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Semantic Feature Analysis targeting verbs in a quadrilingual speaker with aphasia

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Abstract

Background: Semantic Feature Analysis (SFA) (e.g. Boyle & Coelho, 1995) is a treatment approach aimed at enhancing lexical retrieval by improving access to the semantic network in speakers with aphasia. Although there are promising results on trained items, previous studies exploring the impact of SFA on verb production in monolingual speakers have shown mixed results for generalisation to untrained items and discourse. There are few published studies investigating SFA and action naming in multilingual speakers.

Aims: The study explores the impact of SFA on trained and untrained verbs, semantics and syntax, and narrative production in the trained and untrained languages of a multilingual speaker (Japanese-English-German-Norwegian) with moderate non-fluent aphasia. Treatment was conducted in a late-acquired language (Norwegian).

Methods & Procedures: SFA was provided during an intensive schedule of about 22 hours of therapy, with approximately ten hours per week over two and a half weeks. The treatment focused on the production of verbs in sentence contexts.

Outcomes & Results: Outcome measures include the *Bilingual Aphasia Test* (BAT), an action-naming test, and production of semi-spontaneous narratives.

Outcomes in the treated language: Overall, the participant responded positively to the SFA treatment. The trained verbs improved significantly, but no transfer was observed to untrained verbs. There were no changes in the formal testing of semantics or syntax, but improvements were noted in narrative production.

Cross-linguistic outcomes: Transfer to verbs in untreated German was evident. There were significant increases in the semantics and syntax in both English and German. The participant showed an improvement in discourse in English and German, although not in Japanese.

Conclusions: SFA treatment in a late-acquired language can lead to gains in the treated language and transfer to both stronger and weaker languages, with different patterns for the various languages. This indicates that SFA may be a promising method for treating multilingual speakers with aphasia. The authors further advocate the use of narratives as an assessment tool. In addition to enhancing the ecological validity of the findings, the narratives provided information not obtainable from the other assessment tools for within- and cross-linguistic therapy gains for the participant.

Keywords: aphasia; multilingual; cross-linguistic transfer; Semantic Feature Analysis (SFA); verb; action naming

Treatment of aphasia in multilingual speakers is clinically challenging. It is nevertheless important to study as there is a growing number of multilingual speakers and an increase in the number of individuals with aphasia globally (Ansaldo & Ghazi Saidi, 2014). In line with Grosjean (2013) we define the terms 'bilingualism' and 'multilingualism' as the use of two or more languages in everyday life, and we will use the terms interchangeably. Studies of linguistic capacities of multilingual speakers with aphasia are furthermore important as they can offer insights into language processing, and thus contribute to evaluating theories of normal cognition (Nickels, Kohnen, & Biedermann, 2010). Key concerns can be raised around the transferability of treatment effects across languages and contexts of language use. Another concern is the risk of harming the other language(s) when providing treatment in only one of the speaker's languages. The present study explores the impact of Semantic Feature Analysis (SFA) therapy (Wambaugh & Ferguson, 2007; Wambaugh, Mauszycki, & Wright, 2014) on the naming of trained and untrained verbs, semantics, syntax, and narrative production in the treated and untreated languages of a quadrilingual speaker (Japanese-English-German-Norwegian) with non-fluent aphasia. Treatment was provided in Norwegian, a late-acquired language of the participant.

Word retrieval and semantic networks

Word retrieval difficulty is a core symptom of aphasia. For some individuals, naming can be a challenge due to impaired access to the semantic network while, for others, it can be due to impairments in the semantic network itself. Models of lexical access assume that word meanings are represented in the lexical-semantic network as sets of semantic features and properties (Caramazza, 1997). The nodes in the network will typically contain information about a concept and the properties that describe it (e.g. shape and colour, function and semantic roles), in addition

to how they link to other related concepts (e.g. synonyms and antonyms and phonologically related words). In a large network, each concept would assumably be linked to many other concepts. According to Bybee (2001, p. 29) words in the lexicon are linked not only through their meaning and contexts of use, but also through their phonological form. Hence, activation of a word may be facilitated by accessing semantically or phonologically related words. Furthermore, it is assumed that by strengthening the connections between a concept, its semantic features, and its lexical representation, one can facilitate easier access to the word.

Semantic Feature Analysis

Semantic Feature Analysis (SFA) (e.g. Boyle, 2004; Boyle & Coelho, 1995) is a treatment approach aimed at enhancing lexical retrieval by improving access to the semantic network through semantic feature generation. SFA was initially developed to improve the retrieval of nouns in monolingual speakers with aphasia. It has shown promising results on trained items for reports on 16 of 17 monolingual individuals (Boyle, 2004; Boyle & Coelho, 1995; Coelho, McHugh, & Boyle, 2000; Lowell, Beeson, & Holland, 1995; Rider, Wright, Marshall, & Page, 2008). Generalisation to untrained items occurred in some cases (Lowell et al., 1995), but not all (see Boyle, 2010 for a review).

SFA can facilitate generalisation to untrained items through at least two mechanisms: by stimulating the semantic network and by implementing semantic feature generation as a strategy for the person with aphasia (Wambaugh et al., 2014). Some studies have also reported generalisation to connected speech following SFA treatment, even when the treatment focused on single words (Coelho et al., 2000; Davis & Stanton, 2005; Peach & Reuter, 2010). In other studies,

generalisation to discourse was difficult to obtain, even when SFA was used to treat words connected to specific discourse tasks (Boyle, 2004; Boyle & Coelho, 1995; Rider et al., 2008).

To date, a very limited number of studies have been published using a form of SFA with bilingual speakers, and all but one (Goral, Rosas, Conner, Maul, & Obler, 2012) focus on noun retrieval (Edmonds & Kiran, 2006; Kiran & Roberts, 2010). Goral et al. (2012) included both noun and verb retrieval, using a modified SFA treatment protocol in addition to a sentence generation task and a rapid naming task, to examine cross-language generalisation in a multilingual speaker with aphasia. Some generalisation to untreated languages was found. However, the authors do not separate the outcomes of each treatment protocol; it is therefore difficult to say if the generalisation was due to the SFA or to one of the other treatments (or a combination).

All seven participants in the studies by Edmonds and Kiran (2006) (three English-Spanish bilinguals) and Kiran and Roberts (2010) (two Spanish-English and two French-English bilinguals) showed improvement of the trained items in the treated language, indicating that SFA may be a fruitful method for treatment of nouns in bilingual speakers with aphasia. The generalisation patterns differed among participants. All three participants in the study by Edmonds and Kiran (2006) showed cross-language transfer, and the authors concluded that treatment in the weaker language of an individual with bilingual aphasia may be more beneficial in facilitating cross-linguistic transfer than treatment in a stronger language. Cross-linguistic transfer was found only for one of the four participants from the Kiran and Roberts (2010) study.

Although SFA was developed to target noun retrieval, this method has also been adapted to treatment of verb retrieval in two studies of monolingual speakers. Wambaugh and Ferguson (2007) explored the effect of SFA on action naming in a person with anomic aphasia. They found improvement in naming trained verbs. Furthermore, they found improvement in discourse (an

increase in correct information units (CIUs) (Nicholas & Brookshire, 1993)), even though the treatment focused on single words. They also reported improvement for untrained items, but this was partially explained by the repeated probing of these items, and there was no generalisation to untrained items that the person was not exposed to during treatment. Using the same treatment protocol, Wambaugh et al. (2014) studied four individuals with different aphasia types (conduction, anomic, and Broca's aphasia). They found improvement in naming trained items for three of the four participants, but no generalisation to untrained items. An improvement in discourse, measured as an increase in CIUs, was found for one participant only. Wambaugh and colleagues state that the other participants in this study may not have been able to make use of SFA as a strategy to assist them in naming untrained items.

The somewhat surprising finding that treatment of single words may generalise to discourse is explained through the original aim of SFA, namely to strengthen the lexical-semantic network (Massaro & Tompkins, 1994; Wambaugh et al., 2014). One can further assume that training verbs might be especially important in order to enhance connected speech production. Verbs have an important role in constructing a sentence. Semantically, verbs usually refer to events, and events often have participants (arguments) that need to be integrated into the sentence frame. Syntactically, verbs must have a subject, and they assign arguments with semantic roles such as agent and theme (Vigliocco, Vinson, Druks, Barber, & Cappa, 2011). It follows from this that a person who does not increase word retrieval in a naming task after SFA treatment can in fact still make use of SFA as a strategy to improve connected speech (Wambaugh et al., 2014).

Bilingual language processing and cross-linguistic treatment effects

There is a growing body of evidence showing that all the languages of a multilingual speaker are active when s/he is producing words in one of the languages (e.g. Brysbaert & Duyck, 2010; de Bot, 1992; Green, 1998; Kroll, Bobb, & Wodniecka, 2006; Kroll, Dussias, Bice, & Perrotti, 2015; Kroll, Van Hell, Tokowicz, & Green, 2010). This is the case not only when the speaker is using a weaker L2 or L3 (and so on), but also when using the L1. Current models of bilingual language processing also agree that multilinguals have a shared conceptual system for both/all of their languages (Dijkstra & Van Heuven, 2002; Kroll & Stewart, 1994; Pavlenko, 2009). de Bot (1992, 2004) further argues that the conceptual information spreads to and activates lemmas of both/all languages, and the lemma can be linked to various form characteristics depending on the languages involved.

Cross-linguistic influence is found not only at the lexical level, but also at the phonological and syntactic levels. Furthermore, the influence is bi-directional, which implies that not only does the L1 influence the L2, L3 and so on, but the L1 is itself influenced by the L2, L3 etc. (see Kroll et al., 2015 for a discussion). This corresponds with the approach of Bybee (2010) stating that cognitive representations are sensitive to linguistic experience, such as frequency of use. Based on the above approach one can assume that exposure to an L2 will have an impact on the cognitive representations also in L1.

The fact that conceptual representations are shared and that there are links between the lexical representations in the various languages of a multilingual speaker opens up for cross-linguistic effects of language therapy. This is a field which has received an increasing amount of attention since the early 2000s. The findings of the research are, however, still equivocal. Overviews show

that therapy transfer may occur from a treated to an untreated language, but not always (Faroqi-Shah, Frymark, Mullen, & Wang, 2010; Kohnert, 2009).

Among those who found transfer, Ansaldo and Ghazi Saidi (2014) reported in a recent review that semantic therapy is more likely to lead to transfer than phonological approaches (e.g. Croft, Marshall, Pring, & Hardwick, 2011). Pre- and postmorbid proficiency are also important factors in transfer. Several studies have shown that in bilinguals with a higher proficiency in one language than in another, treatment in a premorbidly weaker language may benefit the untreated, stronger language (e.g. Edmonds & Kiran, 2004, 2006; Kiran & Iakupova, 2011). In contrast, Goral (2012) found that therapy in a postmorbidly stronger language enhanced the possibility for cross-linguistic transfer (cf. also Croft et al., (2011)). In addition, studies have shown that treating the language of the environment may enhance the possibility of treatment gains and cross-linguistic transfer (Fredman, 1975; Goral et al., 2012).

Contrary to these findings of cross-linguistic transfer, multiple studies have failed to find a generalisation effect from a treated non-native language to an untreated L1 (Filiputti, Tavano, Vorano, De Luca, & Fabbro, 2002; Goral, Levy, & Kastl, 2010; Miertsch, Meisel, & Isel, 2009). It is likely that the degree of linguistic similarity between the languages plays a role (Goral et al., 2010; Miertsch et al., 2009). It may be easier to find transfer effects between languages with higher degrees of structural overlap than between languages with larger cross-linguistic structural differences. For instance, Ansaldo and Ghazi Saidi (2014) report that therapy gains have been found to transfer between the Indo-European languages (e.g. Bengali-English in Croft et al. (2011), French-English and German-English in Goral (2012) and Spanish-English in Kiran & Roberts (2010)).

Most of the prior studies have examined cross-linguistic effects at the lexical level, like noun cognates (Kohnert, 2004), and nouns assessed in single word contexts (Croft et al., 2011; Edmonds & Kiran, 2006; Kiran & Roberts, 2010). However, Altman, Goral, and Levy (2012) found positive changes to varying degrees in narrative structure and sentence grammaticality in all the languages of a trilingual speaker with aphasia for whom treatment was provided in only one of the languages.

Verbs tend to be morphologically more complex and have more complex semantic representations than nouns (Mätzig, Druks, Masterson, & Vigliocco, 2009). Several studies show that action naming and verb production are more difficult than object naming and noun production for people with aphasia (Black & Chiat, 2003; Faroqi-Shah, 2012; Links, Hurkmans, & Bastiaanse, 2010; Mätzig et al., 2009; Webster & Whitworth, 2012). Verbs are crucial for communication; hence, there is an increased interest in targeting verbs in aphasia treatment. A vast number of studies show that bilingual speakers with aphasia have greater difficulties with action naming than object naming (e.g. Ansaldo, Ghazi Saidi, & Ruiz, 2010; Faroqi-Shah & Waked, 2010; Hernández, Costa, Sebastián-Gallés, Juncadella, & Reñé, 2007; Kambanaros & van Steenbrugge, 2006). In a review of verb treatment studies with monolingual speakers, Webster and Whitworth (2012) found that verb retrieval therapy is effective in improving trained verbs, and verbs respond to similar treatment methods as nouns. However, generalisation to untrained items is still a challenge following verb treatment. Improvements in sentence production have been seen in several studies, including Bastiaanse, Hurkmans, and Links (2006) and Webster, Morris, and Franklin (2005).

Inhibition

The convergence hypothesis states that the two languages of a bilingual speaker share neural networks, and that the acquisition of an L2 involves the same neural regions as the L1 (Abutalebi & Green, 2007). The Inhibitory Control (IC) model predicts that both languages of a bilingual speaker are active during language processing, even when the speaker is using only one of the languages (Green, 1998). This prediction has found support in a range of studies (see Kroll & Dussias, 2013). Language use thus requires the bilingual speaker to constantly inhibit the non-target language.

For multilingual speakers with aphasia, overviews suggest that providing therapy in one language does not seem to harm the other untreated languages, in the sense that the proficiency in these languages deteriorates (Faroqi-Shah et al., 2010; Kohnert, 2009; Kohnert & Peterson, 2012). However, Goral and colleagues point to the possible inhibition of the stronger language when treatment is provided in the weaker language, at least in the short term (Goral, 2012; Goral, Naghibolhosseini, & Conner, 2014). This inhibition manifests itself as a negatively affected performance in the untreated language.

Research questions

Given the limited number of studies on SFA and action naming – both in monolingual and in multilingual speakers – and the mixed results on generalisation to discourse, further research is needed to explore the effect of SFA on verb production in sentence contexts. For multilingual speakers it is also important to explore the possibility of inhibitory effects of language treatment. The present study investigates the impact of SFA treatment focusing on verbs in a quadrilingual speaker with non-fluent aphasia (Japanese (L1), English (L2), German (L3), Norwegian (L4)). In

line with the suggestions of Kiran and colleagues (2004; 2011), treatment was provided in Norwegian, a late-acquired language as well as the language of environment. Since intensive aphasia therapy in the chronic stage has proven to be effective (Bhogal, Teasell, & Speechley, 2003) and SFA has shown promising results for the retrieval of trained verbs and in some cases with an improvement in discourse, it is predicted that the SFA treatment of verbs in sentence contexts should have an impact at several linguistic levels. An improvement for trained verbs in the language of treatment is expected. Generalisation to untrained items, semantics, syntax, and discourse production in the treated language is expected if the participant is able to implement semantic feature generation as a strategy and/or if the semantic network is strengthened sufficiently (Wambaugh et al., 2014).

The assumption that the languages of bilingual speakers share neural networks means that cross-linguistic transfer may occur, at least for some linguistic properties. The greatest gain is expected in the lexical-semantic domain because of the semantic nature of the treatment. Changes in syntax are also expected since the treatment focused on production of verbs in complete sentences. Furthermore, verb training was carried out at the lemma level, which contains information on semantic as well as syntactic properties (de Bot, 1992; Levelt, 1989, 2001). It is anticipated that an improvement in lexical access to verbs combined with an improvement in sentence production might lead to an improvement in discourse production even in the untreated languages.

These expectations apply only to the languages that are linguistically most similar to the language of treatment, namely German and English. Regarding transfer of therapy effects to the participant's L1, Japanese, findings from previous studies are, as mentioned, mixed; hence, the

authors have no firm expectations. The L1 of the participant is also structurally and lexically different from the language of treatment.

As noted above, prior research results are inconclusive about the potentially inhibitory effect on untreated languages following treatment in one language, so this issue is approached without firm expectations.

In sum, the following research questions are addressed:

1. Does SFA therapy targeting verbs in sentence contexts result in improvements at the lexical, semantic and syntactic levels, and/or in discourse production in the language of treatment?
2. Does SFA therapy targeting verbs in sentence contexts result in cross-linguistic transfer in the linguistic areas mentioned above?
3. Does treatment in a late-acquired language lead to inhibition of earlier-acquired languages, the L1 in particular?

Method and procedure

Case details

The participant is a 59-year-old, right-handed female who grew up in Japan speaking Japanese. She learned English at school and through immersion when living in the UK for a few years as an adult. She studied German formally in Japan before moving to Germany, where she passed an exam to work as a German-Japanese interpreter. Norwegian was learned formally and through immersion after she moved to Norway as an adult. She reported using Japanese frequently with her extended family and friends. English was her working language, which she used frequently in her job as a secretary in an international context at the time of the aphasia onset. Norwegian was her home language, and the language of the environment; she used it daily. Her proficiency level was high

in Japanese, English and Norwegian and medium in German, a language she rarely used. Information on language use and proficiency levels for each of the languages was obtained using the *Language Use Questionnaire* (Muñoz, Marquardt, & Copeland, 1999) and part A of the *Bilingual Aphasia Test* (BAT) (Paradis & Libben, 1987).

She suffered a single left-hemisphere stroke seven months prior to the intervention, resulting in a moderate, non-fluent aphasia. Assessment of aphasia type and severity is based on the BAT (Paradis & Libben, 1987) and on clinical judgement. She did not demonstrate dysarthria or apraxia of speech and had no other history of neurologic impairment. She demonstrated normal hearing and had corrected to normal vision. Based on her results on the *Bilingual Aphasia Test* (BAT) (Paradis & Libben, 1987), Japanese was her strongest language post-stroke, followed by Norwegian, and then English and German (see Figure 1). The participant signed a consent form prior to the study, and the Norwegian Social Science Data Service (NSD) approved the ethical standards of the project.

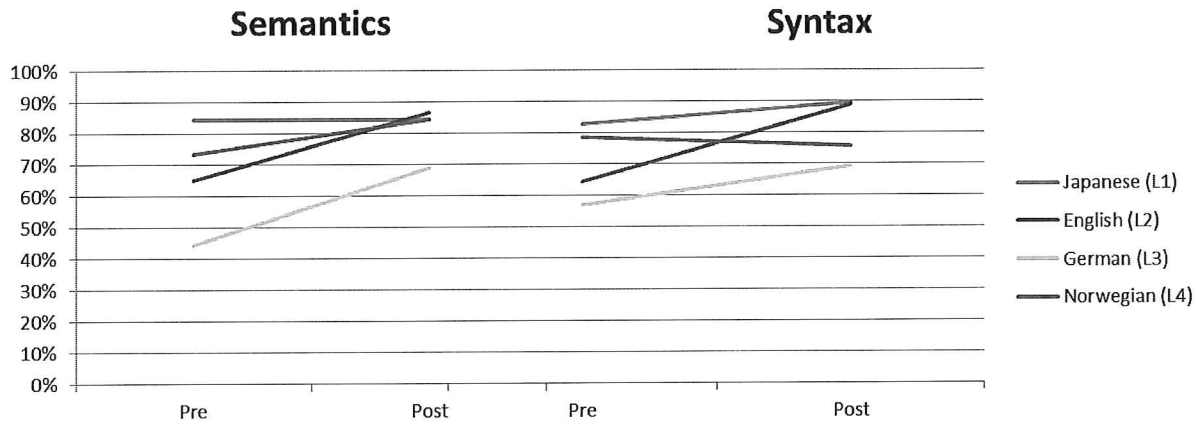

Figure 1. Per cent accuracy pre- and post-SFA on the Bilingual Aphasia Test, divided into linguistic clusters (Paradis & Libben, 1987, p. 213)

Treatment protocol

The treatment was provided during an intensive schedule of 29 sessions divided on three days per week for 2.5 weeks. In total this amounted to about 22 hours of therapy. Most of the sessions lasted for 45–55 minutes, and between nine and fourteen verbs were addressed in each session. Each verb was trained approximately seven times, and the pictures were presented in a random order. The treatment lasted until 80 percent accuracy in naming of the trained verbs was reached.

The treatment programme consisted of three baseline sessions for all languages, followed by two weeks of no treatment, then one pre-test session for each language, 29 SFA treatment sessions and finally one post-treatment session for each language.

Procedure

The SFA therapy provided was essentially adopted from Wambaugh and colleagues (2007; 2014) with some modifications. The semantic features used in this intervention were mostly related to argument structure and semantic roles. They were chosen to trigger information about

- the *agent/experiencer* of the action (asking: "Who usually does this?"),
- the *theme/patient* ("What/who is it done to?"),
- the *usual location* ("Where does this action happen?"),
- the *purpose of the action* ("Why does this happen?"),
- the *means of carrying out the action* ("What part of the body or what tool is used to make this happen?"), and
- the *related objects or actions* that reminded the participant of the target verb ("What does it make you think of?").

Even though these features in reality trigger a noun, the underlying focus was to retrieve the verb describing the action of the pictures, focusing on features connected to the argument structure of the target verbs. The aim was thus to strengthen the connections in order to retrieve the verb. The studies of Wambaugh and colleagues focused on single word retrieval, while this study aimed to retrieve the verb within a simple sentence.

In the intervention a picture of the target action was placed in the centre of a diagram (Appendix 1), and the participant was asked to name the verb referring to this action. Often (especially in the first sessions) she was not able to name the verb, and then the speech and language therapist (SLT) guided her through each of the six semantic features mentioned above, by asking the questions: "Who usually does this?" etc., to elicit information about each of the six features. These features were addressed one at a time and in the same order for each target verb. The participant's responses were written on the diagram. When she was unable to produce an appropriate feature, the SLT would prompt or suggest a response. The prompts could be either semantic or phonological. If this procedure was still unsuccessful, the whole word was provided for repetition. After eliciting all six features, the participant was asked to name the target action in the picture once more. If she was unable to respond appropriately, the SLT again prompted her or provided a plausible verb. Then the participant was asked to repeat the verb, and to produce a simple sentence containing it. If the response was appropriate, affirmative feedback was provided, and the next picture was presented. If she had difficulty in producing a correct sentence, the SLT would help her to make a simple sentence. Lastly, the participant repeated the sentence.

The pictures used initially were chosen from the *Verb and Sentence Resources* of *The Newcastle University Aphasia Therapy Resources* (NATR) (Morris, Webster, Whitworth, & Howard, 2012). These are black and white drawings of everyday actions with high naming-

agreement. Approximately halfway through the intervention, the pictures were changed so that the participant should not associate the target verb with a particular picture, but rather gain a wider understanding of each trained verb. The new pictures were found online, and were all coloured photographs or drawings. Weekly testing (cf. control measures) showed no effect of the switching of stimulus material.

Assessment

Various types of assessments – more standardised methods as well as spontaneous narrative production – were conducted before, during and after the period of intervention.

Baseline

Three baseline examinations were conducted prior to a two-week period of no intervention to establish a stable baseline. Two measures were obtained for the baseline in each of the participant's languages: an action-naming test where the aim was to produce a simple sentence for each picture, and the production of a personal narrative (see descriptions below). The narratives were conducted in two of the three baselines. Each baseline was conducted with three days apart, and at each baseline all four languages were assessed on the same day. The language order of the assessments was counterbalanced, to avoid an order effect.

Control measures

Weekly, during the SFA treatment, the participant was tested with one related and one nonrelated task as a control in the treated language. The related task consisted of naming of 20 untrained verbs,

and the nonrelated task consisted of repetition of 30 nonwords. For repetition of nonwords, subtest 8 from the Norwegian version of PALPA (Kay, Coltheart, & Lesser, 2009) was used.

Pre- and post-tests

Before and directly after the SFA treatment an action-naming test (cf. action-naming test) and the BAT were administered[4], in addition to the elicitation of a personal narrative. The following versions of the BAT were used: Norwegian (Paradis & Knoph, 2010), English (Paradis, Libben, & Hummel, 1987), German (Paradis & Lindner, 1987) and Japanese (Paradis & Hagiwara, 1987).

Lexical measures

For the action-naming test pictures from the NATR were used both in Norwegian (119 pictures) (Morris et al., 2012) and English (120 pictures) (Morris, Webster, Whitworth, & Howard, 2009). This tool does not exist for Japanese and German, so for these two languages pictures from two tests that have been widely used for assessing action naming were selected, namely the *Naming of Verbs* subtest from *Verb- og setningstesten* (VOST) (Bastiaanse, Lind, Moen, & Simonsen, 2006) and the *Action Naming Test* (Obler & Albert, 1979). These sets of verbs are all everyday words. Factors like word frequency, imageability, word length etc. are not controlled for in the resources. To control the naming-agreement of these assessment tools for Japanese and German, they were checked by three native speakers of each language. Some of the items overlapped and were therefore omitted. In total, the action-naming baselines for Japanese and German consisted of 89 different verbs.

In the Norwegian baseline tests, the participant produced 41 of the 119 verbs at all three baselines. Seventy-eight of the verbs she produced either not at all or only once or twice at the

baselines. These were divided into two groups: 44 were used for training, and 34 were used as untrained controls.

Semantic and syntactic measures

To assess semantic and syntactic abilities in general, selected subtests from the BAT were chosen. A primary aim of the BAT is to enable comparison of multilingual individuals' relative ability in their languages (Paradis, 2008; Paradis & Libben, 1987); hence, it is relevant for measuring therapy transfer (Miller Amberber, 2011). The BAT was chosen because it is the only assessment tool available in all the languages relevant for the present study. The semantic domain was assessed with the following subtests: semantic categories, synonyms, antonyms, semantic acceptability, semantic opposites and listening comprehension (Paradis & Libben, 1987, p. 213). To measure changes at the syntactic level the following subtests were used: syntactic comprehension, semi-complex and complex commands and grammaticality judgment (Paradis & Libben, 1987, p. 213).

Highly proficient speakers of each language administered the testing, and the first author was present during most of the assessments. The BAT subtests were scored in line with the BAT manual (Paradis & Libben, 1987). In order to ensure the reliability of the testing, the test administrators were briefed about conducting the test and also about communicating with people with aphasia by the first author. The BAT subtests were scored jointly by the test administrators and the first author, in line with the standards given in Paradis and Libben (1987).

Measures for narrative analysis

For the narrative production, the participant was asked to talk about a movie she had seen, a book she had read, a trip she had made or a happy moment in her life, in all languages (cf. e.g. Kempler

& Goral, 2011). She was encouraged to tell a different story at each measurement, so that she did not practice the same story every time. The narrative production sessions were audio- and videotaped.

The narrative analysis relied on various word, sentence, and discourse-level variables. Lexical measures included the number of verbs produced (types and tokens), including auxiliaries, modal verbs etc. At sentence level, the basic analytical measure was the *Analysis of Speech Units* (AS-unit), defined as "a single speaker's utterance consisting of an independent clause, or sub-clausal unit, together with any subordinate clause(s)" (Foster, Tonkyn, & Wigglesworth, 2000, p. 365). Each AS-unit was scored for completeness and complexity on a five-point scale in line with Altman and colleagues (2012). In addition, each unit was scored as grammatical or ungrammatical.

To investigate the quality of the discourse, the total number of words produced (including false starts and repetitions) and the number of utterances were counted, and a calculation of the speech tempo (words per minute) was performed. In addition, to investigate whether the narratives improved in terms of content, the number of correct information units (CIUs), a measure of content production in discourse which comprises words that are "accurate, relevant and informative relative to the eliciting stimuli" (Nicholas & Brookshire, 1993, p. 340) was counted, and the percentage of words that convey appropriate information were also measured.

All the narratives were transcribed orthographically by a native speaker or a highly skilled speaker with a university degree in the relevant language. The first and second author checked all the transcriptions apart from the Japanese. The Japanese narratives were transcribed in collaboration by two proficient speakers in order to ensure reliability of the transcriptions. The printed transcriptions of the narratives were used for scoring, and transcription disagreements were discussed and resolved before scoring. The two first authors scored all the transcripts in Norwegian,

English and German. Six months after the initial scoring, approximately 1/3 of the transcriptions in Norwegian and English were rescored by the two first authors. For both languages, interrater agreement for scoring of the different variables varied between 82 % and 97%.

Analysis

The results given below show performance in the treated language, within-language performance and cross-linguistic transfer effects on the action-naming test, the BAT and the narratives. To evaluate the significance of the results on the action-naming test and the BAT, the McNemar test for paired analysis was used. This is a non-parametric alternative to the t-test, typically used to measure changes in participants' scores on, for instance, language tests (Field, Miles, & Field, 2012). Here it was used to measure pre- to post-SFA changes.

Pre- and post-treatment scores were also compared by calculating the effect size. This provides a measure of observed change which allows clinicians and researchers to develop a sense of the strength of the specific treatments (Beeson & Robey, 2006). Busk and Serlin's d_1 (1992) is a variation of Cohen's d for determining effect sizes, and according to Beeson and Robey (2006) it is the most reliable estimator for quantifying changes in the level of performance and has been used to calculate pre-post treatment effect for within-subject studies. d_1 was calculated for the narrative measures and the action-naming tests (where multiple baselines were obtained). Only one observation in the post-treatment period was used to calculate d_1. A larger number of observations would doubtlessly have given a better estimate and could also have provided information about the long-lasting impact of the treatment. However, since the participant in the study received another treatment after the SFA, the follow-up results are likely to be affected by this last method and are hence not reported here. Effect sizes larger than 1.0 were considered meaningful, and for scores

given in percentages, a change of 10 % or more was considered clinically significant (e.g. Goral & Kempler, 2009; Goral et al., 2014; Holland & Crinion, 2012).

The participant was stable throughout baseline testing, and the results of the action-naming test fluctuated less than 15 % for the verbs in all the languages across the trials. During the intervention period, no change could be seen on either of the control tasks; neither in the naming of untrained verbs ($p = .288$) nor in the repetition of non-words ($p = 1$).

Results

In the following, the results on the standardised tests are presented first – i.e. the pre- and post-SFA results of the action-naming test and the results of the standardised assessment of syntax and semantics in the BAT. Then the results from the narratives are presented – on lexical, sentence, and discourse variables respectively.

Action-naming test

For details of the action-naming test results, see Table 1.

Table 1. Action-naming test results in Japanese (L1), English (L2), German (L3) and Norwegian (treated L4) (percentage accuracy and effect size)

Languages	Pre-SFA	Post-SFA	Effect size
Japanese	48 %	45 %	d_1 = -0.08
English	61 %	54 %	d_1 = **-1.70**
German	11 %	**23 %***	d_1 = **10.50**
Norwegian trained	10 %	**71 %*****	d_1 = **10.07**
Norwegian untrained	53 %	60 %	d_1 = 0.97

*** $p < .001$; ** $p < .01$; * $p < .05$
Significant changes are highlighted in bold.

Effects in the treated language

In Norwegian (L4), the production of trained verbs increased significantly post-SFA ($p < .001$), with a large effect size ($d_1 = 10.07$). No generalisation to the untrained verbs was found.

Cross-linguistic transfer

Different patterns of cross-linguistic transfer to verbs in the untreated languages were found. Following the treatment a decrease was evident in English (L2) ($d_1 = -1.70$). For German (L3) there was a significant increase in naming target verbs ($p = .033$) with a large effect size ($d_1 = 10.50$). In Japanese (L1) there were no significant changes in verb naming.

BAT results: Semantics

For details on the BAT results, see Table 2.

<TABLE 2 ABOUT HERE, PLEASE>

Effects in the treated language

For Norwegian (L4), no significant improvement was found in semantics as a cluster.

Cross-linguistic transfer

In English (L2) a significant increase was evident in the semantic domain ($p = .026$), with improvements in nearly all subtests. Also in German (L3) there were significant increases in this

domain (p = .021), with positive changes in most of the subtests. For Japanese (L1), no significant improvements in semantics were found.

BAT results: Syntax

Effects in the treated language

In Norwegian (L4) no change was apparent in the syntactic cluster.

Cross-linguistic transfer

For English (L2) a significant increase was evident in the syntactic domain ($p < .001$). Also in German (L3) there were significant increases in the syntax (p = .036). In Japanese (L1) no significant changes in syntax were found.

Narrative production

For details of the narrative results, see Table 3.

<TABLE 3 ABOUT HERE, PLEASE>

Lexical variables

Due to the treatment focus on verbs in sentence contexts, the lexical measures are total number of verb tokens and the number of verb types produced.

Effects in the treated language

In Norwegian (L4) there was a significant increase in the number of verb types (d_1 = 1.98) and tokens (d_1 = 1.54) in the narrative production post-SFA.

Cross-linguistic transfer

Analyses of the lexical variables in the untreated languages show mixed results. In English (L2) there was an increase of verb tokens (d_1 = 1.48). In German (L3) and Japanese (L1) there were no changes at the lexical level.

Sentence variables

The sentence variables are completeness, complexity and grammaticality of sentences.

Effects in the treated language

Following treatment the sentences produced in Norwegian (L4) were more complete (d_1 = 20.24). There was also a considerable increase of complex sentences (level 4 and 5 in the AS-unit scale) post-treatment (d_1 = 11.55). However, a decrease of the number of grammatical sentences was evident (-12 %).

Cross-linguistic transfer

In English (L2) no changes in the sentence variables were found, in either direction. In German (L3), the participant's sentences were more complete following treatment (d_1 = 5.82). In addition,

the number of grammatical sentences increased post-SFA (50 %). In Japanese (L1), a significant decrease of the complex sentences (d_1 = -1.14) was evident, and the sentences also became less complete (d_1 = -1.08).

Discourse variables

The discourse variables are the total number of words produced, the number of utterances, of CIUs and the percentage of words that were CIUs, as well as speech tempo (words per minute).

Effects in the treated language

The total number of words increased in the Norwegian (L4) narrative production (d_1 = 1.01), as well as the speech tempo (d_1 = 4.51). The number of utterances produced did not change, but the content in discourse improved significantly (d_1 = 2.21), as did the percentage of words that were CIUs (14 %).

Cross-linguistic transfer

In English (L2) no significant changes in the discourse was found, apart from an increase in speech tempo (d_1 = 1.06). In German (L3) an increase in the total number of words produced (d_1 = 1.06) and in speech tempo (d_1 = 2.10) was found, as well as a significant change in the number of utterances (d_1 = 1.23). However, a significant decrease in the percentage of words that were CIUs (-17 %) was evident. In Japanese (L1), no significant changes were evident, apart from a decrease in speech tempo (d_1 = -2.02).

An overview of all the assessment outcomes is found in Table 4.

<TABLE 4 ABOUT HERE, PLEASE>

Discussion

This study investigated the impact of SFA treatment on verbs in sentence contexts of a quadrilingual speaker with aphasia. The findings are discussed in relation to the three research questions presented above. Several of the findings are consistent with the expectations.

Intervention effects in the treated language (Norwegian)

The first research question concerned whether SFA therapy on verbs in sentence contexts would result in improvements at different linguistic levels in the treated language.

At the lexical level, clear effects were found. SFA treatment focuses on strengthening the semantic network (Boyle & Coelho, 1995), and this resulted in great improvements on the trained items in the treated language for the participant in the study. The trained verbs improved so much more than the untrained verbs that this can be taken as a direct treatment effect, providing support for the benefit of this type of therapy for this multilingual participant. The lack of improvement in the control tasks also gives support to the assumption of a direct effect of the treatment. An improvement was also found in the lexical variables in the Norwegian narratives. Post-treatment the participant produced more words, more verbs, and a wider variety of verbs. This was in line

with the expectations, given the focus of the treatment. Furthermore, it is in line with other studies on verb retrieval using SFA (Wambaugh & Ferguson, 2007; Wambaugh et al., 2014), but the effect of this method on verb retrieval has not been investigated for multilingual speakers in previous studies. The above also supports the findings of SFA studies on object naming, where an improvement on the trained items occurred for most participants (Boyle, 2010).

In general, it seems to be harder to achieve generalisation from trained to untrained items for verbs than for nouns (Webster & Whitworth, 2012), and the above-mentioned studies by Wambaugh and colleagues did not succeed in facilitating generalisation to untrained items. This was also found in this study. The participant did not show any generalisation effects to the untrained verbs in the action-naming test in the treated language.

In the semantic and syntactic domains as measured by the BAT no significant improvements in the treated language were found. However, even if the syntactic domain of the BAT did not improve, the sentences in the narrative were more complete and complex post-SFA, although they also became less grammatical. It seems like the narrative production task taps other aspects of the syntax than the subtests of the BAT, which are all comprehension or judgement tasks, rather than production tasks. It is possible that when she aims at producing sentences that have a more complete and complex structure, this happens at the expense of grammaticality. It should be noted that sentence grammaticality was not targeted directly in the treatment. Thus, this did not confirm the expectations. It was furthermore anticipated that the semantic nature of the treatment would have an impact in the semantic domain. One possible explanation is that the treatment did

not trigger the semantic network of this speaker. However, the semantic subtests of the BAT are few, and in the narratives the content of the sentences actually improved.

The increase of complex and complete sentences in the narrative may be a result of the treatment triggering verbs at the lemma level in that the trained features tapped argument structure. As the lemma contains information required for grammatical encoding in the particular language (de Bot, 1992, 2004; Levelt, 1989) it was predicted that the treatment would strengthen the semantics and the syntax, and this was partially what was found.

Cross-linguistic transfer

The second research question addressed whether SFA therapy on verbs in sentence contexts could lead to cross-linguistic transfer. No transfer was found to Japanese; this will be discussed later. Transfer was found to German in the naming of verbs, as well as improvements in both semantics and syntax. In English, apart from the decline in the naming of verbs, the participant seemed to benefit from the treatment. She produced more verb types and tokens in the English narratives, as well as showing improvements in the semantics and syntax following the treatment.

This improvement of verbs in the untreated languages is an important finding, given the challenges in achieving transfer to untrained verbs in general (Webster & Whitworth, 2012) and following SFA treatment specifically (Wambaugh & Ferguson, 2007; Wambaugh et al., 2014). Similar results have been found in prior studies of SFA in bilingual speakers (Edmonds & Kiran, 2006; Kiran & Roberts, 2010), with cross-linguistic transfer in some conditions for some participants.

Cross-linguistic transfer may be difficult to achieve (Ansaldo & Ghazi Saidi, 2014; Faroqi-Shah et al., 2010; Kohnert, 2009). However, it was expected that the semantic (rather than phonological) nature of the therapy would lead to transfer, and this was partly confirmed. The results are hence consistent with the findings of Altman et al. (2012) where, following treatment of sentence production, positive changes to varying degrees in narrative structure and sentence grammaticality in the languages of a trilingual speaker with aphasia was found. Such cross-linguistic semantic transfer may occur when a concept in the target language is activated, which in turn also activates semantically related words in the other languages (Costa & Caramazza, 1999; de Bot, 1992; Edmonds & Kiran, 2006; Green, 1998).

In the present study, the goal was to improve verb naming in sentence contexts, thus the participant's improvements in sentence complexity for some of the languages serve as evidence for generalisation from the treatment provided to more functional language skills. This may be related to the nature of verbs, which are connected to larger grammatical structures, for instance through argument structure. In addition, the nature of the treatment may have contributed to these improvements, in that the treatment indeed stimulated the semantic network. The participant's improvements on verbs in German, carrying over to semantics and syntax, suggest that she managed to apply semantic feature generation as a strategy, at least for this language.

Discourse production

In aphasia rehabilitation, an overall goal is to enable people to improve their general language skills, to be able to communicate functionally in daily life contexts. SFA treatment of single words

(both object and action words) resulted in an improvement in the participants' discourse production in some, but not all, of the earlier studies (Coelho et al., 2000; Davis & Stanton, 2005; Peach & Reuter, 2010; Wambaugh et al., 2014). The two first research questions therefore also addressed the issue whether SFA therapy on verbs in sentence contexts could have a positive effect at the discourse level (narrative production) in all the speaker's languages. It was expected that an improved access to verbs and improved sentence production could lead to an improved discourse production.

In the treated language the participant showed great improvements of the narratives. Even if the sentences became less grammatical, the increase in speech tempo and the great increase of complex sentences, in combination with the improved content of the sentences, indicate that the communication skills in the treated language improved substantially.

The findings are congruent with results from past studies on monolingual aphasia, for instance Bastiaanse, Hurkmans, et al. (2006), who reported gains in sentence production where verb retrieval in sentence contexts was targeted. Similar findings were reported by Webster et al. (2005), where the focus was on verb and argument structure. The features used in the present intervention were related to argument structure and semantic roles; hence, the findings of the present study support these previous studies. Also, Wambaugh and colleagues (2007; 2014) found improvement in discourse production in some of the participants following SFA treatment.

Following treatment in Norwegian the participant increased speech tempo in both English and German. When it comes to the content of the discourse in the untreated languages, measured by amount of CIUs, no clear improvements were detected, apart from a somewhat better content in

English, which can be interpreted in relation to the increased use of verbs. It may therefore seem that she, at least for some of the languages, was able to implement the SFA strategy in new contexts of language use. Wambaugh et al. (2014) point out that increased feature generation could result in relevant or non-relevant feature production. The increase in words per minute in all the languages but L1, the increase of verb tokens in Norwegian and English, and also the finding of a larger production of related information (CIUs) in Norwegian and English and a great improvement of several of the measures of German all indicate that this was the case for most of the languages of the participant.

Inhibition of untreated languages

Finally, for the last research question – whether treatment in a late-acquired language would lead to inhibition of earlier-acquired languages – no clear inhibition of the untreated languages was found. The results for English are in line with the suggestions of Kiran and colleagues (2006; 2011) in that treatment in a premorbidly weaker language is more likely to enhance cross-linguistic transfer to untreated languages. As previously presented, treatment transfer to several of the domains in English was found and hence there was no inhibition of this language. As for German, overall improvements at both the lexical, the semantic and the syntactic levels were evident, hence there was no clear inhibition of this language either. German was the pre- and postmorbidly weakest language, and it is likely that this language had the greatest potential for recovery. Thus, this contradicts the view of Kiran and colleagues (2006; 2011), but supports Goral (2012) who suggests that treatment in a postmorbidly stronger language can enhance the possibility of

treatment transfer. Another explanation could be that German is structurally very similar to Norwegian, and this can increase the possibility of transfer (Ansaldo & Ghazi Saidi, 2014; Goral et al., 2010; Miertsch et al., 2009).

Regarding Japanese, the participant's L1, no clear inhibition was detected neither in the verb production nor in the BAT-scores. In the narratives, no significant changes were identified, apart from the significant decrease in sentence complexity and speech tempo. However, this may be seen in relation to a near-significant increase in the number of utterances. When producing more utterances, the outcome happens at the expense of complexity and speed in the L1. This decrease may be too small to be interpreted as a negative effect of the stronger language, as reported by Goral et al. (2014). The slight decrease in some of the measures may be due to the increased activation of Norwegian – and German, which she had not used frequently for years. On the other hand, the results in Japanese could also reflect a plateau effect, given the fact that both pre- and post-stroke proficiency was higher in this language than in the other languages (and on some measurements almost at ceiling level). In addition, it is also the most typologically dissimilar language to Norwegian of all the untreated languages. This, too, might have influenced the lack of transfer to Japanese.

These results are considered valid, given the low cut-off for significance. Hence, no clear inhibition to any of the untreated languages was found. The findings corroborate the conclusions of Kohnert (2009) and Faroqi-Shah et al. (2010), in that no harm is done to any of the untreated languages when providing treatment in a late-acquired language.

Clinical implications and conclusion

The participant in this study demonstrated improvements on trained verbs following SFA treatment. She also improved in semantics, syntax, and in discourse production in both the treated and in some of the untreated languages. The results discussed above indicate that SFA targeting verbs may be a promising therapy not only for monolingual speakers, but also for multilingual speakers with aphasia.

The concern for inhibition of the untreated languages, especially the L1, was not confirmed. This is an important finding theoretically as well as clinically. Greater harm may be done to a bilingual speaker with aphasia if no treatment is provided at all (which is sometimes the case, at least in Norway (cf. Knoph, 2013)), than if treatment in a weaker language is provided. As this study demonstrated, treatment in a late-acquired language can even benefit untreated, stronger languages at different linguistic levels.

This study was not conducted to evaluate the multilingual language system, but data from clinical treatment studies of individuals with cognitive disorders may be useful in developing and evaluating theories of normal cognition (Nickels et al., 2010). As reported initially, there is a general consensus that both/all the languages of bilinguals are active when they are producing utterances in one of their languages (e.g. Kroll et al., 2015), and that multilingual speakers have one shared conceptual system for all of their languages. Cross-linguistic transfer from a treated to an untreated language in aphasia therapy is an indication of such shared networks. Thus, to a large extent the findings support the idea of shared networks of multilinguals, indicated by the great improvement of German and English.

The use of narratives as an assessment tool provided information not obtainable from more specific tests and general language assessment for within- and cross-language therapy gains for the participant. Both for strong languages, like the participant's L1, Japanese, and for the weaker L4, Norwegian, the narratives revealed a different pattern than, for instance, the BAT scores. In addition, using narratives for assessment enhances the ecological validity of the findings, since improving functional language production often is the overall goal in aphasia therapy. It seems important to develop reliable and practical methods to assess the connected speech of the clients in supplement to more traditional assessment methods.

Declaration of interest

There are no conflicts of interest.

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Table 2. BAT results in semantics and syntax in Japanese (L1), English (L2), German (L3) and Norwegian (treated L4), pre- and post-SFA treatment in Norwegian (percentage accuracy)

BAT subtest	Cutoff[a]	Japanese (%)		English (%)		German (%)		Norwegian (%)	
		Pre-SFA	Post-SFA	Pre-SFA	Post-SFA	Pre-SFA	Post-SFA	Pre-SFA	Post-SFA
Semantics									
Semantic categories	4 (80)	80	80	80	80	40	40	60	**100**
Synonyms	4 (80)	100	**80**	20	**100**	20	**100**	80	**100**
Antonyms	8 (80)	70	70	70	**90**	60	**80**	90	**80**
Semantic acceptability	9 (90)	100	100	90	**100**	70	**90**	100	**90**
Semantic opposites	9 (90)	70	**80**	50	**60**	30	30	40	**80**
Listening comprehension	4 (80)	100	100	NA	100	20	**80**	60	60
Syntax									
Simple & semi-complex commands	9 (90)	100	100	100	100	60	**100**	100	100
Complex commands	12 (60)	80	80	40	**20**	0	**60**	40	**20**
Syntactic comprehension	75 (87)	80	88	66	**94**	64	71	82	83
Grammaticality judgment	9 (90)	100	100	50	**70**	40	40	60	**30**
Clusters									
Semantic cluster	-	84	84	65	**87***	44	**69***	73	**84**
Syntactic cluster	-	83	90	64	**89*****	57	**69***	79	76
Overall score	–	86	90	72	**85*****	59	68*	76	81

[a] Cutoff scores for normal performance given in Paradis & Libben, 1987, p. 210; percentages in brackets.

*** $p < .001$; ** $p < .01$; * $p < .05$

Changes exceeding 10 % are highlighted in bold.

Table 3. Narrative results in Japanese (L1), English (L2), German (L3), and Norwegian (L4) with effect sizes

Narrative		Japanese (L1)			English (L2)			German (L3)			Norwegian (treated L4)		
		Pre-SFA (mean)	**Post-SFA**	**Effect size**	**Pre-SFA (mean)**	**Post-SFA**	**Effect size**	**Pre-SFA (mean)**	**Post-SFA**	**Effect size**	**Pre-SFA (mean)**	**Post-SFA**	**Effect size**
Lexical variables	**Verb tokens**	82 (42.58)	68	d_1 = -0.33	33.25 (15.39)	56	**d_1 = 1.48**	15.33 (18.39)	27	d_1 = 0.62	41.67 (23.01)	77	**d_1 = 1.54**
	Verb types	69.67 (33.86)	59	d_1 = -0.32	29.75 (15.67)	45	d_1 = 0.97	12.67 (15.14)	18	d_1 = 0.35	35.33 (16.50)	68	**d_1 = 1.98**
Sentence variables	**Complex sentences**	5	1	**d_1 = -1.14**	1	0	d_1 = -0.87	0	1	*	0	7	**d_1 = 11.55**
	Sentence completeness	2.89	2.16	**d_1 = -1.08**	1.34	1.26	d_1 = -0.61	1.14	1.25	**d_1 = 5.82**	1.54	2.16	**d_1 = 20.24**
	Grammatical sentences	25/34 (74%)	34/47 (72%)	-2%	34/62 (55%)	48/80 (60%)	5%	13/30 (43%)	30/60 (50%)	**50%**	26/51 (51%)	19/49 (39%)	**-12%**
Discourse variables	**Total words**	595 (283.61)	440	d_1 = -0.79	269.75 (182.95)	377	d_1 = 0.59	123 (102.2)	254	**d_1 = 1.28**	254 (146.84)	403	**d_1 = 1.01**
	Words/minute	30.25	26.27	**d_1 = -2.02**	18.64	23.44	**d_1 = 1.06**	7.75 (3.08)	14.21	**d_1 = 2.10**	19.03	30.04	**d_1 = 4.51**
	Number of utterances	34	47	d_1 = 0.98	62	80	d_1 = 0.33	30	60	**d_1 = 1.23**	51	49	d_1 = -0.05
	CIUs	250	209	d_1 = -0.37	100.50	163	d_1 = 0.92	37	28	d_1 = -0.24	111	242	**d_1 = 2.21**
	CIUs/total verbal units	43 %	48 %	5 %	37 %	43 %	6 %	28 %	11 %	**-17 %**	44 %	60 %	**14%**

Significant effects are in bold

* Not available since pre-mean is 0

Table 4. Overview of assessment outcomes

	Japanese (L1)		**English (L2)**		**German (L3)**		**Norwegian (treated L4)**	
	Increase	Decrease	Increase	Decrease	Increase	Decrease	Increase	Decrease
Lexical level (action-naming test)	×	×		√	√		√ (trained)	
Semantics (BAT)	×	×	√		√		×	×
Syntax (BAT)	×	×	√		√		×	×
Lexical level (narratives)	×	×	√ tokens		×	×	√ types, tokens	
Sentences (narratives)		√ complete, complex	×	×	√ complete, grammatical		√ complete, complex	√ grammatical
Discourse (narratives)		√ words/minute	√ tempo		√ words/minute, words, number of utterances	√ CIU	√ words, tempo, content, CIU	

√ = significant improvement; × = no significant change

Appendix 1. SFA diagram

HVEM GJØR DETTE VANLIGVIS? *Who does this usually?* _____	HVA BLIR DET GJORT MED? *What/who is it done to/with?* _____	HVOR SKJER DETTE VANLIGVIS? *Where does this usually happen?* _____
	MÅLBILDE *Picture of target word*	
HVORFOR SKJER DET (MENINGEN)? *Why does it happen?* _____	HVILKEN DEL AV KROPPEN/HVILKET VERKTØY? *Which part of the body/What tool is used?* _____	HVA FÅR DET DEG TIL Å TENKE PÅ? *What does it make you think of?* _____

English translation in italics.