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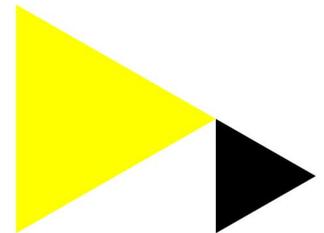
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EFFECTS OF FLUENCY TRAINING ON THE APPLICATION OF LINGUISTIC OPERATIONS IN WRITING

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ABSTRACT:

In this article we report the results of a classroom experiment in grades 5 and 6 of primary education directed at the improvement of children's writing skills. The theoretical basis of our approach is that increased fluency in the use of linguistic operations facilitates student's attention to the meaning level of their texts, resulting in better comprehensibility. Four learning conditions for improving linguistic fluency were discriminated according to the dimensions "focus of learner attention" (focus on form vs. focus on meaning) and "explicitness of instruction" (implicit learning vs. explicit learning): 1) implicit learning with attention to linguistic forms, 2) explicit learning with attention to linguistic forms, 3) implicit learning with attention to meaning, and 4) explicit learning with attention to meaning. The experiment consists of a post test-only design with randomised assignment to experimental groups within a classroom. In a previous analysis, learning effects of all experimental conditions in comparison to a control group on the meaning level of two post test writing tasks have been demonstrated. In the present study effects of the conditions on children's ability to use linguistic operations in meaningful contexts are being explored. In addition, it is studied whether the use of the operations in terms of frequency and accuracy is age-related. Results show significant main effects of the experimental conditions on the application of linguistic operations in one post test task, but not in the other. Moreover, we found significant differences between age-groups, both in frequency and in accuracy (semantically and syntactically) of the linguistic operations. We discuss these results and their implications for our theoretical viewpoint that increased fluency results in a better control of the semantic consequences of linguistic operations and therefore in better writing.

KEY WORDS: writing, writing process, writing instruction, linguistic fluency, focus-on-forms, focus-on-meaning, implicit instruction, explicit instruction, primary education

1. INTRODUCTION

The translation of conceptual ideas into linguistic form is a main component of the writing process (cf. Flower & Hayes, 1980). In cognitive models of writing a distinction is being made between the processes of planning and translating (cf. Bereiter & Scardamalia, 1987; Hayes & Flower, 1980; Hayes, 1996; Kellogg, 1996; Van Gelderen & Oostdam, 2003; Alamargot & Chanquoi, 2001). Translation is part of a complex integration of conceptual and linguistic resources, which was characterised by Flower and Hayes (1980) as a process of juggling constraints. Writers keep in mind the conceptual message together with their rhetorical objectives and at the same time they appeal to linguistic knowledge in order to express their ideas correctly and appropriately. While the translation process goes on, meaning and form aspects compete for working memory capacity and – especially in the case of

inexperienced writers - this may lead to restriction of attentional processes in order to avoid cognitive overload. Lexical and syntactic decisions in formulating may therefore prevent inexperienced writers to pay attention to the meaning communicated (cf. Chenoweth & Hayes, 2001; McCutchen, 1996; McCutchen, Civill, Hoyne & Mildes, 1994; Van Gelderen, 1997). More fluent writers are supposed to use relatively large chunks of language resulting in a more efficient and less attention absorbing translation process (cf. Anderson, 1995; Chenoweth & Hayes, 2001). Therefore, fluent writers are able to pay more attention to the meaning level of the sentences they are producing.

In the experiment reported here, the improvement of linguistic fluency is considered important for helping young writers to direct their attention to the meaning instead of the form of sentences they produce. In general, linguistic fluency is defined as the ability to produce language in a fast rate (cf. Schmidt, 1992). It can be distinguished from language proficiency, because in the latter aspects of syntactic correctness, coherence and appropriateness are included, while in the definition of fluency these aspects are not incorporated (cf. Chenoweth & Hayes, 2001). We define linguistic fluency for *writing* as the efficient access to a rich linguistic knowledge base and the (equally efficient) retrieval of propositions for utterances (Van Gelderen & Oostdam, 2002 and 2003). Thus, we consider the ability to carry out all kinds of linguistic operations – producing various word combinations and sentence structures - as an essential characteristic of writing fluency. Our definition implies that internal (unobservable) mental processes determine how fluent a person is. Therefore, we regard measures of written output only as indirect indicators of writing fluency.

In a classroom experiment (Van Gelderen & Oostdam, 2001) we explored the effects of different instructional conditions for improving writing fluency on the meaning level of children's written texts. The four conditions were based on several theoretical accounts of how fluency is acquired: *implicitly* (i.e. by repeated confrontation with the same linguistic operations) (cf. Ellis, 1996; Hulstijn, 2002; Squire, 1992; Willingham, Nissen, & Bullemer, 1989) or *explicitly* (i.e. by the learning and application of explicit rules for producing linguistic units) (cf. Anderson, 1982; DeKeyser, 2001; Robinson, 1997). At the same time, we were interested in the effect of instructional *focus on form* or *focus on meaning* on children's writing. Is a focus solely on the meaning of the language sufficient for improving fluency, as has been suggested by Krashen (1982)? Or is it necessary to focus on form too, in order to prevent linguistic errors to engrave in the acquisition process (Doughty & Williams, 1998; Long, 1991; Schmidt, 1993)? Consequently, our experiment consisted of four instructional conditions, expressing the roles of both explicitness and focus of instruction: 1) implicit/focus on forms, 2) explicit/focus on forms, 3) implicit/focus on meaning, 4) explicit focus on meaning. In the implicit focus on forms condition no explicit linguistic rules are given and students learn linguistic structures by manipulating as many exemplars as possible (stimulated noticing without explicit linguistic rules). In the explicit focus on forms condition the manipulation of linguistic structures is accompanied by explanation of linguistic rules (stimulated noticing with rules). In the implicit focus on meaning condition no linguistic rules are given and students are instructed to attend only to meaning related issues in formulation (no stimulated noticing of linguistic forms and no rules). In the explicit focus on meaning condition rules are given, but students are instructed to attend to formal aspects of linguistic structure, like syntactic correctness (explicit linguistic rules but no stimulated noticing).

Four consecutive lessons about linguistic operations for adding and deleting information in sentences were administered, according to the four experimental conditions. In all conditions the sentences were placed in a meaningful textual context, following recommendations of Gatbonton and Segalowitz (1988) and Hulstijn (2001) that training directed to linguistic fluency should take place in a meaningful context.

In the post-test writing tasks students had to change or produce sentences in a textual context. The tasks required that students retained a certain number of important content elements, while avoiding unnecessary repetition of information. Post-test scores expressed the degree in which students succeeded in both aspects in their resulting texts. Syntactic errors were not involved in this measure of writing quality. Only the comprehensibility of the content elements was taken into account. The results of the experiment showed that students (grades 5-6) in all four instructional conditions outperformed students in a control condition on the post-test writing tasks. There were however no significant differences between the results of the four experimental conditions, indicating that the conditions were equally effective in improving the children's writing.

Whereas the analysis in the above experiment focuses on the effects on the meaning level of writing, it is appropriate to pay special attention to the linguistic operations that were trained. An important question in this context is whether effects on the level of meaning of the texts are accompanied by effects on the level of form. More specifically, it is of interest to know whether the repeated training in the use of the selected linguistic operations resulted in a more frequent use of these operations by the experimental students in comparison to the controls and whether there are differences in effectiveness of the four experimental conditions. For example, it is possible that conditions focusing on form are more effective in increasing the use or accuracy of the operations than conditions focusing on meaning, although such a difference was not found in the analysis on the meaning level. Moreover, it is of theoretical interest to explore whether the use of the trained operations is conditional on the effect found on the meaning level of the texts. Assuming that the training resulted in an increased fluency in using the operations, we would expect the experimental children to have a higher frequency than the controls. But also the accuracy of the operations may have improved, as a result of the repeated confrontation with exemplars in the lessons. Finally, in this study we also wanted to explore age-related differences in the use of linguistic operations. In some studies (Hunt, 1970; Hillocks, 1986) it has been suggested that the use of linguistic structures depends on 'syntactic maturity'. It is however yet unknown whether this maturity concerns specific operations, such as the ones we trained, or a general tendency towards more complexity of structures.

From other studies into the training of linguistic operations we have some knowledge about its effects. Van de Gein (1991) compared a course teaching children (grade 4) 'sentence construction' skills (based on the generative rhetoric by Christensen and Christensen, 1978) with courses teaching 'direct writing' and traditional grammar. The courses lasted about half a school year. The experimental course concentrated on the inter-relatedness of meaning and structure by familiarizing students with grammatical sentence patterns. There was a focus on adding information to existing sentences, like in our experimental lessons. Moreover, there was a strong focus on knowledge of what distinguishes sentences from non-sentences. No significant effect was found on global text quality, nor were any effects found on T-unit ratio (regarded as a measure of writing fluency) or on conciseness. The only

effect on writing quality found was on a measure of ‘sentence ratio’, indicating that experimental children produced more flawless sentences than other students. Interestingly, this effect was not found on a test especially designed to measure sentence awareness (discriminating complete from incomplete sentences).

Other studies into the effect of training linguistic operations, mainly so-called sentence combining exercises (e.g. Mellon, 1969, O’Hare, 1973) however, have shown improvement on several measures of writing fluency, mainly indicating that trained students use more complex sentences than the controls (cf. Hillocks, 1986; Schuurs, 1990; Van de Gein, 1991; Wesdorp, 1983). Wesdorp (1983) even concludes on the basis of his review of sentence combining research that most studies show a positive effect on global text quality, leading him to the following observation: “It seems as if the increased ‘flexibility’ on syntactical level allows the student to pay more attention to other aspects of the composition, thereby increasing the global text quality” (p.104, translation from Dutch by the authors).

Although the sentence combining approach has been criticized for obtaining effects that can also be achieved without training (e.g. Hillocks, 1986; Smith & Combs, 1980), it seems worthwhile to reflect on the way the effects might be explained. The most relevant question in this context is whether the learning process that takes place is exemplar-based or rule-based. Is it sufficient for students to be confronted with repeated examples of a certain linguistic operation, say: combining two main clauses into one sentence by using a connective (such as ‘because’, ‘and’ or ‘though’) to increase fluency in using this operation in *other* textual contexts (with other words in the main clauses, expressing different ideas and containing different syntactic structures)? If that is the case the learning of a rule has actually taken place, because students recognize the conditions for carrying out the operation irrespective of the (extra) linguistic context. To the degree however that the learning is context-bound (e.g. operations are only applied when the clauses are similar to the examples in the training) the learning is exemplar-based.

Whether the learning is rule- or exemplar-based determines what we can expect from a training in which the focus is on repetitious execution of a given linguistic operation in meaningful contexts. In such meaningful contexts it is impossible to control for all kinds of surrounding (extra) linguistic variables, which means that we cannot focus the learners’ attention to them. Only to the degree that the learning is rule-based we may therefore expect that students will transfer linguistic operations to other sentences and contexts. Moreover, since we are aiming at training in the limited time span of a few weeks, it seems unrealistic to focus on operations that are not already part of children’s linguistic knowledge. Linguistic operations that are new to the children, such as complex subordination in sentences, are unlikely to become fluent in such a short time period.

Our choice of operations was guided by the above considerations. Lesson contents have been selected from classroom materials in use in the Netherlands and Flanders for grades 5-6. From all issues that are related to linguistic fluency (e.g. vocabulary, collocations, sentence structures; see Jacobs & Van Gelderen, 1998) we selected syntactic abilities that are closely related and simple enough to warrant the expectation of fluency gains in a relatively short time period. Because we were interested in increasing fluency, as opposed to learning new linguistic structures, we selected structures that could be assumed to be more or less familiar to the students, at least from a receptive point of view (reading). Moreover, given the differentiation between explicit and implicit conditions, we selected structures that could be handled with and without meta-linguistic explanations.

3. METHOD

3.1. Design of the Study

The experiment consists of a post test-only design with randomised assignment to experimental groups within a class. The control group consisted of two complete classes (one from grade 5 and one from grade 6) comparable to the classes from which the experimental children were recruited, in terms of language background. The control group received normal instruction according to the school schedule.

3.2. Participants

In total 247 children (133 boys and 114 girls) from grades 5 and 6 divided over 11 classes from five different elementary schools in Amsterdam and wide surroundings participated in the study. Most children were 10, 11 or 12 years old. A relatively small group of 18 children was older (13-14).

3.3. Treatment

The treatment consisted of four lessons of 45 minutes. All lessons were directed at adding information to and deleting uninformative parts of sentences. The following subjects were dealt with:

Lesson 1: Adding commentary to parts of a sentence (kernels);

[The *handsome* boy with the *black hair* has the *red* ball that *Ilse* is looking for.]

Lesson 2: Adding subordinate clauses to main clauses;

[The ball that *Paul* is looking for, is in the pond.]

Lesson 3: Combining sentences;

[The teacher wears a *beautiful, warm* coat. Instead of: The teacher wears a coat. It is beautiful and warm.]

Lesson 4: Using anaphora.

[He goes to Australia for a holiday. I would like to do *that* too.]

[Paul and Mary have worked all day. Now *they* are tired.]

The treatment in all the experimental conditions consisted of exercises in order to make sentences in text richer in information, and to avoid unnecessary repetition of information. In all exercises children had to read whole texts, presented in a meaningful context. Exercises in each lesson were systematically ordered from receptive (observation of sentences and answering multiple choice questions about them) to productive (filling in gaps in sentences, first in a closed format, later in a more open format).

In the forms conditions assignments required that linguistic forms were at least being *noticed*. In the meaning conditions, however such noticing was not required. Instead, attention is directed to meaning level problems in the texts. The explicit conditions supply explicit rules explaining the operations that are the objective of the lessons. These rules contain meta-linguistic terminology for defining the structural phenomena (e.g. “A kernel is a part of a sentence that you cannot leave out”) or explain how to use the structures correctly in formulation (e.g. “You can add commentary to a kernel”). The implicit conditions do not contain such rules and terminology. Instead the students are instructed to use the same operations, but in common language, such as “add parts to sentences” (forms) or “add interesting

information to sentences” (meaning). Also, the students in the implicit conditions are asked to observe “which parts can be deleted from a sentence, without making it incomplete” (forms) or “which parts of a sentence are interesting or not” (meaning). See appendix 1 for an overview of the beginning of lesson 1 in the four experimental conditions.

Per lesson each student received a workbook containing the texts and exercises (also the explanation of rules for the explicit conditions) and a booklet containing the answers to the assignments (the answer book). The students had to use this for checking their own answers.

3.4 Procedure

Each lesson lasted 45 minutes. The experiment, including testing, was spread over a period of 3 to 4 weeks. Classroom wide instruction was not possible, because students of the four experimental conditions were working in the same classroom. Students were grouped according to the condition to which they were randomly assigned and worked individually through their booklets. Two trained instructors (from a team of six) supervised the four experimental groups in each class.

3.5. Measuring Instruments

First, a test for linguistic knowledge was administered to be used as a covariate. Two writing tasks formed the post-test in which students applied the acquired skills in the lessons to more communicative and complex tasks.

The test “linguistic knowledge” was administered to measure children’s relevant grammatical knowledge in view of the contents of the lessons. The test concerned five domains of grammatical knowledge which are important for the correct use of the linguistic operations in the lessons: 1) gender of article (choose the correct article); 2) sentence concept (discriminate a complete sentence from an incomplete one); 3) word order in main and subordinate clauses (discriminate correct from incorrect orders); 4) cutting sentences (which parts of a sentence can and cannot be separated); 5) using conjunctions (discriminating sentences in which conjunctions are used correctly or incorrectly). The test consisted of a 85 two-choice questions, to be scored objectively. The reliability (Cronbach’s alpha) of the test was .79.

In the first post-test task “Washing cars for the school library” children had to write two paragraphs for which the content was already given in statements (see Appendix 2). They were not allowed to invent new content elements. The statements were constructed in such a way that children could apply the linguistic structures practiced in the lessons in order to avoid unnecessary repetition of words or phrases.

In the second post-test task “Miss or master wanted” children had to improve a text in which information is given in an overly redundant way (see Appendix 3). The text consists of five paragraphs that have to be rewritten separately. The children are asked to make the text more pleasant to read and remove all unnecessary repetitions. The sentences of the text were construed in a way that allowed the children to use operations that were practiced in the lessons. But both tasks were new to the experimental students, in the sense that the lessons contained no such complete writing assignments.

Although task 1 has a more open format than task 2 (in which a complete text is already given), both tasks require integrative application of the separately learned operations in the lessons. Fluency in execution of the linguistic operations seems an important condition for success.

3.6. Scoring of Linguistic Operations

The use of the four kinds of linguistic operations in the two writing tasks was scored in the following way. First, we identified whether a textual change has actually taken place in comparison to the original phrases (task 1) or the original text (task 2). If this was the case, we determined whether it concerned one of the operations. Here are some examples (from task 1) of operations the children could apply to transform the following phrases into text (see also Appendix 2):

Statements:

- school must buy new books for recreational reading
- books for recreational reading are for the school library

Operations:

- Combining kernel/commentary: The school must buy new books for recreational reading *for the school library*.
- Using subordinate clauses: The school must buy new books for recreational reading *that are meant for the school library*
- Coordinating sentences: The school must buy new books for recreational reading, *because the school library needs them*.
- Using anaphora: The school must buy new books for recreational reading. *They* are for the school library.

In order to make the scoring as objective as possible a set of rules was developed on the basis of several trials by the two investigators. We could not use the punctuation in the children's texts, because knowledge about punctuation conventions is not very well developed in this age group. Therefore, we used only syntactic cues, mainly word-order, to determine the nature of the operations. Operations were not scored when they concerned newly invented contents, because such new inventions were not asked for and explicitly discouraged in the writing assignment (see Appendices 2 and 3).

In addition, each operation was scored in terms of syntactic and semantic correctness. For the syntactic score only word order was decisive. Errors of spelling and erroneous conjugations were ignored. For the semantic score it was decided whether the sentence expressed the meaning in accordance with the purpose of the writing task and was consistent from a logical point of view. The differentiation between syntactic and semantic correctness of the operations was relevant from the point of view of our experimental conditions. We study whether children in the forms conditions succeed in producing more syntactically correct operations, than children in the meaning conditions. On the other hand, we study whether all experimental children are better in avoiding meaning level errors than the controls, because of increased fluency in using the operations.

Finally, we discriminated between operations of different 'types' within the *same* category. For example, it is possible to receive a high score on the category 'anaphora' by repeatedly using a word like "they" with the same referent (the children, see task 1). However, we considered it relevant to analyse the flexibility in

using the operations. This flexibility is better expressed by scoring one “type” of operation only once, if it occurs several times in an identical fashion. So, only when different instantiations of a certain operation occurred – such as using the word “they” but with a different referent – it would result in higher score on type.

The following eight variables were derived for further analysis from the above scores for each child: 1) Total number of operations, 2) Total number of syntactically correct operations, 3) Total number of semantically correct operations, 4) Difference between standardized number of syntactically correct and syntactically incorrect operations, 5) Difference between standardized number of semantically correct and semantically incorrect operations, 6) Total number of types of operations (syntactically *and* semantically correct) , 7) Difference between standardized number of types and syntactically incorrect operations, 8) Difference between standardized number of types and semantically incorrect operations.

The achievement of a precise scoring procedure and a set of objective scoring rules was considered more important in this study than the assessment of interrater reliability. The complexity of the scoring and the probability of errors necessitated this priority. As a test, the two investigators first scored 40 texts, working independently. They had a fairly high agreement on operations that were detected by both raters, but in many cases operations were overlooked. In these cases the problem could be easily repaired. Because the problem was one of precision and not of agreement, it was decided that the scores of each investigator on all texts were checked by the other in order to come to a precise and reliable scoring of the operations. Thus both investigators scored all texts. In addition, both worked blind for the experimental condition of the children who produced the texts. All differences between the two ratings were resolved in a discussion, in which the scoring rules served the role of arbiter.

4. RESULTS

Of the 247 participants four dropped out during the experiment. In addition, the results of ten participants were excluded, because their Dutch proficiency was of a too low level to meet the requirements for the experiment (beginning learners of Dutch as L2 or severe learning problems). Finally, 4 (task 2) and 5 (task 1) participants were absent during the post-tests. So, for the analysis of linguistic operations 227 (task 1) or 228 (task 2) participants remained.

In Table 1 descriptives are given for the four categories of operations used in the two tasks. The mean numbers show that coordinating sentences and using anaphora are the most frequently used operations. Of course, the number of operations used is related to text length in the two tasks. Task 1 consists of two paragraphs. Task 2 is considerably longer (five paragraphs). Therefore, it is not surprising that the mean number of operations is higher in task 2. The students use on average quite a lot of operations (8 to 12) in both tasks. For both tasks we can conclude that they are successful in eliciting the learned operations, although relatively few kernel/commentary- and subordinate clause- operations are used.

For both tasks the number of syntactic errors was less than 1 on average. The number of semantic errors was about 1.30. The frequency of errors is relatively low in comparison to the average number of operations, although we may add that in task 1 the relative number of errors is higher than in task 2, given the fewer number of

operations. This difference can be explained by the fact that task 1 required the formulation of new sentences, whereas in task 2 existing sentences had to be changed.

TABLE 1

Mean numbers and standard deviations (between brackets) for scored operations.

	Task 1 (N=227)	Task 2 (N=228)
Combining kernel/commentary	1.15 (1.04)	0.82 (1.20)
Using subordinate clauses	0.60 (0.87)	1.67 (1.41)
Coordinating Sentences	2.07 (1.84)	3.14 (2.42)
Using Anaphora	4.22 (3.27)	6.25 (3.70)
Total number of operations	8.05 (4.88)	11.87 (6.08)

Eight ANCOVA's per task were carried out with condition (1-5) and age-group (1-4) as independent factors. The factor age-group consisted of the levels 10, 11, 12 and 13-14 years (1 participant was 14 years of age). The eight variables of used operations were used as dependent variables (see table 2). The test for linguistic knowledge was used as a covariate. The first row of table 2 shows the results of the total number of operations in both tasks. There were no significant main effects of condition on this measure, but there was a main effect of age-group in task 1 (p-value is smaller than .05). Inspection of the means reveals that older children have higher scores on this measure, suggesting a rather linear relation: each consecutive age-group produces more operations on average. In the next rows results are shown of the numbers of syntactically correct (row 2) and semantically correct (row 3) operations. Again, there are no main effects of condition in both tasks. There is however a main effect of age-group on the number of semantically correct operations in task 1. Again, post-hoc comparison reveals that older children have higher scores on this measure (each age group has a higher mean than the previous one). The rows 4 and 5 contain corrections on the variables in rows 2 and 3. In row 4 the standardized number of syntactically incorrect operations is subtracted from the standardized number of syntactically correct operations. In row 5 the same kind of correction is carried out for the semantically correct operations. These measures thus 'penalize' students that use operations with relatively much errors. The results show that there is a main effect of condition for the semantic correction in task 1. Post hoc comparison shows that students in the experimental conditions outperform the control students. Thus, the experimental groups appear to have better control of semantic content while using the linguistic operations in task 1, but not in task 2. In addition, in the post-hoc comparison students in the condition forms/implicit are significantly better than students in the conditions forms/explicit and meaning/explicit.

TABLE 2: RESULTS OF THE UNIVARIATE ANALYSIS (ANCOVA'S) ON TOTAL NUMBERS OF OPERATIONS FOR THE TWO POST TEST TASKS (SIGNIFICANT EFFECTS IN ITALICS).

	TASK 1 (N=227)				TASK 2 (N=228)			
	MAIN EFFECT OF CONDITION		MAIN EFFECT OF AGE-GROUP		MAIN EFFECT OF CONDITION		MAIN EFFECT OF AGE-GROUP	
	F-VALUE	P-VALUE	F-VALUE	P-VALUE	F-VALUE	P-VALUE	F-VALUE	P-VALUE
1	1.15	.33	<i>3.80</i>	<i>.01</i>	.14	.97	.26	.85
2	.87	.49	2.31	.08	.28	.89	.20	.90
3	1.52	.20	<i>3.17</i>	<i>.03</i>	.14	.97	.22	.88
4	.64	.64	.97	.41	1.29	.28	.05	.99
5	<i>4.01</i>	<i>.00</i>	.73	.54	.23	.92	.26	.86
6	1.52	.20	2.13	.10	.36	.84	.33	.80
7	1.27	.28	1.38	.25	1.29	.28	.03	.99
8	<i>4.40</i>	<i>.00</i>	.37	.76	.30	.80	.38	.77

1) Total number of operations 2) Total number of syntactically correct operations 3) Total number of semantically correct operations 4) Difference between standardized number of syntactically correct and syntactically incorrect operations 5) Difference between standardized number of semantically correct and semantically incorrect operations 6) Total number of types of operations (syntactically and semantically correct) 7) Difference between standardized number of types and syntactically incorrect operations 8) Difference between standardized number of types and semantically incorrect operations.

In the rows 6-8 of table 2 the results are shown for the analysis of 'types' of operations (see section 3.6). Children who use different operations of the same category score better on these measures than children who use identical operations repeatedly. The results in row 6 show that there are no main effects on total number of types of operations that have been used correctly. In row 7 it is shown that there are also no significant main effects when the correction on syntactic errors is carried out. In row 8, however there is a significant main condition effect in task 1 for the difference between the standardized number of types and the semantically incorrect operations. Like with the other semantically corrected measure (row 5), post-hoc comparison reveals that the experimental groups outperform the controls. Some of the above analyses (1, 2 and 3) result in a significant interaction between condition and age-group, which are not interpreted here. The highest age-group (13-14) is underrepresented in our sample (n=18) and an uneven distribution of this group among the conditions is probably responsible for these interactions.

In order to explore effects for the four different categories of linguistic operations that were learned in the lessons we carried out eight MANCOVA's (condition 1-5; age-group 1-4; covariate: syntactic knowledge) per task. Instead of the eight variables used in the univariate analysis shown in table 2, we used the eight measures for each of the four categories as dependent variables. We report the results of these analyses only as far as a multivariate significant effect has been found. This is a rather conservative strategy. However, this strategy is warranted to avoid the risk of chance capitalization with so many significance-tests.

In both tasks there are no multivariate significant main effects of condition and no significant interactions (applying Wilk's Lambda, Pillai's Trace and Hotelling's Trace). The effect of age-group is however multivariate significant for some of the measures in task 1, but not for task 2. It concerns the measures for total number's of

operations (Wilk's Lambda=.873; p-value=.006), syntactically correct operations (Wilk's Lambda=.885; p-value=.015), semantically correct operations (Wilk's Lambda=.873; p-value=.006), standardized numbers of operations corrected syntactically (number 4) (Wilk's Lambda=.870; p-value=.004), total numbers of types (Wilk's Lambda=.874; p-value=.006) and standardized numbers of types corrected syntactically (number 7) (Wilk's Lambda=.874; p-value=.006).

Post-hoc analysis reveals that in the case of the uncorrected measures (1, 2, 3 and 6) it is mainly the operation 'subordinate clauses' that is significantly more often used by the older children (each age group having a higher mean than the previous one). In the case of the semantically correct operations (3) and number of types (6) also the operation 'coordinating sentences' is significantly more often used by the older students (in the same fashion as mentioned above). However, in the case of the two syntactically corrected measures (4 and 7) it was the operation 'kernel/commentary' that differed significantly between age-groups. The difference in this case was less linear than in the previous ones, because now age-group 3 (12 years) receives the best scores, indicating that the oldest group makes more syntactic errors in this sort of operation. In one of these measures (4: standardized number of operations corrected syntactically) a significant age difference was also found on 'coordinating sentences', which indicated that the oldest students did worse than all the other age-groups. Again this indicates that the oldest group makes more errors in word order, but produces significantly more operations of this category.

5. DISCUSSION

In this experiment the effect of explicitness and instructional focus on the use of linguistic operations was studied. In a previous analysis a significant effect of the experimental conditions on the meaning level of texts produced was demonstrated (Van Gelderen & Oostdam, 2002). Students in the four experimental groups were able to formulate sentences while keeping a better balance between relevant content elements and unnecessary repetitions of words and phrases than the students in the control group. It appeared that the four experimental conditions (implicit/focus on forms, explicit/focus on forms, implicit/focus on meaning, explicit focus on meaning) were equally effective in improving the students' writing on two post test tasks.

The analysis of trained operations shows a different pattern. On both tasks there were no significant condition effects of 'raw' numbers of operations used. There were also no significant differences found for the frequency of operations scored correct (syntactically or semantically). Apparently, the experimental treatment did not result in an increased use of the operations. Therefore, the improvement on meaning level established previously cannot be attributed to these frequency measures. This raises doubts to our assumption that fluency in the use of linguistic operations is important for the production of meaningful texts. Therefore, we checked this assumption by analysing the correlations between the number of linguistic operations and the text quality scores from our previous analysis. The balance between relevant content elements and unnecessary repetitions in the post test tasks was expressed in a so-called trade-off score (the standardized number of content elements minus the standardized number of unnecessary repetitions). Correlations between this score and the total number of operations were substantial (.62 in task 1 and .44 in task 2), supporting our assumption of a conditional relationship. The more of the trained

operations are carried out, the better the balance between content and unnecessary information.

The fact that there is no condition effect on numbers of operations used indicates that the experimental students used other means to obtain a better quality balance in their texts. On task 1 not the 'raw' number of their operations turned out to be greater than that of the control group, but the corrected measures for semantic errors did (both for numbers of operations and for 'types'). In other words, the experimental children made fewer semantic errors while using the operations, which is consistent with our assumption that increased fluency frees working memory space to attend to the meaning level of the text. So far, we also find support for the rule-based nature of the learning process, given that the linguistic operations had to be applied in another context than in which they were learned. The 'types' of operations – referring to the concrete linguistic forms that the operations take - were certainly not identical to the ones that the children encountered in the lessons.

However, for task 2 no main effects of condition on the use of operations were found at all. So, although in this task the experimental students were also more effective on the meaning level than the controls, in this case this result cannot be attributed to any of our linguistic operation measures. Our explanation runs as follows. First, task 2 has a relatively 'closed' format compared to task 1. The task requires that complete sentences in a given text are improved (see appendix 3). The fact that control students and experimental students do not differ in their use of linguistic operations means that they are equally able to apply the operations in this task, also when semantic and syntactic errors are taken into account. The application of the learned operations in this context may therefore be too easy for all students of the given age-groups for our experimental treatments to have an effect (an argument which is supported by the absence of age-group effects). If this is true, the demonstrated condition effect on the meaning level can be attributed to the fact that the experimental students use the operations in a more goal-directed manner. Although the use of linguistic operations is necessary to achieve effects on the meaning level, operations do not necessarily have that effect. Therefore, it is possible that the effect of the treatments for task 2 was that the children became aware of the importance of keeping and deleting information in sentences, changing their view on what it 'takes' to improve sentences from an informational point of view. At the same time however, it is possible that the experimental children did not use more operations in task 2, but have learned to use them with less effort, freeing working memory space to attend at the meaning level in much the same way as our explanation is for the effects in task 1. Future research into effects of fluency training on comparable sorts of writing tasks may shed more light on the question which of these explanations is more valid.

Differential effects of our four conditions were hardly found in this study¹. Thus, focus on form treatment has not been demonstrated to be more effective in fostering error-free use of linguistic operations than focus on meaning treatment. Nor were there any differential effects of implicit versus explicit instructional conditions. The lack of systematic differences between conditions seems to indicate that the instructional differences do not matter in improving the students' fluency and writing

¹ One exception, however, was found, favouring students in the implicit/forms condition over other conditions in task 1 (see results). Given that this was just a single effect, which was not systematically replicated in other measures, we consider it too incidental to give it any weight in the discussion.

skills. The possible reasons and implications are being discussed in Van Gelderen and Oostdam (2002) and are subject to further inquiry.

Some age-related effects have been found in task 1. In interpreting these effects (especially total number of linguistic operations and number of semantically correct operations) we must take into consideration that the results are corrected for syntactic knowledge (the covariate). Therefore, the fact that older students produced more operations and also more semantically correct operations cannot be attributed to their superior syntactic knowledge. Rather, the effects seem to indicate that older students are more inclined to apply the operations while forming new sentences than the younger ones, an effect that may be interpreted as age-related differences in fluency. The multivariate age-effects in task 1 on the different categories of operations (especially subordinate clauses, coordinating sentences and kernel/commentary) are interesting because they suggest that frequency of use of some operations indeed increases with age, but that for some operations this increased use leads to more syntactic errors. In future studies into the age-related use of operations it seems worthwhile to find more corroborative evidence on this matter.

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APPENDIX 1

Overview of parts 1 and 2 of the first lesson in four conditions

TITLE OF LESSON:

“MAKING SENTENCES SHORTER AND LONGER” (FORMS CONDITIONS)

“SNOWBOARDING IS A NICE SPORT” (MEANING CONDITIONS)

PART 1: INTRODUCTORY ASSIGNMENT

explicit/forms and explicit/meaning: knowledge of rules

Rule: Sentences consist of sentence parts. [Omar/ walks/on the street] Each part of a sentence always has a kernel. You cannot leave it out. In the next sentence the parts consist of kernels only. You cannot delete any word. [The boy/has/the ball] You can however extend the parts. [The *handsome* boy *with the black hair* has the *red* ball *that Ilse is looking for*] The italicized pieces do not belong to the kernels. You can leave them out. But they give more information about the kernel. They give a *commentary* on it. So, the commentary says more about the kernel but can be deleted. Commentary can be placed before or behind the kernel. [Before: *handsome* boy; after: ball *that Ilse is looking for*]

implicit/forms: exercise in discriminating long and short sentences

implicit/meaning: exercise in selecting words related to snowboarding

PART 2: RECEPTIVE EXERCISE

all four conditions:

[Two texts about snowboarding; sentences of text 1a contain only kernels; sentences in text 1b contain kernels and commentary. After completion students check their own answers in separate booklet.]

Text 1a

Did you know that snowboarding is a sport? It is the sport of Bianca de Wit. This girl intends to become a champion. Sliding on a board from a slope is what she likes. Et cetera

Text 1b

Did you know that snowboarding is a *very exciting* sport? It is the *favorite* sport of Bianca de Wit, a *thirteen-year-old girl with blond tresses and hefty calves from Rotterdam*. This girl, *now already the top-best of her age*, intends to become a *real* champion. Sliding on a *narrow* board *as fast as she can* from a *steep* slope, is what she likes *best on her winter holiday*. Et cetera.

Condition specific instructions:

Implicit/forms	Explicit/ forms	Implicit/meaning	Explicit/meaning
Check the pieces that have been added in text 1b. [It is observed that some pieces of a sentence can be deleted, while the sentence remains correct.]	Check the pieces that are <u>commentary</u> in text 1b. Commentary can be placed before or after the kernel.	Why are the underlined pieces in text 1b <u>interesting</u> ? Check one of the following answers: a) extra information about snowboarding, b) it helps to understand the text, c) it is fun to read.	Why are the <u>commentaries</u> in text 1b <u>interesting</u> ? Check one of the following answers: a) extra information about snowboarding, b) it helps to understand the text, c) it is fun to read.

APPENDIX 2

Task 1

Washing cars for the school library

Your school needs new **books for recreational reading** for the school library. The old books are dull and worn-out. In order to collect money for new books students are going to wash cars. But who wants to **pay** for it? You are going to write a letter to people who live and work in the neighborhood of the school. The letter is given here. Some pieces have already been written. You write the two remaining pieces. You must use the blocks A and B. They tell you what to write about. Take into account the **text that already is written**. Make your pieces easy to read! **The people must understand immediately what you are going to do**. You decide for yourself how you are going to say everything. **Don't** add new things.

Block A

Give the following information about the **books**:

- school must buy **new books for recreational reading***
- books for recreational reading are for the **school library**
- books for recreational reading must be **fun**
- books for recreational reading must be **exciting**
- library has **mainly old** books for recreational reading
- everybody **already knows** old books for recreational reading

*) The Dutch equivalent of this complex phrase is a simple compound and rather common language (“leesboeken”)

Block B

Say **where** and **when** it is going to happen:

- students come to school **Saturday next week**
- students get **buckets and sponges** at school
- students wash the cars **at the peoples' homes**
- people have filled in the **reply form**
- students **begin at 10 o'clock**
- at 10 o'clock the students **come at the peoples' homes**
- students **stop at 3 o'clock**

Letter (to be completed)

Amsterdam, May 30, 2000

Dear parents, local residents and entrepreneurs,

We, students of theschool ask your kind attention for the following.

Insert Block A

We want to earn minimally 1000 guilders for the school by washing and vacuuming cars. It costs 10 guilders for an ordinary car and 15 guilders for a van. The school will buy more books and magazines if we earn more than the minimum.

Insert Block B

We hope that you will participate in our action. It is for a good purpose. Please complete the reply form down here. You can send it to our school.

Yours sincerely,

The students of the booklet action

APPENDIX 3

Writing task 2 Miss or master wanted

First read the assignment below carefully

There is a shortage of misses and masters at school. The students are making a website calling people to become miss or master. A first draft has been written for the website. That text is printed below. The text **really** needs improving. It is unpleasant to read and has too many repetitions.

- Make the text more pleasant to read
- Remove unnecessary repetitions
- Take care that everything is clear

There are five pieces. Improve the pieces 1 to 5 separately.

Miss or master wanted

1. We have a big problem at our school. It is an annoying problem. The big problem at our school is that children often cannot have lessons. The children often cannot have lessons, because the miss is ill. If the miss is ill, there are no more people to replace her. There are no more people to replace the miss, because there are not enough misses and masters.
2. There are no people any more who want to become miss or master. The people that do not want to become miss or master, are going to look for other jobs. A master or miss does not earn enough money. A master or miss must work too hard.
3. Misses and masters have rather nice work. It is exciting work. It is important work. Misses and masters enjoy very much to engage with children every day.
4. Don't you want to become master or miss? Do you know someone perhaps who wants to become miss or master? If you know people that want to become miss or master, please pass their telephone number. If you pass their telephone number we can ask the masters or misses whether the masters or misses perhaps want to give lessons at ours.
5. We hope that soon the children at our school will not be sent home any more. If soon the children will not be sent home any more the children can do nice things in the classroom. The fact is the children don't like it at all.