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Reading acquisition during game-based training in Dutch

Toivo Glatz1, Wim Tops1, Annemie Desoete2, Natasha Maurits3 & Ben Maassen1

1Centre for Language and Cognition (CLCG), University of Groningen, Groningen, The Netherlands; 2Department of Experimental Clinical and Health Psychology, Developmental Disorders, Ghent University, Ghent, Belgium; 3Department of Neurology, University Medical Center Groningen (UMCG), University of Groningen, Groningen, The Netherlands.

Introduction

• GraphoGame (GG, Richardson & Lyytinen, 2014) is a serious computer game designed to train grapheme-phoneme correspondences in children. Such a training can boost reading abilities in languages with transparent writing systems like Finnish.
• There is fewer evidence that GG can enhance reading in less transparent writing systems as well, perhaps because phonological awareness (PA) has more impact on reading skills in more opaque languages than the knowledge of grapheme-phoneme associations.

In our study we investigated, which factors might predict the effectiveness of GG training in first graders learning to read a rather opaque language (i.e., Dutch).

Materials and methods

• For 5 to 7 weeks, 107 first graders (mean age 6;3) played a Dutch adaptation of GG for 8-12 minutes per day, while an active control group (N=107) played a Math version of the game.
• Children were recruited from the north-eastern part of the Netherlands (Groningen), and the Dutch/Flemish speaking part of Belgium (Gent).
• The game mostly trains skills such as grapheme-phoneme association, PA, whole word reading and spelling. It contains ~1000 items, ranging simple and complex graphemes, syllables, monosyllabic words with and without consonant clusters, as well as non-words.

Assessments:
• CELF-4-NL Phonological Awareness (Kort et al., 2008)
• PROEF Phonological Awareness (Elen, 2006)
• RAN colours and objects (van den Bos, 2003)
• SON-R 6-40 (Tellegen et al., 2014) non-verbal IQ estimate

Here, we present the data of the effect of playing a reading game vs. a math game on the improvement in phonological awareness as measured by the CELF using mixed-effects regression (N=214).

Results

<table>
<thead>
<tr>
<th>Condition</th>
<th>Reading</th>
<th>Math</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender (f/m)</td>
<td>49/51</td>
<td>49/51</td>
</tr>
<tr>
<td>Age (yr)</td>
<td>6.3</td>
<td>6.3</td>
</tr>
<tr>
<td>(range)</td>
<td>5.7-7.2</td>
<td>5.1-6.9</td>
</tr>
<tr>
<td>Non-verbal IQ</td>
<td>98.6</td>
<td>99.1</td>
</tr>
<tr>
<td>Reading (rw)</td>
<td>220</td>
<td>220</td>
</tr>
<tr>
<td>Sessions played</td>
<td>27</td>
<td>27</td>
</tr>
<tr>
<td>Letter Knowledge</td>
<td>13.5</td>
<td>16.4</td>
</tr>
<tr>
<td>PROEF percentile</td>
<td>50</td>
<td>54</td>
</tr>
<tr>
<td>CELF percentile</td>
<td>43</td>
<td>46</td>
</tr>
<tr>
<td>RAN colours (%)</td>
<td>70</td>
<td>64</td>
</tr>
<tr>
<td>RAN objects (%)</td>
<td>77</td>
<td>74</td>
</tr>
</tbody>
</table>

Which children benefit most from serious gaming in first grade?

• GraphoGame had a larger effect on Phonological Awareness than playing a math game for children with low pre-test scores, an above average IQ, below average age (5:1 - 6:3 years), and an exposure to the game of up to 3.5 hours.
• Overall, PA scores increased moderately during the initial months of the first grade (by about 0.5 standard scores), independently of whether children played GG or not.

Conclusion

When learning to read in an opaque language, a certain group of children does benefit from GG training. We believe that serious gaming is able to reach children who have difficulties with reading acquisition by training phonological awareness skills and increasing exposure to relevant reading materials.

To specify further characteristics of this group and the nature of the mechanism underlying GG-based improvement in phonological awareness, we plan to further extend the analyses to in-game assessments, reaction time investigation, playing data, as well as to neurophysiological (EEG) measurements.

Acknowledgments

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