Exploring the Role of Narrative in the Assessment, Diagnosis and Treatment of Aphasia

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Narrative ..... and beyond!
Acknowledgements

Dr Anne Whitworth – Curtin University, Australia

Dr Julie Morris – Newcastle University, UK
The Plan

In the beginning....
- Background – sentence, narrative and discourse production
- Analysing narrative – role within assessment and diagnosis of sentence production difficulties
- Analysing discourse – multi-level analysis

In the middle....
- What we know about language based intervention for word retrieval and sentence production
- Multi-level therapies: The NARNIA study

In the end....
- Measuring outcome
Introduction to Spoken Production in Aphasia

- Historically dichotomy between agrammatism and paragrammatism

**Agrammatism**
- Typical of Broca’s aphasia
- Non-fluent – reduced rate of speech/impaired prosody
- Short phrasal length
- Reliance on single nouns
- Difficulty with verbs
- Omission of function words (determiners, pronouns, auxiliary verbs and some prepositions)
- Auditory comprehension and object naming skills relatively spared
‘cookie jar . . . fall over ..... chair . . water . . . empty . . . ov . . ove ...’ (Examiner: overflow?) ‘yeah’
Introduction to Spoken Production in Aphasia

- Historically dichotomy between agrammatism and paragraphmatism

- **Paragraphmatism**
  - Typical of Wernicke’s aphasia
  - Fluent output (often copious amounts and at a higher rate)
  - Normal phrase length
  - Many function words and affixes but often misused/substitution errors
  - Presence of paraphasias (neologisms, semantic and phonological errors)
  - Impaired naming and auditory comprehension
‘well this is . . . mother is away here working her work out o' here to get her better when she's looking, the two boys looking in the other part. One their small tile into her time here. She's working another time because she's getting too. So the two boys work together an' one is sneakin' around here making his work and his further funnas his time he had. He an' the other fell were running around the work here will mother another time she was doing without everything wrong here.'
Introduction to Spoken Production in Aphasia

Sentence production difficulties – more diverse
- Overlap between features of agrammatic and paragrammatic speakers
- Extensive variability between individual speakers
- Dissociations between features
- Unlikely to be a single underlying impairment
- Labels give limited insight to the features present in an individual speaker

Some researchers moved to considering the sentence production of people with aphasia in relation to model of normal sentence production (e.g. Garrett, 1980, 1988)
Garrett’s Model of Sentence Production

INFERENTIAL PROCESSES

Message Level Representation

LOGICAL & SYNTACTIC PROCESSES

Functional Level Representation

SYNTACTIC & PHONOLOGICAL PROCESSES

Positional Level Representation

REGULAR PHONOLOGICAL PROCESSES

Phonetic Level Representation

MOTOR CODING PROCESSES

Articulatory Representation

Taken from Schwartz (1987)
**Garrett’s Model of Sentence Production**

- **INFERENTIAL PROCESSES**
  - *Message Level Representation*
    - Non-linguistic, conceptual information
  - **LOGICAL & SYNTACTIC PROCESSES**
  - *Functional Level Representation*
    - Abstract semantic representation – verb and its arguments
  - **SYNTACTIC & PHONOLOGICAL PROCESSES**
  - *Positional Level Representation*
    - Phonological representation – syntactic and phrasal structure
  - **REGULAR PHONOLOGICAL PROCESSES**
  - *Phonetic Level Representation*
  - **MOTOR CODING PROCESSES**
  - *Articulatory Representation*
Garrett’s Model of Sentence Production

- **Inferential Processes**
  - *Message Level Representation*
  - *Logical & Syntactic Processes*
  - *Functional Level Representation*
  - *Syntactic & Phonological Processes*
  - *Positional Level Representation*
  - *Regular Phonological Processes*
  - *Phonetic Level Representation*
  - *Motor Coding Processes*
  - *Articulatory Representation*

Event-level processing difficulties

Semantic-level (thematic) sentence processing difficulties

Syntactic-level sentence processing difficulties
A schematic representation of Garrett’s model of sentence production (1982)
Introduction to Discourse Production in Aphasia

- Discourse (Armstrong, 2000)
  - Structuralist - unit of language above the sentence
  - Functionalist - language in use
- Meaning of discourse – not a ‘sum’ of the individual words and sentences
- Cohesion – ‘interpretation of some element in the discourse is dependent on that of another’ (Armstrong, 2000)
  - Grammatical cohesive devices e.g. conjunctions, pronouns, demonstratives
  - Lexical cohesive devices
- Coherence – quality of discourse ‘its unity, connectedness’ (Linnik et al. 2015)
Discourse genres – ‘different ways of using language to achieve culturally established tasks’ (Eggins & Martin, 1997)

- Narrative
- Recounts
- Procedural
- Exposition

Within the conversational exchange of questions and comments, participants may tell their partners about events (narrative discourse), provide directions or instructions (procedural discourse), describe something in detail (descriptive discourse), or explain something in depth (expository discourse)...In real-life discourse speakers are free to switch between discourse types ...” (Boyle, 2011, p 1310).
## Analysing Discourse: Elicitation Paradigms

### Connected Speech

<table>
<thead>
<tr>
<th>Picture Description</th>
<th>Discourse</th>
</tr>
</thead>
<tbody>
<tr>
<td>Complex picture description</td>
<td>Monologues: Narrative, e.g. story retell</td>
</tr>
<tr>
<td>Picture sequences</td>
<td>Personal narrative, e.g. recount</td>
</tr>
<tr>
<td></td>
<td>Procedural narrative</td>
</tr>
<tr>
<td></td>
<td>Expositions, e.g. opinions</td>
</tr>
</tbody>
</table>

Analysing Discourse: Focus of Analysis

- Micro-Structure
- Macro-Structure
- Informativeness
Analysing narrative .....focusing on microstructure
Analysing Narrative: Micro-structure

Some examples:

- Analysis of lexical characteristics of words within narrative (Bird & Franklin, 1996)
- Analysis of verbs and argument structure (Thompson et al. 1995)
- Analysis of syntactic realisation of PAS (Byng & Black, 1989)
- Analysis of thematic and phrasal structure (Webster et al. 2007)

See Summary Table in Handout (Taken from Webster et al. 2009)
Study of Narrative Production

Aims

- Profile thematic, phrasal and morphological structure of sentences
- Compare production of people with aphasia and normal control participants
- Compare patterns seen in people with fluent and non-fluent aphasia

Participants

- 20 normal control participants, 4 men & 16 women, mean age 54.9 years (range 19-90)
- 22 people with aphasia, 10 men and 12 women, mean age 60.6 years (range 40-80). People had aphasia as a consequence of single CVA and presented with sentence production difficulties. 16 non-fluent and 6 fluent speakers.

Study of Narrative Production

Method

- Cinderella narrative
- Narrative produced and transcribed as in Saffran et al. (1989)
- Rate of speech calculated
- Narrative core extracted as in Saffran et al. (1989) except:
  - Whole sample used (as in Bird & Franklin, 1996)
  - Direct speech not excluded
- Analysis of thematic structure (functional level representation), phrasal structure (positional level representation) and morphological structure (positional level representation)
Study of Narrative Production

Analysis

- Comparison of normal control participants and people with aphasia

- Comparison of non-fluent and fluent speakers with aphasia

- Investigation of performance of individual speakers with aphasia
Analysis of Thematic Structure

- Proportion of utterances with an undetermined thematic structure (UTS)
- Distribution and complexity of argument structures (PAS) produced
  e.g. 1 ‘Cinderella cried’
  2 ‘The fairy godmother waved the wand’
  3 ‘She turned the mouse into a coachman’
- Proportion of complex utterances with thematic embedding (TE)
  e.g. ‘so she went to the ball to dance with the prince who was very handsome’
- Omission of obligatory verb arguments
  e.g. ‘Cinderella fetched’
Analysis of Thematic Structure

Significant difference between normal participants and PWA

- Mean thematic complexity
- % of UTS, 2 argument, 3 argument and utterances with TE
- % of obligatory arguments omitted

No significant difference between fluent and non-fluent participants for mean thematic complexity

Fluent participants omitted significantly more obligatory arguments than non-fluent participants
Analysis of Phrasal Structure

- Complexity of noun phrases (NP)
- Complexity of verb phrases (VP)
- Complexity of adjectival phrases (AP)
- Complexity of prepositional phrases (PP)
- Errors involving the use of pronouns, determiners, auxiliaries and prepositions.
Analysis of Phrasal Structure

No significant difference between PWA and normal controls (except AP)  
No significant difference between non-fluent and fluent speakers
Normal control participants produced very few errors.

<table>
<thead>
<tr>
<th>People with Aphasia</th>
<th>Mean % Error</th>
<th>Range</th>
<th>Type of Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Determiners</td>
<td>14.04</td>
<td>0-50</td>
<td>Omissions &amp; Substitutions</td>
</tr>
<tr>
<td>Pronouns</td>
<td>4.54</td>
<td>0-25</td>
<td>Substitutions</td>
</tr>
<tr>
<td>Prepositions</td>
<td>10.68</td>
<td>0-50</td>
<td>Omissions &amp; Substitutions</td>
</tr>
<tr>
<td>Auxiliaries</td>
<td>16.38</td>
<td>0-67</td>
<td>Mainly omissions</td>
</tr>
</tbody>
</table>
Analysis of Morphological Structure

- Frequency of use
  - Regular morphemes – plural ‘s’, possessive ‘s’, third person ‘s’, past ‘ed’, progressive ‘ing’ and perfect ‘en’
  - Irregular forms – irregular plurals and irregular past tense forms

- Errors in use
Analysis of Morphological Structure: Frequency of Use

<table>
<thead>
<tr>
<th></th>
<th>Normal Control Participants Mean Frequency</th>
<th>People with Aphasia Mean Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plural ‘s’</td>
<td>10.60</td>
<td>5.05*</td>
</tr>
<tr>
<td>Irregular Plural</td>
<td>1.85</td>
<td>0.59*</td>
</tr>
<tr>
<td>Possessive ‘s’</td>
<td>0.95</td>
<td>0.09*</td>
</tr>
<tr>
<td>Past ‘ed’</td>
<td>18.35</td>
<td>2.45*</td>
</tr>
<tr>
<td>Irregular Past</td>
<td>22.05</td>
<td>6.45*</td>
</tr>
<tr>
<td>Progressive ‘ing’</td>
<td>4.70</td>
<td>3.68</td>
</tr>
<tr>
<td>Perfect ‘en’</td>
<td>0.75</td>
<td>0.05*</td>
</tr>
<tr>
<td>3rd Person ‘s’</td>
<td>1.15</td>
<td>3.45</td>
</tr>
</tbody>
</table>

* Significant difference between normal control participants and people with aphasia
Normal control participants produced very few errors.

<table>
<thead>
<tr>
<th>People with Aphasia</th>
<th>Mean % Error</th>
<th>Range</th>
<th>Type of Errors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plural ‘s’</td>
<td>11.00</td>
<td>0-54.55</td>
<td>Omission</td>
</tr>
<tr>
<td>Irregular Plural</td>
<td>0</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>Possessive ‘s’</td>
<td>0</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>Past ‘ed’</td>
<td>7.14</td>
<td>0-50.00</td>
<td>Omission &amp; Substitution</td>
</tr>
<tr>
<td>Irregular Past</td>
<td>4.89</td>
<td>0-33.33</td>
<td>Substitution</td>
</tr>
<tr>
<td>Progressive ‘ing’</td>
<td>2.00</td>
<td>0-40.00</td>
<td>Omission &amp; Substitution</td>
</tr>
<tr>
<td>Perfect ‘en’</td>
<td>0</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>3rd Person ‘s’</td>
<td>23.02</td>
<td>0-100</td>
<td>Omission</td>
</tr>
</tbody>
</table>
### Relationship between thematic, phrasal & morphological structure

<table>
<thead>
<tr>
<th>People with Aphasia</th>
<th>Mean Phrasal Complexity</th>
<th>Mean % Phrasal Errors</th>
<th>Mean % Morphological Errors</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Percentage UTS</strong></td>
<td>r = -0.274</td>
<td>r = -0.082</td>
<td>r = 0.029</td>
</tr>
<tr>
<td></td>
<td>p = 0.217</td>
<td>p = 0.716</td>
<td>p = 0.097</td>
</tr>
<tr>
<td><strong>Mean PAS Complexity</strong></td>
<td>r = 0.138</td>
<td>r = -0.028</td>
<td>r = -0.542</td>
</tr>
<tr>
<td></td>
<td>p = 0.541</td>
<td>p = 0.210</td>
<td>p = 0.009*</td>
</tr>
<tr>
<td><strong>Percentage Argument Omission</strong></td>
<td>r = -0.116</td>
<td>r = 0.038</td>
<td>r = 0.226</td>
</tr>
<tr>
<td></td>
<td>p = 0.608</td>
<td>p = 0.866</td>
<td>p = 0.312</td>
</tr>
</tbody>
</table>
Relationship between rate and thematic, phrasal & morphological structure

- No significant correlation between rate of speech and any of the other parameters
  - % UTS \( r = -0.215 \) \( p = 0.336 \)
  - PAS Complexity \( r = 0.305 \) \( p = 0.168 \)
  - Argument Omission \( r = 0.338 \) \( p = 0.124 \)
  - Phrasal Complexity \( r = 0.175 \) \( p = 0.437 \)
  - Phrasal Errors \( r = 0.129 \) \( p = 0.568 \)
  - Morphological Errors \( r = -0.011 \) \( p = 0.963 \)
People with aphasia thought to be impaired if fell outside 2 st dev of normal mean.

For some individual parameters e.g. thematic embedding – large amount of normal variation.

Most people with aphasia presented with a combination of thematic, phrasal and morphological difficulties.

Across individuals, dissociations across parameters within each level of representation and across levels of representation.

Varied severity of those difficulties.

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Conclusions

- Comprehensive analysis – importance of considering both frequency of production and errors
- Analysis enabled features to be linked to processes involved in normal sentence production
- Evidence for independence of processes involved in production of thematic structure, phrasal structure and morphology
- Relative contribution of thematic, phrasal and morphological difficulties
- Features of sentence production independent of speech fluency (rate of speech)
Conclusions

- Highlights importance of understanding normal performance
  - Limitations of sample e.g. complex sentences, varied verb tense
  - Normal variability

- Clinically, important to look at the characteristics of an individual’s sentence production

- But: Detailed analysis can be time consuming
Difficulties producing the thematic structure of the sentence at the functional level representation may be characterised by:

- Word retrieval difficulties – possibly involving the production of hesitations, semantic errors and a reliance on pronouns and ‘semantically light’ verbs e.g. ‘have’, ‘do’, ‘make’, ‘be’
- A high proportion of single words and phrases with reduced production of sentences
- A reliance on simple, one and two argument sentences.

A Checklist for Clinical Use

Positional Level Representation

Difficulties producing the grammatical structure of the sentence at the positional level representation may be characterised by:

- Word retrieval difficulties - possibly involving the production of hesitations, semantic errors and phonological errors
- A reliance on simple, unelaborated phrasal structure
- Errors involving the omission and/or substitution of function words e.g. pronouns, prepositions, auxiliaries and determiners
- Errors involving the omission and/or substitution of bound grammatical morphemes e.g. noun and verb morphology.

Cinderella and um .. sister one two sister and ball .. Cinderella ball and Cinderella ball .. no ball .. and sister one two sister and um .. off .. off and um .. nice nice one two two sister and ball ball .. nice ball um .. off and um .. yes and Cinderella and crying yes crying .. and lady wand .. wand lady
Two sisters have got an invitation. Erm and Cinderella's got none. Erm... the fairy godmother... Erm... she has... a carriage and horses. The horses are mice and the pumpkin no horses are mice and carriage is a pumpkin.
somebody wants to go to the palace they want to go to the ball don't they but erm she can't go because she has no decent clothes and they're all raggy and everything else and she's working too hard so the two sisters they're working Cinderella has to get them all dressed up and their lovely clothes and everything to make sure it's nice for the palace
Analysing discourse .....multi-level analyses
Analysing Discourse: Focus of Analysis

- Micro-Structure
- Macro-Structure
- Informativeness
Multi-level: Analysis of macro- and micro-structure

Some examples:

- Bastiaanse et al. (1996) – structural (within and across sentences) & lexical measures
- Glosser & Deser (1991) local & global coherence, cohesion, structural & lexical measures
- Andretta & Marini (2015) – productivity, structural (MLU, complete sentences), lexical measures & discourse organisation (local & global coherence, cohesion, information content)

See Summary Table (Table 6) in Linnik et al. (2015)
Study of Discourse Production

Aims
- Profile organisational macrostructure across different discourse genres (recount, procedure, exposition & narrative)
- Influence of age & topic of discourse

Participants
- 30 adult speakers across 3 age ranges (20-39 years, 40-59 years & 60+ years)

Study of Discourse Production

**Method** - See Curtin University Discourse Protocol

- 3 x Recount (past injury, weekend, last Christmas)
- 3 x Procedures (scrambling eggs, changing a light bulb, planning an event / meal)
- 3 x Expositions (Bullying, obesity, global warming)
- 1 x Narrative (Cinderella)

**Analysis**

- Organisational structure – elements within orientation, body & conclusion
- Referential cohesion
- Analysis of conjunctions – adversative (e.g. but), causal (e.g. because), conditional (e.g. therefore) and temporal (e.g. then, before)
Telling stories (narratives)

**Purpose:** To entertain/inform

**Focus:** Sequential specific events

2. A catalyst event ➔ initiating event
3. Events – usually in time order ➔ series of events (e.g. main event, resolving event, etc)
4. Conflict and resolution (usually) ➔ concluding event or comment
5. A concluding statement ➔ personal comment / reaction
6. Evaluation (optional)

**Connectives** – time related connectives (e.g. then, next, before)

**Other** - Defined characters, descriptive language, dialogue, usually past tense
First Steps Project, Ministry of Education, Western Australia

**Giving opinions**

**Purpose:** To argue or persuade

**Focus:** A thesis presented from a particular point of view

1. Overall statement or position ➔ establish point of view
2. Supported statements or assertions ➔ present series of pros and cons
3. Reiteration ➔ restate opening statement/points

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**Connectives** – reasoning connectives (e.g. therefore, so, because)

**Verbs** - relational verbs (being/having) and many mental verbs

**Reference** - specific or generic reference

**Other** - Generalised participants, passives to help structure discourse, nominalisation (actions becoming nouns e.g. pollute becomes pollution)
Study of Discourse Production

Summary of Results

- Normal adult speakers use macrostructure elements to develop and maintain coherence (orientation, body & conclusion)
- Macrostructure elements adhered to different frameworks for different genres of discourse
- Some variation across discourse genres e.g. amount of orienting material, different conjunctions
- Some significant differences across different age groups e.g. number of elements within body
- Individual variation across speakers
Development of Multi-Level Measure

**Micro-Structure**

- **Verb Analysis**
  1. no. of light verbs *(e.g. is, come, go, bring)*
  2. no. of heavy verbs *(e.g. run, talk, swim)*
  3. ratio of light to heavy verbs

- **Thematic Analysis**
  1. % incomplete sentences
  2. Argument structure complexity
  3. % missing obligatory arguments
  4. Ratio of simple to complex sentences

**Macro-Structure**

- **Coherence**
  Organisational features
  (orientation, number of key events / steps / points offered, ending, etc)

- **Cohesion**
  1. Referential cohesion
  2. Number of conjunctions
  3. Variety of conjunctions
Exploring the Role of Narrative in the Treatment of Aphasia
The Plan

In the beginning....
• Background – sentence, narrative and discourse production
• Analysing narrative – role within assessment and diagnosis of sentence production difficulties
• Analysing discourse

In the middle....
• What we know about language based intervention for word retrieval and sentence production
• Multi-level therapies: The NARNIA study

In the end....
• Comparing outcome measures
Aim of Therapy for Aphasia

Webster, Whitworth & Morris (2015)

- Maximise gains in everyday communication
- Reduce the disability associated with aphasia
- Increase participation

- Many people with aphasia want to improve their language and communication skills
Language-focused aphasia treatment: What do we know?

Treatments for improving retrieval of single words (nouns)

- Large evidence base (see reviews in Nickels, 2002 & Whitworth, Webster & Howard, 2014)
- Improved retrieval of treated words
- Limited generalisation to untreated words
  - Therapy developing use of a strategy which can be applied across words (e.g. Nickels 1992)
  - Generalisation more likely in participants with good semantics and poor phonological encoding (see Best et al., 2013)
Language-focused aphasia treatment: What do we know?

- Limited investigation of impact on word retrieval in connected speech
- Some examples of gains in connected speech
  - Rose & Douglas (2008) – gains in number of nouns produced in procedural discourse e.g. 'animals' when describing 'going to zoo'
  - Herbert et al. (2008) – performance on naming task related to lexical retrieval in conversation
  - Spencer et al. (2000) – increase in CIU following phonological therapy
  - Best et al. (1997) – gains in rated communicative effectiveness
Language-focused aphasia treatment: What do we know?

Treatments for improving retrieval of single words (verbs)


- Improved retrieval of treated words

- Limited generalisation to untreated words

- Improved production of sentences around treated verbs (e.g. Marshall et al. 1998, Raymer & Ellsworth, 2002)

- Some generalisation to production of sentences around untreated verbs (e.g. Marshall et al. 1998)
Language-focused aphasia treatment: What do we know?

- Studies which have monitored impact of single word verb therapy on production of connected speech (Rose & Sussmilch, 2008, Boo & Rose, 2011, Carragher et al. 2013)
- Some lexical and structural gains in connected speech – but only for some participants
- Carragher et al. (2013) – no significant change in number of verbs in conversation following single word verb therapy
  - No correlation between verb naming and verb retrieval in conversation
  - No correlation between improvement in verb naming and verb retrieval in conversation
Language-focused aphasia treatment: What do we know?

Treatments combining work on verb retrieval and sentence production
Verb and argument structure therapies (e.g. Webster et al. 2005)
- 3 components of therapy:

1. Single verb retrieval
Language-focused aphasia treatment: What do we know?

Treatments combining work on verb retrieval and sentence production

Verb and argument structure therapies (e.g. Webster et al. 2005)

- 3 components of therapy

1. Single verb retrieval

2. Verb and noun association

<table>
<thead>
<tr>
<th>washing</th>
<th>box</th>
<th>dishes</th>
<th>computer</th>
</tr>
</thead>
<tbody>
<tr>
<td>washing</td>
<td>towel</td>
<td>brush</td>
<td>flannel</td>
</tr>
<tr>
<td>digging</td>
<td>farmer</td>
<td>doctor</td>
<td>ballerina</td>
</tr>
<tr>
<td>digging</td>
<td>tarmac</td>
<td>hole</td>
<td>carpet</td>
</tr>
</tbody>
</table>
Language-focused aphasia treatment: What do we know?

Treatments combining work on verb retrieval and sentence production

Verb and argument structure therapies (e.g. Webster et al. 2005)

3 components of therapy:

3. Sentence Generation

<table>
<thead>
<tr>
<th>WHERE?</th>
<th>WHAT WITH?</th>
</tr>
</thead>
<tbody>
<tr>
<td>in the bathroom</td>
<td>flannel</td>
</tr>
<tr>
<td>in the washroom</td>
<td>washing machine</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>WHAT TO?</th>
<th>WHO?</th>
</tr>
</thead>
<tbody>
<tr>
<td>face</td>
<td>man</td>
</tr>
<tr>
<td>clothes</td>
<td>woman</td>
</tr>
<tr>
<td>car</td>
<td>dog</td>
</tr>
</tbody>
</table>
Language-focused aphasia treatment: What do we know?


- Outcome of these therapies
  - Gains in retrieval of treated verbs
  - Some general gains on tests of verb and noun retrieval as consequence of VNeST
  - Improved sentence production around both treated and untreated verbs
  - Structural changes in sentence production in connected speech – reduction in number of single phrases, increase in number of sentences, increase in number of complete sentences, increase in complexity of sentences
  - Not clear if therapies have impact on lexical content of connected speech e.g. diversity of verbs
Language-focused aphasia treatment: What do we know?

- Structured language focused aphasia treatment results is effective in changing performance on constrained tasks.
- Gains seen on treated items and generalisation to untreated items dependent on therapy task and nature of person’s difficulties.
- Limited evidence that word retrieval therapies result in change in word retrieval in connected speech.
- Combining work on verb retrieval and sentence production has been shown to result in structural changes in connected speech.
  - BUT: Not every participant shows significant improvement.
- Major leap from words and sentences to using language in everyday speaking contexts.
And so…. a novel approach to treatment

• Developing a novel intervention based around how people structure their talk - looking beyond the word and sentence to the structure of narratives

Relationship between word, sentence and narrative structures in real life communication (Whitworth, 2010)
And so…. a novel approach to treatment

- Multi-level therapy combining work on words, sentences & discourse

- Combine what we know about effective treatment for verb and sentence production difficulties with knowledge about organisation of discourse
  - Verb & argument structure therapies (e.g. Webster et al. 2005)
  - Developmental frameworks for discourse organisation (Stein & Glenn, 1979, 1982)

- Single case studies – positive preliminary findings (Whitworth, 2010)
NARNIA: A Novel Approach to Real-life communication: Narrative Intervention in Aphasia

Dr Anne Whitworth (Curtin University, Australia)
Prof Graeme Hankey (UWA, Australia)
Dr Suze Leitão (Curtin University, Australia)
Dr Jade Cartwright (Curtin University, Australia)
Dr Janet Webster (Newcastle University, UK)
Ms Jan Zach (State Rehabilitation Service, WA)
Ms Vanessa Wolz (Curtin University, RPH)
Prof David Howard (Newcastle University, UK)
## NARNIA study

- Prospective, single blind Randomised Control Trial (RCT)
- 14 people with mild-moderate aphasia following stroke
- Comparison of i) Usual care and ii) NARNIA intervention

<table>
<thead>
<tr>
<th>Intervention Group</th>
<th>n</th>
<th>Aphasia severity (WAB-B)</th>
<th>Age (years)</th>
<th>TPO (months)</th>
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<tbody>
<tr>
<td>NARNIA</td>
<td>8</td>
<td>8.17 (sd 1.12) 4 mild, 4 moderate</td>
<td>63 (range: 42-87)</td>
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<tr>
<td>Usual Care</td>
<td>6</td>
<td>7.75 (sd 1.33) 3 mild, 3 moderate</td>
<td>55 (range: 37-66)</td>
<td>32.6 (range: 3 - 156)</td>
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</table>
NARNIA study: Inclusion criteria

- Recruited from in- and out-patient rehabilitation services
- Neurologically stable
- No previous aphasia or progressive cognitive difficulties
- Proficient in English prior to their stroke
- Apraxia or dysarthria not primary area of difficulty
NARNIA study

- Background assessment
- Primary outcome measure: Curtin University Discourse Protocol (Whitworth et al. 2015)
- 3 data points (pre, post and 5 weeks post)
  - 3 x Recount (past injury, weekend, last Christmas)
  - 3 x Procedures (scrambling eggs, changing a light bulb, planning an event / meal)
  - 3 x Expositions (Bullying, obesity, global warming)
  - 1 x Narrative (Cinderella)
- Treatment - 20 individual sessions with a trained Speech Pathologist, 4 x weekly, over a 5 week period

Multi-Level Measure

**Micro-Structure**

Verb Analysis
1. no. of light verbs *(e.g. is, come, go, bring)*
2. no. of heavy verbs *(e.g. run, talk, swim)*
3. ratio of light to heavy verbs

Thematic Analysis
1. % incomplete sentences
2. Argument structure complexity
3. % missing obligatory arguments
4. Ratio of simple to complex sentences

**Macro-Structure**

Coherence
Organisational features
(orientation, number of key events / steps / points offered, ending, etc)

Cohesion
1. Referential cohesion
2. Number of conjunctions
3. Variety of conjunctions
Usual care

- Individualised to meet assessed need
- Employed usual practice procedures around goal setting
- Intervention drawn from therapies routinely used in clinical practice (standardised procedure agreed by group of clinicians)
  - Word retrieval
  - Sentence production
  - Reading
  - Writing
  - Functional activities across domains
NARNIA: Multi-level therapy

Word level processes
- Identify and select main verb within each event
- Identify and produce the main nouns

Sentence level processes
- Create a complete argument structure around each verb

Discourse level processes
- Work with the narrative framework
- Identify connectives to link sentences (e.g. “and then”, “so”, “after”)
NARNIA: Multi-level therapy

**Picture sequences**

3 events through to 8 events
Progress through identifying:

1. main event / action
2. verb
3. nouns
4. full sentence for each event
5. narrative framework
6. connectives

**Discussion of opinions/ideas/beliefs**
- picture stimuli
- personal experience

**Recall of events**
- personal experience

**Planning of future events**
- personal experience
**Sentence level processes:** Verb argument structure
Narratives...

- Setting the scene
  - Who?
  - Where?
  - When?

- Middle
  - Main events?
  - Turning point?

- The ending
  - Ending?
  - Reactions
  - Feelings
  - Moral or message?
  - What next?

STORY TITLE
CONJUNCTIONS
(linking words)

Coordinating Conjunctions: And Or But Nor So For Yet
Subordinating Conjunctions: Because Even if As long as While Unless While

ADVERBS
(little words for extra information)
Adverbs are words that describe (modify) verbs, adjectives and other adverbs. They tell us how, when, where, to what extent and why.

<table>
<thead>
<tr>
<th>How</th>
<th>When</th>
<th>Where</th>
<th>To what extent</th>
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</thead>
<tbody>
<tr>
<td>Beautifully, quickly, urgently</td>
<td>After, never, then</td>
<td>Everywhere, here, upstairs</td>
<td>Extremely, no (n’t), quite</td>
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</tbody>
</table>
How did I go…?

Finding the verb (action)

Finding the nouns (people and things)

Completing sentences ___+ ___ + ___

Setting the scene (beginning)

Linking ideas

Ending

Clear story overall? 😊

Self-monitoring
• Each rated
• Each time
Narratives...

Setting the scene

Who?

Where?

When?

Middle

Main events?

Turning point?

STORY TITLE

The ending

Ending?

Reactions

Feelings

Moral or message?

What next?
Opinion…

Beginning - BACKGROUND

Middle - WHY

- Evidence
- Alternatives
- Personal experience
- Summary
- Repeat final opinion

The ending

Context
- Who
- Where
- When

For/ Against?
Recounts…

Introduction:
- Who?
- Where?
- When?
- Why?

Middle:
- Main events?
- High points?
- Low points?
- How did it end?
- What next?
- Lessons learnt?
- Reactions
- Feelings

The ending
Procedures…

- Beginning
  - GOAL
  - Who?
  - Where, when?
  - Why?

- PROCEDURE

- Middle
  - Materials
  - Method

- Evaluation

- Ending
"Sequence Plus: Sequence Pictures with Vocabulary". Circuit Publications.
Narratives... about my job
## Background assessment

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Everyday discourse pre-therapy

- Significant differences in the discourse of the people with aphasia (as a whole group) from the healthy participants before therapy

- No significant differences in the discourse between the NARNIA participants and the Usual Care participants before therapy
### Everyday discourse pre-therapy

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<tr>
<th>Language level</th>
<th>Language measure</th>
<th>Controls (n=30) ($\bar{x}$)</th>
<th>All aphasia participants (n=14) ($\bar{x}$)</th>
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<td>2 arg structures</td>
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Independent t-tests
Everyday discourse pre-therapy

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Outcome of intervention: Constrained assessment

- **Some significant gains** on word level assessments

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<td>p=.008*</td>
</tr>
<tr>
<td>Noun naming</td>
<td>✓</td>
<td>p=.045*</td>
</tr>
</tbody>
</table>

- **No significant gains** on sentence level assessments
Everyday discourse post therapy

Overall output

* p=.03

Number of Utterances

<table>
<thead>
<tr>
<th></th>
<th>Pre-Therapy</th>
<th>Post-Therapy</th>
<th>Usual Care</th>
</tr>
</thead>
<tbody>
<tr>
<td>NARNIA</td>
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</tbody>
</table>

|            |             |              |            |
Everyday discourse post therapy
Lexical change: Heavy verbs

* p=.004
Everyday discourse post therapy
Lexical change: Light verbs

* p=.002
Everyday discourse post therapy
Structural change: 2 argument structures

NARNIA
Usual Care

Number of Utterances

* p=.02

Pre-Therapy  Post-Therapy
Everyday discourse post therapy
Structural change: 3 argument structures

* p = .001
Everyday discourse post therapy
Structural change: Complex sentences

![Bar chart showing number of utterances for NARNIA and Usual Care pre and post therapy.

- NARNIA Pre-Therapy: 0, Post-Therapy: 40
- Usual Care Pre-Therapy: 15, Post-Therapy: 35

* p=.02 for NARNIA post-therapy
* p=.012 for Usual Care post-therapy]
Everyday discourse post therapy
Discourse Structure

<table>
<thead>
<tr>
<th>Lang. measure</th>
<th>NARNIA</th>
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<tbody>
<tr>
<td></td>
<td>PRE</td>
<td>POST</td>
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<tr>
<td>Orientation</td>
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<tr>
<td>Body</td>
<td>59.2</td>
<td>89.1</td>
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<tr>
<td>Conclusion</td>
<td>3.6</td>
<td>4.2</td>
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## Changes in Everyday Discourse Post-Therapy

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<th>Usual Care</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall output</td>
<td>No. of utterances</td>
<td>✓</td>
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</tr>
<tr>
<td>Word level</td>
<td>Heavy verbs</td>
<td>✓</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Light verbs</td>
<td>✓</td>
<td>-</td>
</tr>
<tr>
<td>Sentence level</td>
<td>2 arg structures</td>
<td>✓</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>3 arg structures</td>
<td>✓</td>
<td>-</td>
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<tr>
<td></td>
<td>Complex sentences</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>Discourse level</td>
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<td></td>
<td>Body</td>
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<td>-</td>
</tr>
<tr>
<td></td>
<td>Conclusion</td>
<td>-</td>
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</tr>
</tbody>
</table>
NARNIA: Multi-level therapy

- Multi-level therapy including a focus on word, sentence & discourse levels – very promising results
- Change in single word retrieval (potential generalisation to untreated words)
- Within discourse:
  - Change on lexical measures
  - Change in sentence production
  - Change in structure of discourse
What components of therapy are responsible for change?
- Relative contribution of word retrieval (unconstrained vocabulary), focus on argument structure & focus on discourse

What is the role of the discourse component?
- Scaffold for word and sentence production
- More naturalistic context for intervention
Multi-level therapies: Word, sentence & discourse

Carragher, Sage & Conroy (2015) - Exchange of new information within story-telling

Therapy Approach - conveying information with short video clips

- For person with aphasia
  - Production of words and argument structure
  - Principles of story grammar to structure information

- For communication partner
  - Conversation coaching to develop strategies to check and clarify information
Multi-level therapies: Word, sentence & discourse

Carragher, Sage & Conroy (2015) - Exchange of new information within story-telling

- Four participants with non-fluent aphasia

- Three participants showed generalisation to untrained stories
  - Improvements in communication of ideas
  - Changes in structure of simple narratives

- No straightforward relationship between changes in the ability of the person with aphasia to communicate ideas and the extent to which they were understood (by their communication partner)
Multi-level therapies: Word, sentence & discourse

Milman et al. (2014) Integrated Training for Aphasia

- Therapy approach
- Within each session

WORD ➔ SENTENCE ➔ DISCOURSE

- 20 mins of lexical retrieval of core vocabulary (food/activity)
- 20 mins of sentence production training (simple sentences containing core vocabulary) e.g. ‘I am watching TV’ ‘I am eating melon’
- 10 mins of scripted dialogue training
- 10 mins of generative conversation around related topic

- Group session
Multi-level therapies: Word, sentence & discourse

Milman et al. (2014) Integrated Training for Aphasia

- 3 participants with non-fluent aphasia

- Gains on treated items (lexical retrieval and sentence production)

- No systematic generalisation to untreated items

- Gains in connected speech – both lexical and structural measures (although differed between participants)

- Only change for 1 participant on measure of ‘communication’ e.g. CETI
Multi-level therapies: Word, sentence & discourse

- Outcome of multi-level therapies are promising
- Reasons for multi-level therapies (Milman et al. 2014)
  - Linguistic networks are extensive and inter-connected
  - Facilitate generalisation of treatment to everyday communicative interactions
  - Most individuals have multiple language impairments

‘We may use multi-component and multi-level therapies to maximise the prospect of targeted and generalised change but we need to ensure we do not package everything up in a therapy without understanding what contributes to the improvement and whether all aspects are important and necessary.’ (Whitworth & Webster, 2015)
Exploring the Role of Narrative in Measuring Outcome
The Plan

**In the beginning....**
- Background – sentence, narrative and discourse production
- Analysing narrative – role within assessment and diagnosis of sentence production difficulties
- Analysing discourse

**In the middle....**
- What we know about language based intervention for word retrieval and sentence production
- Multi-level therapies: The NARNIA study

**In the end....**
- Comparing outcome measures
Introduction

Webster, Whitworth & Morris (2015)

- Maximise gains in everyday communication
- Reduce the disability associated with aphasia
- Increase participation

- Importance of monitoring the direct effects of therapy & generalisation
  - Linguistic change (including impact on connected speech)
  - Overall impact for person

<table>
<thead>
<tr>
<th>Level</th>
<th>Word</th>
<th>Sentence</th>
<th>Connected Speech</th>
</tr>
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<tbody>
<tr>
<td>Elicitation Methods</td>
<td>Picture naming</td>
<td>Constrained phrase or sentence production tests</td>
<td>Complex picture description</td>
</tr>
<tr>
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<td>Word association</td>
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<td>Picture sequences</td>
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<td>Naming to definition</td>
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<tr>
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<td>Role play</td>
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**Focus**

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<td>Discourse</td>
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<td>Monologues</td>
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<td>• Constrained phrase or sentence completion</td>
<td>• Narrative, e.g. story retell</td>
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<td>• Word association</td>
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<td>• Complex phrase or sentence completion</td>
</tr>
<tr>
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<td>• Naming to definition</td>
<td></td>
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<td>• Sentence completion</td>
<td></td>
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<td>• Word fluency</td>
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Change in production of treated and untreated sentence structures or the overall structure of discourse

<table>
<thead>
<tr>
<th>Level</th>
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<th>Connected Speech</th>
</tr>
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<td>Elicitation Methods</td>
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<td>Narrative, e.g. story retell</td>
</tr>
<tr>
<td></td>
<td>Naming to definition</td>
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<td>Personal narrative, e.g. recount</td>
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<td>Sentence completion</td>
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<td></td>
<td></td>
<td></td>
<td>Change in interaction</td>
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</table>

Change in ability to get the message across

What should we measure and how?

- Need to consider:
  - Elicitation paradigm
  - Type of analysis

- Reliability of measure

- Clinical feasibility
# Analysing Discourse: Elicitation Paradigms

## Connected Speech

<table>
<thead>
<tr>
<th>Picture Description</th>
<th>Discourse</th>
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</thead>
<tbody>
<tr>
<td>Complex picture description</td>
<td>Monologues:</td>
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<tr>
<td>Picture sequences</td>
<td>Narrative, e.g. story retell</td>
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<td>Personal narrative, e.g. recount</td>
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<tr>
<td></td>
<td>Procedural narrative</td>
</tr>
<tr>
<td></td>
<td>Expositions, e.g. opinions</td>
</tr>
</tbody>
</table>

|                        | Dialogues:     |
|                        | Conversation (more or less naturalistic sampling) |
|                        | Role play |

- Complex picture description
- Picture sequences
Conversation

Conversation is frequently considered to be the gold standard in demonstrating the generalisation of treatment effects following aphasia therapy. (Carragher, Conroy, Sage, & Wilkinson, 2012; Lind, Kristoffersen, Moen, & Simonsen, 2009)

And yet we know that conversation is characterised by...
- its interactional nature and the presence of the conversation partners
- variability in terms of structure and organisation (or lack of) – topic, conversation partner
- reduced syntactic complexity and length of utterance when compared to other monologic discourse.
Relationship between elicitation conditions

Conroy, Sage & Lambon Ralph (2009)

- Explored effects of naming therapy for nouns & verb – single picture naming, picture-supported narrative & unsupported retell of narrative

- Step-wise reduction in naming accuracy as the elicitation method became more complex
  
  Picture naming > Picture supported narrative > Narrative re-tell

- Tasks differ in:
  - Linguistic complexity
  - Cognitive complexity
Relationship between elicitation conditions

Whitworth et al. (2015) - NARNIA study

- Relationship between everyday discourse (recount, procedure, exposition) and narrative

- Some differences in the patterns seen pre-therapy (when compared to normal control participants)
## Changes in Everyday Discourse Post-Therapy

<table>
<thead>
<tr>
<th>Level</th>
<th>Measure</th>
<th>NARNIA</th>
<th>Usual Care</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall output</td>
<td>No. of utterances</td>
<td>✓</td>
<td>-</td>
</tr>
<tr>
<td>Word level</td>
<td>Heavy verbs</td>
<td>✓</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Light verbs</td>
<td>✓</td>
<td>-</td>
</tr>
<tr>
<td>Sentence level</td>
<td>2 arg structures</td>
<td>✓</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>3 arg structures</td>
<td>✓</td>
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</tr>
<tr>
<td></td>
<td>Complex sentences</td>
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<td>✓</td>
</tr>
<tr>
<td>Discourse level</td>
<td>Orientation</td>
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<td>-</td>
</tr>
<tr>
<td></td>
<td>Body</td>
<td>✓</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Conclusion</td>
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</table>
Changes in Narrative Discourse Post-Therapy

<table>
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<th>Level</th>
<th>Measure</th>
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<th>Usual Care</th>
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</thead>
<tbody>
<tr>
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<td>No. of utterances</td>
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<td>-</td>
</tr>
<tr>
<td>Word level</td>
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<td></td>
<td>Complex sentences</td>
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<td>Discourse level</td>
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<td>Body</td>
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<td></td>
<td>Conclusion</td>
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<td>✓</td>
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</tbody>
</table>
Relationship between elicitation conditions

Whitworth et al. (2015) - NARNIA study

- Relationship between everyday discourse (recount, procedure, exposition) and narrative
- Marked differences between changes seen in everyday discourse and changes seen in narrative
- Possible explanations:
  - Individual variation in production
  - NARNIA protocol – only focused on picture supported narrative at early stage of programme
  - Cinderella – cultural relevance, familiarity with story
- Narrative production may not be useful outcome measure for this type of intervention
Relationship between elicitation conditions

Further examination of the changes seen post-NARNIA Therapy

- Relationship between everyday discourse (recount, procedure, exposition) and conversation
- Eight participants within NARNIA group
Micro-Structure

Verb Analysis
1. no. of light verbs (e.g. is, come, go, bring)
2. no. of heavy verbs (e.g. run, talk, swim)
3. ratio of light to heavy verbs

Thematic Analysis
1. % incomplete sentences
2. Argument structure complexity
3. % missing obligatory arguments
4. Ratio of simple to complex sentences
# Changes Post-Therapy

<table>
<thead>
<tr>
<th>Level</th>
<th>Measure</th>
<th>Everyday Discourse</th>
<th>Conversation</th>
</tr>
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<td>Heavy verbs</td>
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<td>Light verbs</td>
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<tr>
<td></td>
<td>Complex sentences</td>
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Micro-Structure

Verb Analysis
1. no. of light verbs *(e.g. is, come, go, bring)*
2. no. of heavy verbs *(e.g. run, talk, swim)*
3. ratio of light to heavy verbs

Thematic Analysis
1. % incomplete sentences
2. Argument structure complexity
3. % missing obligatory arguments
4. Ratio of simple to complex sentences

Informativeness of Conversation

Correct Information Units (CIU)
From Nicholas & Brookshire (1993)
Changes Post-Therapy

There was NO main effect of treatment on informativeness of conversational speech

\[ F(2, 12) = 0.96, \ p > .05 \]

<table>
<thead>
<tr>
<th>Participants</th>
<th>Pre</th>
<th>Post</th>
<th>Significance</th>
<th>Post</th>
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<td>80.50</td>
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<td>( p = .29 )</td>
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<td>004</td>
<td>76.60</td>
<td>83.50</td>
<td>( p = .32 )</td>
<td>83.50</td>
<td>82.39</td>
<td>( p = .50 )</td>
<td></td>
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</tr>
<tr>
<td>006</td>
<td>75.81</td>
<td>86.21</td>
<td>( p = .23 )</td>
<td>86.21</td>
<td>86.39</td>
<td>( p = .52 )</td>
<td></td>
<td></td>
</tr>
<tr>
<td>007</td>
<td>77.38</td>
<td>74.81</td>
<td>( p = .45 )</td>
<td>74.81</td>
<td>N/A</td>
<td>N/A</td>
<td></td>
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</tr>
<tr>
<td>010</td>
<td>81.40</td>
<td>83.76</td>
<td>( p = .46 )</td>
<td>83.76</td>
<td>83.46</td>
<td>( p = .52 )</td>
<td></td>
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</tr>
<tr>
<td>013</td>
<td>59.46</td>
<td>64.71</td>
<td>( p = .35 )</td>
<td>64.71</td>
<td>46.15</td>
<td>( p &lt; .05 )</td>
<td></td>
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</tr>
<tr>
<td>014</td>
<td>81.97</td>
<td>83.33</td>
<td>( p = .49 )</td>
<td>83.33</td>
<td>85.52</td>
<td>( p = .47 )</td>
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</tr>
</tbody>
</table>

Results of Fisher's Exact Test for %CIU across treatment periods
Relationship between elicitation conditions

Further examination of the changes seen post-NARNIA Therapy

- No parallel gains in conversation in participants who had made robust improvements in everyday discourse

- With the exception of a significant reduction in single phrases, the gains seen at the word and sentence levels did not generalise to conversation.

- No change seen in the informative measure used across the conversation samples.
Conclusions

- Whilst changes in conversation may be the desired treatment aim – can be difficult to show robust gains post-therapy

- Need to understand the relationship between different elicitation conditions, discourse genres and conversation
Overall Conclusions

Narrative (and discourse more broadly)

- Useful in description of spontaneous speech of people with aphasia
- Useful in diagnosis of underlying sentence production difficulties
- Useful within intervention – as scaffold or as context for intervention
- Important to consider when monitoring treatment effects and generalisation
Thanks for listening

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