

The Impact of a Language Teaching Computer Game on ESL Students' Recognition of Spoken and Written Word Forms

Amanda Müller

Flinders University (Australia)
amanda.muller@flinders.edu.au

Abstract

*This study tests the effectiveness of a language-teaching computer game, *Medicina*, that seeks to improve the ability of English-as-a-Second-Language (ESL) nursing students to hear and identify medication names in class and clinical placement. This aim is achieved through an improvement in phonological awareness of word parts and an increase in listening and reading skills. The study uses a triangulation of quantitative and qualitative methods to ascertain the degree to which the aims of *Medicina* is achieved and the validity of the theoretical assumptions. Significant improvement in listening skills were discovered, with very large effect sizes. Finally, qualitative comments reveal the personal impact the game has on listening and reading ability, and effect in the classroom.*

1. Introduction

One of the problems faced by international ESL students at the School of Nursing & Midwifery of Flinders University is a lack of familiarity with medication names. They have the greatest difficulty comprehending spoken orders for medications and scanning through the labels in a medication cabinet to find a particular medication [1]. There are a vast number of generic medications with an even greater number of brand names. It is too large a task to rote-learn them all, and such an approach ignores possible underlying issues. Indeed, it is likely that the ESL student has inadequacies in the reception skills of listening and reading [2]. More specifically, the problem may lie in an insufficient phonological awareness and language improvement [3] that is coupled with the student having inadequate levels of exposure [4]. This insufficient phonological awareness will also be evident in other spoken English interactions. Indeed, it is the case that ESL nursing students have problems with other kinds of medical terminology [5], and they also have difficulty with performing a wide variety of language tasks generally [6]. Another indication of insufficient phonological awareness is a noticeable accent when speaking, which points to a likely perceptual 'accent' during listening activities [7-9].

Training is a key element in improving phonetic sensitivity [10]. It has been demonstrated that giving students an opportunity to consciously attend to novel phonetic forms may be a way to enhance their learning [11]. This, and the above discussion, provides evidence for the establishment of a learning resource that supports phonological awareness. The result is a computer game, called *Medicina*. This game involves a task where learners must correctly process audio input to choose the correct answer among five similar medication names. After hearing the pronunciation of the word, the learner will need to mentally rehearse the sounds used until an exact match is found. Since real words are used, *Medicina* has the further benefit of increasing familiarity with the type of word forms found within medication names. Furthermore, four different female speakers were used to produce the game. The rationale for this strategy was that the greater number of speakers produces better phonological competence [12].

While *Medicina* does not pair words as exactly as linguistic exemplars, it extends the concept of minimal pairs, an analytical tool in linguistics, and transforms it into an educational task which draws attention to phonemic features and word form. Indeed, one *Medicina* strength is that it places the learner in a situation where they have to practice active analytical listening. It is speculated that second language (L2) rephonologizations are most powerfully invoked in situations where there is an "activation of several competing lexical items" [13] and an impeded ability to communicate, i.e. misunderstanding or slow processing time. According to the Perceptual Assimilation Model for second language learning (PAM-L2), this type of pressure should force an improvement in phonological awareness [14]. The game presents "several competing items" and the learner loses the game as a result of misunderstanding or slow reaction time. This is how the game's design seeks to activate perceptual change and phonological restructuring in the mind of the learner, and hopefully produce more finely tuned phonological awareness that will support wider educational activities and clinical performance. Furthermore, improvement in phonological awareness is correlated with better production skills when speaking and reading [15-16].

If it is the case that learning new vocabulary – particularly that which occupies densely populated phonological space – can activate the process of rephonologization, then it should follow that *Medicina* will improve phonological awareness, resulting in a greater ability to distinguish between similar phonemes.

3. Method

3.1 Participants

The study contained 25 volunteer participants, predominantly female, in the first semester of their graduate nursing degree. Participants came from a range of countries: China, India, South Korea, the Philippines, Japan, Malaysia, Bangladesh, Cambodia, Thailand, Sri Lanka, Russia, and Italy. The average age of the participants was 30 and the average length of time spent in Australia was 2 years. In terms of English proficiency, participants were at an advanced level and had an average score of 7.0 each for the listening and reading components of the IELTS test.

3.2 Materials

This study used the *Medicina* game as an intervention in a pre-test post-test design followed by a qualitative survey. The pre-test and the post-test were identical, designed specifically to ascertain phonological awareness. During the test, the student listened to a timed audio recording that issued a new word after a three-second gap. Participants needed to select the correct option from an answer sheet. Test marks were given for each of the 46 word parts selected correctly.

This test was designed using non-words so it was not possible for participants to learn the content (even unconsciously) between tests. Each of the non-words contained a confusable phoneme in each of the two word parts. Thus, the word parts 'cele' and 'mide' might be combined to produce 'celemide'. Next, variant items were created using the principle of minimal pairs, based upon common interference phonemes identified for the Asia region. Therefore, 'celemide' produced variants such as 'ceremide', 'celemite', and 'ceremite'.

3.3 Procedure

The study required participants to complete the pre-test during a two-week test period and the post-test/survey during a four-week period. Students were asked to play the game (the intervention) as much as they wanted during the intermediate two-week period, resulting in an average of 688 word

exposures, about 100 minutes, per participant. A dependent t-test was conducted on the pre-test and post-test scores and the qualitative survey answers were collated.

3.4 Results

Overall, participants experienced a significant increase in phonological awareness $t(24) = -5.18, p < .0001, r = .73$, as evident in the scores found in the pre-test ($M = 36, SE = .87$) as compared to the post-test ($M = 40, SE = .55$) administered after the intervention. Considering the effect size, this is a substantive finding.

The results were similar for sub-group of word parts that appeared both in the test and the *Medicina* game. For this subset, participants demonstrated a significant increase in phonological awareness after the intervention, $t(24) = -4.88, p < .0001, r = .71$, with an increase in post-test scores ($M = 20, SE = .36$) compared to pre-test scores ($M = 18, SE = .50$).

Significant results were also found for the sub-group of word parts that were used in the test but did not appear in the game. Again, participants demonstrated a significant increase in phonological awareness after the intervention, $t(24) = -3.34, p < .005, r = .56$, with an increase in post-test scores ($M = 20, SE = .36$) compared to pre-test scores ($M = 18, SE = .50$).

Discussion

The purpose of this study was to ascertain if *Medicina* increases phonological awareness. The statistical tests and effect sizes confirm that phonological awareness was indeed improved substantially after the participants played the *Medicina* game during a two-week period. Furthermore, since the participants' IELTS scores for listening and reading were excellent (they are eligible for professional registration), it makes the results more remarkable. One might not expect that a significant improvement in phonological awareness is possible among such advanced learners, yet they demonstrated a greater ability to distinguish between similar phonemes in the post-test. It points to the need for phonological awareness training even at an advanced level.

As discussed earlier, the game was designed to evoke rephonologization by presenting the necessary competing items, misunderstandings, and communicative breakdowns theorised to trigger the process of phonological perceptual change. In terms of theoretical importance, the findings of this study supports the PAM-L2 notion that "forceful linguistic pressure" can drive the process of rephonologization, helping reconceptualise existing phonological categories and spurring the creation new phonological categories [16].

Table 1. A selection of qualitative survey responses

<p>Perceiving Sound</p> <p><i>Sometimes you can repeat the word when you hear it to help you remember what was pronounced, for example 'pam' or 'bam'.</i></p> <p><i>[The game teaches] how slight differences in the way a word is pronounced can make it so different. When I heard the names I was guessing before, but listening and thinking now.</i></p> <p><i>You will come to know your tendency/weak point in your listening skill.</i></p> <p><i>I was able to familiarize the pronunciation ... better than before....it improves my reaction in finding the right medication each time I play the game.</i></p>
<p>Perceiving Accent</p> <p><i>It helped in differentiating different word sound... understanding the difference between how certain words are pronounced.</i></p> <p><i>[It helps] understanding different accents and volume (loud or not) of the voice.</i></p> <p><i>[It helps me] to realize there are slight accent difference between different people.</i></p>
<p>Effects in the classroom</p> <p><i>I found it quite helpful to become familiar with the "sound" of each drug name, because it help me to pick up the sound in my class.</i></p> <p><i>This game is very helpful for me. In class, the teacher uses the words and it quickly reflects in my mind and I know it is medication – it ease my fear of new words.</i></p>

Participant responses also support the conclusions drawn from the quantitative data (see some comments in Table 1). It is clear that not only did participants feel that *Medicina* familiarised them with medication names, they saw a result in the ability to discriminate between similar sounds in general. Participants were glad to have the opportunity to listen to the words as pronounced by different speakers, and to relate these words to their written form. Finally, it was common for participants to comment that they are now hearing and processing, not just listening and guessing, and that their performance was improving dramatically in the classroom.

In conclusion, considering the overall results, participants significantly improved in their overall phonological awareness and could rapidly relate spoken phonemes to their written form after playing *Medicina*. The effect of phonological improvement was wide-reaching, going beyond the game and into the classroom and clinical practice.

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