The relationship between performance on spoken diadochokinetic (DDK) tasks and oral motor tasks by children with speech difficulties.

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Diadochokinetic skills (DDK)

- “the ability to perform repetition of syllables at a maximum rate of production”. (Fletcher, 1978).
- Examples of syllables used in tasks:
  monosyllables: /pʌ/, /tʌ/, /kʌ/
  nonsense tri-syllables: /pʌtʌkʌ/
  real polysyllabic words: PAT-A-CAKE
DDK tasks and children with speech difficulties

• Used routinely in assessments by SLTs.
• To determine if there is a motor component to a child’s speech difficulty.
• However, clinicians often struggle to interpret results.
• Why?
DDK issues and children with speech difficulties

• There is still limited information available in the published literature.
• Studies have included children of different ages & severity.
• They have involved varying methodology: tasks, stimuli, measures.
• Usually little/no detail of the individual children’s profiles of presenting speech difficulties.
DDK tasks and oral motor tasks

• There has been theoretical debate over whether DDK a speech or a non-speech task (Maas 2017).

• DDK tasks are often included in oral motor assessments e.g. Oro-motor assessment in the DEAP (Dodd et al. 2002).

• Papers often report DDK findings under a heading of “oral diadochokinesia” (e.g. Henry 1990; Modolo et al. 2010; Icht & David 2014).
DDK tasks and oral motor tasks

• In research studies, DDK tasks have been identified as having a role in differential diagnosis of motor speech disorders.

• Therefore, the usual purpose of DDK tasks when utilised by SLTs is to assess **speech motor skill** rather than **oral motor skill**.

• Including DDK tasks in Oral motor assessments assumes that speech motor skills and oral motor skills are associated. But are they?
Early speech development

• Literature on early speech development has challenged this association (e.g. Steeve et al. 2008). Instead ...........

• Speech and non-speech oral behaviours involve:
  - separate co-ordinated structures which develop in parallel but along divergent paths (Rvachew & Brosseau-Lapre 2012).
Findings from a detailed DDK study

• DDK performance of a group of children aged 4-7 years with speech difficulties was compared to that of a group of age matched typically-developing controls.

• For the children with speech difficulties (SD): the relationship between DDK performance and performance on other measures of speech and oral motor skill was investigated.
Participants

Clinical (SD) group
- N=40 aged 4;1-7;10 yrs
- 30 boys & 10 girls
- Current obvious speech difficulties – range of presentations & severities
- Receiving SLT intervention in either a primary or a specialist setting
- Met set inclusion criteria

Control (TD) group
- N=40 aged 4;4 - 7;6 yrs
- 21 boys & 19 girls
- Attending mainstream schools & nurseries
- Met set inclusion criteria
DDK Tasks

• Matched real words, non-words, syllable sequences (modified from Williams & Stackhouse 2000)
• 4 di-syllabic & 4 tri-syllabic DDK stimuli in each condition
• 2 practice stimuli (1 of each syllable length)
• Picture support for real words
• Procedure: repeat target after adult model 1 x, then 5 x at speed
DDK Test Stimuli

<table>
<thead>
<tr>
<th>Real Word Target</th>
<th>Non-Word Target</th>
<th>Syllable Sequence Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>potty</td>
<td>'pәте</td>
<td>'pә'tә</td>
</tr>
<tr>
<td>motorbike</td>
<td>'maутібік</td>
<td>'maә'tә'бә</td>
</tr>
<tr>
<td>party</td>
<td>'путә</td>
<td>'пә'tә</td>
</tr>
<tr>
<td>cardigan</td>
<td>'кudәңи</td>
<td>'кә'dә'гә</td>
</tr>
<tr>
<td>patacake</td>
<td>'пәтікәук</td>
<td>'пә'те'кә</td>
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<td>money</td>
<td>'миңе</td>
<td>'ме'ңе</td>
</tr>
<tr>
<td>letterbox</td>
<td>'letиbәкѕ</td>
<td>'ле'тә'бә</td>
</tr>
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<td>telephone</td>
<td>'тәлефәңи</td>
<td>'те'ле'фә</td>
</tr>
<tr>
<td>digger</td>
<td>'dәғи</td>
<td>'дә'гә</td>
</tr>
<tr>
<td>coffee</td>
<td>'кifә</td>
<td>'кে'фә</td>
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</tbody>
</table>
DDK Real words picture support

Money

Pat-a-cake
AG6 –pat-a-cake
IF5 – ['kudægən]
Other tasks – SD group only

- Mispronunciation detection task
- DEAP Oro-motor Assessment: Isolated movements and Sequenced movements
- Single consonant and vowel sound imitation task
- DEAP Phonology Assessment
- DEAP Inconsistency Assessment
- Informal connected speech task, describing “what’s wrong/funny?” pictures
DDK, Oral motor & Speech tasks

- Detailed scoring methods were devised for the DDK tasks
- DDK performance was measured in terms of:
  • Accuracy
  • Consistency
  • Rate
- Standardised Oro-motor and Speech tasks were scored according to the published manual
Relationship between DDK and the oral motor measures

No significant correlation was found between any **DDK measure** (accuracy, consistency or rate) and

- Isolated movements
- Sequenced movements

In comparison:...........
Relationships between DDK and other speech measures (1)

A significant correlation was found between DDK accuracy and:
• **Accuracy of imitated single consonant sounds** \( (p<0.01) \)
• **Accuracy of single word naming** \( (p<0.01) \)
• **Accuracy of lexical representations** \( (p<0.01) \)
Relationships between DDK and other speech measures (2)

- A **significant** correlation was found between **DDK consistency** and:
- **Consistency of single word naming** (p<0.01)
- **Accuracy of lexical representations** (p<0.05)
- **Accuracy of single word naming** (p<0.05)
Relationships between DDK and other speech measures (3)

No correlation was found between **DDK** rate and any other speech measure including **connected speech rate** *

*as measured in this study*
Take home message: DDK & Oral motor skills

• DDK is often included in oral motor assessments.
• In my study, no correlation was found between DDK & oral motor results.
• Thus supporting a dissociation view between speech motor skills & oral motor skills.
• Although they involve the same anatomical structures, control over speech and non-speech movements appears to be independent.
Take home message: Interpreting DDK findings

• Therefore, it is recommended that SLTs assess and evaluate DDK performance in the context of performance on other speech tasks.

• For example, a child’s performance on a single consonant sound imitation task can be compared with their performance on DDK tasks.
Take home message: Intervention for speech sound disorders

- Findings from this study may help to explain why evidence for the use of Non-Speech Oral Motor Exercises (NSOMEs) has been lacking.

- NSOMEs may improve oro-motor functioning, but this cannot transfer to speech motor functioning, as different independent underlying systems are involved.
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Thank you for listening!

• Questions?

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