Supporting multilingual development in the family and (pre)school

How to get the best of both worlds in inclusive societies

Paul Leseman
What do parents (& children) want?

• Many studies across Europe indicate that, if facilitated, parents from language minorities want their children to become proficient bilinguals.

• Increasing pressure from main-stream (monolingual) parents to introduce dual language programs in (pre)primary education.

• **Paradoxical policy!** Strong emphasis on learning the main language and no support for immigrant languages, but introduction of Western foreign languages.... (Helot & Young, 2002).
Immigrant parents’ views

Parents with a first or second generation immigration background.

About 64% of the parents with a 1st or 2nd generation immigration background find support for dual language learning for 3- to 6-year-olds important or highly important.
Experiences of immigrant parents

• Focus group discussions in 7 countries with parents from immigrant and native working class groups.

• Respect for cultural habits and views, and for religious values is really an issue:
  o Feelings of being discriminated, undervalued, lack of trust in official institutions.
  o Respect for heritage languages, the first languages of the children, is another issue – a big one.
“It’s not possible. How can a child be happy when he cannot speak? You have to feel good, then you can develop. When you say in school “Don’t speak Turkish”, you get a very quiet school. Sometimes I hear they do that in some schools and my heart breaks (...) I knew a school with a line on the ground with a plate that reads “Stop speaking Turkish, beyond the line you have to speak Dutch” (Pre-school teacher, Beringen, Belgium)
What is society’s response?

- Countries vary in diversity policy, from exclusion and forced assimilation to respectful integration.
- Supporting respectful integration, including first language support, seems most effective.
- The worst thing seems to be not having a clear policy on inclusion.

Berry et al., 2006 (JADP)
Negative discourse on multilingualism: peel the onion
On the outside: disadvantages

• Bilingual immigrant children do *on average* less well in education.

• Several national and international studies (PISA, TIMMS, PIRLS) reveal:
  – Difficulties with literacy, mathematics and science literacy – with a few interesting exceptions.
  – Bilingual students tend to end-up in the lower (vocational) secondary school tracks.
Peeling the onion

• Negative effects of bilingualism – to what extent are they due to confounds, such as:
  – Lower socioeconomic status of bilingual communities.
  – Quantity and quality of exposure to both L1 and L2.
  – Competition for limited exposure time?

• On the inside: are there advantages?
  – Having command of two or more languages is an asset in a globalizing world.
  – Cognitive (EF) advantages.
Reading comprehension

• Dutch monolingual and Turkish-Dutch bilingual 5th graders (N = 82).
• Reading texts with (explicit) and without connectives (implicit text).
• Eye-tracking to examine specific difficulties during the reading process.
• Interaction effect explicit text × reading skill > more skilled readers profit.
• Connectives! -> longer fixations, more regressions in bilinguals, even after controlling for general vocabulary.

Van den Bosch, Leseman, Sanders & Cain, 2015
Crosson & Lesaux, 2013
A group of cyclists makes a bike-trip around the IJsselmeer. Their speed is on average 30 km per hour and they rest every two hours half an hour. They depart from the beginning of the Afsluitdijk at 8 o’clock in the morning. They return there at 5.30 in the afternoon. How many kilometers was the trip?
Types of language difficulties

• Difficult (rare, technical, archaic) words, including specific math words and symbols.

• Difficult expressions and complex sentences, and difficult (semantic, logical) connections between sentences.

• Implicit social script and world knowledge that needs to be activated to ‘fill in’ the gaps in the text.

• “Consume”, “flat spoonful”, “each time” [telkens], “on average”, “per”.

• “How much does a cup of tea cost just for the tea?”. “Per 100 km the car consumes 8,5 liters gasoline”.

• “sales” → a period of price reduction; “a full tank at departure” → tank contains 40 to 50 liters fuel.
Errors in 5th-graders math word problem solving (N = 60)

<table>
<thead>
<tr>
<th></th>
<th>Dutch</th>
<th>Turkish-Dutch</th>
<th>Moroccan-Dutch</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M (sd)</td>
<td>Range</td>
<td>M (sd)</td>
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<tr>
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<tr>
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<tr>
<td>Reading errors</td>
<td>0.3 (0.5)</td>
<td>0-1</td>
<td>0.0 (0.0)</td>
</tr>
</tbody>
</table>
Advantages of bilingualism

• Advantages of bilingualism in several areas:
  – Metalinguistic awareness.
  – Higher level ‘academic’ skills.
  – Better cognitive control (inhibition, flexibility).
  – Protective factor in Alzheimer’s disease.
  – As such.

• Critique: self-selected, higher-SES samples, languages with high social prestige.

• Inconsistent research findings.
Calvo & Bialystok (2014)

• Study with 175 children, carefully selected to be placed in one of four subgroups:
  – Low-SES + monolingual, High-SES + monolingual, Low-SES + bilingual, and High-SES + bilingual.

• No differences in nonverbal IQ.

• Flanker task.

• Frog Matrices task.

• Language tests.
Results based on composites

- Main effects of SES and language profile.
- No interaction effects.
- Bilingual advantage in EF tasks across social class, but a disadvantage in language-related tasks, also for high SES bilinguals.
Bilingual advantage: beyond attention and inhibition

- 52 monolingual Dutch, 68 bilingual Turkish-Dutch 5- to 6-year-olds, all from low income families.
- As expected, lower level of Dutch language skills for the bilingual children (see Figure).
- Bilingual advantages for working memory, controlling for SES and vocabulary?

Blom, Verhagen, Küntay & Leseman, 2014 (JECP)
Bilinguals: better working memory

- Controlled for SES and Dutch receptive vocabulary.
- Advantages in short term and working memory, especially in visuo-spatial memory.

### Visuo spatial STM
- **Dot Matrix**

### Visuo-spatial WM
- **Odd One Out**

- Turkish-Dutch bilinguals
- Dutch monolinguals
“Draw a (…flower…) that does not exist”

English-Hebrew bilingual 4- to 6-yr-olds

• Bilingual advantage: *cross-category insertion (creativity).*
• Monolingual disadvantage: *within category deletion.*

Hebrew monolingual 4- to 6-yr-olds

Adi-Japha et al., 2010 (CD)
Linguistic relativity and bilingualism

- Bilinguals outperform monolinguals in nonverbal creativity, whereas the opposite is true for verbal creativity (Kharkhurin, 2010).
- Habitual code switchers outperform non-habitual code switchers on a test of (nonverbal and verbal) creativity (Kharkhurin & Wei, 2015).
  - Mechanism based in EF?
- Linguistic relativity – is learning a second language broadening the mind through creating a richer, non-standard perception-action repertoire?
Is EF-evidence really robust?

• Counter-evidence and file-drawer problem.

• Lack of theoretical work on the underlying mechanisms of the cognitive advantages of bilingualism - several likely candidates:
  – Suppression (inhibition), conflict monitoring and selective ‘focused’ attention (resistance to interference).
  – Improved general task performance and switching (flexibly (dis)engaging attention).
  – Improved visuo-spatial processing.
Duñabeitia et al. (2014)

• 250 Spanish-Basque bilingual and 250 Spanish monolingual children and adolescents from grade 3 to grade 8, carefully matched.

• Spanish was the first language of the bilinguals, Basque was learned on average from age 2 – (pre)schools provided 50-50% instruction in immersion classrooms.
  – Languages are instructed separately.

• Verbal and non-verbal Stroop tasks.
Verbal Color Stroop task: read the word as fast as you can – RT, accuracy

- Congruent trials: shortest RTs, least errors.
- Incongruent trials: longest RTs, most errors.
- Neutral trials: in-between.

- Resistance to interference & inhibition ≈ ‘concentration’, ‘not too fast, careful’
Main findings

• Main effects of task component (congruent items faster Reaction Times, higher Accuracy Rates).

• Shorter RTs and higher ARs with increasing age.

• No main and interaction effects of language profile, neither on Stroop-task components nor on overall processing efficiency.

• Lack of mixing (=mixed instruction and use) of the two languages?
Advantage of bilingualism for executive functions at age 3

- Sample of 829 monolingual and 200 bilingual children of 3 to 3.5 years of age.
- When controlled for SES, age and gender, bilingual and monolingual children do not differ in most EF measures.
- Perhaps different situations of bilingualism should be taken into account.
## No simple bilingual advantage

<table>
<thead>
<tr>
<th></th>
<th>Bilinguals</th>
<th></th>
<th>Monolinguals</th>
<th></th>
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<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td><strong>Selective attention</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of located targets</td>
<td>5.95</td>
<td>1.00</td>
<td>6.02</td>
<td>.97</td>
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<tr>
<td>Number of repetition errors</td>
<td>.17</td>
<td>.33</td>
<td>.09</td>
<td>.23</td>
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<tr>
<td>Visuospatial Memory</td>
<td>81.2</td>
<td>15.4</td>
<td>82.7</td>
<td>15.7</td>
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<tr>
<td><strong>Delay of gratification</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% of children not looking in bag</td>
<td>74.0 %</td>
<td></td>
<td>74.8 %</td>
<td></td>
</tr>
<tr>
<td>% of children not touching bag</td>
<td>89.0 %</td>
<td></td>
<td>89.4 %</td>
<td></td>
</tr>
<tr>
<td>% of children not touching gift</td>
<td>86.5 %</td>
<td></td>
<td>91.8 %</td>
<td></td>
</tr>
<tr>
<td><strong>Verbal Inhibition &amp; Switching</strong></td>
<td>2.16</td>
<td>1.55</td>
<td>2.11</td>
<td>1.61</td>
</tr>
</tbody>
</table>

**Inhibition/switching**
- ‘Make the sound of the other animal’

**Delay of Gratification**
- ‘You must try not to touch the present’
‘Delay of gratification’ – self-regulation

- Attractive object is placed in front of the child on the table.
- Instruction: “You must try to wait”.
- Can children wait (for one minute, two...)?
- Switching, inhibition, attention focusing, working memory...
# One or two languages at home?

<table>
<thead>
<tr>
<th></th>
<th>Bilinguals</th>
<th></th>
<th>Monolinguals</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Only L1 at home (L2 at pre-school)</td>
<td>Both L1 &amp; L2 at home</td>
<td>Only the main Language</td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
</tr>
<tr>
<td>Selective attention</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of located targets</td>
<td>5.95</td>
<td>1.00</td>
<td>5.92</td>
</tr>
<tr>
<td>Number of repetition errors</td>
<td>.19</td>
<td>.20</td>
<td>.11</td>
</tr>
<tr>
<td>Visuospatial Memory</td>
<td>79.8</td>
<td>15.5</td>
<td>82.3</td>
</tr>
<tr>
<td>Delay of gratification</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% of children not looking in bag</td>
<td>71.5 %</td>
<td></td>
<td>77.1 %</td>
</tr>
<tr>
<td>% of children not touching bag</td>
<td>83.3 %</td>
<td></td>
<td>94.3 %</td>
</tr>
<tr>
<td>% of children not touching gift</td>
<td>79.4 %</td>
<td></td>
<td>94.3 %</td>
</tr>
<tr>
<td>Verbal Inhibition &amp; Switching</td>
<td>1.98</td>
<td>1.52</td>
<td>2.57 **</td>
</tr>
</tbody>
</table>

Verhagen, Mulder & Leseman, 2017 (BLC)
Brain evidence –switching, inhibition
(Buchweitz & Pratt, 2015; Petitto, 2009, 2016)

• Representation vs. control.
  – Semantics: largely shared, embodied.
  – Linguistic rules: separately represented but in topographically close areas.

• Basal ganglia: brain system controlling which language is ‘on’ and to which language to switch.
  – Highly plastic, rich dopamine projections to PFC and limbic system.
  – Individual differences in dopamine activity related to language skill.
DASH-study 2005-2015
(Development of Academic Language at School and at Home)

• Sample at age 3:
  – Dutch children and families: 58
  – Turkish-Dutch children and families: 56
  – Moroccan-Berber-Dutch children and families: 48

• Inclusion criterion: L1 use in at least 70% of everyday communicative situations.

• Positive response rates: 65%, 68%, 48%.

• Attrition rates at 4\textsuperscript{th} (age 6, transition to primary school) and at 9\textsuperscript{th} measurement (age 11, end of primary school): about 15% respectively 16%.

Leseman et al., in press
Scheele et al., 2010 (AP)
Measurements

- Academic Vocabulary and Concepts in L1 and in Dutch as L2:
  - PPTV-like equivalent parallel tests measuring vocabulary & conceptual knowledge needed for school instruction.
- Academic Discourse skills in L1 and L2:
  - Comprehension and production of narrative and instruction discourse in L1 and L2.
- General cognitive abilities.
- Follow-up: school achievement Grade 1-5.
- Language input in L1 and L2 (from age 3 to 6) – based on structured interviews with parents: frequency × language used.
General cognitive abilities and Dutch vocabulary at age 3

-digit span
-visuo-spatial span
-Raven IQ
-Dutch vocabulary

Dutch
-Moroccan-Dutch
-Turkish-Dutch
Turkish vs. Tarifit-Berber

• Turkish language, as a ‘cultural tool’, is used for educational and academic purposes.
• Tarifit-Berber is a family of non-scripted languages, historically mainly used for informal communication.
• Academic Turkish is available to Turkish immigrant communities through written materials, official institutions and television.
• Tarifit-Berber is not (books), or much less (television, songs, stories) available.
L1 and L2 vocabulary development

Dutch (as L2)

First Language
Changes in L1 and L2 input
(composites of reading, conversations, story telling)

Dutch (as L2)

First Language
Facilitation and competition in bilingual vocabulary development

• How is L1 and L2 vocabulary development from age 3 to age 6 related to changes over time in L1 and L2 input at home?

• Complex latent growth model:
  – Fixed measurement weights.
  – All structural parameters constrained to be equal across the Moroccan-Dutch and Turkish-Dutch samples.
  – $\chi^2_{(246)}=283.117$, $p=.052$, CFI=.918, RMSEA=.038
<table>
<thead>
<tr>
<th>Developmental relations input and vocabulary age 3 to 6</th>
<th>Moroccan-Dutch</th>
<th>Turkish-Dutch</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct transfer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept VOCAB L1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept INPUT L1 – Intercept VOCAB L1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Slope INPUT L1 – Slope VOCAB L1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Competition for exposure time</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept INPUT L1</td>
<td></td>
<td>.48**</td>
</tr>
<tr>
<td>Intercept INPUT L2 – Intercept VOCAB L2</td>
<td></td>
<td>-.41**</td>
</tr>
<tr>
<td>Slope INPUT L1 – Slope VOCAB L2</td>
<td>-.44**</td>
<td>-.66**</td>
</tr>
<tr>
<td>Within-language input effects</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept INPUT L1 – Intercept VOCAB L1</td>
<td>.37*</td>
<td></td>
</tr>
<tr>
<td>Slope INPUT L1 – Slope VOCAB L1</td>
<td>.53</td>
<td>.36*</td>
</tr>
<tr>
<td>Intercept INPUT L2 – Intercept VOCAB L2</td>
<td>.49**</td>
<td>.50**</td>
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<tr>
<td>Slope INPUT L2 – Slope VOCAB L2</td>
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<td>.44**</td>
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<td>Cross-language input effects</td>
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<td>.57**</td>
<td>.57**</td>
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</table>

*Note.* Standardized coefficients
Summary

• L1 input over time is related to L1 vocabulary development; L2 input is related to L2 vocabulary development.

• L1 and L2 input covary negatively, pointing to competition for scarce family time.

• L1 vocabulary (the more developed language) predicts L2 vocabulary acquisition, pointing to ‘facilitation’ or ‘transfer’.

• L1 input is also positively related to L2 vocabulary (facilitation), but apparently not the other way around – parental skills more advanced in L1?
Follow-up – age 6 academic language as related to school achievement

• Type of language needed to efficiently understand and convey cognitively complex (abstract) information (Halliday, Schleppegrell).

• Features:
  – Lexically dense, diverse, specific and technical.
  – Explicit through specific (non–deictic) references.
  – Syntactically complex (subordination, nominalization).
  – Cohesive through connectives and other devices.

• Related to reading comprehension, math, science literacy, ...
Story book reading: narrative

- Child is read a story and then asked questions about the story.
- Child is asked to ‘read’ the booklet by the pictures to the doll Ernie.
- L1 and L2 versions.
- Narrative and syntactic structure, lexical choices, use of cohesiveness devices such as connectives.
Task with Duplo®: instruction

- Child is asked to follow the instructions of the research assistant in order to build an object with Duplo blocks.
- Child is asked to instruct Ernie to do the same, using a photo of the target.
- **L1 and L2 versions.**

- Technical and (spatial) referential vocabulary, color- and shape names, action verbs, ‘similar’, ‘different’. 
### Productive academic language in *Dutch* (story retelling)

<table>
<thead>
<tr>
<th></th>
<th>Dutch</th>
<th></th>
<th>Moroccan-Dutch</th>
<th></th>
<th>Turkish-Dutch</th>
<th></th>
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</thead>
<tbody>
<tr>
<td><strong>Age</strong></td>
<td>4;3</td>
<td>5;10</td>
<td>4;3</td>
<td>5;10</td>
<td>4;3</td>
<td>5;10</td>
</tr>
<tr>
<td># of content words</td>
<td>2,34</td>
<td>3,03</td>
<td>1,92</td>
<td>2,42</td>
<td>1,91</td>
<td>2,81</td>
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<tr>
<td>Explicit reference</td>
<td>24%</td>
<td>30%</td>
<td>15%</td>
<td>24%</td>
<td>13%</td>
<td>30%</td>
</tr>
<tr>
<td>Verb tense</td>
<td>48%</td>
<td>75%</td>
<td>32%</td>
<td>65%</td>
<td>14%</td>
<td>68%</td>
</tr>
<tr>
<td>Declarative mood</td>
<td>78%</td>
<td>90%</td>
<td>66%</td>
<td>84%</td>
<td>71%</td>
<td>87%</td>
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<tr>
<td>Multi-clause utterance</td>
<td>11%</td>
<td>26%</td>
<td>4%</td>
<td>14%</td>
<td>3%</td>
<td>11%</td>
</tr>
<tr>
<td>Logical connectives</td>
<td>2%</td>
<td>6%</td>
<td>0%</td>
<td>3%</td>
<td>1%</td>
<td>3%</td>
</tr>
<tr>
<td>Cohesion rating (1-7)</td>
<td>4,2</td>
<td>5,3</td>
<td>3,4</td>
<td>4,6</td>
<td>3,7</td>
<td>5,3</td>
</tr>
<tr>
<td>Abstraction (1-4)</td>
<td>2,9</td>
<td>3,3</td>
<td>2,7</td>
<td>3,2</td>
<td>2,5</td>
<td>3,3</td>
</tr>
</tbody>
</table>

Source: Scheele, 2010; Scheele et al., 2012
Productive academic language in the First Language

<table>
<thead>
<tr>
<th></th>
<th>Dutch</th>
<th></th>
<th>Moroccan-Dutch</th>
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<tbody>
<tr>
<td></td>
<td>4;3</td>
<td>5;10</td>
<td>4;3</td>
<td>5;10</td>
<td>4;3</td>
<td>5;10</td>
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<td>34%</td>
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<tr>
<td>Verb tense</td>
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<td>63%</td>
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<tr>
<td>Declarative mood</td>
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<td>54%</td>
<td>81%</td>
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<td>21%</td>
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<td>8%</td>
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<tr>
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<td>0%</td>
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<td>3,5</td>
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<td>3,2</td>
<td></td>
<td></td>
<td>2,4</td>
<td>2,7</td>
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</table>
Mean scores L1 and L2 academic language (two composites) at age 6.

<table>
<thead>
<tr>
<th></th>
<th>Dutch academic vocabulary</th>
<th>Dutch academic discourse</th>
<th>Correlation</th>
</tr>
</thead>
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<tr>
<td>Dutch academic vocabulary</td>
<td>0</td>
<td>0</td>
<td>.675</td>
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<tr>
<td>Dutch academic discourse</td>
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<td>-1.536</td>
<td>.600</td>
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<table>
<thead>
<tr>
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<th>L1 academic vocabulary</th>
<th>L1 academic discourse</th>
<th>Correlation</th>
</tr>
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<tr>
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<td>-1.349</td>
<td>.895</td>
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<tr>
<td>L1 academic discourse</td>
<td>0</td>
<td>-1.657</td>
<td>.747</td>
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</tbody>
</table>

- Dutch: $\chi^2(22)=27.982, p=.179; \text{CFI}=.923; \text{TLI}=.937; \text{RMSEA}=.081.$
- L1: $\chi^2(14)=19.014, p=.164; \text{CFI}=.925; \text{TLI}=.943; \text{RMSEA}=.094.$

Quite big disadvantages for the bilingual children – stronger disadvantage in L1 for the Moroccan-Dutch and stronger disadvantage in L2 for the Turkish-Dutch.
Growth in reading and math skills in primary school

- Sizeable differences in reading comprehension in grade 1, no catching-up in primary school.
- Smaller differences in math and a significant catching-up effect.
- Turkish-Dutch children in this sample outperform Moroccan-Dutch children in reading.
Academic Vocabulary and Discourse Skills $\rightarrow$ achievement

<table>
<thead>
<tr>
<th></th>
<th>Dutch MOR</th>
<th>Dutch TUR</th>
<th>L1 MOR</th>
<th>L1 TUR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>0.29*</td>
<td>0.29*</td>
<td>0.30*</td>
<td>0.36*</td>
</tr>
<tr>
<td>Slope</td>
<td>-0.17</td>
<td>-0.01</td>
<td>-0.17</td>
<td>-0.13</td>
</tr>
<tr>
<td>Intercept</td>
<td>0.47**</td>
<td>0.41*</td>
<td>-0.13</td>
<td>0.27</td>
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<tr>
<td>Slope</td>
<td></td>
<td>-0.27</td>
<td></td>
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</tr>
</tbody>
</table>

Positive effects of L1 skills on L2 school achievement in the Turkish-Dutch group, but not in the Moroccan-Dutch group.

Leseman et al. (in press)
Summary

• Early skills in L2 predict initial levels of reading comprehension and mathematics indicating lasting consequences of early language learning.

• No effect of early language skills on academic growth, suggesting influences of school instruction.
  – No catching-up effect in reading: current reading instruction is not effective enough to compensate.
  – Catching-up effect in mathematics.

• For the Turkish group, findings for L1 are consistent with Cummins’ interdependence hypothesis.

• Academic language as a subject, much like math?
Verbal math input at home in L1 and L2 and emergent math skills

- Test of children’s emergent mathematical skills, including counting skill, knowledge of geometrical shapes, sense of quantities.
- Detailed interviews with the principal caregivers about informal mathematical and counting activities at home.
- L1 vs. L2 exposure: frequency \times language used.

Leseman, van ‘t Noordende & Kroesbergen, in prep.
Assessing emergent math

• Pre-math skills and concepts *in Dutch*:  
  – Verbal math concepts ("more", "same").  
  – Labelling geometric shapes ("triangle").  
  – Knowledge of digit symbols (e.g., "8" or "4").  
  – Verbal counting, simple addition and subtraction.

• Three measurements waves (4-6 yrs).

Smallest cat?  
Triangle?  
How many balls are left when you take one out?
Informal mathematical activities at home, in L1 or in L2?

- Playing counting games, exercising the count row
- Comparing, sorting, measuring.
- Instructing addition and subtraction.
- Playing board games.
- Naming shapes of objects.
- Spatial references to describe object position.
- *In all, 12 items, Cronbach’s α = .83*

- Does your child spontaneously count things while playing?
- Do you explain how to name and to write digits?
- Do you name, to your child, the shapes of objects such as circle, square, ...?
- Which language do you use when you...?
Math-talk at home in L1 and L2: changes over time

Dutch (as L2)

First Language
### Developmental relations input-math

<table>
<thead>
<tr>
<th>Effects of L1 and L2 input on math</th>
<th>Moroccan-Dutch</th>
<th>Turkish-Dutch</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Regressions (standard effects)</td>
<td></td>
</tr>
<tr>
<td>Intercept L1 input</td>
<td>.070</td>
<td>.462**</td>
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<tr>
<td></td>
<td>-.318*</td>
<td>-.064</td>
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<tr>
<td>Intercept L2 input</td>
<td>.219+</td>
<td>.342*</td>
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<tr>
<td></td>
<td>.158</td>
<td>.204</td>
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<tr>
<td>Slope L1 input</td>
<td>-.004</td>
<td>.351*</td>
</tr>
<tr>
<td>Slope L2 input</td>
<td>.277*</td>
<td>.256+</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Covariances (correlations)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept L1 input</td>
<td>-.326*</td>
</tr>
<tr>
<td>Slope L1 input</td>
<td>-.696**</td>
</tr>
</tbody>
</table>

Chi-square = 209.09, df = 104, p = .000, chi-square/df = 2.001, CFI = .901, RMSEA = .078

**Note.** Standardized regressions and covariances.
Summary

• Immigrant parents adapt to the external context and, overall, use *L1 increasingly less* and *L2 increasingly more* for math talk.

• L1 and L2 compete for scarce exposure time.

• No easy answer to the question of facilitating effects of L1 on L2-mathematics:
  – Positive transfer seems to depend on whether the first language provides (sophisticated) language for addressing math, as in Turkish language.

• Effects of math talk at home tend to decline the longer the children are in (pre)school.
The best of both worlds?

• Near-native proficiency in two or more languages is possible (and desirable!), but required is:
  – Early onset of L2, preferably before age 5 (or even earlier, before age 3 or before age 1).
  – Sufficient exposure to both languages, sufficient variation across situations of language use, and sufficient linguistic and academic quality.

• Several advantages, but extra support and adequate pedagogies are needed:
  – Supporting parents in providing high quality L1.
  – Allowing (encouraging) mixed use of L1 and L2.
Traditional language pedagogy

• Still prevalent prescriptions and policies:
  – “Keep the two languages as separate as possible, don’t mix!” (one-parent-one-language strategy).
  – “Forbid children to use their L1 in (pre)school!”.
  – “Withhold L2 until L1 has sufficiently matured”.

• No support in brain research: the two languages are represented in the same brain areas and highly interconnected, yet distinct from early on (e.g., Petitto, 2009).
New pedagogy – still experimental

• *Trans-languaging* – using languages deliberately inter-mixed, while drawing attention to structural, semantic and pragmatic similarities and differences – considerations:
  – Use of both L1 and L2 at home, that is: ‘mixed’, seems to be related to cognitive advantages.
  – Using only L1 at home and only L2 in (pre)school, or separate instruction in the two languages in school, perhaps not.

• Positive socio-emotional effects, but language learning and cognitive effects need to be studied.
Super-diversity: practical problems

• Can we employ teachers for all desired L1-L2 combinations, who are:
  – Near-native speakers of L1 and L2 (in order to provide high linguistic quality);
  – Good pedagogues?
• Can we create sufficient time per child for varied dual L1-L2 exposure? How to implement this in a classroom with several different L1’s?
• Need for creative solutions: involving parents and new educational technology.
Involving parents – feasible?

- Dutch HIPPY ("Opstap") to stimulate language, cognitive and emotional development.
- Mother works with the child 15 minutes per day (30 weeks per year) **in the first language**, raising the (academic) quality of L1 input.
- Two-year program, providing educational materials and activities via worksheets.
Results for Turkish-Dutch children

Standard Effect Sizes
Experimental vs. Control (=0)

Leseman & Van Tuijl, 2001 (JMMD)
Van Tuijl, Leseman & Rispens, 2000 (IJBD)
L2TOR – a perfectly bilingual robot

- High quality, native-like speech in L1 and L2.
- Gesturing, acting, recognizing emotions.
- Interactive, playful, motivating.
- Conceptual domains:
  - Spatial language.
  - Mathematical language.
  - Mental state language.

- University of Plymouth
- Tilburg University
- Utrecht University
- Koç University
- University of Bielefeld
Robot: Hello... (name of child). I am Robyn. Let’s play together! Do you like games?
Child: (probably yes, answer doesn’t really matter)
Robot: I really like games! My favorite game is I spy with my little eye. Today we’re going to play it on the tablet. Look!
(Robot “touches” tablet and the screen displays some scenery.)

Robot: I will say, I spy with my little eye, and you have to touch what you think I’m seeing.
Child: (answer doesn’t really matter, robot can continue anyway)
Robot: I spy with my little eye and it is... yellow.
→ Child touches the sun.
- In case of correct response, tablet says ‘sun’
- If the child touches something else, the robot says ‘no that wasn’t it, try again’
- If the child says something, the robot says ‘can you touch it on the tablet’
- If nothing happens, the robot says ‘do you see something yellow? Touch it on the tablet!’
  - If still nothing happens, the robot shows the child how to do it: ‘it was the sun! Look, I’m touching the sun.’
Robot: Wow did you hear that! The tablet said sun, I think that’s the English word for sun. Say sun.
Child: Sun.
- If the child says ‘sun’ or something else (we probably can’t recognize whether the child says something correctly), the robot says: ‘good job!’
- If the child does not say anything, the robot says: ‘I know you can do it, say it just like I do: sun’
Robot: Cool, we’re learning English words! Let’s try this again.
To conclude

• Supporting multilingual development meets the wishes of parents and children, and can increase the inclusiveness of (pre)primary education.

• Supporting multilingual development is important in a globalizing world and can have cognitive and communicative benefits.

• Partnerships between family and (pre)school, and the use of educational technology opens new avenues to get the best of both worlds.
Selected references