^2 = .380$]. Thus, the experimental and control group differed significantly in the number of target words versus matching words after the intervention period. Looking at the mean scores shown in table 3.1, the direction of this interaction indicates that the experimental group produced more target words than the control group after intervention. In producing matching words however, the experimental group did not produce in all cases more matching words compared to the control group.

3.2. Results average new words learned

One of the sub questions of this study was: “How many new words do children with specific language impairment in the age of 2-4 years learn in 4 weeks out of a set of 50 words?”

The participating children ($n = 22$) in this study learned on average 6.55 new words (SD = 4.31) out of 50 words, with a minimum of 0 and a maximum of 17 words. Per language level the mean value of new words learned including their standard deviation and range are presented in Table 3.3.

Table 3.3. Mean values, standard deviations and ranges for number of new words learned per language level.

	<i>n</i>	<i>M</i>	<i>SD</i>	<i>Range</i>
Language level 1;3 to 1;10 years	5	4.60	3.58	0.00 – 10.00
Language level 1;11 to 3;0 years	8	7.00	4.47	1.00 – 14.00
Language level 3;0 to 5;0 years	9	7.22	4.66	0.00 – 17.00

3.3. Results learning new verbs

Because children with SLI have especially difficulty learning new verbs, the data concerning the verbs only were also investigated. The sub question “How many new verbs do children with specific language impairment in the age of 2-4 years learn in 4 weeks out of a set of 14 verbs?” was answered by investigating the number of verbs at pre- and posttest. The number of verbs included in this study was too small to analyze statistically; therefore the data concerning verbs were explored only.

The participating children ($n = 22$) in this study learned on average 2.00 new verbs ($SD = 2.49$) out of 14 verbs, with a minimum of -3 and a maximum of 7 verbs. The mean values and standard deviations of the number of verbs produced at pre- and posttest are shown in table 3.4. Both groups show a small increase in produced verbs after intervention. However, for the experimental group the mean values do not appear to differ between target and matching verbs.

Table 3.4. Descriptive information on verbs for experimental and control group.

	<i>N</i>	<i>T1 (pretest)</i>				<i>T2 (posttest)</i>			
		<i>Target verbs</i>		<i>Matching verbs</i>		<i>Target verbs</i>		<i>Matching verbs</i>	
		<i>Mean</i>	<i>SD</i>	<i>Mean</i>	<i>SD</i>	<i>Mean</i>	<i>SD</i>	<i>Mean</i>	<i>SD</i>
Experimental group	12	2.25	1.96	2.10	1.62	3.67	2.50	3.17	2.21
Control group	10	1.80	1.62	2.40	2.27	2.30	1.95	3.30	1.83
Total	21								

3.4. Results evaluation of protocol statements speech and language therapists

In answering the sub question: “What is the clinical opinion of 3 speech and language therapists about working with a uniform group intervention focusing on vocabulary during 4 weeks?” the speech and language therapists were asked to answer to 20 statements about the vocabulary intervention protocol. When all the groups finished the intervention phase these statements were distributed among the speech and language therapists. Answer options to the statements were: ‘agree’ and ‘disagree’. The complete overview of the results is shown in a bar graph in Appendix II. The opinions of the speech and language therapists corresponded with each other for 13 out of the

20 statements (65%), their opinions differed in 7 out of 20 statements (35%). In general, all 3 speech and language therapists found the vocabulary intervention protocol suitable for preschoolers with SLI within the *NSDSK*. In executing the protocol, 2 speech and language therapists indicated to find it difficult to follow the script to the letter. All 3 speech and language therapists agreed in the statement "I have presented more phonological than semantic cues to the children." One speech and language therapist indicated she found the amount of selected target words too little. She specified this by: "the amount of words for the language levels 1;11 to 3;0 and 3;0 to 5;0 years was too little and for the language level 1;3 to 1;10 years sufficient." The other 2 found the amount of selected target words sufficient. Other statements the speech and language therapists differ in opinion are: "I find the duration of the vocabulary intervention sufficient (4 weeks)." and "I find the duration of 1 session (15 minutes) sufficient." One speech and language therapist disagreed with the first statement and 2 speech and language therapists disagreed with the second statement. One speech and language therapist disagreed with the statement "The element 'repetition' of the provision of the target words was insufficiently present in the protocol." One speech and language therapist added a remark that session 11 (checking receptive word knowledge) was not challenging enough for the children, because the protocol was at its end. The chosen activities were described as 'fun' and 'appealing'.

3.5. Summary of the results

The number of produced words turned out to be comparable between the experimental and control group at pretest. Therefore, the starting point in produced words for both groups was similar. Both groups (experimental and control) showed an increase in produced words after 4 weeks intervention. Significant between group differences, i.e. between experimental and control, were not found for the number of words at pre- and posttest. However, the number of words at pre- and posttest did significantly differ for the different language levels. The group who received vocabulary intervention by the protocol learned significantly more new target words after intervention than new matching words. The control group did not show a significant difference between target and matching words learned.

The results also show that preschoolers with SLI learn on average 6 new theme words out of a set of 50 words in 4 weeks. The participated children with a language level of 1;3 to 1;10 years learned below this average number of words (on average 4 new words) at group level, the children with a language level of 1;11 to 3;0 years learned on average 7 at group level and the children with a language level of 3;0 to 5;0 years learned also on average 7 new words at group level.

The average number of new verbs learned by preschoolers with SLI is 2 out of 14.

On most statements concerning the protocol, i.e. two third, the speech and therapists are in agreement. The speech and language therapists find the protocol suitable for preschoolers with SLI within the *NSDSK*. One of the statements the speech and language therapist disagree on, concerns the number of words to select. The speech and language therapists also disagree in the difficulty of executing the protocol.

4. Discussion

This study aimed to (1) develop and implement a uniform vocabulary intervention protocol for preschoolers with SLI (2) compare the number of new words learned in preschoolers with SLI who received direct vocabulary intervention according to the developed protocol in addition to the usual care (the experimental group) with SLI preschoolers who received the usual care only (the control group) (3) to examine how many words (nouns and verbs) and verbs only preschoolers with SLI learn in 4 weeks from a set of 50 words, and (4) to evaluate and summarize the experience of the speech and language therapists in working with the vocabulary intervention protocol. The number of theme words, out of 50 words, produced by the preschoolers with SLI was obtained by pre- and posttest assessment through a picture naming task. The results of the 12 children in the experimental group and 10 children in the control group were analyzed using repeated measures ANOVA to establish between-group and within-group differences.

Results reveal a significant difference between the number of words produced at pretest versus posttest, in that the number of words produced at posttest is higher. This finding could be accounted to spontaneous developmental vocabulary growth of the children. Furthermore, both groups received vocabulary intervention, as in the usual care, and were exposed to the theme words at the intervention groups. The usual care provided by the *NSDSK* early intervention groups together with developmental vocabulary growth presumably contributed to the increase of the number of produced words.

The children who received vocabulary intervention according to the protocol produced more target words than matching words at posttest. This difference in target and matching words does not apply for the control group. These results suggest that the developed vocabulary intervention protocol enhances expressive word production in young children with SLI. Furthermore, the speech and language therapists indicated this protocol is suitable for preschoolers with SLI at the *NSDSK* early intervention groups. Children with SLI have difficulties in learning new words without direct teaching (Brackenbury & Pye, 2005). This protocol with the Verhallen and Verhallen (1994) four-phase model implemented secures the direct vocabulary intervention. In addition, a sufficient vocabulary is an important predictor for learning to read (Muter et al., 2009). To optimize word learning in

preschoolers with SLI, direct vocabulary intervention according to the principles by this protocol is recommended. Therefore, the vocabulary gap at school age between SLI children and their typically developing peers could be reduced.

The number of produced words differed significantly between the 3 language levels groups. This was to be expected, because different language levels of the children would expect different scores. For example it is expected a child with a language level of 1;3 to 1;10 years produces little or no words belonging to the language level of 3;0 to 5;0 years, at the contrary a child with a language level of 3;0 to 5;0 years is expected to produce words of the language levels 1;3 to 1;10 and 1;11 to 3;0 years and therefore obtain a higher score. According to the results, the children with the youngest language level did produce the least words compared to the older language levels.

In this study, the children with a language level of 1;3 to 1;10 years who received the vocabulary intervention according to the protocol, did not benefit as much as their fellow group members with higher language levels. There are some possible explanations to consider in this finding. First, the number of participants with a language level of 1;3 to 1;10 years in this study was small ($n = 5$) compared to the higher language levels: $n = 8$ for 1;11 to 3;0 years and $n = 9$ for 3;0 to 5;0 years. One of the children in the youngest language level group did not produce any words and was therefore identified as an outlier. This small sample size ($n = 4$) could result in the data not to be sufficiently representable. Secondly, within this language level group, the highest dropout rate was reported, i.e. 3 children missed 4 or more sessions. That is, these children missed one third or more of the intervention by the protocol. Children with SLI need more exposures of words than their typically developing peers in learning new words (Gray, 2003). The children with the youngest language level in this study might have produced more words when they had been exposed more to the words. Finally, the content of the vocabulary intervention could have been inefficient for this language level group of children. Although the speech and language therapists responded positively to the statement "I find the vocabulary intervention according to this protocol suitable for children with a language level of 1;3 to 1;10 years", they reported during the execution of the intervention protocol that children with a language level of 1;3 to 1;10 years found it more difficult in keeping the pace than the other children. In expressive vocabulary intervention the language level of the child need to form the base for the chosen target words. The structure of the mental lexicon could develop inadequately if the chosen target words are too high in language level for the child (Van den Dungen, 2006). Therefore, differentiation of the intervention in vocabulary is very important. This present study reveals that children in the two highest language levels could benefit from this vocabulary intervention protocol and children with a language level 1;3 to 1;10 years not so evidently. One could hypothesize that direct vocabulary intervention for children with SLI and a language level of 1;3 to 1;10 years needs to contain different methods and activities than the direct vocabulary intervention

for children with SLI and higher language levels. Further research into the effects of direct vocabulary intervention and the different language levels is recommendable.

The non-significant difference found for the main effect for group (experimental and control) suggest that this vocabulary intervention protocol does not ensure generalization in word learning for children with SLI. Furthermore the experimental group producing more target than matching words at posttest supports that generalization does not appear. These findings corresponds to Sheng & McGregor (2010), Brackenbury & Pye (2005) and Steele & Mills (2011) who reported children with SLI have difficulties in incidental word learning and need an additional direct vocabulary intervention approach. This result supports the fact implementing the vocabulary intervention protocol within the *NSDSK* method warrants direct vocabulary intervention.

Per language level wordlists by the *NSDSK* target words were selected for this vocabulary intervention protocol: 6 nouns per language level wordlist, 2 verbs from the language levels 1;3 to 1;10 years and 3;0 to 5;0 years wordlists and 3 verbs for the language level 1;11 to 3;0 years wordlist. This means that for the language levels 1;3 to 1;11 years and 3;0 and 5;0 years a set of 8 target words and for the language level 1;11 to 3;0 years a set of 9 target words was provided in the corresponding language level for the child. However, the children did not only learn new words belonging to their own level, but target words from other language levels were learned as well. In order to reach a sufficient vocabulary for the age of 4, with the lower limit set at 1000 words according to Verhallen & Verhallen (1994), the average number of 6 new words in 4 weeks is not sufficient ($1.5 \text{ words a week} \times 52 \text{ weeks} = 78 \text{ words a year}$). To implement this practically, increasing the vocabulary intervention protocol sessions by doubling (6 sessions of 15 minutes a week instead of 3 sessions of 15 minutes a week) is advisable and more than 25 target words should be presented to the children.

Finally, the number of new verbs learned was scrutinized separately, because children with SLI appear to have difficulties especially in learning new verbs (Brackenbury & Pye, 2005; Steele & Mills, 2011). Therefore, the importance of enhancing verb learning is essential in vocabulary intervention for children with SLI. However, exploring the data of the number of verbs learned in this study indicates that the vocabulary intervention protocol does not enhance verb learning in children with SLI. At this point, the vocabulary intervention protocol needs to be revised. Strategies explicitly aimed at new verb learning need to be included in the protocol and need to be investigated in future research.

4.1. Evaluation protocol

For this study a vocabulary intervention protocol was developed for children with SLI visiting the *NSDSK* young intervention groups. After evaluation with the speech and language therapists and

analysis of the data, this version of the protocol turns out not to be fulfilling yet. In further research the appropriate number of target words to provide for the different language levels of the children should be examined. The emphasis on providing strategies for preschoolers with SLI in learning new verbs need to be revised in the protocol and elaborated. In addition, the speech and language therapists indicated that they used more phonological cues than semantic cues in the intervention. However, Gray (2005) found that preschoolers with SLI benefit from both phonological as semantic cues and this author hypothesized that using both cues together could be better than either alone. In practice semantic cues were not or rarely provided for the young children. However, in the protocol both phonological as semantic cues were elaborated per target word per session. Perhaps, the speech and language therapists could formulate semantic features and cues for target words before intervention themselves. This could enhance their awareness in semantic features and cues of words. In addition, theoretical information and relevance of the use of both phonological and semantic cues might enhance the use of semantic cues by speech and language therapists during vocabulary intervention.

Another discussion point is the duration and intensity for a direct vocabulary intervention within a theme. Marulis and Neuman (2010) performed a meta-analysis investigating the effect of vocabulary intervention in word learning in young children. One of the aspects they investigated was the dosage of the intervention. Effect sizes were calculated for duration, frequency and intensity. For all three aspects longer interventions (more than 8 weeks, more than 18 sessions and more than 20 minutes) did not result in larger effects. Therefore, this meta-analysis implies a smaller dosage of intervention possibly results in vocabulary expansion (Marulis & Neuman, 2010). The dosage of the protocol developed for this study was small, i.e. less than 8 weeks, less than 18 sessions and shorter than 20 minutes. With this amount of dosage of the intervention the children who received intervention by the protocol did benefit from the intervention.

4.2. Limitations present study

In the present study, there are some limitations, which should be regarded while discussing these results. First, the researcher had no access to the treatment information files of the children. Therefore, the assumption all participating children had a primary language impairment was made based on the available information. If children with a speech and language delay instead of impairment participated in this study, the results could be skewed, i.e. these children might produce more words than children with SLI. Especially for bi- or multilingual children the distinction between a speech and language delay and a speech and language impairment is difficult to establish. For this study it was assumed the participating children had specific language impairment.

Second, the experiment was performed in the months June and July so children ($n = 3$) in the experimental group missed multiple sessions (range from 4 to 7 sessions) because they left for a holiday. Another child ($n = 1$) missed 3 sessions because of illness. Therefore, these children did not receive the exposure as described in the protocol.

Third, it would have been better to perform a pilot in the picture-naming task used in the pre- and posttest. Therefore, unclear pictures and pictures with multiple interpretations could have been identified prior to this study. For the pre- and posttest for the theme 'Animals/Zoo' the pictures for *schrikken* "to scare" and *voer* "the feed" the children did not produce the target words adequately. For the pre- and posttest for the theme 'Summer', the pictures for *vakantie* "holiday", *hollen* a synonym for "to run" and *zwemles* "swimming class" seemed to be difficult for the children to produce. Another threat to the reliability of the picture-naming task was that some children scored a 1 for a particular word at pretest and a 0 for the same word at posttest. This could also be a result of unclear pictures. A pilot study of the picture-naming task could have reduced these problems.

Fourth, the set of words tested at pre- and posttest was equal. This could result in a learning effect. However, a control group was included in this study to overcome a possible learning effect.

Finally, the vocabulary intervention protocol was executed at 3 intervention groups, where 2 groups were engaged in the same theme ('Summer') and 1 group was engaged in a different theme ('Animals/Zoo'). This was due to dependence of the year planning of the groups. A more ideal situation would have been to include 3 groups who received the same theme intervention and target words. An alternative could be to include 3 groups who treat 3 different themes to establish the independency of the different theme words.

5. Conclusion

This study provides evidence for a 4 weeks direct vocabulary intervention protocol with the Four-phase model by Verhallen and Verhallen (1994) as framework, in enhancing word learning in preschoolers with SLI. Children with SLI and a language level below 1;11 years do not seem to benefit as evidently from the direct vocabulary intervention than the children with higher language levels. Further research in vocabulary intervention and the different language levels is recommended to establish whether it is necessary adjusting vocabulary intervention to the different language level(s). In the present study, learning new verbs in children with SLI was slightly enhanced. However, the increase in verbs was comparable in children with SLI who received the direct vocabulary intervention compared to the children with SLI receiving usual care. Further research in examining effective strategies for learning new verbs should provide more evidence to include in vocabulary intervention.

Despite the intensive direct intervention, the amount of new words learned by preschoolers with SLI is still insufficient to approach or to close the vocabulary gap entirely compared to typical language development peers at school age. Therefore the adequate number of selected words for intervention, adjusted per language level, requires further investigation in future research.

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Appendix I

Selected target and matching words per theme

Theme 'Animals/Zoo'

Target words green	Mond	Buik	Vogel	Vis	Aap	Haar	Eten	Hap	
Matching words green	Neus	Oog	Konijn	Beer	Eend	Teen	Drinken	Plassen	
Target words red	Bek	Giraffe	Olifant	Dier	Tand	Leeuw	Springen	Zwemmen	Likken
Matching words red	Nek	Pinguïn	Krokodil	Poot	Tong	Slang	Schrikken	Vliegen	Rollen
Target words purple	Haai	Hol	Hoorn	Voer	Kangoeroe	Slurf	Graven	Brullen	
Matching words purple	Dolfijn	Kooi	Zeehond	Boomstam	Nijlpaard	Zebra	Sissen	Krabben	

Theme 'Summer'

Target words green	Eend	Bloem	Broek	Boot	Bal	IJsje	Spelen	Pakken	
Matching words green	Hond	Boom	Bril	Tas	Bad	Koekje	Lopen	Kijken	
Target words red	Druppel	Tuin	Badpak	Glijbaan	Wolk	Vakantie	Hollen	Zwemmen	Klimmen
Matching words red	Schommel	Pet	Handdoek	Speeltuin	Zand	Caravan	Likken	Glijden	Trekken
Target words purple	Zonnebrandcrème	Tuinslang	Schaduw	Zwemband(je)	Zwemles	Weer	Drijven	Zinken	
Matching words purple	Motorboot	Roeiboot	Springtouw	Zomerjurk	Zeilboot	Golf	Schijnen (zon)	Wippen	

Appendix II

Bar graph statements vocabulary intervention protocol

