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

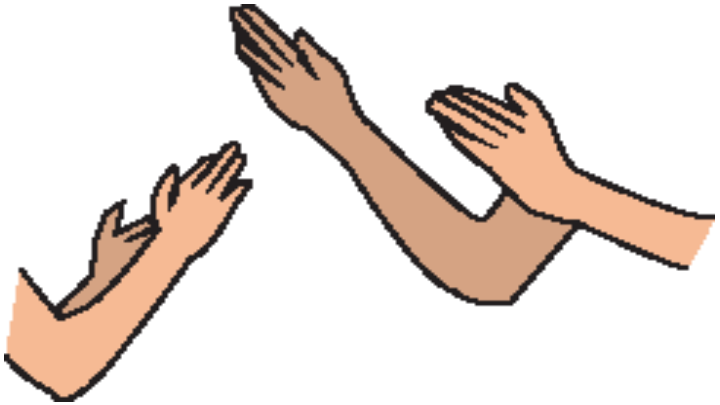
DDK Test Stimuli

Real Word Target	Non-Word target	Syllable Sequence Target
potty	ˈpetə	ˈpəˈtə
motorbike	ˈmɑʊtɪbeɪk	ˈməˈtəˈbə
party	ˈputə	ˈpəˈtə
cardigan	ˈkudægɪn	ˈkəˈdəˈgə
patacake	ˈpɒtɪkəʊk	ˈpəˈtəˈkə
money	ˈmɪnə	ˈməˈnə
letterbox	ˈlʌtɪbæks	ˈləˈtəˈbə
telephone	ˈtɒləfaɪn	ˈtəˈləˈfə
digger	ˈdægɪ	ˈdəˈgə
coffee	ˈkɪfə	ˈkəˈfə

DDK Real words picture support

Money

Pat-a-cake



AG6 –pat-a-cake

IF5 – [ˈkudægən]

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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