Diagnosing reading and writing in a second or foreign language

Ari Huhta
University of Jyväskylä

Lea Nieminen
University of Jyväskylä

J Charles Alderson
Lancaster University

Riikka Ullakonoja
University of Jyväskylä

AAAL Chicago, March 27, 2011
Outline

- diagnosing second / foreign language
- reading in a second or foreign language
- DIALUKI study – diagnosing reading and writing in a first and second / foreign language
  - inter-disciplinary; see www.jyu.fi/dialuki
- preliminary results: predicting reading in English as FL
Diagnosis

- How did we get interested in this?
  - DIALANG - www.dialang.org
  - very under-developed and under-theorised in language testing and applied linguistics in general

→ Little agreement on e.g. what diagnostic tests are

- Our definition: Focus on learners’ strengths and weaknesses; prediction, even explanation

- Diagnosis requires a better understanding of language abilities at a more detailed level than is currently the case

- Need to define constructs both theoretically and operationally.

Diagnosis

- Diagnosis common in e.g. medicine, car mechanics and first language reading
  - Can we learn from these?

Aims for the future:
- Developing tests / procedures that can identify problems
- Developing suitable, meaningful feedback
- Effective advice on remediation in L2/FL?
Diagnosis – a fusion of SLA and language testing

- Needs a theory of language development from SLA
- Needs insight from LT into variability in performance across test tasks and into designing valid and reliable measures

- Reading – a particularly interesting area: little SLA research into comprehension & not the strongest area of LT research either
Defining constructs – What is reading?

- Huge field, enormous literature – for L1
- Much less for L2, and L2 highly derivative of L1 reading theory.
- We don’t subscribe to any particular model of reading for our study

Grabe, W. 2009. Reading in a Second Language: Moving from Theory to Practice. CUP.
Lower-level processes

- Must be highly **automatised** for fluent reading
- Rapid and automatic **recognition** of a large number of **words** crucial
- **Working memory** plays a key role in low level processes but also in the interaction of different levels of processes
What is reading?
Higher level processes; main components:

A. **Text level model of comprehension** extracts the meaning the **writer** is attempting to convey.

B. **The situation model of reader interpretation** is the synthesis of the **reader**'s background knowledge with the text model, taking into account the purpose of the reader in reading the text.

C. **A set of reading skills and resources** under the command of the executive control in working memory (strategies, goals, inferences, background knowledge, comprehension monitoring)
Evidence suggests that L2 reading is more of a language problem than a reading problem
- Threshold of language proficiency below which L1 reading does not transfer to L2

Many L1 reading problems transfer to L2 reading (Sparks et al) – but not all

L2 reading problems likely vary across different L1 backgrounds.

Role of orthography in learning to read: Deep vs shallow, Alphabetic vs non–alphabetic
Reading in a second or foreign language (SFL)

To summarise, little is known about

- how SFL reading develops
- how to identify strengths and weaknesses
- which abilities contribute most to the development of overall SFL reading performance
- how teachers can best facilitate reading abilities
Our study

DIALUKI – Diagnosing reading and writing in SFL

- Project timeline 2010–2013, i.e. in progress
- Funded by Academy of Finland, University of Jyväskylä, UK Economic and Social Research Council, Pearson Assessment

- Can different cognitive and L1 & L2 linguistic measures predict difficulties in SFL reading and writing?
- How does SFL proficiency in reading and writing develop in psycholinguistic and linguistic terms?

- Cooperation between language testers, other applied linguists (SLA in particular) and psychologists (L1 reading)
- Paves way for better diagnostic tests in the future by increasing our understanding of diagnosing L2 reading and writing
DIALUKI - Diagnosing reading and writing in a second or foreign language

The project studies the diagnosis of reading and writing abilities in a second or foreign language. It seeks to identify the cognitive features which predict a learner’s strengths and weaknesses in those areas. The project brings together scholars from applied linguistics, psychology and assessment to engage in multidisciplinary work and to develop innovative ways of diagnosing the development of second and foreign language abilities.

The main contribution of the project will be to offer novel, well-grounded theoretical insights and to develop a range of methodologies to study second and foreign language development and its diagnosis. We are exploring the causes underlying strengths and weaknesses in language development, and the relationship between literacy skills in one’s first language and the development of second language abilities. The results of the project will also have practical implications by providing a sounder theoretical basis for the development of curricula, pedagogic materials and diagnostic tests.
Finnish–speaking learners of English as FL
- primary school 4th grade (age 10/11)
- lower secondary school, 8th grade (age 14/15)
- gymnasium (academically oriented upper secondary school), 2nd year students (age 17/18)

Russian–speaking learners of Finnish as SL at beginner and intermediate levels
- in the primary and lower secondary schools
Three major studies in DIALUKI

**Study 1** (in 2010): A cross-sectional study with 3 x 200 + 200 students.
- Exploring the value of a range of L1 & L2 measures in predicting L2 reading & writing, in order to select the best predictors for further studies.

**Study 2** (in 2011): Several training / experimental studies, each a few weeks in length
- The effects of training on SFL reading and writing
- Using computerized learning games in L1 and L2.
  - **Graphogame** for diagnosing & treating dyslexia
  - https://graphogame.com

**Study 3** (in 2011 – 2012/13): Longitudinal, 2–3 years.
- The development of literacy skills, and the relationship of this development to the diagnostic measures.
Focus today

Study 1 (in 2010): Explore the value of a range of L1 and L2 measures in predicting L2 reading & writing, in order to select the best predictors for further studies.

- cross-sectional
  - 3 x 200 learners of English, 200 learners of Finnish

- preliminary results on the predictors of ...
  - reading
  - in English as a FL
  - for the 8th graders’ group (age 14/15) (n = 207)
Dependent variable – reading in English as FL

- Self-assessment / reading in L1 (Finnish)
- Spelling in L1 (correcting real L1 words)
- Size of L1 Finnish vocabulary (vocabulary test score)
- Size of FL English vocabulary (vocabulary test score)
- Attitude to reading in the free time
- Frequency of reading in English

- Effectiveness of working memory (backward digit span score in L1)
- Effectiveness of working memory (backward digit span score in FL)

- Rapid recognition of words (accuracy of identifying rapidly presented words in L1)
- Rapid recognition of words (accuracy of identifying rapidly presented words in FL)

- Speed of lexical access (speed of reading a list of words in L1)
- Speed of lexical access (speed of naming in L1)
- Speed of lexical access (speed of reading a list of words in FL)
- Speed of lexical access (speed of naming in FL)

- Spelling in L1 (accuracy of spelling non-words in L1)

- Reading in FL (English) (= DIALANG and Pearson PTE General test score)
Study 1 – dependent variable(s)

Reading in a foreign language (English)
- DIALANG reading test of English (2 levels), 30 items; linked with the CEFR levels
- Pearson Test of English (PTE) General, 24 operational reading items; linked with the CEFR
for this study, 20 + 20 best items combined into a measure of reading in English

(Writing in English: tasks from PTE General & a Finnish CEFLING study)
(Reading and writing in L1 (Finnish): e.g., PISA reading tests)
Cognitive / psycholinguistic measures

- Speed of lexical access
  - (speed of reading a list of words in L1)
  - (speed of naming in L1)
  - (speed of reading a list of words in FL)
  - (speed of naming in FL)

- Spelling in L1
  - (accuracy of spelling non-words in L1)

- Reading in L1 (Finnish)
  - (= PISA test score)
  - (= DIALANG and Pearson PTE General test score)

- Effectiveness of working memory
  - (backward digit span score in L1)

- Rapid recognition of words
  - (accuracy of identifying rapidly presented words in L1)

- Size of L1 Finnish vocabulary
  - (= vocabulary test score)

- Size of FL English vocabulary
  - (= vocabulary test score)

- Frequency of reading in English

- Attitude to reading in the free time

- Independent variables
# Study 1 – independent / predictor variables 1

<table>
<thead>
<tr>
<th>Cognitive/psycholinguistic features (constructs)</th>
<th>Cognitive/psycholinguistic measures (operationalizations)</th>
</tr>
</thead>
<tbody>
<tr>
<td>efficiency of working memory (capacity, speed, ...)</td>
<td>backwards digit span task</td>
</tr>
<tr>
<td>efficiency of phonological processing (and of phonological loop) phonological awareness</td>
<td>repetition of non–words in L1 &amp; L2 finding common phonemes in L1 non–words phoneme deletion task in L1 non–words writing heard non–words in L1</td>
</tr>
<tr>
<td>speed of lexical access</td>
<td>rapid recognition of real L1 &amp; L2 words rapid reading a list of real L1 &amp; L2 words</td>
</tr>
<tr>
<td>efficiency of syntactic and semantic processing and awareness</td>
<td>text segmentation task</td>
</tr>
</tbody>
</table>

... 

**Administered individually (about 1 hour)**
# Backward digit span memory test in L1 and FL
- repeat the numbers you hear but backwards

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>2 - 5</td>
</tr>
<tr>
<td>2.</td>
<td>5 - 7 - 4</td>
</tr>
<tr>
<td>3.</td>
<td>7 - 2 - 9 - 6</td>
</tr>
<tr>
<td>4.</td>
<td>4 - 1 - 3 - 5 - 7</td>
</tr>
<tr>
<td>5.</td>
<td>1 - 6 - 5 - 2 - 9 - 8</td>
</tr>
<tr>
<td>6.</td>
<td>8 - 5 - 9 - 2 - 3 - 4 - 2</td>
</tr>
<tr>
<td>7.</td>
<td>6 - 9 - 1 - 6 - 3 - 2 - 5 - 8</td>
</tr>
</tbody>
</table>
Rapid Automatic Naming / Rapid Alternating Stimulus (colours + letters + numbers)
– in L1 and L2
– say these as fast and accurately as you can
Rapid reading (aloud) of a list of real L1 words
- read as many as you can in one minute

<table>
<thead>
<tr>
<th>Osio</th>
<th>Vastaus</th>
<th>P.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. eli</td>
<td>36. haluttaisiin</td>
<td></td>
</tr>
<tr>
<td>2. soi</td>
<td>37. mörökölli</td>
<td></td>
</tr>
<tr>
<td>3. jäät</td>
<td>38. Eveliina</td>
<td></td>
</tr>
<tr>
<td>4. Esa</td>
<td>39. rinnakkain</td>
<td></td>
</tr>
<tr>
<td>5. seis</td>
<td>40. kauneimmillaan</td>
<td></td>
</tr>
<tr>
<td>6. mies</td>
<td>41. tyhjennetty</td>
<td></td>
</tr>
<tr>
<td>7. talo</td>
<td>42. kynnel</td>
<td></td>
</tr>
<tr>
<td>8. poro</td>
<td>43. pyyhkeet</td>
<td></td>
</tr>
<tr>
<td>9. lasi</td>
<td>44. kortistot</td>
<td></td>
</tr>
<tr>
<td>10. kala</td>
<td>45. lakritsi</td>
<td></td>
</tr>
<tr>
<td>11. kissa</td>
<td>46. kangerrela</td>
<td></td>
</tr>
<tr>
<td>12. housut</td>
<td>47. vingahdus</td>
<td></td>
</tr>
<tr>
<td>13. vaari</td>
<td>48. kerskailla</td>
<td></td>
</tr>
<tr>
<td>14. kuulo</td>
<td>49. professori</td>
<td></td>
</tr>
<tr>
<td>71. kokoontuminen</td>
<td></td>
<td></td>
</tr>
<tr>
<td>72. tummanharmaa</td>
<td></td>
<td></td>
</tr>
<tr>
<td>73. trikopahta</td>
<td></td>
<td></td>
</tr>
<tr>
<td>74. röyhkeys</td>
<td></td>
<td></td>
</tr>
<tr>
<td>75. Australia</td>
<td></td>
<td></td>
</tr>
<tr>
<td>76. arabialaiset</td>
<td></td>
<td></td>
</tr>
<tr>
<td>77. tuulahdus</td>
<td></td>
<td></td>
</tr>
<tr>
<td>78. kyykkysillään</td>
<td></td>
<td></td>
</tr>
<tr>
<td>79. kierrätyskeskus</td>
<td></td>
<td></td>
</tr>
<tr>
<td>80. pihlajanmarjat</td>
<td></td>
<td></td>
</tr>
<tr>
<td>81. vanginvartija</td>
<td></td>
<td></td>
</tr>
<tr>
<td>82. kansanedustaja</td>
<td></td>
<td></td>
</tr>
<tr>
<td>83. hiihtourheilu</td>
<td></td>
<td></td>
</tr>
<tr>
<td>84. kruununprinssi</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Reading rapidly presented real words in a FL
– say which word you see on the screen
Reading rapidly presented words

day
Reading rapidly presented words

%&#
Reading rapidly presented words

%&#
Independent / predictor variables 2 – Linguistic measures
Study 1 – independent variables 2

Linguistic constructs and their measures

Receptive vocabulary
- FL (Nation / Schmitt et al. Vocabulary Levels test of English)
- L1 (Finnish vocabulary test from DIALANG)

L1 reading
- PISA reading tests

Spelling (& phonology)
- correcting spelling errors in real L1 words (+writing heard L1 non-words)

(Syntax: segmentation task in L1 and FL)

Self-assessed reading and writing in L1 and FL

Group tasks
(about 3 hours)
Motivation and background variables

- Iwaniec Motivation measure of Instrumentality, Intrinsic Interest, Motivational Intensity, Parental Encouragement, Anxiety, Self-regulation and Self-concept
- Background variables based on questionnaires from PISA and previous research projects
Informants in Study 1 & in this talk

- Finnish 8th graders (ca. 14–year–olds) learning English as a FL
- from 14 schools around the country (rural, semi–urban, urban)
- 207 students
First results – predicting reading in a FL (English) 14–year–olds

PSYCHOLINGUISTIC / COGNITIVE TASKS ONLY

- Effectiveness of **working memory**
  - (backward digit span score in L1)

- Effectiveness of **working memory**
  - (backward digit span score in FL)

- **Rapid recognition of words**
  - (accuracy of identifying rapidly presented words in L1)

- **Rapid recognition of words**
  - (accuracy of identifying rapidly presented words in FL)

- **Speed of lexical access**
  - (speed of reading a list of words in L1)

- **Speed of lexical access**
  - (speed of naming in L1)

- **Speed of lexical access**
  - (speed of reading a list of words in FL)

- **Speed of lexical access**
  - (speed of naming letters, numbers & colours in FL)

- **Spelling in L1**
  - (accuracy of spelling non-words in L1)

- **Reading in FL (English)**
  - (= DIALANG and Pearson PTE General test score)
First results – predicting reading in a FL (English)  

**Correlations**

**PSYCHOLINGUISTIC / COGNITIVE TASKS ONLY**

- Effectiveness of working memory (backward digit span score in L1)
- Effectiveness of working memory (backward digit span score in FL)
- Rapid recognition of words (accuracy of identifying rapidly presented words in L1)
- Rapid recognition of words (accuracy of identifying rapidly presented words in FL)
- Speed of lexical access (speed of reading a list of words in L1)
- Speed of lexical access (speed of reading a list of words in FL)
- Speed of lexical access (speed of naming in L1)
- Speed of lexical access (speed of naming letters, numbers & colours in FL)
- Reading in FL (English) (= DIALANG and Pearson PTE General test score)
- Spelling in L1 (accuracy of spelling non-words in L1)

Correlations:
- 0.221
- 0.336
- 0.211
- 0.289
- 0.360
- 0.363
- 0.509
- 0.130

Preliminary results - please do not quote
Predicting reading in a FL (English) with psycholinguistic tasks

Regression analysis

- stepwise multiple linear regression analysis
- adjusted R square .294
  - 3 variables explained almost 30% of variance in reading in FL in these data
Predicting reading in a FL (English) with psycholinguistic tasks

Regression analysis

PSYCHOLINGUISTIC / COGNITIVE TASKS ONLY

Effectiveness of working memory (backward digit span score in FL) → 0.336

Rapid recognition of words (accuracy of identifying rapidly presented words in FL) → 0.289

Reading in FL (English) (= DIALANG and Pearson PTE General test score) → -0.509

Speed of lexical access (speed of naming letters, numbers & colours in FL) → RAS 25%

\[ R^2 = 0.294 \]
First results – predicting reading in a FL (English)
Language & psycholinguistic measures & background variables

- Self-assessment / reading in L1 (Finnish)
- Spelling in L1 (correcting real L1 words)
- Size of L1 Finnish vocabulary (vocabulary test score)
- Reading in L1 (Finnish) (PISA test score)
- Size of FL English vocabulary (vocabulary test score)
- Attitude to reading in the free time
- Frequency of reading in English
- Effectiveness of working memory (backward digit span score in L1)
- Effectiveness of working memory (backward digit span score in FL)
- Rapid recognition of words (accuracy of identifying rapidly presented words in L1)
- Rapid recognition of words (accuracy of identifying rapidly presented words in FL)
- Speed of lexical access (speed of reading a list of words in L1)
- Speed of lexical access (speed of naming in L1)
- Speed of lexical access (speed of reading a list of words in FL)
- Speed of lexical access (speed of naming in FL)
- Spelling in L1 (accuracy of spelling non-words in L1)

Reading in FL (English) (DIALANG and Pearson PTE General test score)
First results – predicting reading in a FL (English)  Correlations

- Self-assessment / reading in L1 (Finnish)
- Spelling in L1 (correcting real L1 words)
- Size of L1 Finnish vocabulary (vocabulary test score)
- Size of FL English vocabulary (vocabulary test score)
- Attitude to reading in the free time
- Frequency of reading in English

Correlations:
- .272: Self-assessment / reading in FL (English)
- .282: Size of L1 Finnish vocabulary
- .403: Reading in L1 (Finnish) (PISA test score)
- .740: Attitude to reading in the free time
- .337: Reading in FL (English) (DIALANG and Pearson PTE General test score)
- .245: Spelling in L1 (accuracy of spelling non-words in L1)

Additional correlations:
- .137: Self-assessment / reading in L1 (Finnish)
- .221: Effectiveness of working memory (backward digit span score in L1)
- .336: Effectiveness of working memory (backward digit span score in FL)
- .211: Rapid recognition of words (accuracy of identifying rapidly presented words in L1)
- .289: Rapid recognition of words (accuracy of identifying rapidly presented words in FL)
- .360: Speed of lexical access (speed of reading a list of words in L1)
- .363: Speed of lexical access (speed of naming in L1)
- .282: Speed of lexical access (speed of reading a list of words in FL)
- .509: Speed of lexical access (speed of naming in FL)

Preliminary results – please do not quote
Predicting reading in a FL (English) with language & psycholinguistic tasks & some background variables  Regression analysis

- stepwise multiple linear regression analysis
- adjusted R square .623
- 3 variables explained 62% of variance in reading in FL in these data

### Model Summary

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R Square</th>
<th>Adjusted R Square</th>
<th>Std. Error of the Estimate</th>
<th>R Square Change</th>
<th>F Change</th>
<th>df1</th>
<th>df2</th>
<th>Sig. F Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.740</td>
<td>.547</td>
<td>.544</td>
<td>.11808</td>
<td>.547</td>
<td>182.401</td>
<td>1</td>
<td>151</td>
<td>.000</td>
</tr>
<tr>
<td>2</td>
<td>.783</td>
<td>.613</td>
<td>.608</td>
<td>.10955</td>
<td>.066</td>
<td>25.446</td>
<td>1</td>
<td>150</td>
<td>.000</td>
</tr>
<tr>
<td>3</td>
<td>.794</td>
<td>.630</td>
<td>.623</td>
<td>.10743</td>
<td>.017</td>
<td>6.966</td>
<td>1</td>
<td>149</td>
<td>.009</td>
</tr>
</tbody>
</table>
Predicting reading in a FL (English) with psycholinguistic and language tasks

**Regression analysis**

\[ R^2 = 0.623 \]

- **Reading in L1 (Finnish)**
  - (= PISA test score)
  - \( R = 0.403 \)

- **RAS**
  - (= naming speed)

- **Size of L1 Finnish vocabulary**
  - (= vocabulary test score)
  - \( R = 0.282 \)

- **Size of FL English vocabulary**
  - (= vocabulary test score)
  - \( R = 0.740 \)

**Reading in FL (English)**
- (= DIALANG and Pearson PTE General test score)
- 54%
Next steps

- Further analyses of Study 1 Finnish/English data
  - more IVs e.g. the remaining psycholinguistic tasks
  - similar analyses on writing in a FL (writing as DV)
  - structural equation modeling of the relationships between different IVs and DVs (e.g. path analyses)

- Analyses of Study 1 Russian/Finnish data
  - same / different results?

- Analyses of Finnish/English data across 3 groups
  - to what extent do the 4th, 8th, and gymnasium students differ?

- Implications for Studies 2 and 3
Thank you!

Questions, comments, suggestions and ideas for, e.g., further analyses most welcome!

ari.huhta@jyu.fi

c.alderson@lancaster.ac.uk

www.jyu.fi/dialuki