School-based learning problems

- In Canada: 10 to 15% of school aged children (ACTA, 2010; AQETA, 2010)
- Not associated with pervasive developmental disorder, specific language impairment, head trauma, intellectual delay, etc.
- Cause: generally unknown
- Temporary condition when appropriate intervention is provided

References:

School-based learning problems

- Process of identification is on trial and error basis.
- Meanwhile:
  - accumulation of delays in the academic learning process
  - child becomes discouraged
  - psychosocial adjustment difficulties
  - etc.

References:
School-based learning problems

- Many children with school-based learning problems (SBLP) do not qualify for specialised services. Their success depend on:
  - the sensitivity and skills of the teacher
  - the advocacy and support of the parent
  - the sensitivity and skills of the consulting professionals
  - etc.
- Enormous individual variations among children with SBLP
- The heterogeneity of the population of children with SBLP is not transparent in the scientific literature

Aim of the study

- to examine multiple aspects of development, specifically, oral and written linguistic abilities, auditory and visual information processing performance, and fine and gross motor skills in a group of French-speaking children experiencing learning problems at school.

Methods - Participants

- Recruited children with school-based learning problems
- Specific inclusion criteria:
  - Age: from 8 to 12 years old
  - Language spoken at home: exposed to French since birth
  - Language spoken at school: French
  - Cognitive ability: able to complete evaluation tasks
- Specific exclusion criteria:
  - documented low IQ, pervasive developmental disorder, visual impairment or hearing loss
  - history of head trauma
  - documented neurological and/or cognitive problem
Methods – Procedure

Preliminary information

• Case history
• Canadian Occupational Performance Measure (COPM)
  (Law et al., 1990; Law et al., 1994) *

References:

Methods – Procedure

Preliminary information

• Test of Nonverbal Intelligence-4 (TONI-4) (Brown et al., 2010) – used for screening intelligence, aptitude, abstract reasoning, and problem solving
• Evaluation of the peripheric hearing system including:
  – Audigram
  – Immitancemetry
  – Otoacoustic emission (DPOAE)

References:

Test battery

Attention Skills

• Test of Everyday Attention for Children (TEA-Ch) (Manly et al., 1999) – The screening version was used (i.e. the first 4 subtests) – Helps assess different attention abilities

Visual Skills

• Test of Visual Perceptual Skills - 3rd Ed (TVPS-3) (Martin, 2006) – To evaluate different components of visual perception

References:
Methods – Procedure

Test battery

Motor Development

- **Movement Assessment Battery for Children (M-ABC)**
  
  (French version by Soppelsa & Albaret, 2004; Henderson & Sugden, 1992)
  
  1) manual dexterity: speed and precision of the movement of each hand
  2) eye-hand coordination for control of the pencil
  3) gross motor skills

References:


Test battery

Core Stability and Posture

- **Bruininks-Oseretsky Test of Motor Proficiency, 2nd edition (BOT-2)**
  
  (Robert H. Bruininks, PhD & Brett D. Bruininks, PhD)
  
  Three subtests:
  - Subtest 5: balance
  - Subtest 6: running
  - Subtest 8: strength

Reference:


Test battery

Language skills

  
  - Assessment of Core Language, Receptive Language, Expressive Language, Language Structure, Language Content, Language Memory, and Working Memory

- **Wechsler Individual Achievement Test – 2nd Edition (Wiat-II)** (Weschler, 2001)
  
  - Assessment of academic skills and problem solving abilities, including reading skills and written language

Reference:


Methods – Procedure

Test battery

Language Skills

- Closure activity (adapted from Allal et al., 2001)
  - Spelling abilities, including lexical and grammatical spelling
- Peabody Picture Vocabulary Test-4 (PPVT-4)
  - Receptive vocabulary

References:

Hearing Skills

- Masking Level Difference (MLD) (Licklider, 1948; Hirsch, 1948)
- Pitch Pattern Sequence Test (PPST) (Musiek & Pinheiro, 1987)
- Test de Mots dans le Bruit (TMB) (Lagacé, 2010)
- Random Gap Detection Test (RGDT) (Keith, 2002)
- Auditory evoked potentials with clicks and the syllable /da/ *

References:

Results

On April 1, 2013:

- 30 participants were recruited (since October 2011)
  - 20 had completed the test battery
  - 8 participants in the middle of the test battery
  - 2 participants are waiting for their evaluations to begin

Demographics

<table>
<thead>
<tr>
<th>Sex</th>
<th>7 females, 13 males</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average age at first evaluation</td>
<td>9 years 10 months</td>
</tr>
<tr>
<td>Repeated a grade</td>
<td>6</td>
</tr>
<tr>
<td>Attention disorder</td>
<td>2</td>
</tr>
<tr>
<td>- with medication*</td>
<td>2</td>
</tr>
<tr>
<td>- without medication*</td>
<td>2</td>
</tr>
<tr>
<td>Have received intervention in the past</td>
<td>17</td>
</tr>
</tbody>
</table>

- In speech-language pathology
Results

- **TONI-4**
  - All participants included had a percentile rank above 8

- **Hearing Acuity**
  - Thresholds ≤ 20 dB HL from 0.25 to 8 kHz

Results

Which language does the child most often speak with his/her:

<table>
<thead>
<tr>
<th>N=20</th>
<th>French</th>
<th>English</th>
<th>Both</th>
<th>Other</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mother</td>
<td>16</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Father</td>
<td>11</td>
<td>6</td>
<td>2</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Siblings</td>
<td>11</td>
<td>4</td>
<td>4</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

Results

What is the parents’ highest completed level of education?

<table>
<thead>
<tr>
<th>N=20</th>
<th>Elementary</th>
<th>High School</th>
<th>College</th>
<th>University</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mother</td>
<td>0</td>
<td>1</td>
<td>10</td>
<td>9</td>
</tr>
<tr>
<td>Father</td>
<td>0</td>
<td>4</td>
<td>8</td>
<td>8</td>
</tr>
</tbody>
</table>
Results

• How many participants obtained results below the norms?

Language skills
n = 14

Auditory processing
n = 8

Visual-perceptual skills
n = 3

Motor Skills
n = 6

Results

Heterogeneity

<table>
<thead>
<tr>
<th>Areas (results below norms at 1 or more subtests)</th>
<th>Number of participants</th>
<th>Comorbidity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Language</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Hearing perception</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Visual perception</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Motor skills</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Language and hearing</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Language and visual perception</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Language and motor skills</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Hearing and visual perception</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Hearing and motor skills</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Visual perception and motor skills</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Language, hearing, visual</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Language, hearing, motor</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Language, visual, motor</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Hearing, visual, motor</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Language, hearing, visual and motor skills</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Normal results in all areas</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>n = 6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>n = 3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>n = 1</td>
<td></td>
</tr>
</tbody>
</table>

Results

About the linguistic skills

Core Language (CELF)

Written Expression (WIAT-II)

Reading (WIAT-II)

3

2

2

1

5

1

0

No language problem: n = 6

uOttawa
### Results

**Does the linguistic background influence language skills?**

<table>
<thead>
<tr>
<th>French</th>
<th>Bilingual</th>
</tr>
</thead>
<tbody>
<tr>
<td>11 francophone families</td>
<td>9 bilingual families</td>
</tr>
<tr>
<td>Participants below norms:</td>
<td>Participants below norms:</td>
</tr>
<tr>
<td>- 6/11 for Core Language</td>
<td>- 5/9 for Core Language</td>
</tr>
<tr>
<td>- 6/11 for Written Expression</td>
<td>- 5/9 for Written Expression</td>
</tr>
<tr>
<td>- 2/11 for Reading</td>
<td>- 5/9 for Reading</td>
</tr>
</tbody>
</table>

**Language**

- Writing
- Reading

### Results

**Is there a link between the hearing skills and the language skills?**

<table>
<thead>
<tr>
<th>With Hearing Processing Difficulties</th>
<th>Without Hearing Processing Difficulties</th>
</tr>
</thead>
<tbody>
<tr>
<td>8 participants with hearing processing difficulties</td>
<td>12 participants without hearing processing difficulties</td>
</tr>
<tr>
<td>Participants below norms:</td>
<td>Participants below norms:</td>
</tr>
<tr>
<td>- 4/8 for Core Language</td>
<td>- 7/12 for Core Language</td>
</tr>
<tr>
<td>- 4/8 for Written Expression</td>
<td>- 6/12 for Written Expression</td>
</tr>
<tr>
<td>- 3/8 for Reading</td>
<td>- 4/12 for Reading</td>
</tr>
</tbody>
</table>

**Language**

- Writing
- Reading

### Results

**Is there a link between the motor development and language skills?**

<table>
<thead>
<tr>
<th>With Motor Problems</th>
<th>Without Motor Problems</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 participants with motor problems</td>
<td>14 participants without motor problems</td>
</tr>
<tr>
<td>Participants below norms:</td>
<td>Participants below norms:</td>
</tr>
<tr>
<td>- 4/6 for Core Language</td>
<td>- 7/14 for Core Language</td>
</tr>
<tr>
<td>- 5/6 for Written Expression</td>
<td>- 6/14 for Written Expression</td>
</tr>
<tr>
<td>- 2/6 for Reading</td>
<td>- 5/14 for Reading</td>
</tr>
</tbody>
</table>

**Language**

- Writing
- Reading
Results

Is there a link between the visual skills and the language skills?

3 participants with visuo-perceptual problems
- Participants below norms:
  - 3/3 for Core Language
  - 3/3 for Written Expression
  - 3/3 for Reading

17 participants without visuo-perceptual problems
- Participants below norms:
  - 8/17 for Core Language
  - 8/17 for Written Expression
  - 4/17 for Reading

Is there a link between the working memory abilities and the language skills?

9 participants with working memory problems
- Participants below norms:
  - 7/9 for Core Language
  - 9/9 for Written Expression
  - 6/9 for Reading

11 participants without working memory problems
- Participants below norms:
  - 4/11 for Core Language
  - 2/11 for Written Expression
  - 1/11 for Reading

Limits of the study

- Limitations of certain tests and test battery
- Tests administered by more than one person
  - Students, clinicians, research assistants
- Participants sometimes evaluated later during the day
- Some participants had already received services (SLP, special education, etc.)
- Caution must be taken that this finding may be limited to the children with SBLP who participated in the current study and may not generalize to a broader population of children with SBLP
- No specific data on the socioeconomic status of each family was collected, which is known to have an influence on school-based learning.
Future steps

- Psychological dimension to be explored

- Children with SBLP: heterogeneous group and evidence of comorbidity. The present study is still in progress. A larger sample should allow:
  - a better understanding of the overlap of deficits between the different areas;
  - the identification of the factors that are more strongly associated with school-based learning;

- Cluster analyses to establish characteristic SBLP profiles and the factors associated with them:
  - better understanding of the nature of SBLP
  - better tailoring of therapeutic programs to the needs of individuals depending on their specific problems.

Discussion and conclusions

- To be presented at the conference