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Second language acquisition by low-literate learners: An under-studied population

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Many adolescent and adult L2 learners in language classrooms, both in the US and other countries, have little or no alphabetic print literacy. Language teachers may turn to SLA research for assistance, yet almost all research on oral SLA has focused on educated, highly-literate learners (Bigelow & Tarone 2004; Tarone, Bigelow & Hansen 2009). The assumption seems to have been that the findings of this research hold for ALL learners, including learners with little to no literacy. However, research in cognitive and experimental psychology shows that the acquisition of grapheme–phoneme correspondence – the ability to associate a phoneme and a visual symbol – changes the way oral language is processed. The present paper shows the relevance of these findings for SLA. It summarizes a three-part study on oral L2 processing, a partial replication of previous SLA research, carried out in a population of low-literate adolescent Somali learners of L2 English. The findings confirm that alphabetic print literacy level had a significant impact on oral L2 processing. The paper concludes with a call to replicate current SLA studies and findings with populations of learners who have little or no alphabetic literacy.

1. Introduction

Increasingly, language teachers both in the US and other countries encounter adolescent and adult L2 learners who have little or no alphabetic print literacy. These teachers may turn to SLA research for assistance, yet almost all research on oral SLA has focused on educated, highly-literate learners (Bigelow & Tarone 2004; Tarone, Bigelow & Hansen 2009). The assumption seems to have been that the findings of this research hold for ALL learners, including learners with little to no literacy. But we must now question this basic assumption.

I will review research findings in cognitive psychology that show that the acquisition of grapheme–phoneme correspondence – the ability to associate a phoneme and a visual symbol – changes the way oral language is processed. SLA researchers must now seriously consider the consequences: alphabetic literacy must also change the way L2 learners process oral L2 input. Particularly in view of the fact that large numbers of immigrant L2 learners in the US have little to no alphabetic literacy, it is urgent that we replicate standard SLA studies within

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this population, to gain a better understanding of the way they process and acquire oral L2 English. This understanding may then enable us to develop a more effective pedagogy for low-literate immigrant adult L2 learners.

This paper reviews published research in cognitive psychology comparing the way alphabetically literate and illiterate adults perform oral language processing tasks in their native language, and represent it in short-term memory. The paper then extends these findings to the field of SLA, summarizing a three-part study (Tarone et al. 2009) on oral L2 processing. This study was a partial replication of previous SLA research, carried out in a population of low-literate adolescent Somali learners of L2 English. The findings of this study confirm that alphabetic print literacy level has a significant impact on oral L2 processing. Only with such replication studies in SLA can we possibly reach an understanding of the language learning processes of low-literate adults, thereby providing a reliable foundation upon which language teachers can build a more effective pedagogy.

2. Impact of alphabetic literacy on adults' oral language processing

Research in the realm of native-language cognitive processing has amassed solid evidence that illiterate adults have significant difficulty with oral language tasks requiring a focus on segments of language (Morais, Cary, Alegría & Bertelson 1979; Morais, Bertelson, Cary & Alegría 1986; Adrian, Alegría & Morais 1995; Reis & Castro-Caldas 1997; Petersson et al. 2000; Dellatolas et al. 2003; Loureiro et al. 2004; Tarone & Bigelow 2005). The simple tasks in question require an awareness of, and sometimes an ability to manipulate, individual language segments – phonemes, syllables or words. In a typical example of such a task, the listener is asked to delete or reverse the order of individual phonemes or syllables that are presented orally. For example, I might say the word *stan* and ask you to say that word without the 's' in front (*tan*). I could do the same task with syllables and ask you what remains if I take the 'ka' off of a pseudoword *kade* (*de*). Reversal tasks can also be performed with both phonemes and syllables: *tan* reversed is *nat*; now tell me what is *los* reversed (*sol*)? Or, with syllables, *kade* backwards is *deka*; now tell me what is *mepa* backwards (*pame*)? And so on. Such tasks are significantly harder for adults who are not alphabetically literate.

We see similar differences in performance on 'phonological fluency tasks', which require an individual to list all the words they can think of in one minute that begin with the sound 's', or 't', 'p'. Illiterate individuals are worse at this than literate ones. In contrast, there is no difference between literate and illiterate adults in their performance of 'semantic fluency tasks', where the individual is asked to list all the 'animals' or all the 'foods' they can think of in one minute. So alphabetic literacy affects the processing of oral language in terms of linguistic segments, but not its processing in terms of meaning.

We see the same distinction between results for literate vs. illiterate adults in oral word repetition tasks – either real words they know and can process in terms of meaning, or 'pseudo' words have no meaning (made up from real words by changing consonants – so, *ballpark* might become *nallkark*). There is no difference between literate and illiterate adults in ability to repeat real words, but illiterate adults have a significantly harder time repeating pseudowords. These differences have a physical reality in the brain. Castro-Caldas et al. (1998: 1057) display brain

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scans of literate and illiterate adults as they repeated meaningful vs. pseudowords. There were no differences in the scans when meaningful words were repeated, but dramatic differences between the literate and illiterate brains during pseudoword repetition.

So literacy appears to have a dramatic impact on the cognitive processing of oral language in terms of its linguistic segments (phonemes, syllables and words) rather than its meaning. In the 1980s, a Wisconsin–Madison scholar, Charles Read, headed an important project in this line of research. Observing that all the previous studies had involved literacy in alphabetic scripts, Read wondered whether it was literacy itself that had this impact, or whether the root cause was ALPHABETIC literacy, specifically. Read, Zhang, Nie & Ding (1986) administered the same oral tasks as those described above to older adults in China. Although all the participants were well-educated, half of them had only learned to read Chinese characters, which are logographs, while the other half had also learned to read Chinese in Hanyun Pinyin, which is an alphabetic script. Read et al. found the same differences between these two groups that we have already seen in comparisons of adults who were literate or illiterate (in alphabetic scripts). The group that could read an alphabetic script did significantly better than the character-only group on the oral tasks requiring awareness and manipulation of linguistic segments. The Read et al. study shows that it is specifically the ability to decode ALPHABETIC script that improves one's ability to perform phonological awareness tasks. In alphabetic literacy we learn to use a visual symbol to represent a phoneme, and then learn to organize these into groups of symbols to represent words. Reis & Castro-Caldas (1997) conclude that the ability to represent sound segments with visual symbols affects short-term memory, where those visual symbols can be manipulated in cognition, changed in order, added or deleted, and then rendered back into oral form. This ability constitutes a powerful tool for processing language in terms of its form, rather than just in terms of its meaning.

Consider the implications of these conclusions for current research on adult SLA, which has been carried out almost exclusively with learners who are literate – typically, college or university students who can be assumed to be highly literate – and most of these individuals have been literate in alphabetic scripts (Bigelow & Tarone 2004). But if, as we have seen, alphabetic literacy significantly affects the cognitive processing of oral NATIVE languages, we have to assume that it also affects the way oral SECOND languages are processed by learners who are not literate. The unavoidable conclusion is that current SLA research findings on the way adult learners process oral L2 input, as well as current SLA theories that are based on those findings, may not apply to illiterate L2 learners. And there are increasing numbers of illiterate and low-literate L2 learners, not just in third world countries, but coming as immigrants and refugees to first-world countries. We need a better understanding of the language processing limitations and abilities of these learners.

3. A three-part study on literacy level and L2 acquisition

There is therefore an urgent need for replications of SLA studies in populations of illiterate and low-literate learners. The three-part study described below began as an attempt to take some central SLA studies that have been originally carried out with highly literate L2 learners, and replicate them with low-literate L2 learners, to determine whether literacy level seemed

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to affect the outcomes. We chose the following three types of SLA studies, two of which focused explicitly on learners' processing of oral L2 input:

- corrective feedback study
- elicited imitation study
- interlanguage analysis of narratives

As these three studies are described in detail and readily available elsewhere (Hansen 2005; Bigelow, delMas, Hansen & Tarone 2006; Tarone, Swierzbin & Bigelow 2006; Bigelow, Hansen & Tarone 2007; Tarone & Bigelow 2007; Tarone, Bigelow & Hansen 2009), in this paper I will simply summarize their overall design and briefly present their results and conclusions.

We gathered the data for all three parts of this study at the same time in 2003–04 from the same group of 35 low-literate participants. My co-researchers had previously spent a year engaging in a variety of activities in this community, which included tutoring, support for a youth soccer team, and a range of community events. Our participants were 15–27 years old, and were members of a large community of Somali immigrants living adjacent to the University of Minnesota in Minneapolis. All 35 participants were reading English at a range of levels one would normally expect of elementary school students. Their oral English was noticeably fluent, confident, and pragmatically adept, in spite of containing a range of morphosyntactic inaccuracies. To more precisely establish their literacy levels, we administered the Native Language Literacy Screening Device in both Somali and English, and assigned each participant a quantitative score ranging from 1 (lowest literacy) to 9 (highest literacy) in Somali and in English, using a rubric we designed. Based on those scores, we selected two groups of learners for further study: the four least-literate participants (mean literacy scores of 3.5–6) and the four most-literate participants (mean literacy scores of 8–9). These two groups were well balanced in terms of years of schooling, oral scores on the SPEAK test, and age, and minimally different in terms of gender. It is interesting that years of schooling did NOT always correspond to measured literacy levels, validating our decision to empirically establish literacy levels using an objective measure.

We compared the performance of the low-literate and the moderate-literate groups on (i) corrective feedback tasks focused on English question formation, (ii) elicited imitation tasks with English questions, and (iii) their use of several interlanguage forms in oral narrative tasks. As set out above, the overall goal of the three-part study was to obtain initial empirical data to establish whether overall oral language processing outcomes of low-literate L2 learners might be different from those of considerably more literate learners performing similar oral language tasks in published SLA research. In addition, we asked whether within-group differences in literacy level could be shown to have significant effects on the oral language processing outcomes of these participants on all three parts of the study. Below we summarize data collection, data analysis and results for the corrective feedback, elicited imitation, and interlanguage analysis parts of the study.

3.1 Corrective feedback

The corrective feedback part of the study (Bigelow et al. 2006) was a partial replication of Philp (2003), a study that was originally carried out with university students who were learners of

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L2 English. Philp's study focused on the learners' responses to corrective feedback provided in response to their errors in English question formation. Using Pienemann, Johnston & Brindley's (1988) proficiency framework to focus on six stages of acquisition of English questions, Philp studied the factors influencing these learners' accuracy of recall of recasts of their questions that were provided in response to their errors. Her findings showed that the recall accuracy of these highly literate learners was significantly affected by their own proficiency level, the length of the recast, and the number of changes made in the recast relative to the original error. The longer the recast, the more changes made by the recast, and the lower the participant's proficiency level, the less accurate the participants' recall was. Philp concluded that these factors affected the learners' ability to NOTICE the difference between their initial questions and the corrections provided in the recasts.

We partially replicated Philp's study, using its task design and data collection methodology, which was entirely oral and required absolutely no reading on the part of the participants. We examined the impact of two of the three variables she did – recast length and number of changes in the recast – on recall accuracy. All our participants were placed at the same proficiency level with regard to question formation, following standard procedures used in Philp's study, so we could not examine the impact of proficiency level. We added a literacy variable unexamined in Philp (2003) but important for reasons outlined above – whether the participants were low-literate or moderately-literate. Because we had few participants, we measured the statistical significance of the relationships among these variables using the exact permutation test (Effron & Tibshirani 1993: 210), which is commonly used under similar conditions in other fields.

An overall comparison of the results of our study with those of Philp (2003) shows some interesting patterns. Our results were the same as Philp's in one regard: the number of changes made in the recast affected the accuracy of the recall of our less literate learners (in both groups) just as it affected recall by Philp's participants. However, it is interesting that the length of the recast was not statistically related to accuracy of recall in our study, in contrast to Philp's. We have considered elsewhere the possible reasons for this lack of relationship between recast length and recall accuracy among our participants, but we feel more research is needed to find whether these reasons are related to the overall lower literacy level of our learners.

We found the most interesting results in our within-study analysis examining the impact of differences in literacy level on accuracy of recall. As noted earlier, our low-literacy group had mean literacy levels of 3.5–6, and our moderate literacy group had mean literacy levels of 8–9. The moderate literacy level group performed better in overall accuracy of recall than the low-literacy group ($p = .043$). The moderate literacy group also did much better on recall when the recasts presented two or more changes to their original question form ($p = .014$).

In Tarone & Bigelow (2007), we used a more qualitative methodology to examine in detail one of these participants' responses to our recasts. This analysis shows that the learner had repeated difficulty noticing and repeating recasts involving changes in word order (e.g., changing *Why he is mad?* to *Why is he mad?*). Such changes in word order do not change the meaning of the original utterance. But we also observed that the same learner seemed to have no difficulty noticing and accurately recalling corrective feedback that supplied a new vocabulary word (*jar*). Indeed, he spontaneously used this word later in the conversation, suggesting that he also may have acquired it. This analysis suggests that recasts focused

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on changes to language form were not noticed by this low-literate learner, while corrective feedback focused on meaning were not only noticed, but learned.

Bigelow et al. (2006) conclude that these findings are consistent with the research and interpretations articulated in section 2 above – alphabetic literacy appears to improve one's short-term memory for language. Alphabetic literacy can help L2 learners to notice language forms present in oral L2 input that differ from forms they themselves produce, and particularly to notice formal differences that do not affect meaning. As Reis & Castro-Caldas (1997) state, alphabetic literacy provides a visual tool that can be used in cognitive processing to enable individuals to do phonological processing of oral input, in addition to the semantic processing done by illiterate and literate people alike.

3.2 Elicited imitation

The elicited imitation part of the study (fully reported in Hansen 2005) is patterned on numerous elicited imitation studies in SLA that have heretofore been carried out exclusively with literate L2 learners (Bley-Vroman & Chaudron 1994). As in the first part of the study, we used Pienemann et al.'s (1988) proficiency framework to focus on the learners' production of various stages of English questions. This part of our study explored the impact of literacy level on accuracy of recall of English questions in both elicited imitation (EI) and recast tasks. We speculated that the elicited imitation task would require more phonological processing in short-term memory than the recast task because the recast task provides a more meaningful context and more support for semantic processing.

In the EI part of our study, the learners had to recall decontextualized, sentence-level L2 questions that the researcher read to them. Each learner heard the same 28 questions (each one eight syllables long, at different question stages), with each question semantically unrelated to the one preceding it. Because the learners did not know what question to expect from one to the next, we hypothesized that they would need to rely more on phonological processing than semantic processing in recalling them. In the recast task – because learners were recalling corrected forms of L2 questions they themselves had initiated in contextualized, meaningful interaction – we thought their use of semantic processing might be more helpful than in the EI task. We predicted that the less literate learner group would have more difficulty recalling questions in the EI task than the moderate literate learner group would, and that the performance of both groups would be worse on the EI task than on the recast task.

The results of this part of the study generally upheld our predictions. The moderately literate group recalled questions more accurately than the low-literate group on both tasks. Exact permutation analysis showed that the difference in performance between the moderate and low-level literacy groups approached significance on the EI task at $p = .057$, and was highly significant on the recast task at $p = .014$. Both groups found the EI task significantly more difficult than the recast task, at $p = .008$.

We concluded that alphabetic print literacy appeared to promote better recall of oral L2 question prompts in both recast and EI tasks. The moderately literate group recalled questions better than the low-literacy group no matter what the task, a difference that was most pronounced on the recast task. Possible explanations point to an interaction among

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literacy skills, short-term memory (see Baddeley 1986), the impact of literacy on brain activity, and contextual factors.

3.3 Interlanguage analysis

The third part of our study (fully reported in Tarone, Swierzbin & Bigelow 2006) focused on morphosyntactic forms produced by the study participants in oral narrative tasks. We asked whether the two literacy level groups used the same morphemes and syntactic forms in producing the same narratives. We were particularly interested in their use of semantically redundant grammatical morphemes, and also in the syntactic complexity evidenced in their story retells. Would low-literate learners use fewer 'variational features'? These are the semantically redundant grammatical morphemes previously identified in large-scale SLA studies that included unschooled learners (Clahsen, Meisel & Pienemann 1983). This study did not explicitly measure the literacy levels of these L2 learners, as we did in our study. We wondered whether the literacy levels of our participants might correspond to their use or omission of semantically redundant morphemes in English (e.g. plural *-s*, third person singular *-s*, past tense *-ed*). We also wondered if sentence complexity would be related to literacy level; more complex syntax might be harder to process without an ability to visualize it.

This third part of our study focused on grammatical forms produced in narrating stories based on an examination of a series of pictures. To look at the impact of literacy level on use of semantically redundant morphemes, we compared the two literacy groups in terms of:

- their use of 'bare verbs' – that is, verbs with no morphological marking at all – vs. verbs with morphology (*-s*, *-ed*, etc., whether or not accurate)
- their supply of plural *-s* on regular nouns vs. use of 'bare nouns'

To look at the impact of literacy level on sentence complexity, we compared the two groups with regard to number of relative clauses, noun clauses, and clauses expressing causality with *because*, *so*, or *since*. Because there were such small numbers of all these grammatical forms produced by both literacy groups, we did not conduct a quantitative analysis to assess the significance of differences between the groups' performance. Here we report observable trends.

Both groups used many 'bare verbs', with the low-literacy group appearing to produce more of these (205/351, 64%) than the moderate literacy group (230/458, 50%). Example (1) displays this difference in use of 'bare verbs':

(1) Najma: (low literacy): Her mother they *say*, "We going right now. . ."
Faadumo: (moderate literacy): Her mom *says*, "Come in now, in a car."

There was considerable difference between the two literacy groups in their use of 'bare nouns', unmarked regular plural nouns. The low-literacy group failed to use add *-s* to regular plural nouns considerably more (36/69, 52%) than the moderately literate group (13/57, 23%). But we also noticed considerable individual variation in the use of this morpheme, so larger-scale studies are needed.

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Sentence complexity varied between the two literacy groups as well. For example, the moderate literacy group used more dependent clauses and clauses with *so* than the low-literate group (131 versus 72). Where the moderate literacy group used 28 relative clauses in their narrations, the low-literacy group used only eight. But the study of sentence complexity is complex, and we would need a considerably larger group of participants, and possibly a longer stretch of time, to really tease apart and test these apparent differences in syntactic complexity related to literacy level. For now, it is enough to say that this part of the study looked into this aspect of learner language use, and found some trends that are consistent with our other findings documenting the relationship between alphabetic print literacy and oral L2 processing. Specifically, if L2 learners with low literacy are less likely to notice semantically redundant language forms in the input, then they are probably less likely to acquire those forms over time. And complex syntactic patterns whose processing may benefit from the ability to visualize their constituent elements may also be acquired more easily by more literate learners. But conclusions on these last points must await further, more rigorous study by SLA researchers. The urgency of such studies cannot be overestimated, given the increasing numbers of illiterate and low-literate L2 learners world-wide who are entering educational institutions in the developing and developed worlds alike.

4. Conclusion

In this paper, I have reviewed research in cognitive and experimental psychology showing that the acquisition of grapheme–phoneme correspondence – the ability to associate a phoneme and a visual symbol – changes the way oral language is processed.

The relevance of these findings for SLA has been established through a summary of a three-part study on oral L2 processing, a partial replication of previous SLA research in a population of low-literate adolescent Somali learners of English L2 in the US. The findings of all three parts of the study support the paper's contention that alphabetic print literacy level has such a significant impact on oral L2 processing that existing research cannot be assumed to apply across the board to illiterate and low-literate L2 learners. The paper concludes with a call to SLA researchers, at every level, to identify current SLA studies and findings that can be replicated with populations of learners who have little or no alphabetic literacy, and then to carry such studies out with the utmost urgency, given the increasing numbers of illiterate and low-literate L2 learners in our midst.

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