The Outcome of Semantic Feature Analysis Treatment in Aphasia with and without Apraxia of Speech

Scholl, D.I., Ballard, K.J., McCabe, P. & Nickels, L.
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Introduction

Purpose

Compare the effects of Semantic Feature Analysis Treatment (SFA), a language-based treatment in individuals with post-stroke aphasia with and without Apraxia of Speech (AOS / APH)

Why? Typically the presence/absence of AOS is difficult to accurately diagnose in individuals presenting with APH in the clinical context, and the impact of this dual diagnosis of Aphasia plus AOS (AOS+) on the response to this treatment approach is not known.

Given the necessity to justify services and provide evidence of effective treatment via the delivery of the most beneficial treatment selection, finding responses to this question was timely.
Why SFA?

- Addresses word finding difficulties in both groups, by stimulating semantic networks (spreading activation) to facilitate lexical access but also providing a strategy to assist listeners in identifying target words.
- Well tested and shown to improve naming for treated items, although generalisation to untreated words in the same or different semantic categories has been limited in many studies.
Importance of Semantic System

PALPA model (Kay, Lesser & Coltheart, 1996)
What is Semantic Feature Analysis?

Background -

› SFA is designed “to improve retrieval of conceptual information by accessing semantic networks” (Boyle & Coelho, 1995).

› Based on the spreading activation theory of semantic processing (Collins & Loftus, 1975; Levelt, 1999 and others)
Semantic Activation Model

Adapted from Cardell, E., 2007; Nickels, L., 2008

Collins & Loftus, 1975
• Single case study

• Individual with aphasic dysnomia (Broca’s aphasia) post L-fronto parietal ischemic stroke

Findings:

• Improved confrontation naming and some generalization to untreated pictures

• No clear generalisation to connected speech measures
Evidence base

- Considered low on evidence hierarchy (mostly single case design; case series)
- Variability in how SFA is administered:
  - Tx duration
  - Tx intensity,
  - Tx format
  - Number of features
  - How features elicited
  - Cueing hierarchies
  - Feedback
Findings across studies may be related to:

- Type / etiology of aphasia
- Severity
- Time post-onset
- Specific measures used

Overall:

- **Treated items**: Improvement in naming, with maintenance
- **Untreated items**: positive but smaller gains than on treated items
- **Standardised assessments**: small gains, particularly in confrontation naming
- **Generalisation measures**: some changes in connected speech but limited maintenance
1. SFA would benefit both groups (APH, AOS+)
   - Improvement on naming of treated items
   - Generalisation to untreated items in same category
   - No generalisation to untreated items from different category

2. Phonetic accuracy post-treatment would be higher for APH than AOS as SFA targets the word retrieval deficit central to the aphasia but not the phonetic-motor planning deficits of AOS
<table>
<thead>
<tr>
<th></th>
<th>AOS+</th>
<th>Aphasia</th>
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<tbody>
<tr>
<td><strong>Age</strong></td>
<td>64.0 (± 8.8)</td>
<td>62.1 (± 11.5)</td>
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<tr>
<td></td>
<td>ns</td>
<td>ns</td>
</tr>
<tr>
<td><strong>Sex</strong></td>
<td>8M 2F</td>
<td>5M 2F</td>
</tr>
<tr>
<td><strong>Education</strong></td>
<td>16.1 (± 3.8)</td>
<td>14.3 (± 2.1)</td>
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<tr>
<td><strong>WAB Aphasia Quotient</strong></td>
<td>66.3 (± 11.4)</td>
<td>67.5 (± 11.7)</td>
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<tr>
<td><strong>Lesion</strong></td>
<td>Single Left Hemisphere CVA</td>
<td>Single Left Hemisphere CVA</td>
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<tr>
<td><strong>Time post-onset</strong></td>
<td>45.1 (± 51.97)</td>
<td>31.1 (± 19.67)</td>
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Boyle & Coehlo, 1995; Coehlo, McHugh, and Boyle, 2002
Group
This belongs to....?

Location
Where do you find this?

Physical Properties
What does this look like?

Use
What can you do with this?
3 steps for each picture stimulus presented

› **Step 1**
  - Randomly selected picture; participant asked to independently name; feedback provided as per feedback schedule

› **Step 2**
  - Describe semantic features Group; Location; Physical Properties; Use, regardless of response to Step 1
  - To establish and encourage use of the SFA technique, a minimum of ¾ features are produced for each picture
  - If the participant is unable to describe a feature, clinician provides a forced choice (Location – Does a banana grow on a vine or a palm?)
  - If the participant selects the incorrect choice, the clinician asks a question requiring a yes/no response (Location – Does a banana grow on a vine?)
  - If the response is incorrect, the clinician provides the correct response (Yes, a banana grows on a palm) and then proceeds to the next feature or to Step 3.

› **Step 3**
  - Imitative naming of the picture with feedback provided as per feedback schedule.
Incorporated principles thought to enhance “learning”

- **Intensity:** 1 hour/day, 4 days a week, 4 weeks
- **Dose:** 50 independent and 50 imitative attempts at target words per session (total of 1600 naming attempts)
- **Random order of stimulus presentation**
- **Variable practice:** 3 different pictures to elicit each target word
- **Feedback:**
  - **Type:** Knowledge of results (not knowledge of performance)
  - **Frequency:** feedback gradually faded out during each session
  - **Timing:** provided with 5s delay
METHODOLOGY

› Probe schedule
  - Four baseline tests of 230 words, to identify words produced correctly 0 or 1 time

› Develop individualised stimulus sets
  - 20 treated words – edible / household items (1/2 with initial fricatives)
  - 20 untreated words of same semantic category (1/2 with initial fricatives)
  - 20 untreated words of different semantic category (1/2 with initial fricatives)
  - (20 untreated words with initial fricatives)

› Probe performance on the 80 items once a week during treatment and at 1 week, 1 month, and (4 months) post-treatment
› Household items

› Edible items
A word is correct if:

✓ The target word is produced (i.e. ‘plum’ for ‘plum’).
✓ >50% of target phonemes correct
✓ The word produced does not mean something else
  (i.e. ‘self’ for ‘shelf’, ‘staple’ for ‘stapler’, ‘bath’ for ‘bathtub’).
✓ For all phoneme additions, except terminal ‘-s’, the phoneme closest to the addition is penalised / scored as incorrect.
RESULTS - Lexical accuracy

Words Correct - Treated Category

Improvement from BL4 to 1-week post-treatment (p<.001, $\eta^2=.79$), some decline (p=.012, $\eta^2=.35$)
Improvement from BL4 to 1-week post-treatment ($p<.001$, $\eta^2=.71$), no decline ($p>.05$)
Improvement from BL4 to 1-week post-treatment (p<.001, $\eta^2=.68$), no decline (p>.05)
Both groups showed significantly improved word retrieval for treated words.

Effects of treatment generalised to untreated words in the same and a different category.

Treatment and generalisation effects were retained post-treatment for both groups.

No group effect.
Articulatory Accuracy: Treated Category

Phoneme Correct - Treated Category

Improvement from BL4 to 1-week post-treatment (p<.001, eta²=.83), no decline (p>.05)
Articulatory Accuracy: Untreated Same Category

Phoneme Correct - Untreated Same Category

Improvement from BL4 to 1-week post-treatment (p<.001, eta²=.70), no decline (p>.05)
Articulatory Accuracy: Untreated Different Category

Improvement from BL4 to 1-week post-treatment (p<.001, eta²=.74), no decline (p>.05)
Both groups showed significantly improved accuracy of phonemes for treated words.

Effects of treatment generalised to untreated words in the same and a different category.

Treatment effects deteriorated but remained above baseline levels; generalisation effects were retained post-treatment for both groups.

No group effect.
Conclusions

› Outcomes for an intensive naming treatment were positive
  - Significant effects of treatment
  - Significant generalisation of treatment effects to both trained and untrained words

› Both groups showed similar treatment effects
  - Tendency in all measures for the AOS+ to respond slightly better than APH but not significant
More work is needed

Possible reasons for the lack of group differences

- SFA, particularly in the form provided here, provides intensive practice in both lexical retrieval and articulatory planning
- The high number of trials provided practice in both naming the items as well as practice in varied responses for the feature analysis part of each trial
- Target words reflecting higher complexity structures (i.e. multiple syllables, initial fricative / affricate sounds, consonant clusters, compound words)

We still need to explore any differential responses to the subset of fricative items in each stimulus set – differences in responses to words of similar articulatory characteristics
QUESTIONS
**SFA Research Articles:**


T.S.D. Getchius, L.K. Moses, J. French, MD, FAAN, G.S. Gronseth, MD, FAAN, J.D. England, MD, FAAN and J. Miyasaki, MD, MEd, FAAN

AAN guidelines, A benefit to the neurologist