Portuguese Foundation Graphogame: Preliminary Results

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Abstract

The Portuguese Foundation Graphogame is an adaptation of the Graphogame software to European Portuguese. The Graphogame contributes to reading and spelling acquisition. It has been designed and implemented for different languages with results that reveal that this is an effective tool to the reading and spelling acquisition. In this paper the methodology adopted in Portuguese Graphogame and the results of its implementation in schools are described.

Keywords: *Graphogame; reading acquisition; word reading*

Introduction

The Graphogame is a software that contributes to the reading and spelling acquisition. The software was developed as a friendly computer game, focusing on the training of grapheme-phoneme relationships with children at risk of experiencing difficulties learning to read. Graphogame was developed at the University of Jyväskylä (Finland) aiming to be a complementary and free tool to regular education [1;2] When playing Graphogame children listen to a sound corresponding to a letter (or word /nonword, in more advanced levels) and, at the same time, several written options appear on the screen. The child's task is to select the correct match to the sound she has heard.

The game presents the same stimuli hundreds of times, at different playing levels and through different tasks. In addition, during the game, the child has to make quick phoneme-grapheme associations thus promoting reading automation. There are two types of tasks: the main tasks require the child to associate an audio segment to the correct written representation; more active tasks require the child to write the word or nonword she has heard.

The Graphogame has been adapted to various languages (English, German, Finnish, among others) with results that suggest that this software is an effective tool for the promotion of the reading and spelling acquisition.

Saine et al (2011) administrated Graphogame to Finnish children identified as at risk of developing difficulties in reading acquisition. After the intervention there was a significant progress in terms of letter knowledge, reading and spelling skills [3] In addition, about sixteen months after the intervention, children presented reading and spelling accuracy and fluency skills similar to the rest of the classroom. In Austria, a six weeks intervention using the German Graphogame improved the accuracy and speed reading of children attending the second and fourth grades [4] In the UK, after twelve weeks of intervention, children with ages 6–7 in the experimental group improved reading, writing and phonological skills compared to children in the control group, maintaining the gains four months after the intervention [5].

The Portuguese Foundation Graphogame (PFG) study was conducted with a group of children attending the first grade, identified as at risk of failure in reading acquisition. The aim of the study was to assess the impact of Graphogame to the acquisition of reading foundation skills, specifically: phonemic awareness, the relationship between letters and sounds and decoding skill.

Materials and Methods

2.1. Design

A longitudinal study was conducted to assess the impact of a sixteen weeks implementation of PFG. Appropriate schools and parent's authorization were obtained for each child to participate.

Participants were assessed before the intervention (pre-test M1, February) and by the end of sixteen weeks of intervention (post-test M2, June). On both occasions, the evaluations were conducted individually in a room adjacent to the classroom.

2.2. Participants

Thirty-eight monolingual first grade native speakers of European Portuguese took part in this study (see Table 1). Children were selected for being at risk of experiencing reading difficulties. Participants were divided between experimental and control group. In both groups the socioeconomic context was controlled by selecting children from economically deprived school areas (TEIP) and children from non-economically deprived school areas (N-TEIP).

Table 1: Participants description by experimental and control group, school area economical context and sex

Characteristics	Control Group		Experimental Group	
	TEIP	N-TEIP	TEIP	N-TEIP
N	15	10	8	5
Sex (F;M)	5;10	6;4	2;6	2;3
Age (years; months)	7;0	6;5	6;7	6;7
IQ *	17,4	18,2	15,9	20,6
Playing time(minutes)	----	----	451	474
Percentage of success	----	----	75,10%	78,90%

* Results fall between percentiles 35-65, corresponding to "average intellectual ability" [6]

2.3. Assessment tests

The vocabulary was assessed with the vocabulary WISC subtest [6]. The letter-sound knowledge was assessed with a task integrated in the PFG. The remaining assessments were conducted using the ALEPE [5] a Portuguese reading and spelling assessment battery that includes: Letter Spelling, Metalinguistic Phonemic Awareness; Word Reading; and Pseudoword Reading.

2.4. Research questions

Our expectation for the results of the intervention was (i) to find a more pronounced learning curve in the experimental group than in the control group, (ii) the extinction or the decrease of TEIP effect, i.e. after intervention, results of children in the experimental group in TEIP schools should be closer to those in N-TEIP schools and (iii) to find a steady motivation throughout the training to play Graphogame.

2.5. Procedure

The Graphogame training was conducted at schools with groups of five children, ten minutes a day five days a week, under the supervision of a specially prepared professional (speech therapist, psychologist or teacher). The Graphogame was administered to children in the experimental group, whereas children in the control group followed the normal schooling.

Results

The results of the Graphogame training are shown in Table 2. In all measurements the learning effect is stronger in the experimental group than in the control group.
As for the TEIP effect, when it was not extinguished (in the M2 assessment) it was less pronounced in the experimental group than in the control group.

Table 2: Description of correct answers per task between the experimental group and the control group (expressed as a percentage for all tasks except for the Vocabulary – a WISC subtest – expressed in rough values).

Tasks	Assessment	Control Group		Experimental Group	
		TEIP	N-TEIP	TEIP	N-TEIP
Letter-sound knowledge	M1	44,4	66,4	53,7	57,1
	M2	64,1	69,7	74,9	82,9
Letter spelling	M1	47,3	73,9	50,4	58,7
	M2	68,5	85,2	89,6	91,3
Phonemic awareness	M1	31,3	36,7	29,4	34,2
	M2	60,4	53,3	83,3	84,2
Word reading	M1	6,3	16,7	4,1	18,3
	M2	17,4	50	32,2	51,1
Pseudoword reading	M1	3,3	17,3	4	15,3
	M2	15	45,3	30,7	48,7
Vocabulary	M1	10,1	8,6	7,7	11,3

Letter-sound results revealed, as expected, a learning effect, $F (1,34) = 126.763$, p < .05) with better results for the experimental group (ca. 80 % in M2) when compared to the control group (ca. 65% M2), $F (1,34) = 6.917$, p < .05. Although the economically deprivation effect was not extinguished, it is important to notice that TEIP children in the experimental group achieved better results than TEIP children in the control group (75 % vs. 64%), $F (1,34) = 4.126$, p = .05. There was a triple interaction which was due to the learning effect (between M1 and M2), more expressive in the experimental group than in the control group (respectively 24% and ca. 12%), along with a learning effect more expressive in TEIP than in N-TEIP groups (respectively 20 % and 15 %), $F (1,34) = 4.794$, p = . 036 .

As for the spelling letter task, the learning effect was once again significant, $F (1,34) = 45,505$, p <.05, with superiority of the experimental group (ca. 35% vs.10%), $F (1,34) = 14,956$, p <.05. The economically deprivation effect disappeared in M2 in the experimental group, $F(1,34) = 4,748$, p <.05, (89,6% *vs.* 91,3), whereas in the control group it was maintained. Finally, it is important to highlight that all children attained ceiling results, with exception to those in the TEIP schools in the control group.

The results of the phonemic awareness task reveal a significant learning effect ($F (1,34) = 33,939$, p <.05), more pronounced for the experimental group (50% evolution *vs.* 25%). The economically deprivation effect was extinguished in M2, $F (1,34) = 5,103$, p <.05).The results of the word reading task also revealed a larger learning effect, favoring the experimental group (30 % *vs.* 20%), $F (1,34) = 60.729$, p <.05. The economically deprivation effect has not disappeared, but a better performance is observable among TEIP schools in the experimental group, when compared with TEIP schools in the control group (32 % vs. 17%), $F (1,34) =$

10.210, p = .003. There was an interaction between Moment of Assessment and TEIP, which was due to significantly higher progression between Moment of Assessment for those children in N-TEIP schools compared to those in TEIP schools (respectively, 30% and 22%) , F (1,34) = 6.046, p = . 019.

Finally, the pseudoword reading task results revealed a significantly more pronounced learning effect for the experimental than for the control group, $F(1,34) = 34,799$, p<.05 (30% *vs.* 10%). As observed in the word reading task, although the economically deprivation effect did not disappear, children from the experimental group in TEIP schools attained, in the second assessment, better results than those in TEIP schools in the control group (31% *vs.* 15%)**,** $F(1,34) = 10,725$, p = .002.

Conclusions

For all measures explored in this study there was a more expressive learning effect for the experimental than for the control group. These results are promising, because they reveal the efficacy of the PFG.

The typical disadvantage of children in economically deprived schools was present during the first assessment. After the intervention this disadvantage was less pronounced between children in the experimental group, whereas for those children in the control group the effect remained. Finally, children were motivated to play the PFG throughout the weeks along all the training period.

The preliminary results of the impact of the Portuguese Foundations Graphogame are strong enough to sustain its adoption with children at risk for experiencing reading acquisition difficulties.

References

[1]   Lyytinen, H., Ronimus, M., Alanko, A., Poikkeus, A., & Taanila, M. (2007). Early identification of dyslexia and the use of computer game-based practice to support reading acquisition. Nordic Psychology, *50*(6), 109 -126.

[2]   Lyytinen, H., Erskine, J., Kujala, J., Ojanen, E., & Richardson, U. (2009). In search of a science-based application: A learning tool for reading acquisition. Scandinavian Journal of Psychology. 59(2) pp 668–675.

[3]   Saine, N.L.; Lerkkane, M.; Ahonen, T.; Tolvanen, A. & Lyytinen, H. Computer-Assisted Remedial Reading Intervention for School Beginners at Risk for Reading Disability. Child Development, 82(3). pp 1013–1028. 2011.

[4]   Huemer, S.; Landerl. K.; Aro, M. & Lyytinen, H. (2008). Training reading fluency among poor readers of German: many ways to the goal. Ann. of Dyslexia 58(2). pp.115–137.

[5]   Kyle, L.; Kujala, J.; Richardson, U.; Lyytinen, H. & Goswami, U. (2013). Assessing the Effectiveness of Two Theoretically Motivated Computer Assisted Reading Interventions in the United Kingdom: GG Rime and GG Phoneme. Reading Research Quarterly. 48(1), pp. 61–76.

[6]   Simões, M. R., Seabra, M. J., Albuquerque, C. P., Pereira, M. M., Almeida, L. S., Ferreira, C., Lopes, A. F., Gomes, A. A., Xavier, R. E., Rodrigues, F., Lança, C., Barros, J., San Juan, L. & Oliveira, E. (2003). Escala de Inteligência de Wechsler para Crianças – Terceira Edição (WISC-III). In M. Gonçalves, M. Simões, L. Almeida & C. Machado (Eds.). Avaliação Psicológica – Instrumentos Validados para a População Portuguesa. Vol. I., pp. 221-252. Coimbra: Quarteto Editora.

[7]   Sucena, A., & Castro, C.L. (2011). ALEPE - Avaliação da Leitura em Português Europeu, Lisboa: CEGOC-TEA.