CHILD LANGUAGE
TEACHING & THERAPY

Child Language Teaching and Therapy

Contents

Efficacy of the Lexicon Pirate strategy therapy for improving lexical learning in school-age children: A randomized controlled trial
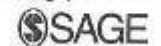
Hans-Joachim Motsch and Dana-Kristin Marks
University of Cologne, Germany

Abstract
Lexicon Pirate was originally developed as a strategy intervention programme to treat lexical disorders of pre-school children. To evaluate the therapy's effectiveness for school-age students, a randomized controlled trial (RCT, $N = 157$) was conducted. Based on a pre–post-test design, the programme's impacts were compared with a control group (CG) that did not receive the strategy training. Potential long-term impacts were analysed with a follow-up test (four months after the intervention was completed). Therapeutic success is interpreted by an improved performance in standardized tests compared to the CG. The experimental group (EG) made significant to highly significant progress on both lexical and syntactical levels. The improvements of the EG are statistically significantly higher compared to the control group's performance (exception: Subtest 1, P-ITPA). Consequently, the trial proves the advantages of this strategy therapy compared to the CG, finding that the Lexicon Pirate is an effective approach for treating lexical disorders of school-age students.

I Introduction

I Lexical disorders in children with specific language impairment

Specific language impairment (SLI) is characterized by delayed, inconsistent and desynchronized language acquisition in children with age-adequate nonverbal cognitive skills, normal hearing

Corresponding author:
Hans-Joachim Motsch, Department of Speech and Language Pathology, University of Cologne, Klosterstrasse 79b, D-50931 Cologne, Germany.
Email: j.motsch@uni-koeln.de

abilities and no obvious sign of neurological damage (Leonard, 2014; Schwartz, 2009). Additionally, (morpho-)syntactic or phonological deficits, as well as difficulties in the acquisition of vocabulary are common symptoms of (specific) language impairment (McGregor et al., 2013; Schwartz, 2009). A late onset of first words can be seen as a first indication of (S)LI (McGregor et al., 2002). Consequently, children who suffer from lexical disorders commonly know fewer words than their peers and thus show a deficit in the breadth of word knowledge, i.e. at a quantitative level (McGregor et al., 2013; Rupp, 2013). But there may also be deficits in the quality (depth) of stored lexical knowledge, encompassing: the semantic and/or phonological representations of words, little categorical knowledge and entries that are insufficiently linked within the complex networks of the mental lexicon (McGregor et al., 2002, 2013). These deficits often result in retrieval difficulties and naming errors as a result (McGregor, 2009; Messer and Dockrell, 2006). Thus, lexical disorders may cover both, a receptive deficit as well as an expressive deficit.

Lexical disorders (also called lexical deficits, vocabulary deficits, vocabulary difficulties) often persist into adulthood (Clegg et al., 2005; Stothard et al., 1998; Tomblin et al, 2003). Problems tend to become increasingly pronounced at school age, when these children experience word-finding difficulties (McGregor, 2009) as well as difficulties in understanding verbal analogies (Masterson and Perrey, 1994), abstract terms and figurative language (Norbury, 2004). Thus, the problems of children with lexical disorders also manifest themselves in discourse (German, 2002; Stiegler and Hoffman, 2001).

The importance of students' lexical abilities is not to be underestimated since lexical deficits can affect students' grammatical and communicative-pragmatic development, as well as their social development and academic performance (Dollinger et al., 2008; Leonard, 2014). With increasing age, these children often do not meet expectations with regard to the use of abstract and flexible vocabulary, or associated skills of analysing and reasoning (Dollinger et al., 2008; Glück, 2003). Taking into account that normally developing peers learn approximately 3,000 new words a year (Rothweiler, 2001), children with SLI are at great risk of continually lagging behind their normally developing peers on measures of vocabulary.

Consequently, an effective therapy for children with lexical disorders, whether quantitative-qualitative or receptive-expressive, must achieve transfer to untrained words in a time-limited therapy setting. Therefore, it is important that students are enabled to learn autonomously (Kannengieser, 2012; McGregor, 2009; Motsch and Brüll, 2009; Ulrich, 2012).

2   Intervention for lexical disorders

Although researchers agree on the importance of lexical performance, little research exists on the effectiveness of specific therapy approaches concerning school-age children with lexical disorders. Comparing and evaluating the quality of previous studies is difficult due to major differences in the way in which data were gathered and reported in these studies. Generally, most of the studies can be assigned to the evidence levels III or IV (Oxford Centre for Evidence-based Medicine, 2009), which do not represent the highest quality levels of research. Additionally, various methodological limitations lead to an insufficient data base:

- The sample sizes in the studies are often too small ($N \leq 10$) or are (single) case studies; e.g. Easton et al., 1997; McGregor, 1994; McGregor and Leonard, 1989; Marks and Stokes, 2010; Norbury and Chiat, 2000.
- Sufficient comparability is not given due to missing or inadequate control groups; e.g. Best, 2005; Ebbels et al., 2012; Parsons et al., 2005; Stiegler and Hoffman, 2001.

- Some studies do not take into account long-term effects which could be measured by follow-up tests; e.g. Justice et al., 2005; Stiegler and Hoffman, 2001; Wing, 1990; Zens et al., 2009.
- In other studies the intervals for measuring long-term effects are too short; e.g. Best, 2005; German, 2002; McGregor and Leonard, 1989; Sim, 1998.
- Most studies show an (immediate) impact on trained words; e.g. Best, 2005; Bragard et al., 2012; Easton et al., 1997; Justice et al., 2005; German, 2002; Hyde Wright, 1993; McGregor, 1994; McGregor and Leonard, 1989; Marks and Stokes, 2010; Sim, 1998; Wittmann, 1996. As has already been pointed out, however, transfer effects on untrained words should be the primary goal of any successful intervention.
- Furthermore, standardized and normalized assessment tools should be used in order to evaluate whether students manage to narrow the gap to their peers; e.g. Test of Word Finding-3, German, 2014; Wortschatz- und Wortfindungstest 6-10, Glück, 2011. Only a few studies have made use of such tests so far; e.g. Ebbels et al., 2012; Easton et al., 1997; Munro et al., 2008; Wing, 1990.

Most of the studies mentioned above evaluate therapy concepts that focus on semantic and/or phonological elaboration. In a systematic review of the literature, Glück (2003) pointed out that the success of this type of treatment is judged to be limited, especially with respect to long-term generalization effects. Bragard et al. (2012) support these findings. They conducted a multiple-single-case study on combined phonological and semantic elaboration therapy, but did not find generalization effects. Bragard et al. (2012) suggest that therapy with school-age children with word-finding difficulties should, therefore, primarily focus on everyday language. However, this study does not discuss the possibility of achieving generalization effects by teaching suitable lexical learning strategies focused on each student's individual symptoms.

In consideration of missing long-term generalization effects, other researchers suggest forms of intervention that focus on individual lexical learning strategies (strategy approach). This approach intends to help students expand their vocabulary independently, to deepen their semantic and phonological knowledge of individual words where necessary, and to gain access to existing lexical entries. First, it is important to change the students' reaction when they fail to understand or fail to retrieve a word, so that they become aware of their problem as well as of ways in which they can tackle this problem. In a second step, the students need to learn strategies of storing and retrieving words more effectively and how to apply these strategies in everyday life (for a comparison of an elaboration therapy and a strategy therapy, see Motsch et al., 2015).

Intervention studies by McGregor and Leonard (1989), Wing (1990), Hyde Wright (1993), Wittmann (1996), Easton (1997) and German (2002) consider individual strategy elements. In the strategy approach, Word-Finding Intervention Program (WFIP), German (1992, 2005) takes into account different aspects of treatment, such as a remediation component or self-advocacy instruction. For each aspect, detailed information is given on how to teach relevant strategies, such as the conscious use of a rehearsal strategy or a reflective pause. More recent studies also contain strategic elements such as a 'How do we learn new words?' worksheet (Parsons et al., 2005: 46), a 'word bank book' (Parsons et al., 2005: 47) or a dice listing phonological and semantic retrieval strategies (Ebbels et al., 2012). These interventions confirm therapeutic effects of the strategy approach and include first indications of generalization effects (for an overview, see Ulrich, 2012). However, in addition to methodological restrictions such as the ones reported earlier, these studies also leave many questions unanswered. They only include some strategic elements and do not deliver a detailed strategy therapy concept over several sessions. The only exception is the WFIP (German,

1992, 2005), which has only been evaluated in small case studies (German, 2002). There is still a great need for research to evaluate interventions that teach strategies for word learning and retrieval.

In 2009 and 2010, a large randomized control trial (RCT) was conducted with pre-school-age children to empirically test the effectiveness of the newly developed Lexicon Pirate lexical strategy therapy (Motsch, 2008). The results indicate that in just 13 therapy sessions, Lexicon Pirate can treat lexical disorders in pre-school children more successfully than the classic elaboration approach, especially with regard to long-term effects (up to one year after therapy completion) and generalization to non-targeted words (Motsch and Ulrich, 2012; Ulrich, 2012). An evaluation of the therapy's effectiveness for school-age children could also prove to be very valuable. Impacts on school-age children might be expected to be greater in comparison to impacts on pre-school-age children since the metacognitive and metalinguistic abilities of school-age children would be more advanced and they might be expected to be more open to a strategic lexical approach (Büttner, 2003; Glück, 2003).

As already discussed, the problems of school-age children with lexical disorders also become manifest in discourse. Therefore, therapeutic success should not only be measured by improving performance in picture naming tasks (Stiegler and Hoffman, 2001). Advanced lexical skills, such as retrieving different semantic relations by finishing sentences, associating to verbally presented sentences, or sentence comprehension skills should also be measured. Intervention studies that take into account improvement of those skills are scarce.

For school-age children, peers become an increasingly important reference, and the question can be raised whether and how peers can be used for therapeutic purposes. Some evidence for a positive influence of peer support has already been found (e.g. Berg, 2013). In the strategy approach Lexicon Pirate, children are encouraged to learn from role models and so it will be useful to evaluate the effectiveness of this approach in small groups to assess whether peers can serve as a model and support each other in applying lexical strategies. If this were the case, small groups would profit from the intervention to a larger extent than children who were trained individually. In the German school system, children with SLI are taught in special schools for students with severe language impairments, which are designed to help them make academic progress and ameliorate their speech and language abilities. There they can benefit from optimized instruction in the class-room as well as therapy and support lessons in single or small groups. The language intervention classes are conducted by especially qualified teachers who focus on including specific speech and language therapy methods in their didactic concept. A large number of the students with vocabulary disorders attend these schools. Because of limited financial and human resources at the schools, support lessons in small groups can often be integrated more easily into their organizational structure. Effective therapy in small groups could be an interesting alternative to the commonly used therapy setting with only one child. Hence, intervention studies that focus on the effectiveness of therapy in (small) groups are needed (Ebbels et al., 2012).

3 Aims of the study

Based on the current state of research, this study addresses the following questions:

1. Does the Lexicon Pirate strategy therapy help in improving the lexical skills of school-age children? This hypothesis is corroborated if the effects manifest as a significant improvement over time in standardized expressive vocabulary assessments (WWT 6-10; Glück, 2011). As in the preceding study of Lexicon Pirate (Motsch and Ulrich, 2012), size of expressive vocabulary was chosen as the primary dependent variable to show generalizing effects of the intervention. If the generalization was assessed through receptive vocabulary size, qualitative deficits in the storage of lexical entries could be overlooked since

entries – which are often stored incompletely – may be sufficient for the understanding but not for the production of words. 'The expressive vocabulary is the stronger diagnostic criterion for measuring generalizing effects' (Motsch and Ulrich, 2012: 162).

2. Does therapy at the lexical level also have an impact on the sentence level, as demonstrated by significant increases in scores on the *Sprachstandserhebungstest* (SET 5-10, Petermann, 2010; this is a German test of sentence comprehension) and on the *Potsdam-Illinois Test für Psycholinguistische Fähigkeiten* (P-ITPA, Esser et al., 2010; this is a German test in which the child is asked to complete sentences and thereby retrieve semantic relations and to report on associations with presented sentences)?

3. Do any generalization effects that have been achieved through the intervention demonstrate significantly greater increases in scores on the WWT, P-ITPA and SET compared to an equivalent control group?

4. Do any intervention effects in children trained with the Lexicon Pirate differ depending on whether therapy is delivered individually or to small groups?

II Method

1 Research design

A randomized controlled trial was conducted (RCT, $N = 157$) to evaluate the effectiveness of the Lexicon Pirate therapy concept (Motsch, 2008), which was modified for school-age children. Based on a pre–post-test design, the therapy's impacts were compared with a control group (CG) that did not receive the therapy. Potential long-term impacts were analysed with a follow-up test that was administered four months after the intervention's completion. In addition, the research design includes a variation of the setting in the experimental group (EG 1: individual therapy; EG 2: small group therapy, $n = 2$).

2 Selection of participants

A total of 212 third graders from special schools for children with SLI in the German state of North Rhine-Westphalia took part in the clinical selection procedure for the study. Speech and language therapists tested every child individually, and children with a diagnosed lexical deficit were included in the study. Lexical deficits were measured by the *Wortschatz- und Wortfindungstest für Sechs- bis Zehnjährige* (Test of vocabulary size and word-finding abilities for children between six and ten, WWT 6-10; Glück, 2011). The WWT 6-10 is a standardized (computer-based) picture-naming and pointing test for school-age children consisting of nouns and category nouns, as well as verbs and adjectives (evoked by the opposite). It measures both expressive and receptive vocabulary size. Children scoring at least 1 SD below the mean (i.e. *t*-score of less than 40) on the expressive section of the test are diagnosed as lexically disordered.

A total of 157 students with diagnosed lexical disorders participated in the study. At T2 and T3, four children could no longer be included in the tests because they had moved away or had a long-term illness. These four children were excluded from all of the analyses reporting the degree of change between T1 and T3. Consequently, the final sample size after T3 is 153 children (EG: $n = 76$, CG: $n = 77$).

3 Pre-tests

In order to verify whether any improvement in lexical skills also has a positive influence on sentence comprehension, all children were tested with the subtest *Handlungssequenzen* (Acting

Sequences) of the *Sprachstandserhebungstest für Fünf- bis Zehnjährige* (Test of language development for children between five and ten, SET 5-10; Petermann, 2010). This subtest assesses sentence comprehension with an object manipulation method (acting out verbally presented sentences) such as *Das Mädchen klettert auf den Baum, obwohl der Baum im Wind schwankt* ('The girl climbs up the tree even though the tree is swaying in the wind').

Moreover, retrieval skills for semantic relations were measured in a sub-sample ($n = 86$) using two sub-tests from the *Potsdam-Illinois Test für Psycholinguistische Fähigkeiten* (Potsdam-Illinois test for psycholinguistic abilities, P-ITPA; Esser et al., 2010: Forming Analogies and Vocabulary subtests). Both subtests from the P-ITPA measure retrieval skills of different semantic relations by requiring the participants to finish sentences or associate verbally presented sentences (form analogies or associate antonyms [opposites] or meronyms [parts of the whole] such as *Eine Fee ist gut, eine Hexe ist …* ('A fairy is good, a witch is …') or *Ich denke an etwas, das hat eine Flamme. Was könnte das sein?* ('I'm thinking of something that has a flame. What could it be?').

Furthermore, the capacity of the phonological loop was tested by the Number Recall subtest; and, as a proxy for cognitive abilities, the Triangles Subtest of the Kaufman Assessment Battery for Children (K-ABC, German Edition: Melchers and Preuss, 1991) was used.

4   Randomized assignment of groups

A total of 157 students with diagnosed lexical disorders participated in the study. At the beginning of the intervention study, the mean age of the participants was 9 years 6 months (SD = .23); 31.2% of the students were female, which corresponds to the average percentage of girls with SLI (Tomblin et al, 1997). The participating students were randomly assigned to two groups: a control group (CG, $n = 79$) and an experimental group (EG, $n = 78$). The children of the CG continued to receive their regular lessons at the special school for children with SLI. The children of the EG received therapy sessions with the Lexicon Pirate treatment method to be evaluated in addition to their school lessons at the same type of school as the CG. The EG was subdivided into two sub-groups (also randomized): 40 individual therapy (EG 1, $n = 40$) and 19 small groups (EG 2, $n = 38$).

Table 1 provides an overview of the most important variables to compare the performance of the two groups; *t*-tests for independent samples show that the means of the two groups on all measures do not differ significantly prior to the intervention ($p > .20$). This also applies to the sub-divided experimental groups EG1 (individual setting) and EG2 (small group setting).

As Table 1 clearly shows, the comparability of the two groups has been ensured. The average non-verbal processing skills and the slightly under-average capacity of the phonological working memory correspond to the criteria and symptoms of children with SLI (Gathercole, 2006; Gathercole and Baddeley, 1990; Schwartz, 2009). Furthermore, the results reveal that both groups with an averaged respective *t*-score of 17.88 (EG) and 18.37 (CG) show considerable deficiencies in expressive vocabulary.

To further examine the comparability of the two groups, teacher and parent questionnaires (see Appendices 1 and 2) were used at T3 (four months after the intervention was completed) to collect information on whether additional specific vocabulary support was given outside of or within school during the intervention period. Language intervention classes at special schools contain elements of vocabulary work. To control the impact of this factor, the number of students who received specific forms of vocabulary support within their regular lessons is listed in Figure 1. It shows a slightly higher level of lexical support for the CG. In addition to this vocabulary support in class, some children received specific lexical support lessons at the special school in individual or small group settings or external speech and language therapy. Figure 1 shows that a comparable number of students

Table 1. Participant characteristics across groups: mean (M) and standard deviation (SD) of the two research groups as to pre-test competences (T1, N = 157).

T1	Control group (n = 79)	Experimental group (n = 78)
Sex: male:female	55:24	53:25
Age (age, months)	M = 9.06	M = 9.06
	SD = .27	SD = .16
Nonverbal processing skills: Triangles subtest, K-ABC (scale score, mean 10, SD 3)	M = 8.80	M = 8.26
	SD = 2.68	SD = 2.70
Phonological working memory: Number recall subtest, K-ABC (scale score, mean 10, SD 3)	M = 6.58	M = 6.99
	SD = 2.08	SD = 2.30
Expressive vocabulary: WWT 6-10 expressive (t-score, mean 50, SD 10)	M = 18.37	M = 17.88
	SD = 10.89	SD = 10.77
Receptive vocabulary: WWT 6-10 receptive (raw score, 95 items)	M = 80.46	M = 81.58
	SD = 9.33	SD = 7.39
Sentence comprehension: Acting sequences subtest, SET 5-10 (t-score, mean 50, SD 10)	M = 32.18	M = 33.13
	SD = 9.08	SD = 9.15
Retrieval skills of different semantic relations:	n = 45	n = 41
Forming Analogies, P-ITPA (t-score, mean 50, SD 10)	M = 30.62	M = 30.83
	SD = 6.13	SD = 7.25
Vocabulary, P-ITPA (t-score, mean 50, SD 10)	M = 30.80	M = 31.52
	SD = 9.48	SD = 8.42

received speech and language therapy focusing on lexical skills in both groups. Taking into account all kinds of vocabulary support at school and outside of school, children in the control group received a higher number of therapy lessons compared to the experimental group overall.

5 Post-tests

The effectiveness of the strategy therapy is proved if a generalization of treated vocabulary to competences in standardized tests can be documented. Therefore, performance on the standardized assessments was compared before and immediately after completing the intervention (T1 and T2) (for all participants: WWT 6-10 German, subtest from SET 5-10; for a sub-sample: subtests from P-ITPA). The proof of a long-term therapy effect is even more important, so performance levels were measured four months after the intervention was completed (T3). In order to guarantee objectivity, the post-tests were conducted blinded, such that the assessors did not know to which group each participant belonged.

6 Intervention procedure

Seventeen speech and language therapists delivered the intervention. They had no prior experience with the lexical strategy therapy Lexicon Pirate. They were instructed in the implementation of the therapy in two one-and-a-half-day training sessions: the first block was completed before the study started; the other block took place after half of the therapy sessions had taken place. Additionally, the therapists met on a regular basis (twice a week at the beginning of the intervention and once a week later on the project) in order to clarify questions and to discuss how to proceed methodologically in the following week.
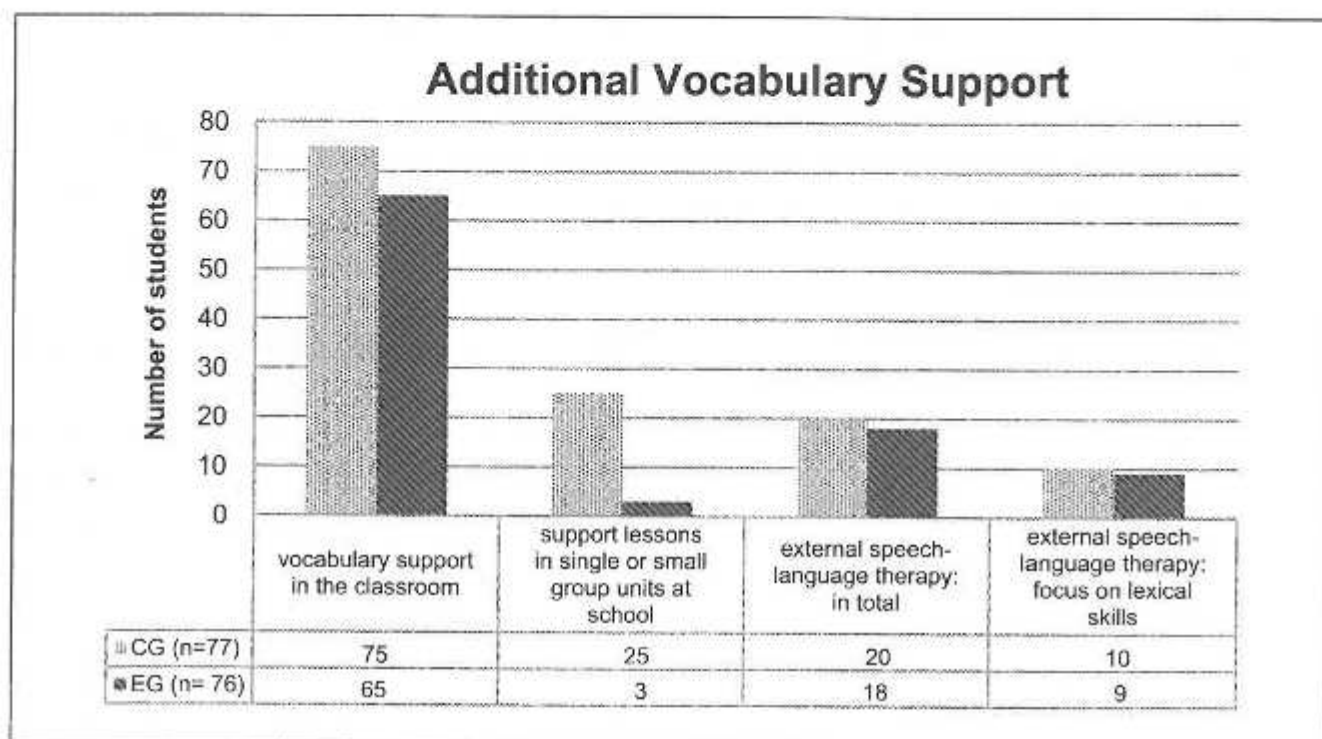
Additional Vocabulary Support

	vocabulary support in the classroom	support lessons in single or small group units at school	external speech-language therapy: in total	external speech-language therapy: focus on lexical skills
CG (n=77)	75	25	20	10
EG (n= 76)	65	3	18	9

Figure 1. Number of students who received additional vocabulary support during the intervention.

After the pre-tests and randomization were concluded, the intervention for the children in the EG began immediately. It was conducted at the special schools once per week (for 30 minutes in individual settings and 45 minutes in small group settings) within a period of five months and involved 20 therapy sessions. The students of the EG were taught lexical strategies and were encouraged to actively learn by discovering lexical gaps. They were taught a variety of semantic and lexical learning strategies to independently expand their vocabulary and differentiate it on their own (Motsch and Ulrich, 2012).

7   Intervention programme: Lexicon Pirate for school-age children

Various elements of the Lexicon Pirate programme for school-age children remain unchanged from the pre-school-age version (Motsch and Ulrich, 2012), but the therapy format has been adjusted to the abilities and interests of school-age children (Wahn, 2012; Menyuk, 2000). Changes include game formats and therapy items. Furthermore, experiences from preceding studies were taken into consideration. The entire 20 therapy lessons of the programme are described in detail (e.g. word material, activities) by Motsch et al. (2015).

a   Framework and therapy phases. Corresponding with the Lexicon Pirate for pre-school age (Motsch and Ulrich, 2012), the therapy's framework plot is a treasure hunt. Together with the Pirate Tom hand puppet, the child starts to find unknown or temporarily non-retrievable words that must be clarified as a result. The use of the Pirate Tom hand puppet enables the therapist to present the question strategies as an example over and over again. Each individual therapy unit follows a precisely determined sequence of different therapy phases.

- Phase 1: Discovering the Treasure Chest. After the treasure chest has been discovered, the goal is to discover which objects in picture form the child does not know or cannot name, and Pirate Tom and the child put the unknown ones into their treasure bag.

- Phase 2: Exploring Collected Treasures. During this period, the treasures are taken out of the bag and elaborated upon semantically and phonologically by means of question strategies. By using the speech model, the therapist – as Pirate Tom – continually encourages the child to implement the strategies: If there is a difficult word, especially a polysyllabic one, Pirate Tom shows the child a trick for remembering it better: 'pronounce it loudly, slowly and clearly three times' (rehearsal function). From the fourth therapy session on, each lesson presents a game that aims to continue exploring the word material to be elaborated on (Coppit, 'courier service', gapped and quiz sentences, pantomime, and much more). During these games, the therapist (as Pirate Tom) demonstrates to the child how to deal with a lack of knowledge, as well as saving and retrieval problems, in a constructive way by using various lexical strategies.
- Phase 3: Receiving the Little Treasure Pictures. In order to be allowed to keep the collected treasures in the form of little pictures, the child must name the treasure and explain it. The therapist supervises the procedure. Furthermore, the child receives one stamp on a stamp template for each treasure that was examined during the therapy lesson.
- Phase 4: The Treasure Box. Pictures of the collected treasures are stuck onto index cards, the names are noted and important semantic features or relationships between special words (like hypernyms, antonyms and polysemes) may be written down. All collected cards are put into a small treasure box.

b   *Therapy items.* In the pre-school version, the therapy items were taken from different semantic fields (e.g. 'in the bathroom': nail file [*Nagelfeile*] or to varnish [*lackieren*] or, e.g. 'in the kitchen': whisk [*Schneebesen*] or to dry the dishes [*abtrocknen*], etc.). For school-age children, the new focus was working with semantic relations (e.g. hypernyms like vegetables, dishes or currency; antonyms like sharp and blunt, prohibit and allow or scent and stench; homonyms like days and daze, etc.). Furthermore, there is a focus on the creative use of word forms by elaborating compound words (e.g. doorbell, whirlwind, paperback or backbone) and dealing with prefixes (e.g. to come, to over-come and to be-come). Furthermore, written language is also taken into account as an additional access to lexical knowledge.

c   *Visualization of lexical strategies: the Tip Board.* Another new feature for school-age children is the introduction of the Tip Board, which serves to visualize important lexical strategies. The Tip Board's use is gradually learned within the first three therapy units. It is intended as an important element of the therapy and functions as a kind of cheat sheet to support the child in applying the learned strategies in cases of lacking semantic knowledge or unsuccessful word retrieval.

d   *Transfer of lexical strategies by the everyday pirate.* The Weekend Pirate aims to achieve a transfer of the learned lexical strategies to the children's familiar domestic surroundings. Therefore, the children are asked to search for unknown words at the weekend. The School Pirate is introduced to the children in order to integrate the concept of 'school' into the transfer process as one of the children's key areas where lexical learning takes place. On Lexicon Pirate Day, which is conducted twice a week with the whole class during one selected school lesson, each child must discover a new word, explain it and take it to the therapy sessions.

e   *The reward system.* Discovering and explaining lexical gaps is explicitly strengthened through positive reinforcement using a reward system. For each treasure collected from the therapy session, the child is given a stamp on his or her stamp template. If the template is completely filled, the child is awarded a Lexicon Pirate Certificate.

8   Data analysis

The groups EG and CG were compared with regard to their achievement in standardized tests (WWT 6-10, P-ITPA, SET 5-10). Data were prepared for statistical calculations and analysed with SPSS 22 (IBM, 2013). Changes over time were measured by means of *t*-tests for paired samples and their effect sizes. Using the provided normal distribution of data, additional variance analyses with the corresponding lexical performance increase, i.e. the degree of change, in raw score and *t*-score of T1 to T3 were used as dependent variables and the group assignment (EG, EG1, EG2 or CG) as an independent variable (comparable to Best, 2005). The effect of other factors, such as age, non-verbal processing skills or capacity of phonological working memory, on the results was measured using co-variance analyses. A significance level of $p \leq .05$ was taken for all statistical calculations. The determination of effect sizes (d) was based on the convention by Cohen (1988) (small effect: ≥ 0.2; medium effect: ≥ 0.5; large effect: ≥ 0.7).

III   Results

1   Generalization effects on vocabulary skills

Expressive and receptive lexical abilities, as measured by the standardized tests, improved in both groups (EG and CG) significantly or highly significantly at the lexical and the syntactical level. Table 2 shows the increase of mean scores from the pre-test (T1) to the follow-up test (four months after the intervention was completed, T3) for each of the two groups; *t*-tests for paired samples show that changes in performance of the experimental group correspond to highly significant differences and average effect sizes on all assessments except the *Analogien bilden* [Forming Analogies] subtest, which did not achieve significance on the level of the *t*-score ($t(40) = 1.64, p > .05, d = .21$). According to Cohen's conventions (1988), this is still a minor effect. Using raw scores, the increase in scores on this subtest did attain statistical significance with a major effect ($M = 4.27, SD = 4.71, t(40) = 5.80, p < .001, d = .79$). Similar results can be seen when the EG is divided into EG1 (individual setting) and EG2 (small group setting) (see Table 2).

The CG also had significant gains in expressive vocabulary (WWT 6-10), but did not achieve significant improvements on the level of the *t*-score in both of the P-ITPA sub-tests ($p > .05$). The improvements in scores of the CG showed minor effect sizes.

2   Comparison of experimental and control groups

In addition to the effect of time, differences between the groups, EG (EG1, EG2) and CG, were also compared, to find out whether the Lexicon Pirate lexical strategy therapy leads to more pronounced improvements in lexical development. Expressive vocabulary was measured by the WWT 6-10 (Glück, 2011). There was no significant main effect of group (EG and CG) for change in scores between T1 and T3 (raw score: $F(1,151) = 2.97, p = .09, \eta^2 = .020$, *t*-score: $F(1,151) = 1.33, p > .05, \eta^2 = .009$). However, the gain in expressive vocabulary size was significantly higher for EG2 (small group setting) compared to the CG (raw score: $p = .036, \eta^2 = .036$; *t*-score: $p = .039, \eta^2 = .039$). There was no significant difference in gain in vocabulary score for EG1 (individual setting) in comparison to the CG (EG1 vs. CG $p > .05, .006 \leq \eta^2 \leq .01$), only on the descriptive level. Figure 2 shows the differences between the groups.

The results of the Forming Analogies subtest (P-ITPA) are illustrated in Figure 3 and show the therapy's significant effect on the development of these retrieval skills (impact of factor 'group

Table 2. Mean scores (M) and standard deviation (SD) of the t-scores concerning lexical abilities before the intervention (T1) and four months after the intervention (T3) in experimental (n = 76) and control group (n = 77), paired t-tests (two-tailed) including Cohen's d.

| | Lexical abilities at T1 and T3 | | | | Paired t-tests (two-tailed) | | | |
	T1		T3		t	df	Significance (p)	Cohen's d
	Mean	SD	Mean	SD				
Expressive vocabulary (WWT 6-10):								
CG	18.40	11.01	24.21	12.10	15.84	76	< .001	.50
EG	17.70	10.72	24.88	11.93	7.74	75	< .001	.63
EG 1	17.48	9.66	23.13	11.25	4.66	39	< .001	.54
EG 2	17.94	11.91	26.83	12.50	6.41	35	< .001	.73
Forming Analogies (P-ITPA):								
CG	30.68	6.18	29.43	7.71	1.46	43	> .05	.18
EG	30.63	7.22	32.51	10.17	1.64	40	> .05	.21
EG 1	30.53	7.57	32.59	6.87	2.04	16	> .05	.28
EG 2	31.75	7.82	32.38	10.27	.43	23	> .05	.07
Vocabulary / retrieval of semantic relations (P-ITPA):								
CG	30.89	9.57	32.16	9.77	1.13	43	> .05	.13
EG	31.41	8.50	34.22	7.91	3.64	40	< .001	.34
EG 1	29.06	6.17	32.71	10.36	1.80	16	> .05	.43
EG 2	32.04	9.21	35.38	8.52	3.19	23	.004	.38
Sentence comprehension (SET 5-10):								
CG	32.26	9.15	34.81	8.07	2.48	76	.02	.29
EG	33.14	9.21	38.14	10.74	4.71	75	< .001	.50
EG 1	33.38	9.36	39.63	12.50	4.15	39	< .001	.57
EG 2	32.89	9.16	36.50	8.23	2.44	35	.02	.41

Notes. CG = control group; EG = experimental group.

(CG, EG1, EG2)' on scores: raw score: $F(1,83) = 10.65$, $p = .002$, $\eta^2 = .114$; t-score: $F(1,83) = 4.874$, $p = .030$, $\eta^2 = .055$). With an explained respective variation of 11.4% or 5.5%, this corresponds to a medium effect (Cohen, 1988). Both EG1 and EG2 showed statistically significant greater changes in scores than the CG, with medium to large effect sizes. Considering the raw scores, differences in improvement between EG1 and CG and between EG2 and CG achieved statistical significance (raw score: EG1 vs. CG $p = .001$, $\eta^2 = .176$; EG2 vs. CG $p = .038$, $\eta^2 = .068$). With respect to the t-score, only the differences between EG1 and CG were statistically significant (t-score: EG1 vs. CG $p = .01$, $\eta^2 = .115$; EG2 vs. KG $p > .05$, $\eta^2 = .021$). The results of the comparison between CG and EG2 also correspond to a medium effect (raw score) or a minor effect (t-score), which means that the children who received lexical strategy therapy in individual settings and in small group settings showed a greater change in scores than the group without this specific form of therapy (CG).

For the P-ITPA Vocabulary Subtest the contrasts revealed no significant interaction when comparing each of the two EGs separately to CG (raw score: $F(1,83) = 2.20$, $p > .05$, $\eta^2 = .026$; t-score: $F(1,83) = 1.23$, $p > .05$, $\eta^2 = .015$). However, these contrasts yielded small effect sizes. As Table 3 indicates, the EGs showed a descriptive superiority over the CG regarding the change between T3 and T1 (performance increase).
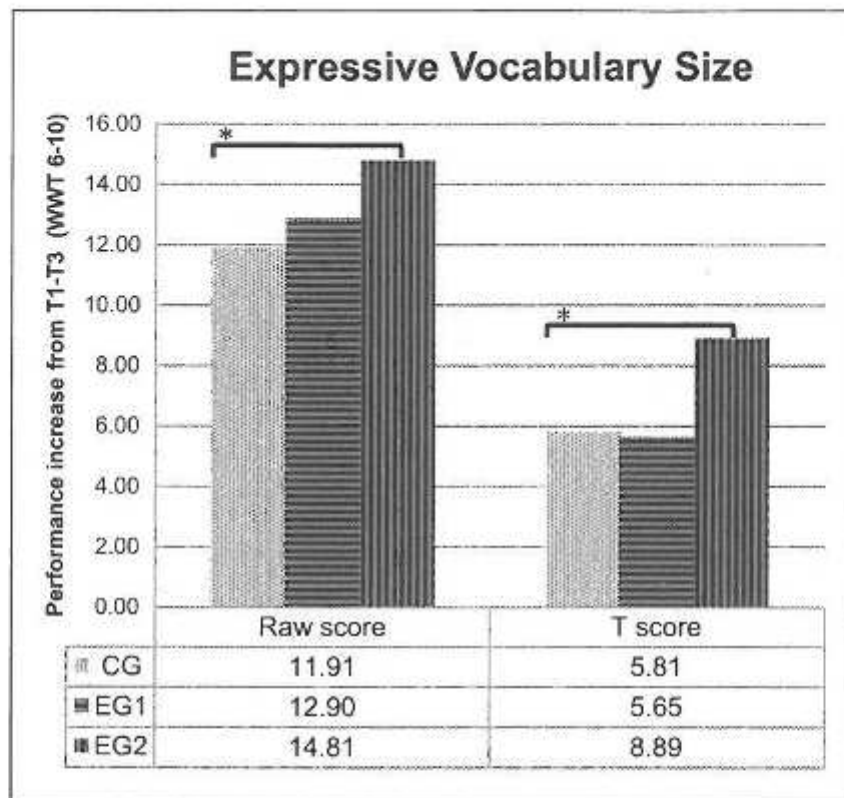
Expressive Vocabulary Size

	Raw score	T score
CG	11.91	5.81
EG1	12.90	5.65
EG2	14.81	8.89

Figure 2. Performance increase in expressive vocabulary size (WWT 6-10) for CG, EG1 and EG2; results of ANOVA.
Note. * $p < .05$.

Forming Analogies

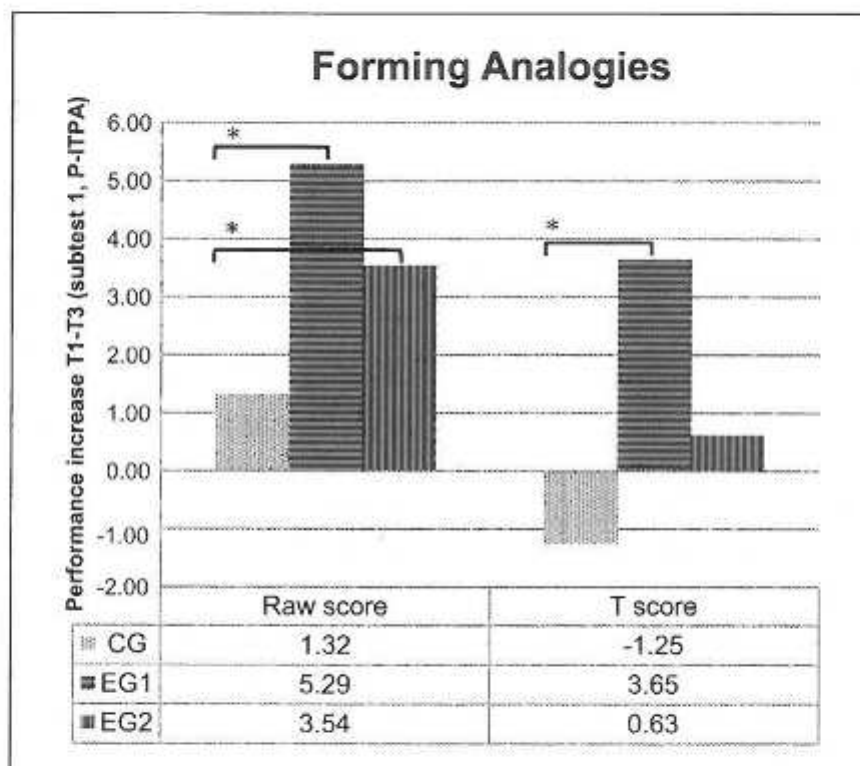|	Raw score	T score
CG	1.32	-1.25
EG1	5.29	3.65
EG2	3.54	0.63

Figure 3. Performance increase in forming analogies and retrieving semantic relations (Subtest 1, PITPA) for EG1, EG2 and CG; results of ANOVA.
Note. * $p < .05$.

Increases in performance between T1 and T3 for sentence comprehension (SET 5-10) are shown in Figure 4, and analysis reveals significant differences when comparing EG1 with the CG: Children who received strategy therapy in the individual setting increased their sentence comprehension to a significantly greater extent than children in the CG (t-score: EG1 vs. CG $p = .039$, $\eta^2 = .036$). The improvements in performance on this subtest suggest that the word-learning strategies have been transferred to the sentence level.

In summary, the EGs improved their lexical abilities in all assessments to a significant or even highly significant extent. With the exception of one subtest, the EG scored significantly higher on all tests than the CG. Even though the variance analysis and contrasts showed no significant interaction term on the Vocabulary Subtest (P-ITPA), the EG was, at least, superior on the descriptive level in this measurement.

As indicated by the results reported above, the performance of children in both EGs was quite similar with regard to the different subtests. None of the tests showed a significant difference in improvements between EG1 and EG2 ($p > .05$, $\eta^2 < .02$).

Table 3. Performance increase (change between T3 and T1) in retrieving semantic relations (Subtest 2 on Vocabulary, P-ITPA) for EG1, EG2 and CG; mean (*M*) and standard deviations (*SD*).

	Raw score		t-score		n
	M	*SD*	*M*	*SD*	
Control group	6.64	9.23	1.27	7.46	44
Experimental group 1	9.18	5.98	2.06	4.72	17
Experimental group 2	9.13	5.90	3.33	5.12	24

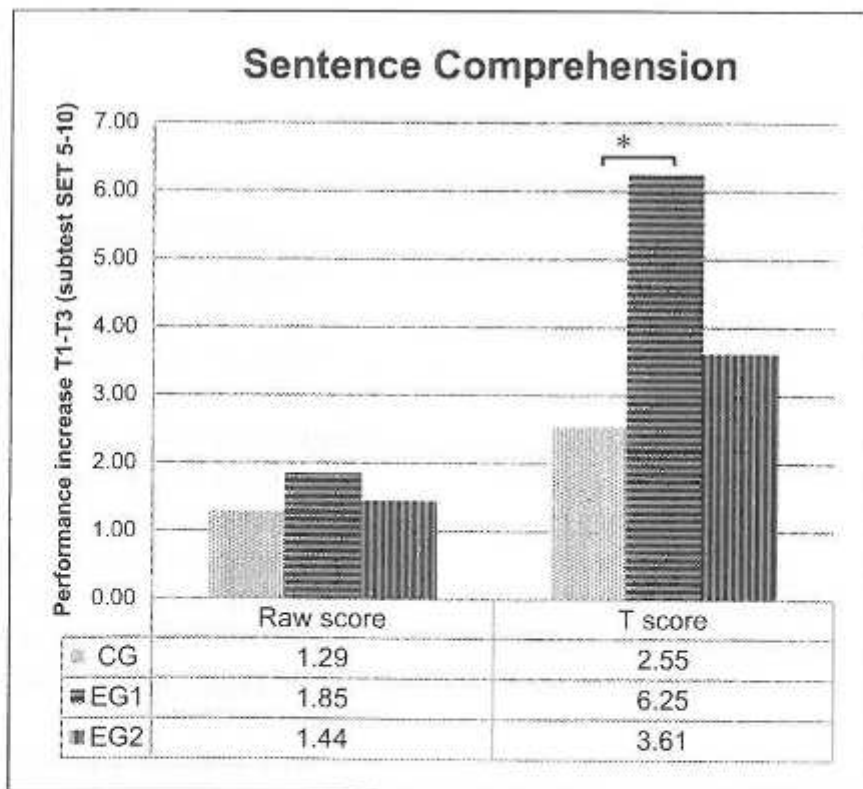|	Raw score	T score
CG	1.29	2.55
EG1	1.85	6.25
EG2	1.44	3.61

Figure 4. Performance increase in sentence comprehension (subtest in SET 5-10) for EG1, EG2 and CG; results of ANOVA.
Note. * $p < .05$.

3   Possible influential factors on performance

The possible influence of additional factors has also been examined (age, non-verbal processing capacities, capacity of phonological working memory, starting level of expressive vocabulary, and additional vocabulary support within the school day and external speech and language therapy as measured with teacher and parent questionnaires).

Analysis confirms the influence of the participant's age on gain in vocabulary. With respect to the gain in expressive vocabulary size (WWT 6-10 t-score), the covariate of age had a significant effect, and explained 8.5% of the variance (EG entire group, CG: $F(1,149) = 13.93$, $p < .001$, $\eta^2 = .085$), as well as the interaction between the factors of age and group assignment, which explains 2.8% of the variance (EG entire group, CG: $F(1,149) = 4.37$, $p = .038$, $\eta^2 = .028$). The impact of age seems to be greater in the EG than in the CG: The children of the EG (in total) could improve their abilities more with increasing age than the children of the CG did.

As shown in Figure 1, some students received additional specific vocabulary support: either lessons in their special schools for children with SLI (in individual or small group settings) or external speech and language therapy outside of school. Considering only those participants who did not receive any such additional support ($n = 131$, EG = 73, CG = 58), variance analyses show even stronger effects of the within-subject factor group with respect to the EGs (WWT 6-10: $N = 153$: $\eta^2 = .033$, $n = 131$: $\eta^2 = .039$; P-ITPA Forming Analogies: $N = 153$: $\eta^2 = .080$, $n = 131$: $\eta^2 = .110$; P-ITPA Vocabulary: $\eta^2 = .019$, $n = 131$: $\eta^2 = .037$).

Furthermore, covariance analyses show that the improvements in performance on all tests is independent from the treating therapist in the EGs ($p > .05$), external speech and language therapy ($p > .05$), nonverbal processing skills ($p > .05$), the starting level of expressive vocabulary ($p > .05$) and the capacity of phonological working memory ($p > .05$). Presumed less favourable starting conditions like lower non-verbal processing skills, a limited phonological working memory capacity or a lower starting level in expressive vocabulary size do not appear to influence the children's benefit from the lexical strategy therapy method.

IV   Discussion

With regard to the treatment of lexical disorders, generalization effects on untrained words are desirable. Traditional elaboration therapies have not been shown to deliver those effects. Some recent treatment methods include the mediation of self learning strategies (lexical strategy approach). Only one comparable strategy intervention programme has been published so far: the WFIP (German, 1992, 2005). German (2005) describes this therapy programme for school-age children with word-finding difficulties, that, similar to the Lexicon Pirate programme, focuses on self-advocacy instruction, encourages the children to use self-priming strategies and aims at a transfer of helpful word-finding strategies to the child's everyday life. As in the Lexicon Pirate approach, strategies are first taught on the level of single words. Subsequently, target words are used in sentences and short stories. The Lexicon Pirate programme additionally includes strategies for better storage of difficult words, strategies to link words according to their semantic relation, as well as the work on 'creative vocabulary' (creating compound words and derivations). The WFIP (German, 1992, 2005) is not based on broad empirical evidence as only a small part of the programme (4 therapy lessons) was evaluated in an intervention study with two children (German, 2002).

The present study aimed to close this research gap. From a qualitative point of view, it can be concluded that the students who received the lexical strategy therapy (EG) learned how to apply the new strategies successfully. In the programme they were confronted with unknown vocabulary and were motivated to try out the strategies of monitoring, saving, questioning and retrieving and

encouraged to reflect upon their own learning success. It appears that the children were successful in transferring the learned strategies to everyday situations. The participants who received the lexical strategy therapy were able to significantly improve their lexical performances on both the word and the sentence level. Since there were no overlaps between the targeted items within the therapy and items in the diagnostic assessments, a generalization effect to unpractised words can be assumed. This effect was measured four months after completion of the intervention and appears to be a long-term effect. Compared to the CG, the EG achieved significantly greater changes in scores on all of the diagnostic assessment tools.

The greater improvements by the EG on the sentence level represent an important finding, since lexical disorders are often revealed in discourse rather than solely on the single-word level. Transfer effects are desirable and were demonstrated in the present study. It is not surprising that the treatment showed transfer effects to such a considerable extent. As in the programme target words were used in sentences and short stories. Also, strategies for decoding word meaning in context were explored (e.g. in therapy sessions about homonyms). For further research, it might be interesting to evaluate the therapy's effectiveness in discourse by a discourse analysis (comparable to the TWDF; German, 1991).

The setting of the intervention, individual or small group setting does not have an influence on the benefit from the therapy method. Students in both settings (EG1: individual, EG2: small group) improved their lexical skills to a similar degree. The therapy approach can therefore be recommended as effective for support lessons with small groups.

Independent of their initial conditions, all participants were able to benefit from the therapy format to a similar extent. Furthermore, age proved to have a positive effect: The older the children at the start of the study, the more significant the EG's improvements were in comparison to the CG. In addition, students of both EGs especially benefited from the new therapeutic method with increasing age. A possible explanation could be the strong focus on written language in this therapy method: Students with higher competences in writing are required to use less of their resources for this component, which allows them to better focus on learning and practising the lexical strategies.

Some of the students of the EG continued to have a t-score ≤ 40 on WWT 6-10 (expressive vocabulary) and so had not overcome their lexical disorder. However, this is not surprising, as to achieve a t-score > 40, these students would have had to name 24 additional items in the follow-up test. More time may be needed for school-age children to close the gap with their peers (McGregor, 2009). Further research should focus on the question whether longer follow-up terms are needed (as in Motsch and Ulrich, 2012). Furthermore, the findings suggest that it is advisable to start with the treatment as early as possible since school-age children already lag behind their peers to a much larger extent than the pre-school children.

It should be critically noted that, strictly speaking, the CG was not a non-treatment control group. In fact, the CG received the comparable number of therapy lessons (vocabulary support inside or outside school) as the experimental group. Thus, one might assume that the therapy efficacy in the EG was not due to the increased number of therapy sessions. In conclusion, the new therapy format of the Lexicon Pirate for school-age children appears to be a convincing successor to the version devised for pre-school-age children.

Declaration of conflicting interest

Funding

References

Berg M (2013) Kontextoptimierung in der Schuleingangsphase [Context optimization for first graders]. In: Ringmann S and Siegmüller J (ed.) *Handbuch Spracherwerb und Sprachentwicklungsstörungen: Schuleingangsphase*. München: Elsevier, 189–210.

Best W (2005) Investigation of a new intervention for children with word-finding problems. *International Journal of Language and Communication Disorders* 40: 279–318.

Bragard A, Schelsträte MA, Snyers P, and James D (2012) Word-finding intervention for children with specific language impairment: A multiple single-case study. *Language, Speech, and Hearing Services in Schools* 43: 222–34.

Büttner G (2003) Gedächtnisentwicklung im Kindes- und Jugendalter [Memory development in childhood and adolescence]. *Sprache-Stimme-Gehör* 27: 24–30.

Clegg J, Hollis C, Mawhood L, and Rutter M (2005) Developmental language disorders: A follow up in later adult life: Cognitive, language and psychosocial outcomes. *Journal of Child Psychology and Psychiatry* 46: 128–49.

Cohen J (1988) *Statistical power analysis for the behavioral sciences*. Hillsdale, NJ: Erlbaum.

Dollinger SJ, Matyia AM, and Huber JL (2008) Which factors best account for academic success: Those which college students can control or those they cannot? *Journal of Research in Personality* 42: 872–85.

Easton C, Sheach S, and Easton S (1997) Teaching vocabulary to children with wordfinding difficulties using a combined semantic and phonological approach: an efficacy study. *Child Language Teaching and Therapy* 13: 125–42.

Ebbels SH, Nicoll H, Clark B, et al. (2012) Effectiveness of semantic therapy for word-finding difficulties in pupils with persistent language impairments: A randomized control trial. *International Journal of Language and Communication Disorders* 47: 35–51.

Esser G, Wyschkon A, Ballaschk K, and Hänsch S (2010) *Potsdam–Illinois Test für Psycholinguistische Fähigkeiten (P-ITPA) [Potsdam–Illinois test for psycholinguistic abilities, P-ITPA]*. Göttingen: Hogrefe.

Gathercole SE (2006) Nonword repetition and word learning: The nature of the relationship. *Applied Psycholinguistics* 27: 513–43.

Gathercole SE and Baddeley AD (1990) Phonological memory deficits in language disordered children: Is there a causal connection? *Journal of Memory and Language* 29: 336–60.

German JD (1991) *Test of Word Finding in Discourse (TWFD)*. Austin: Pro-Ed.

German JD (1992) Word-finding intervention for children and adolescents. *Topics in Language Disorders* 13: 33–50.

German JD (2002) A phonologically based strategy to improve word-finding abilities in children. *Journal of Learning Disabilities* 17: 353–59.

German JD (2005) *WFIP-2: Word-Finding Intervention Program*. 2nd edition. Austin: Pro-Ed.

German JD (2014) *TWF-3: Test of Word Finding*. 3rd edition. Austin: Pro-Ed.

Glück CW (2003) Semantisch-lexikalische Störungen bei Kindern und Jugendlichen. Therapieformen und ihre Wirksamkeit [Lexical disorders in children and adolescents. Therapy methods and their effectiveness]. *Sprache-Stimme-Gehör* 27: 125–34.

Glück CW (2011) *Wortschatz- und Wortfindungstest für Sechs- bis Zehnjährige (WWT 6–10) [Test of vocabulary size and word-finding abilities for children between six and ten, WWT 6–10]*. München: Elsevier.

Hyde Wright SH (1993) Teaching word-finding strategies to severely language-impaired children. *European Journal of Disorders of Communication* 28: 165–75.

IBM SPSS 22 (2013) Retrieved from: http://www-01.ibm.com/software/de/analytics/spss/products/statistics/ (February 2014).

Justice LM, Meier J, and Walpole S (2005) Learning new words from storybooks: An efficacy study with at-risk kindergartners. *Language, Speech, and Hearing Services in Schools* 36: 17–32.

Kannengieser S (2012) *Sprachentwicklungsstörungen: Grundlagen, Diagnostik und Therapie [Specific language impairment: Foundations, assessment and therapy]*. 2nd edition. München: Elsevier.

Leonard LB (2014) *Children with specific language impairment*. 2nd edition. Cambridge, MA: MIT Press.

Masterson JJ and Perrey CD (1994) A program for training analogical reasoning skills in children with language disorders. *Language, Speech and Hearing Services in Schools* 25: 268–70.

Marks I and Stokes SF (2010) Narrative-based intervention for word-finding difficulties: A case study. *International Journal of Language and Communication Disorders* 45: 586–99.

McGregor KK (1994) Use of phonological information in a word-finding treatment for children. *Journal of Speech and Hearing Research* 37: 1381–93.

McGregor KK (2009) Semantics in child language disorders. In: Schwartz RG (ed.) *Handbook of child language disorders*. New York: Psychology Press, 365–87.

McGregor KK and Leonard LB (1989) Facilitating word-finding skills of language-impaired children. *Journal of Speech and Hearing Disorders* 54: 141–47.

McGregor KK, Newman RM, Reilly RM, and Capone NC (2002) Semantic representation and naming in children with specific language impairment. *Journal of Speech, Language and Hearing Research* 45: 998–1014.

McGregor KK, Oleson J, Bahnsen A, and Duff D (2013) Children with developmental language impairment have vocabulary deficits characterized by limited breadth and depth. *International Journal of Language and Communication Disorders* 48: 307–19.

Menyuk P (2000) Wichtige Aspekte der lexikalischen und semantischen Entwicklung [Important aspects of the lexical and semantic development]. In: Grimm H (ed.) *Sprachentwicklung: Enzyklopädie der Psychologie* C III: Band 2. Göttingen: Hogrefe, 171–92.

Messer D and Dockrell JE (2006) Children's naming and word-finding difficulties: Descriptions and explanations. *Journal of Speech, Language, and Hearing Research* 49: 309–24.

Melchers P and Preuss U (1991) *Kaufman assessment battery for children*. German edition. Amsterdam: Swets and Zeitlinger.

Motsch HJ (2008) Der Wortschatzsammler [Lexicon Pirate]. Unpublished Manual, University of Cologne, Cologne, Germany.

Motsch HJ and Brüll T (2009) Der Wortschatzsammler: Interventionsstudie zum Vergleich lexikalischer Strategie- und Elaborationstherapie [Lexicon Pirate: Intervention study to compare lexical strategy therapy and elaboration therapy]. *Vierteljahresschrift für Heilpädagogik und ihre Nachbargebiete* 78: 346–47.

Motsch HJ and Ulrich T (2012) Effects of the strategy therapy 'lexicon pirate' on lexical deficits in preschool age: A randomized controlled trial. *Child Language Teaching and Therapy* 28: 159–75.

Motsch HJ, Marks DK, and Ulrich T (2015) *Der Wortschatzsammler: Evidenzbasierte Strategietherapie lexikalischer Störungen im Kindesalter [Lexicon Pirate: An evidence-based strategy therapy for treating lexical disorders in childhood]*. München: Reinhardt.

Munro N, Lee K, and Baker E (2008) Building vocabulary knowledge and phonological awareness skills in children with specific language impairment through hybrid language intervention: A feasibility study. *International Journal of Language and Communication Disorders* 43: 662–82.

Norbury CF (2004) Factors supporting idiom comprehension in children with communication disorders. *Journal of Speech, Language, and Hearing Research* 47: 1179–93.

Norbury CF and Chiat S (2000) Semantic intervention to support word recognition: A single-case study. *Child Language Teaching and Therapy* 16: 141–63.

Oxford Centre for Evidence-based Medicine (2009): *Levels of evidence (March 2009)*. Available at: http://www.cebm.net/oxford-centre-evidence-based-medicine-levels-evidence-march-2009 (December 2014).

Parsons S, Law J, and Gascoigne M (2005) Teaching receptive vocabulary to children with specific language impairment: A curriculum-based approach. *Child Language Teaching and Therapy* 21: 39–59.

Petermann F (2010) *Sprachstandserhebungstest für Fünf- bis Zehnjährige (SET 5–10) [Test of language development for children between five and ten, SET 5–10]*. Göttingen: Hogrefe.

Rothweiler M (2001) *Wortschatz und Störungen des lexikalischen Erwerbs bei spezifisch sprachentwicklungsgestörten Kindern [Lexicon and disorders of lexical acquisition in children with specific language impairment]*. Heidelberg: Winter Verlag, Edition S.

Rupp S (2013) *Semantisch-lexikalische Störungen bei Kindern [Children with semantic-lexical disorders]*. Heidelberg: Springer.

Schwartz RG (2009) Specific language impairment. In: Schwartz RG (ed.) *Handbook of child language disorders*. New York: Psychology Press, 3–43.

Sim I (1998) One plus one equals three! Improving vocabulary acquisition and learning in pupils with speech and language impairments. *Child Language Teaching and Therapy* 14: 83–93.

Stiegler LN and Hoffman PR (2001) Discourse-based intervention for word finding in children. *Journal of Communication Disorders* 34: 277–303.

Stothard SE, Snowling MJ, Bishop DVM, Chipchase BB, and Kaplan CA (1998) Language impaired preschoolers: A follow-up into adolescence. *Journal of Speech, Language, and Hearing Disorders* 41: 407–418.

Tomblin JB, Buckwalter P, and O'Brien M (2003) The stability of primary language disorder: Four years after kindergarden diagnosis. *Journal of Speech, Language and Hearing Research* 46: 1283–96.

Tomblin JB, Records NL, Buckwalter P, Zhang X, Smith E, and O'Brien M (1997) Prevalence of specific language impairment in kindergarten children. *Journal of Speech and Hearing Research* 41: 188–99.

Ulrich T (2012) *Effektivität lexikalischer Strategietherapie im Vorschulalter. Eine randomisierte und kontrollierte Interventionsstudie [Efficacy of lexical strategy therapy in pre-school age. A randomized controlled trial]*. Aachen: Shaker.

Wahn C (2012) *Entwicklung und Modifikation des semantisch-lexikalischen Systems im Spracherwerb [Development and modification of the lexical system in language acquisition]*. Frankfurt am Main: Peter Lang.

Wing C (1990) Preliminary investigation of generalization to untrained words following two treatments of children's word-finding problems. *Language, Speech, and Hearing Services in Schools* 21: 151–56.

Wittmann S (1996) A case study in word finding. *Child Language Teaching and Therapy* 12: 300–13.

Zens NK, Gillon GT, and Moran C (2009) Effects of phonological awareness and semantic intervention on word-learning in children with SLI. *International Journal of Speech-Language Pathology* 11: 509–24.

Appendix I

Teacher questionnaire

School _____   Class _____   Teacher _____

Additional Specific Vocabulary Support

Dear Teachers,

This questionnaire is used to collect information on whether additional *specific* vocabulary support was given to particular students within the school day (inside or outside the classroom) during the intervention period (If you are uncertain about what *specific vocabulary support* means, read the following examples a), b), c)).

1. Within the classroom: Has additional specific vocabulary support taken place during school lessons?

□ no

□ yes, such as the following:

a)   □ The students were offered aids to store words better

e.g. segmenting of words in syllables (e.g. by clapping); repeated oral presentation of the new word by the teacher; asking the students to repeat a new word).

How often?   □ never   □ infrequently   □ sometimes   □ frequently

---

b)   □ The students were given aids to retrieve missing words

e.g. phonologically (say the initial sound/first syllable, prosodic characteristics, syllable structure) or semantically (description of the function, semantic properties and/or the context in which the word is used).

How often?   □ never   □ infrequently   □ sometimes   □ frequently

---

c) □ The students were taught specific questions

e.g. to ask for the meaning of a word during text reading, etc.

How often? □ never □ infrequently □ sometimes □ frequently

d) □ Others: _____

2. **Outside of the classroom: Has additional specific lexical support in single or small group sessions taken place during the school day?**

Legend: IS = individual setting, GS = small group setting, TL = numbers of therapy lessons.

Appendix 2

Student	no	TL in:		Method/program (if known)
		IS	GS	

List of participating students

Parent questionnaire

Dear Parents,

The research project is almost over. We very much appreciate your child's participation in the project until the end. To evaluate whether the therapy is effective, we need some more information on your child: Please let us know whether additional speech and language therapy has taken place outside of school.

We kindly ask you to fill in the questionnaire and to hand it back to the teacher (by this date: _____).

Has your child received speech and language therapy by an external speech and language therapist outside of school within the period of January to September of this year?

□ yes □ no

If yes: on which topic?

□ Pronunciation □ Vocabulary □ Grammar □ Myofunctional □ Others
(if you are uncertain, please ask your speech and language therapist)