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Learning to read for the first time as adult immigrants in Finland: Reviewing pertinent research of low-literate or non-literate learners' literacy acquisition and computer-assisted literacy training

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Against the backdrop of increasing global humanitarian migration to highly literate countries and the resulting necessity and challenge to provide language and literacy education to non-literate or low-literate adult second language (L2) learners, this article calls for more research on a new population of late literacy learners, particularly in Finland. The article begins by outlining the pressing necessity for research on this special group of L2 learners who has traditionally been ignored by Second Language Acquisition (SLA) research. It will then go on to illuminate essential components of developing reading literacy, drawing on relevant previous research on pre-literates. Further, the role of orthography, in particular the shallow transparency of the Finnish language, are critically examined with regard to alphabetic literacy. As adult non-literacy is a relatively new phenomenon in the highly literate society of Finland, there is a scarcity of research on how non-literate adults acquire Finnish. Growing academic interest and emerging Literacy Education and Second Language Learning for Adults with little or no schooling (LESLLA) research in Finland, with focus on reading literacy skills, is presented and discussed. The article highlights the possibilities of technology to enhance the individual literacy process for LESLLA learners and presents the Digital Literacy Instructor (DigLin) as one technology-enhanced practice environment for the very first steps in learning to decode the alphabetic code. Finally, conclusions on LESLLA learners' late literacy acquisition and a future research perspective are drawn, emphasizing the potential of computer-assisted language learning (CALL).

Keywords: adult learner, alphabetic literacy, computer-assisted language learning, Finnish as a second language, late literacy, non-literate, Literacy Education and Second Language Learning for Adults with little or no schooling (LESLLA), reading, second language acquisition

1 A new population of beginning readers in Finnish

Finland has recently been ranked the world's most literate nation (Miller & McKenna, 2016) and for a long time, reading has not only been valued but even

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taken for granted by this highly literate society (Tammelin-Laine, 2011b, p. 67). In the past decade, however, Finland has seen an increase in a non-literate population, mostly due to immigration of low-literate or non-literate adults[1]. Upon arrival, this population is faced with the dual challenge of acquiring simultaneously both oral and literacy skills in a second language (L2). In Finland, the global refugee crisis in 2015 led to a hitherto unseen record number of 32,150 asylum seekers, the highest increase in all European countries, an impressive surge of 822% compared to 2014. Many of these adults, registering for the first time as asylum seekers, are from Iraq (63%), Afghanistan (16%), Somalia (6%) and Syria (3%); they lack previous education in their home countries and are thus low-educated, low-literate or non-literate (Eurostat, 2016; FIS, 2015). As the literacy rate for female refugees is particularly low, most non-literates are female adults (Wagner, 2000, p. 14)[2]. Being "one of the best predictors of competent functioning and active participation in literate societies" (Van de Craats, Kurvers & Young-Scholten, 2006, p. 13), literacy, "the ticket of entry into our society" (Bialystok, 2001, p. 152), is seen to prevent social exclusion.

Reading and writing skills are commonly defined as literacy skills (UNESCO, 2005, p. 149). It is, however, beyond the scope of this paper to exhaustively define *literacy*, "a complex and dynamic term with many different definitions and interpretations" (UNESCO, 2005, p. 147). In the present paper, a review of research focusing on basic L2 reading skills of adult immigrants with little or no L1 literacy, i.e. LESLLA learners, is presented. The acronym *LESLLA* stands for Literacy Education and Second Language Learning for Adults with little or no schooling prior to learning a second language[3]. The term *reading literacy* is employed to emphasize the focus on this paper on the process of learning to read, its initial stages and development (see Netten, Droop & Verhoeven, 2011, p. 414). Basic reading skills include the ability to blend sounds and fundamental letter/word recognition skills.

The aims of this review are the presentation and discussion of relevant research on

1. literacy acquisition of low-literate or non-literate learners,
2. LESLLA research in Finland,
3. computer-assisted language learning and two practical implementations relevant for LESLLA learners and teachers in Finland.

The following section functions as an introductory literature overview to reading research of pre-literates, including children and non-literate adults. Section 2.1 focuses on cognitive mechanisms that facilitate pre-literate learners' development of reading literacy. The role of orthographic transparency and relevant research, focusing on Finnish, are discussed in 2.2. In section 3, the set-up of the conducted literature search is followed by a descriptive review of the most relevant current studies on LESLLA literacy research in Finland. In section 4, benefits of *computer-assisted language learning* (CALL), particularly for LESLLA learners of Finnish, are highlighted and two CALL applications for literacy intervention are presented. Concluding remarks are provided in the final section.

2 Emergent reading literacy of pre-literates

Wagner (2004) states that while language learning "is natural for nearly all humans" (p. 239), literacy is not. This claim has been reinforced by Bialystok (2001)

highlighting that "without special tutelage, it may not occur at all" (p. 155) and further stressing that as written text is a symbolic system for spoken language, beginning readers need to develop an understanding for this representation. Only after "the reader has seen it on paper" can language become "an object of reflection" (Kurvers, 2015, p. 74). However, mere input is on no account sufficient for developing literacy. Beginning readers need to become aware of the encoding of language and its different phonological, syntactic, morphological, lexical components, as well as train word recognition skills. The encoding of spoken language in a writing system requires the reader to "make links to language at the morphological and morphemic level" (Perfetti, 2003, p. 3).

The following sections introduce essential factors for the development of reading literacy. Both cognitive as well as language-specific features are presented and discussed further in the next section.

2.1 Cognitive processes involved in reading acquisition

2.1.1 Metalinguistic awareness – Awareness of spoken language

The ability to identify, analyse and manipulate language units is crucial in the process of learning to read. Beginning readers need to make conscious "links between a language and its writing system" (Koda, 2007, p. 2). To do so, *metalinguistic awareness* of structural units of spoken language is employed, enabling the reader to segment words into phonemes, syllables and morphemes. Metalinguistic awareness has been described as the "conscious reflection on, analysis of, or intentional control over various aspects of language" (Karmiloff-Smith, Grant, Sims, Jones & Cuckle, 1996, p. 198), including phonology, semantics, morphosyntax etc. Pre-literate children have been found to develop metalinguistic awareness by the age of three (Young-Scholten & Strom, 2006, p. 47). Ramachandra and Karanth (2007, p. 173) acknowledge the challenging nature of metalinguistics research, yet also stress its prominence due to its connection to reading acquisition of both pre-literate children and adults (p. 175).

Pre-literate adults have been the subject of sizeable research particularly on *phonological awareness*, i.e. the ability to manipulate sub-lexical units like onset-rhyme, syllables, or phonemes (Kurvers, Van Hout & Vallen, 2006, p. 70). Several studies investigated adult pre-literates' phonological awareness of various languages (L1s and L2s) including Portuguese (Morais, Cary, Alegria & Bertelson, 1979; Morais, Content, Bertelson, Cary, & Kolinsky, 1988), French (Gombert, 1994), Spanish (Adrian, Alegria, & Morais, 1995), Serbo-Croatian (Lukatela, Carello, Shankweiler, & Liberman, 1995), Turkish (Durgunoğlu & Öney, 2002), Dutch (Kurvers, 2002) as well as Hindi and Kannada (Ramachandra & Karanth, 2007). To date, no study has investigated phonological awareness of adult pre-literates learning Finnish as a L2.

Morais et al.'s (1979) early study on non-literate L1 Portuguese speakers demonstrated that "the ability to deal explicitly with the phonetic units of speech is not acquired spontaneously" (p. 330) and underlined the reciprocal relationship between learning to read and the development of phonetic awareness. Gombert's (1994) study on North-African L2 French LESLLA learners confirmed and extended the results of Morais et al.'s later (1988) study. It was found that phonological, phonemic and *lexical awareness*, i.e. the ability to separate language forms from their meaning and to segment sentences along word boundaries (Kurvers et al., 2006, p. 70), are by-products of learning to read, as the effect of

metalinguistic training for both low-literate and particularly for non-literate participants was very powerful.

Kurvers (2002) aimed to establish whether metalinguistic knowledge was a developmental consequence or mainly caused by systematic literacy acquisition and compared the metalinguistic abilities of both pre-literate children, non-educated adults and low-educated adults. Her study discovered that the metalinguistic potential of pre-literates, both adults and children, was strikingly similar. Pre-literates have a common source of difficulty, *phonemic awareness*, and use semantic instead of linguistic strategies to segment sentences (Kurvers, 2015, p. 74). Research has credibly shown that both pre-literate children and adults perform poorly in segmenting words into phonemes. The main reason for this is that phonemic awareness develops only through reading instruction in an alphabetic script (Young-Scholten & Strom, 2006, p. 62). In turn, alphabetic print literacy facilitates phonemic awareness for both children (Goswami & Bryant, 1990, p. 26) and adults (Pettitt & Tarone, 2015, p. 21).

Durgunoğlu and Öney (2002) found in their longitudinal study on pre-literate adults' literacy development that "literacy acquisition progresses in remarkably similar ways in children and adults, at least in the context of Turkish" (p. 262). These findings in turn support Kurvers et al.'s (2006) literacy hypothesis predicting differences between readers and non-readers, regardless of their age, emphasizing the fact that literacy more than cognitive or linguistic development contributed to the development of metalinguistic abilities (Kurvers, 2015, p. 64). Regarding the comparability of adults' and children's cognitive capabilities, Young-Scholten and Strom (2006, p. 45) stress that the lack of empirical studies makes it complicated to determine whether unschooled L2 adults have the same reading potential as pre-school children. Likewise, Durgunoğlu and Öney (2002, p. 248, 261) state that due to inadequate data, cognitive processes can only be assumed to be similar in literacy acquisition and are comparable only to some degree, as, for example, sociocultural factors need to be considered as well.

2.1.2 Word recognition – Cracking the alphabetic code

Crucial for successful reading development are not only the awareness of linguistic units, such as words, but also the ability to recognise these quickly and accurately (Kurvers, 2015, p. 65). Early *word recognition skills* are regarded as a major predictor of later reading comprehension, as only learners that had reached the orthographic stage "were able to makes sense of the meaning of the written discourse" (Kurvers, 2015, p. 75). Most researchers agree on word recognition being an essential skill in the development of reading; there are, however, contrasting views on the learning processes involved (Kurvers, 2007, p. 23).

The two most common models of beginning reading development are the *stage models* and *non-stage models*, both based on initial reading of children and disputed amongst researchers (Van de Craats et al., 2006, p. 14)[4]. Even though models vary in detail in their description and identification of sub-stages, Kurvers (2007) stresses that many models support the view of "a sequence of rather uniform stages" (p. 23) in which cracking the alphabetic code, making grapheme-phoneme correspondences and blending the phonemes, are considered essential (Kurvers, 2015, p. 65). The stage model proposes a first stage of direct word recognition (*logographic stage*), followed by indirect word recognition (*alphabetic stage*) and a third stage of automatized direct word recognition (*orthographic stage*) (Van de Craats et al., 2006, p. 14). Even though stage models vary in their details, previous research confirms that discrete stages are involved in the development of word recognition (Kurvers,

2007, p. 40). Kurvers and Van der Zouw's (1990, p. 35) study found that adults seem to follow the same stages in the process of learning to read as children.

Young-Scholten and Strom (2006, p. 47) point out that not all beginning readers are equally successful at cracking the written code for spoken language. Acquiring *alphabetic literacy*, i.e. "the ability to decode and encode alphabetic script, mainly at the word, phrase and sentence level" (Tarone, Hansen & Bigelow, 2013, p. 180), can be a laborious endeavour for pre-literate children and adults for whom language is "a medium of communication" not an abstract system with "elements that can be parsed into structural units" (Kurvers et al., 2006, p. 84). Beginning readers must first recognize *which* spoken elements are encoded in the writing system (*the general mapping principle*) and then infer *how* they are encoded (*the mapping details*). The mapping details are language-specific and different writing systems stipulate different ways of segmenting language (Koda, 2007, p. 12).

In addition to understanding the alphabetic principle, beginning readers, both children and adults, need to develop lower-level rapid, automatic decoding skills to progress to a higher level of reading, for which comprehension and interpretation skills are needed (Grabe, 1991, p. 383). Unlike L1 children, who have been obtaining a large receptive vocabulary before embarking on their reading endeavour, beginning LESLLA readers are equipped with a minimal L2 vocabulary. Acquiring decoding and blending skills is not enough for LESLLA learners to become competent readers as vocabulary development is a critical component of reading comprehension (Grabe, 1991, p. 380). After the consolidation of the basic reading skills, functional reading requires a L2 vocabulary of 2000–7000 words (Grabe, 1991, p. 392). Regarding Finnish, an agglutinative language with many suffixes and stem changes, long multisyllabic words consequently complicate the word recognition process. Niemi, Laine and Tuominen (1994, as cited in Aro, 2004, p. 14) emphasize that due to different combinations of the 15 case markers in Finnish, the plural marker and various clitics, any noun can have over 2000 orthographic forms and 150 so called core-forms. For a detailed account of an example see Karlsson (1996) who generated a list of 2253 possible orthographic forms of *kauppa* 'shop', e.g.

> *kauppa-kin* 'the shop too' NOM SG KIN, *kauppa-ni* 'my shop' NOM SG SG1, *kauppa-ni-kin* 'my shop too' NOM SG SG1 KIN, *kaupa-t-kin* 'shops too' NOM PL KIN, *kauppa-ni* 'my shops too' NOM PL SG1, *kaupa-ssa-kin* 'in the shop too' INE SG KIN, *kaupa-ssa-ni-kin* 'in my shop too' INE SG SG1 KIN, *kaupo-i-ssa-ni-kin* 'in my shops too' INE PL SG1 KIN, *kauppa-a-ni-kin* 'to my shop too' ILL SG SG1 KIN[5].

Aro and Wimmer (2003) noted in their cross-language comparison study on children's reading development that "a larger number of phonemes have to be assembled in a coherent pronunciation than in any other orthography" (p. 625. Compared to the opaque and complicated morphology, Finnish orthography is in fact very transparent and simple (Aro, 2004, p. 14). The role of orthographic transparency as a crucial, language-specific factor in reading acquisition is discussed in the following section.

2.2 The role of orthographic transparency – a language-specific factor in literacy acquisition

With regard to literacy in an alphabetic script, it is vital to scrutinize "the set of rules for using a script" (Cook & Bassetti, 2005, p. 3), as orthography reflects "a

unique relationship to its language's structural characteristics" (Katz & Frost, 1992, p. 2) and conveys both phonologic and morphologic information (Katz & Frost, 1992, p. 6). In a sound-based writing system, such as the Roman alphabetic writing system, graphemes represent phonemes, whereas graphemes of other writing systems represent consonants, syllables or morphemes (see Cook & Bassetti, 2005, p. 5). It is important to note that low-literate LESLLA readers with some degree of familiarity of their L1 non-alphabetic writing system such as Arabic are not able to benefit from a positive transfer of L1 literacy skills as alphabetic and non-alphabetic writing systems require different metalinguistic awareness (Cook & Bassetti, 2005, p. 42). Writing systems are not only defined according to their representation of language units, but also placed on a continuum of orthographic depth, also known as *phonological/orthographic transparency* or *orthographic regularity* (Cook & Bassetti, 2005, p. 7, 13). According to Lyytinen, Erskine, Hämäläinen, Torppa and Ronimus (2015, p. 331) "transparency of a writing system refers to the consistency of links between sounds or phonemes in speech and the graphemes (letters, letter clusters) that represent them in the text". Finnish is one of the orthographically most transparent languages with an almost entirely phonemic alphabetic orthography, consistent grapheme-phoneme correspondences and a small number of phonemes. The phoneme /ŋ/ constitutes the only exception not being marked with a corresponding single letter.

Seymour, Aro and Erskine (2003) tested early child reading acquisition in 13 languages including Finnish. They found that the development of basic reading skills in orthographically inconsistent languages (e.g. English) seems to take twice as long compared to the reading acquisition in orthographically consistent languages (e.g. Finnish). It was concluded that literacy acquisition in a shallow orthography is apparently based on a single (alphabetic) process, whereas acquisition of a deep orthography requires the formation of a dual (alphabetic + logographic) foundation (Seymour et al., 2003, p. 168). As a result, the divergence in literacy acquisition rates was directly attributed to orthographic depth leading to the employment of a single process for shallow orthographies or distinct processes in deep orthographies. Similarly, Elley (1992) found that Finnish pupils, aged 9 and 14, showed the highest reading literacy levels compared to pupils in other countries. While orthographic regularity was not seen to be the main reason for diverging literacy levels (Elley, 1992, p. 41)., it was emphasized that the influence of orthography could not be totally ruled out for Finnish with its "unusually regular orthography" (Elley, 1992, p. 52).

Aro (2004) claims that "a reader is able to decode practically any Finnish word" (p.14) with grapheme-phoneme knowledge and phonemic assembly skills, emphasizing that "from the perspective of literacy acquisition, the Finnish orthography is in many ways optimal" (p. 15). The transparency of the Finnish orthography with its small set of grapheme-phoneme correspondences seems to enhance children's reading acquisition, as previous studies have consistently found that basic word decoding skills are easily acquired by L1 Finnish children (Lerkkanen, 2003, p. 23). Basic decoding and reading comprehension skills are acquired quickly, generally at the age of seven, during the first school year. There is even a considerable proportion of pre-schoolers (17–38%) who have already acquired reading skills without formally being taught (Lerkkanen, 2003, p. 25). Durgunoğlu and Öney (2002, p. 24) report that children learning to read in Turkish, with an orthographic transparency similar to Finnish, also develop good

decoding skills after six months of instruction even though teaching methods do not acknowledge the orthographic transparency. The orthographic transparency is considered as the main factor for the quick development of decoding proficiencies (Durgunoğlu & Öney, 2002, p. 261).

Learning to read in an orthographically very shallow language such as Finnish or Turkish appears to be relatively easy which in turn may lead to the assumption that all one needs are sound-letter correspondences and the ability to blend sounds into words (Tammelin-Laine & Martin, 2015, p. 53). Nevertheless, it is vital to keep in mind that in contrast to L1 children, beginning L2 readers, including both children and adults, are faced with the challenge "of learning to read in a language that they have yet to master" (Droop & Verhoeven, 2003, p. 78); and particularly LESLLA readers are faced with the challenge of mastering both oral and written L2 skills at the same time. Tammelin-Laine and Martin (2015) identify the claim that "Finnish is written the way it is spoken" as a common misconception, pointing out that "the textual structure of speech is not the same as the structure of writing, the syntax is different, and many spoken words are seldom written and vice versa" (p. 40). Tammelin-Laine and Martin (2015) emphasize further that even in cases of regular grapheme-phoneme correspondences "mere knowledge of the letters is not enough to trigger their ability to blend sounds" (p. 39).

Due to the relative lack of research, the hypothesis that orthographic transparency facilitates reading has not been conclusively confirmed. According to Aro (2004, p. 9) this is "somewhat surprising, since knowledge of the problems caused by irregular orthography is not new". Previous research by Seymour et al. (2003) and Elley (1992) suggests that orthography plays a role in early literacy acquisition, especially regarding difficulties of reading acquisition, making reading either easier for transparent orthographies or more difficult for more opaque orthographies. On the other hand, Geva and Siegel (2000, p. 1) point to the on-going debate amongst researchers whether acquisition of reading skills is dependent on orthographic transparency (*script dependent hypothesis*) or interdependent on orthographic transparency, but subject to cognitive processes (*central processing hypothesis*).

The following section describes the set-up and results of the literature search which was conducted for this paper to establish the extent of current LESLLA research in Finland.

3 Evolving research on LESLLA literacy in Finland

According to Tammelin-Laine (2011b, p. 76), little research has been done on how non-literate adults acquire Finnish as "adult non-literacy is a new phenomenon in Finland". To establish the current state of academic LESLLA research in Finland, a specific literature search was carried out electronically[6]. This electronic literature search, employing the key terms *maahanmuuttaja* 'immigrant', *aikuinen* 'adult', *lukutaito* 'literacy' and *lukutaidoton* 'non-literate', *suomen kieli* 'Finnish language', was conducted in the following 10 Finnish databases (Doria, Finna, Theseus, Lauda, UEF-Finna, Jyx, Oula-Finna, Journal, TamPub, Helka)[7]. Teaching material for LESLLA learners (e.g. Häkkinen, 2017) or professional development literature for LESLLA teachers (e.g. Laine, Nissilä, & Sergejeff, 2007) was not considered in this study. The international search conducted in the databases

EBSCOhost and SCOPUS employed the search terms *illiterate, Finnish, non-literate, low-educated* and provided only two publications (Tammelin-Laine, 2014c; Tammelin-Laine & Martin, 2015). An overview of studies identified as relevant to current LESLLA research in Finland, including descriptions and summaries of methodology and main results of the studies, is presented in Table 1 below.

Table 1. Detailed description of pertinent studies of LESLLA research in Finland.

Study. Research type/ field. Research focus/question(s). *Catalogue listings.* **Further publications** relating to this study	Set-up and analysis	Study participants	Relevant main findings and results
Halme (2008). Unpublished MA dissertation, Finnish and General Linguistics. Written language skills of non-literate adults after 6 month of Finnish literacy training. *Doria, Finna.* **Halme (2009).** *Finna, UEF-Finna, Oula-Finna.*	Cross-sectional study. Qualitative analysis. Written tests to test listening and reading comprehension, writing and vocabulary skills. The tasks included 1. dictation (8 sentences + 4 picture-sentence matching tasks) 2. a true/false picture-sentence matching task (12 pictures/sentences) 3. a collocation task 4. a lexical decision task (8 real-words and corresponding sets of 3 non-words) and written tasks including 6. continuing a sentence (6 sentences) and 7. describing a picture (Halme, 2008, p. 6; Appendix 1, pp. 2/8–7/8).	8 female participants. -4 participants from Thailand, L1 Thai: Kanya, aged 28, L2 English, 24 months residency in Finland (R24)/10 months Finnish language training (F10); Mai, L2 English, (R8/F6); Talap, 38, L2 English, (F6); Jaidee, (R ca. 24/6). -1 participant from Nepal, the L1 of the Nepalese participant Anju, 43, (R30/F10), is not reported. -1 participant from Iraq, Safiyah, 23, (R11/F6), stated Arabic and one participant from Iran, Simin, 35, (R48/F6), reported Kurdish as her L1. -Pashto was the L1 of participant Mahira (R28/F6) from Afghanistan.	Significant individual differences in achieving basic literacy achievement. A high discrepancy was found between the results of the strongest and weakest participant. -Four participants displayed emerging functional reading skills, while three participants did not reach the threshold of basic mechanic reading skills. -One participant understood the principle of alphabetic literacy but was not able to read independently.
Heikkinen (2009). Unpublished MA dissertation, Finnish language. Written and oral language skills of non-literate adults after 6 months of Finnish literacy training. *Doria, Finna.*	Cross-sectional study. Qualitative and Quantitative analysis. Oral interview to measure participants' oral skills. Written tasks comprised, additionally to two tasks previously	12 female participants. -All 4 participants from Africa (two from Somalia, L1= Somali; one from Congo, L1= Lingala and one from Sudan. The L2 of the Sudanese participant was reported to be *sylyk* in Finnish, a	Strong development of oral skills and the results in all tasks improved. This performance was attributed partly also to the group's homogeneity. -Only one participant was not able to make grapheme-phoneme correspondences and blend sounds.

	developed and employed by Halme (2008), also of 3. a dictation task and 4. a recognition task of grapheme-phoneme correspondences in diphthongs (Heikkinen, 2009, pp. 37–38). For the test exercises, including Halme's tasks (2008), see Appendix 1 (Heikkinen, 2009, pp. 114–119).	translation into English could not be found.)were L1 non-literate. -The other 8 participants were literate in their L1 employing a non-Roman alphabet including Punjabi, Tamil, Vietnam and Thai. -All 5 Thai participants reported to have a Finnish-speaking partner.	
Jurvela (2016). Unpublished MA dissertation, Finnish language. The use of LESLLA learners' gestures, their functions and copying in literacy classrooms. *Tampub.*	The analysis was limited to examples where the participants imitated gestures of demonstrative or descriptive nature.	Audio-visual material (165 min) has been gathered during adult immigrant literacy lessons and transcribed displaying the participants' voice, its speed, pitch, pauses and volume, participants' laughter, direction of the participants and the gestures.	Participants imitated gestures when solving comprehension problems, making comments on what they read, expressing and justifying their opinions.
Kärki (2014). Unpublished MA dissertation, Finnish language, Functional Pedagogy. Surveying what kind of learning material teachers look for (needs assessment). Creating learning material based on the results of the needs assessment and testing it with learners. *Finna, Jyx.*	Semi-structured oral interviews. Content analysis and thematic categorizing. The learning material was tested with five groups of learners of varying abilities.	3 teachers were interviewed.	The interviewed teachers were not content with the available teaching material. They reported to create most of their teaching material themselves. -The lack of social topics was reported to be the greatest problem regarding listening comprehension material and regarding oral skills, the teachers stressed everyday survival skills. -Based on the results of the survey, listening comprehension tasks were devised and tested. -It was found that task instructions were the greatest obstacle, therefore the learners were familiarized with the instructions which they learnt rather quickly. -Overall, this study emphasizes the need for more LESLLA teaching material based on practical needs assessment.
Keski-Hirvelä (2008). Unpublished MA dissertation. Education.	Thematic interviews. Content analysis.	19 interviewees. -15 course participants aged	Most educational methods used in the training were mainly based on functional

Investigating the literacy education LESLLA students were offered and the study skills they acquired during a literacy intervention. *Theseus.*		29–57, length of residence in Finland 2–17 years, various L1s (Arabic, Turkish, Somali, Persian, Punjabi, Vietnamese, Thai), 13 interviewees, interviews lasting 20–30 min. -6 teachers, interviews lasting 1-2h (5 female, 1 male, three teachers aged 35–42 and three aged 50–55, three novice teachers and three teachers with over 10 years of experience).	pedagogy, but not all methods were seen to be successful. -The course participants reported that they had acquired skills beneficial for the integration in the Finnish society. Cultural knowledge, learning and professional skills were experienced to have improved. -For teachers, the major challenge was to identify the skills of the group and the individual student needs. The teaching material had to be applied separately to each group. Teachers found the identification of individual student needs crucial. All teachers perceived the identification of underlying causes, e.g. traumatic experiences, as particularly difficult. Further, teachers called for professional skills in special needs pedagogy. -Since the learning pace was very slow, the course, lasting 10 months, was found to be too short. All teachers reported the group size of 15 students as too big. The assessment of language skills and development was further criticized by four teachers.
Määttänen (2007). Development Project Report. Adult Education. This development project report, based on interviews with Finnish language teachers and a project coordinator, looked at an educational literacy project, its outcome and best practice and was assigned by the Social security office of the Finnish town of Savonlinna. *Finna, Theseus.*	Telephone interviews with educators and a project coordinator from the Employment and Economic Development Centre. This report is neither a quantitative nor a qualitative study, but a compilation of examples of LESLLA educators' teaching experience, good practice and suggestions for future improvement.	10 interviewees.	The best learning results were achieved in homogenous groups and educators wished to teach non-literate people in small homogenous groups of 8–10 learners. -The learning-by-doing method (*toiminnallinen oppiminen*) was perceived as useful. An interpreter should be used at the beginning to define individual learning goals. School assistants were also seen as necessary. -More realistic learning targets should be defined for older students and primary (L1) non-literate. Their learning targets should differ from secondary (L2) non-literate and young LESLLA learners. -Time was seen as the most important resource, as the learning pace was very slow. Many teachers expressed a wish for shorter school days (4 hours a day) and a longer

			duration of the courses, at least 1 school year, but up to 2-3 years in the same institution. -LESLLA students' feedback was not systematically collected, yet some students wished for more oral skill intervention. Students were interested in further education possibilities; however, no systematic follow-up was conducted after this pilot intervention. It appeared that younger students continued with other literacy courses while older students and mothers did not. -Teacher education does not answer the needs of LESLLA students and the availability of suitable teaching material is very low. Social security and employment officials and educators should cooperate in planning the education.
Mustaparta (2015). Unpublished MA dissertation. Social work. Investigating experiences of non-literate women in Finland, significance of literacy for the participants and participants' future hopes and plans. *Lauda.*	Oral interviews Content analysis	12 female participants. -5 participants from Somalia (Woman 1, aged 74; Woman 2, 28; Nainen 3, 32; Woman 11, 25; Woman 12, 22). -3 participants from Afghanistan (Woman 5, estimated age 50–54; Woman 6, 52; Woman 7, 68). -1 participant from Russia (Woman 4, 79). -1 participant from Thailand (Woman 10, 29). -2 participants from Africa, not further specified (Woman 8, 54; Woman 9, 24).	The lack of literacy among immigrant women relates to their gender and their weak social status in their home countries. In Finland, immigrant non-literate women are also more bound to the home than men who can learn the L2 better as they spend time outside their home. -Due to their lack of language and literacy skills, the participants are often dependent on their children. The lack of literacy skills complicates the orientation in a new environment, because LESLLA learners are not able to read street names or bus signs. -The complex and abstract language used in official letters is not only a challenge for LESLLA learners but also more advanced literate immigrants learning Finnish as a L2.
Myllymäki (2008). Unpublished MA dissertation. Finnish language. Surveying the need for professional development of adult immigrant language teachers in Middle-Finland.	Semi-structured oral interviews. Thematic analysis and categorizing.	19 teachers were interviewed.	Multiculturalism and intercultural competence emerged as the most important themes. Significant categories relating to professional development were further: student counselling, teaching methods, Finnish as a second language - studies, special needs of

Finna, Jyx.			refugees, LESLLA learners' instruction, curricula and their changes as well as student assessment.
Noorzadeh (2014). Unpublished MA dissertation. Finnish language. Clarifying whether the national literacy curriculum (FNBE, 2012) and course curricula emphasize one area of language skills, how well textbooks correspond to the objectives set by the curriculum and what types of literacy training pathways exist, in other words, how well goals are achieved. *Finna.*	Qualitative and quantitative study. Qualitative analysis was used to study the learning materials and curricula. Quantitative analysis was seen suitable for studying participants' educational pathway data.	3 curricula were investigated, including two from educational institutions in the Finnish municipalities of Tampere and Hämeenlinna and the national literacy curriculum for adult immigrants (FNBE, 2012). -The following four Finnish teaching materials for nonliterate (*Aasta se alkaa*, *Moi! Naapuri hississä)* and literate learners (*Suomen mestari 1)* were studied. -Data of 86 course participants' educational pathways were examined.	The new FNBE (2012) curriculum and the course curricula put a strong emphasis on oral skills. FNBE (2012) mentions, on several occasions, oral skills as preliminary to literary skills. This can be problematic, as students might be unmotivated to practice literacy skills if their oral proficiency is much stronger than their writing skills. -The textbooks correspond quite well to the content of FNBE (2012), although there are shortcomings. As FNBE (2012) emphasizes the role of oral skills, textbooks should provide tasks that sufficiently support and guide the learner how to communicate orally. The analysed textbooks do not emphasize oral skills but focus on mechanical reading and writing skills as well as vocabulary. Some key themes, such as leisure and employment, were missing. -Analysing data on students' educational paths is important to evaluate how well the curriculum goals are realized and how courses should be developed. The fact that 45 from 86 students continued to study was regarded as a good result. Age appeared to be a decisive factor determining whether students continued to study. -As education institutions providing literacy courses are required to follow the new FNBE (2012) curriculum, teaching oral skills is predicted to become even more prominent. This may result in students having more difficulties in continuing with more advanced literacy courses as they are not able to acquire sufficient basic literacy skills which they need to advance on their educational path. -A contradiction in the new FNBE (2012) and its practical

			implementation in literacy interventions was detected. Strong oral skills do not necessary enable students to study further.
Pöyhönen, Tarnanen, Vehviläinen and Virtanen (2011). Academic study investigating data of the development project *Participative Integration in Finland* (*Osallisena Suomessa*). Examining the discourse by civil servants and language educators about so-called adult immigrants with special needs. Main questions: 1. How are the aims and implementation of integration training (i.e. administrative responsibilities) discussed? 2. What kind of image of adult immigrants with special needs is construed in the discussions by experts? *Journal.* Key words: *aikuiset maahanmuuttajat* 'adult immigrants'.	37 written statements by civil servants on the development project amounting to ca. 100 pages. -Two recorded expert group discussions (in total ca. 4h) on the issues of counselling and training of adult immigrants. -The expert group discussions consisted of semi-structured focus group interviews. -Content analysis.	15 language teachers participated in the expert group discussions.	There was no shared or clear understanding of the aims of integration training for adult immigrants with special needs, which were either categorized as homogenous groups, e.g. stay-at-home mothers, or heterogenous groups, often grouped into opposing groups, e.g. academic vs. illiterate immigrants. -Pöyhönen et al. (2011) highlight that their results contrast Lainiala and Säävälä's (2010) study which examined non-literate, literate and academically educated immigrants' own views and opinions. The expert discourse examined by Pöyhönen et al. (2011) reflected only marginally the immigrants' own activity and agency. -Teaching LESLLA learners was perceived by teachers as arduous. This attitude might be a result of missing professional skills. In fact, LESLLA teaching is a relatively new pedagogical endeavour in Finland with a paucity of research and an unestablished pedagogical practice.
Tammelin-Laine (2014a). Doctoral dissertation. Finnish language. Usage-based and sociocultural approach to language learning (Lantolf & Thorne, 2006) and strong practical orientation. Describing and exploring the learning process of non-literate adult learners during their first L2 Finnish literacy intervention. Research questions: 1. How do the Finnish language skills (oral, reading and writing skills) of the participants develop during the observation	Longitudinal qualitative study with 4 different sub-studies. -In sub-study 1 the development and use of verbs in four participants' L2 oral Finnish skills were investigated. -In sub-study 2 interrogative utterances in three participants' spoken L2 Finnish were recorded and analysed. In addition to audio recordings, participants in sub-study 1 and 2 were	5 female participants. -Asra, 24, from Afghanistan, L1=Dari, L2=Farsi, 18 months in Finland. -Jamiila, 31, from Somalia, L1=Somali, 8 months in Finland. -Amina, 45, Afghanistan, L1=Dari, L2=Russian, 15 months in Finland. -Husna, 45, from Afghanistan, L1=Dari, 16 months in Finland. -Rana, 28, from Iran, L1 Sorani	The participants' oral and reading skills developed faster than their writing skills which developed very slowly. Verbs were used rather infrequently with only 22.7% of all the utterances produced without external help. Interrogative utterances (mainly yes/no questions, complex to express in standard Finnish) were mostly formed with rising intonation, not the most common question marker in Finnish but very common in the participants' L1s. -No participant achieved functional literacy, but some mastered the concept of grapheme-phoneme correspondences and word

period of ten months? 2. What kind of relationships can be detected between the development of these various skills? 3. What light does the research so far shed on how the learning of another language by non-literate learners differs from that of literate learners? *Finna, UEF-Finna, Jyx, Oula-Finna, Helka.* **Tammelin-Laine (2014b); Tammelin-Laine (2015); Tammelin-Laine and Martin (2016); Kela (2015)** in *Finna.* **Tammelin-Laine (2011a)** in *Finna, Jyx.* **Tammelin-Laine (2014c)** in *EBSCOhost (MLA International Bibliography).* **Tammelin-Laine and Martin (2015)** in *SCOPUS.*	also observed in the classroom. -Data of the third sub-study consisted of oral and written tests measuring decoding skills and reading comprehension. Results were quantitatively and qualitatively evaluated. -Sub-study 4 aimed at investigating typical features of emergent writing skills below the Common European Framework of Reference for Languages (CEFR) level A1.1 and was conducted as a case study with one participant.	Kurdish, L2=Farsi, 12 months in Finland.	formation by blending of letters. - "The study suggests that receptive vocabulary and phonological memory have some sort of relationship with the development of reading skills, but a wide vocabulary is not always a prerequisite for technical reading skills in an orthographically transparent language like Finnish." (Tammelin-Laine, 2014a, p. 84). -The 10-month language and literacy course (1400 hours of instruction) was deemed to be insufficient for achieving functional reading skills, or even consistent emerging literacy skills.
Vedenpää &Vierikko (2013). Unpublished Bachelor's thesis. Social work. Exploring what kind of challenges non-literate immigrant women in Finland face in their everyday lives and which strategies they employ to cope with these challenges, either independently or with the help of the others. *Theseus.fi*	Qualitative study. Thematic semi-structured, individual interviews focusing on the following topics: challenges in everyday life, strategies to overcome these and future dreams and plans. Content analysis.	6 female interviewees, aged 32–52. -4 participants from Afghanistan. -1 participant from Iraq. -1participant from Thailand. -All women had children, some of them born in Finland. One women had a Finnish husband. -The women's length of residence in Finland differed significantly, ranging from 1,5–14 years. Their oral Finnish skills were, however, regraded to be comparable in level.	The most significant challenges were understanding different kinds of communication with authorities (various letters or documents, making appointments, speaking Finnish on the phone), learning the language and communicating with others. -Expectations of the Finnish society differ from the cultures the women come from and can cause role conflicts. -Making new contacts, misunderstandings, the use of the English language, the lack of an open communication and cultural differences were further obstacles. Other challenges were related to finding time to study. The age of children also contributes substantially to studying. Individual challenges included e.g. own language skills not perceived as sufficient for independent activities, uncertainty about the use of language, lack of self-

			confidence or personal character traits. -Dependence on the help of others is common. In some cases, integration of family members has happened at a different pace and it can either delay or improve the integration of the women. However, the family turned out to be the most significant help in everyday life. -Language skills and social relations with the Finnish population provide opportunities to successfully integrate. Even though language learning was perceived as challenging due to the alphabet and vocabulary, learning the Finnish language was experienced as a key to improve the future.

The critical evaluation of the results of this electronic literature review showed that there is currently very little published research on how low-literate/non-literate adult learners acquire language and literacy skills in Finnish. Based on the results, 12 pertinent studies and 8 related publications were identified, as illustrated in Table 1. These studies offer valuable information about different aspects of low-educated immigrants' educational and everyday experiences in Finland. The aim of many studies has been to investigate LESLLA learners' educational aspects to develop literacy interventions in practice (Keski-Hirvelä, 2008; Kärki, 2014; Määttänen, 2007; Myllymäki, 2008; Noorzadeh, 2014; Pöyhönen et al., 2011). Two studies presented an account of low-educated female immigrants' experiences in Finland (Mustaparta, 2015; Vedenpää & Vierikko, 2013). The studies by Halme (2008), Heikkinen (2009) and Tammelin-Laine (2014a) provided significant findings on LESLLA learners' L2 written and oral language development. Tammelin-Laine's work was identified as seminal in emerging LESLLA research in Finland, being further the only one whose results had also partly been disseminated in English (Tammelin-Laine, 2011b; Tammelin-Laine & Martin, 2015, 2016). Tammelin-Laine's (2014a) longitudinal study examined the L2 acquisition, including reading literacy development, of five adult immigrants during their first 10-month long Finnish L2 language and literacy course. In a similar vein, the small-scale studies by Halme (2008) and Heikkinen (2009), comparable in their set-up and pool of participants, focused on the L2 language and literacy development of adult non-literate learners during an intensive literacy intervention of six months.

Halme (2008) examined the L2 Finnish skills of eight female non-literate adults (mean age 33.4, mean length of residence 23.3 months) and tested her participants' written skills after six months of intensive Finnish language training (see Table 1). The results of a dictation task suggest that the participants Safiyah (L1 Arabic) and Simin (L1 Kurdish) were not able to establish grapheme-phoneme correspondences, whereas the other six participants were found to have developed phonological awareness (Halme, 2008, p. 42). The reading comprehension task, read

aloud by the researcher, comprised of a true/false picture-sentence matching task with 12 sentences (with three to seven words) and accompanying pictures, e.g. *Pallo on laatikossa* 'A ball is in a box' (Halme, 2008, p. 45). Kanya from Thailand managed to match 10 out of 12 correctly and the other Thai participants also successfully matched over 40–58%, while Safiyah and Simin performed in less than a quarter of cases successfully (Halme, 2008, p. 46). The results of this small-scale study illustrate the enormous heterogeneity in basic literacy achievement of non-literate adults. While half of this study's participants succeeded, the other half did not. According to Halme (2008, p. 85) all participants were highly motivated, yet their literacy development was significantly curbed by their insufficient L2 skills, and it was consequently suggested to concentrate on teaching oral skills instead of literacy skills to support the learners' L2 development.

Heikkinen's (2009) study sheds light on the Finnish L2 literacy development of twelve female adult learners, aged 20 to 48, during a period of six months of intensive study (see Table 1). Heikkinen (2009) tested her participants on three occasions with the same written tasks at intervals of two to four months. Contrary to Halme's (2008) study, Heikkinen also conducted an interview to measure her participants' oral skills. Compared to Halme's participants, the mean length of Heikkinen's participants' residency in Finland was with 59.5 months considerably longer. The majority of Halme's participants had been residing in Finland for one to two years (Halme, 2008, p. 9), whereas most participants in Heikkinen's study had been staying between five to ten years in Finland (Heikkinen, 2009, p. 121). A strong development of the participants' oral skills was detected and the results in all tasks improved throughout the six-month testing period (Heikkinen, 2009, p. 81; 93). It is important to note that in contrast to Halme's (2008) participants, all but one of Heikkinen's participants were able to write words and sentences from the beginning of the observation period and performed significantly better (Heikkinen, 2009, p. 55, 63). This better performance was attributed partly also to the group's homogeneity. The oldest participant, Batulo, who had been in Finland for over 10 years was the only participant who was not able to make grapheme-phoneme correspondences or to blend sounds. However, Batulo's poor performance was partly also attributed to a lack of motivation to acquire literacy skills (Heikkinen, 2009, p. 81).

Contrary to Halme (2008), Heikkinen (2009, p. 9) found that the individual differences narrowed down as participants, who performed well at the beginning of the testing period, did not improve as much as participants who did not do that well at the beginning. Reasons for this development could not be detected, but the role of L2 use and input outside the classroom was emphasized as the oral test performances of participants with Finnish partners were particularly good (Heikkinen, 2009, p. 102). In a similar vein to Halme (2008), Heikkinen (2009, p. 195) also calls for more focus on oral skills as a significant correlation of oral skills and literacy skills was observed (Heikkinen, 2009, p.101).

Tammelin-Laine (2014a) explored in her study the development of Finnish L2 skills of five female adult immigrants, aged 24–45 (mean age 34.6), during a 10-month long literacy intervention. No participant had any L1 literacy skills prior to this first Finnish course. Even though the mean length of residence in Finland had been 13.8 months at the start of the observation period (with a range of 8 to 18 months of residence), the participants' oral Finnish skills were reported to be very low (Tammelin-Laine, 2014a, p. 82). Therefore, regarding L2 oral skills and length of residence, this test group differs considerably from Halme's (2008) and Heikkinen's

(2009) test groups. This study's findings indicate that during the observation period the participants' oral and reading skills developed faster than their writing skills (Tammelin-Laine, 2014a, p. 85). A correlation between oral and literacy skills was also detected by Heikkinen (2009), but larger empirical studies and samples are needed to illuminate the nature of this reciprocal relationship.

None of Tammelin-Laine's participants achieved functional literacy, even though some participants mastered the initial stages, the concept of grapheme-phoneme correspondences and word formation by blending of letters (Tammelin-Laine, 2014a, p. 84). Subsequently the participants' language and literacy course (1400 hours of instruction) was found to be insufficient for achieving functional reading skills, or even consistent emerging literacy skills. Based on the poor performance of Tammelin-Laine's (2014a) study participants, a second year of instruction was regarded as essential (Tammelin-Laine & Martin, 2015, p. 53). A slow learning pace and great variation in individual progress has also been attested for Dutch LESLLA learners by Kurvers, Stockmann & Van de Craats (2010), who emphasize that "the individual variation is tremendous and that, therefore, the idea of introducing a benchmark for L2 literacy tracks (with all kinds of implications for funding) does not seem to work very well" (p. 77).

Based on current research findings on LESLLA learners' literacy acquisition, presented in this section, it seems clear that LESLLA learners in Finland need to be provided with a specific learning environment that caters to their individual needs and supports the discovery and acquisition of language-specific challenges and features in Finnish. The following section introduces computer-assisted language learning (CALL) as a supporting tool in reading intervention and presents one example of a CALL reading intervention for LESLLA learners that has been the result of a European research project aiming at advancing LESLLA literacy training.

4 Computer-assisted language learning in literacy development intervention

Computer-assisted language learning (CALL) has not only been found to enhance the L2 reading development for literate adult learners (see Chun, 2006), but educational computer games, so-called edutainment games, have also been successfully used in L1 literacy training of young children. One example of such a technological-based intervention method is GraphoLearn (*Ekapeli* in Finnish), an online learning environment for children with reading difficulties[8]. It was designed and developed, according to evidence-based findings of intensive longitudinal research on children at risk for dyslexia, by the University of Jyväskylä in collaboration with the Niilo Mäki Institute in Finland (see Lyytinen, Erskine, Kujala, Ojanen & Richardson, 2009). GraphoLearn supports children's Finnish L1 and L2 reading acquisition by providing training in phoneme-grapheme correspondences and positive results have been achieved for struggling readers (for an overview of theoretical and methodological aspects, see Richardson & Lyytinen, 2014). A longitudinal study by Saine, Lerkkanen, Ahonen, Tolvanen & Lyytinen (2011) found this remedial reading intervention to be highly beneficial for Finnish L1 children with reading difficulties: "the overall gains in the computer-assisted intervention were significant, not only in letter knowledge, decoding and accuracy, but also in fluency and spelling" (p. 1023) and recommend a computer-assisted intervention like GraphoLearn "in the very beginning of the first grade, at least in an opaque [transparent] orthography like Finnish" (p. 1025).

Pennala, Richardson, Ylinen, Lyytinen and Martin (2014, 2011) found in their study that computer-based learning games such as GraphoLearn can be beneficial for both dyslectic Finnish children and L1 Russian children learning Finnish, as they help to train phonological awareness and to recognize the quantity feature (Pennala et al., 2011, p. 20; see also Oksanen, 2010). Finnish is a quantity language making a phonological distinction, physically indicated by sound duration, between short and long phonemes. The fact that sound duration can in some cases be "the only detectable discriminating feature" between words with different meanings (Nenonen, Shestakova, Huotilainen, & Näätänen, 2003, p. 492), see Example 1 below, highlights its relevance.

tuli 'fire' ≠ *tuuli* 'wind' ≠ *tulli* 'customs'

The Finnish quantity feature has been recognized as one main difficulty for many dyslexic children (see Pennala, 2013) as they struggle with the discrimination of the *phonemic length* which in turn may hinder their letter-sound acquisition (Lyytinen et al., 2015, pp. 331-332, 336). Overall, phonemic differentiation is key to successfully acquire alphabetic literacy and if learners are unable "to differentiate certain phonemes from each other, this can take some time to learn and, in the most difficult situation, requires a great deal of drilling to learn such a distinction" (Lyytinen et al., 2015, p. 671). This applies to both pre-puberty and post-puberty learners struggling to read.

In the light of these positive findings on the impact of computer game-based practice on children's literacy acquisition, it seems clear that LESLLA readers could potentially also benefit from such a CALL literacy intervention in Finnish. In fact, LESLLA research has in recent years started to explore the potential of CALL to facilitate language and literacy acquisition for non-literate learners. In her study with LESLLA learners of Dutch, Strube (2014, p. 269) found a remarkably positive correlation between CALL learning and LESLLA learners' oral test results. Kurvers and Stockmann (2009) found in their study on non-literate adults' L2 Dutch reading development that time allotted to individual computer activities, for example practising decoding skills, had a positive effect on the participants' reading scores, whereas whole-group activities were seen to have a negative influence on the participants' reading and writing development (Kurvers, 2015, p. 73). As explicit instruction for making grapheme-phoneme correspondences and identifying word boundaries is usually necessary for emerging literacy skills, a suitable CALL application could provide enjoyable and frequent opportunities to practise.

The importance of enjoyment and motivation is highlighted by Saine et al. (2011) who point out that "in the computer-assisted environment provided by GraphoLearn, a child presumably has a chance to learn to read in a more fun way, which probably enhances willingness to practice reading" (p. 1025). The GraphoLearn computer-assisted practice constantly adapts to the player's skill level to keep the training optimally challenging and accordingly, the feedback is mostly positive (in approximately 80% of trials) which was expected to provide the player with a positive self-concept as a learner (Ojanen et al., 2015, p. 2). Similarly, Ronimus (2012) emphasizes the motivational appeal of GraphoLearn in her study. She found that the reward system increased the time spent playing and that children playing at school were more motivated than those playing at home.

The *Digital Literacy Instructor* (DigLin) is an example of a pioneering online training environment for LESLLA learners to discover and decode the alphabetic code[9]. The main aim of DigLin, a collaboration of European universities and

partners from four countries, was to advance LESLLA learners' literacy training. This CALL application for English, Finnish, German and Dutch was developed for and tested by LESLLA learners in different settings and countries. The participants' use was tracked by log-files during the field-testing period. The log-file database provided data from the LESLLA participants in Finland for the study of Malessa (2016) in which the learner behaviour of LESLLA learners was investigated. Filimban's (in progress) study employed log-file data from the LESLLA learners in the United Kingdom and investigates the effectiveness of DigLin training on the L2 (English) decoding skills of low-literate learners.

Malessa and Filimban (2017, p. 157) found that CALL activities have a positive and motivational effect on LESLLA learners' decoding development and log-files proved to be an accurate and precise research tool providing both information on individual performance as well as the learning process. The results of Malessa's (2016) study showed that log-files provide accurate empirical evidence on learner engagement, preference, performance and productivity and CALL activities were found to enhance the individual learning process. CALL activities enable LESLLA learners to train vocabulary skills by providing exercises with both visual and aural clues, as the screenshot of a DigLin exercise in Figure 1 below demonstrates.

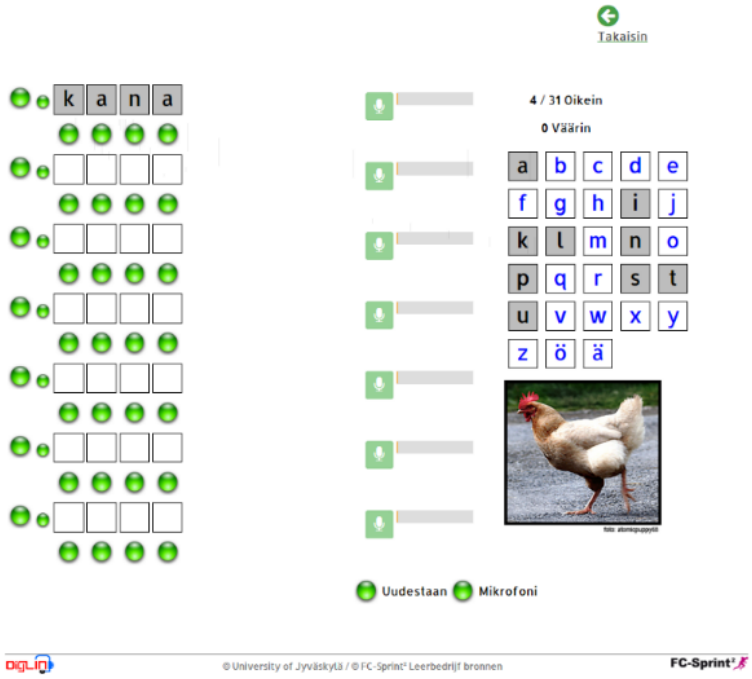

Figure 1. Screenshot of an exercise type in 'DigLin'.

In DigLin, LESLLA learners could repeatedly listen to the individual phonemes of the words, e.g. in theword kana 'chicken' (see Figure 1) to establish phoneme-grapheme connections, thus practising their decoding and recognition skills. By combining visual and aural clues as illustrated in Figure 1, working with similar CALL exercises could help LESLLA learners to train their phonological working memory and simultaneously also their vocabulary skills.

Sound duration in speech perception and production is an extremely pertinent and often partly due to L1 influence particularly difficult feature for L2 learners. Previous research has found the Finnish quantity feature to be difficult to perceive, produce and spell for both literate L2 Finnish learners (see Nenonen et al., 2003; Ullakonoja, Kuronen, Hurme, & Dufva, 2014; Ylinen, Shestakova, Alku, &

Huotilainen, 2005) as well as pre-literate and low-literate L2 Finnish learners (Heikkinen, 2009; Malessa, 2016). Heikkinen (2009, p. 49) found in her study that LESLLA learners struggled with the quantity distinction of both double vowels and geminates and revealed that most quantity errors concerned the distinction between /k/ - /kk/ and/v/ - /vv/. Malessa (2016, p. 45) made similar observations about errors that were made while training letter-sound correspondences in one set of words containing geminates (see Figure 2 below).

Figure 2. Screenshot of a 'DigLin' word set containing geminates.

Malessa's (2016) log-file data revealed further that word-final vowel perception seemed to be problematic for her study's participants. The importance of correct vowel perception can be illustrated by the perception error relating to the word pullo 'bottle' in Figure 2, perceived as pulla 'sweet bun', altering thus the word's meaning significantly (Malessa, 2016, p. 42). Malessa's (2016) findings are supported by previous research on L2 Finnish learners' comprehension and production difficulties (see Vihanta, 1990). By providing suitable vocabulary, constant automatic feedback, unlimited practice time and opportunities, CALL activities could help LESLLA learners to train their perception skills and specifically quantity distinction skills. 'Edutaining' CALL activities could further increase learners' individual training time and activate and maintain the desire to become literate, even for unmotivated LESLLA learners like the participant Batulo in Heikkinen's (2009) study.

5 Calling for more LESLLA and CALL in literacy research

Until recently, researchers have paid a lot of attention to the L1 reading efforts of children and L2 reading progress of educated adults, yet, "there is next to nothing on the linguistic and cognitive processes underlying reading development by adults

with little or no schooling" (Van de Craats et al., 2006, p. 8)[10]. Little is known about the literacy development of LESLLA learners in Finland as most literacy research has concentrated on L1 children and while plenty of research has been conducted on literate adult Finnish L2 learners, "hardly any research is available on how non-literate adults learn Finnish" (Tammelin-Laine 2014a, p. 4)[11]. Kurvers et al. (2006) wonder "why so little is known about the language conceptions of illiterate adults" (p. 69) resulting in a "miniscule" amount of research on non-educated learners (Young-Scholten & Naeb, 2010, p. 88).

Traditionally, second language acquisition (SLA) research has focused on educated, highly-literate L2 learners, regardless of the fact that vast numbers of L2 learners are not literate (Tarone et al., 2013, p. 200). This in turn has led to a gap in SLA research concerning the population of LESLLA learners (Tarone, 2009; Young-Scholten, 2015). However, to fully understand key variables affecting SLA processes and to be able to make universal claims, it is vital to include LESLLA learners in SLA research (Bigelow & Tarone, 2012, p. 5). As only few studies have focused on adult LESLLA learners' alphabetic literacy development, SLA theory cannot account for an extensive range of contexts in which second languages are learnt (Bigelow & Tarone, 2004, p. 690). Young-Scholten and Naeb (2010, p. 88) conclude that "until there is an exponential increase in studies contributing to our evidence base, we will be unable to say for certain how [LESLLA readers] can become proficient readers in a second language at age 20, 30 or 70" and urge teachers to "do what they are already doing, engage their learners in activities that accelerate their phonological acquisition, promote phonological awareness and build their vocabulary".

There seems to be no critical period for reading (Young-Scholten & Strom, 2006, p. 50). However, Tammelin-Laine and Martin (2015, p. 53) emphasize that LESLLA readers are often affected by traumatic experiences, family responsibilities and worries slowing down their literacy progress. Additionally, weak linguistic L2 competence will have detrimental effects on the development of phonological awareness and decoding skills of LESLLA readers. In addition to insufficient linguistic knowledge, the significance of insufficient L2 exposure should not be overlooked. Droop and Verhoeven (2003, p. 81) emphasize that for L2 readers "limited exposure to the second language may lead to qualitatively weaker word representations and both slower and less accurate reading". Literacy and language skills are, nevertheless, due to their socio-economic function, regarded as essential for successful integration (Holme, 2004, p. 235). In 2012 the Finnish National Board of Education adopted the National Core Curriculum for integration training of adult migrants to promote migrants' integration into Finnish society and support their active participation in it (FNBE, 2012, p. 7). The National Core Curriculum is based on a socio-constructivist approach to learning in which learning is seen as:

> an interactive process between a student and his or her environment. […] Exchanging and sharing information and experiences and reflecting on these together are vital prerequisites for deeper understanding and change involved in learning. Adults are cast in the role of learners in instruction, which places emphasis on taking students' prior experiences into account (FNBE, 2012, p. 16).

Family literacy programmes such as the Let's Read Together Network, offering language and literacy training for immigrant women in Finland, complement the literacy intervention provided by the authorities. They make a valuable contribution to promoting and supporting LESLLA learners' opportunities to

actively participate and successfully integrate in the Finnish society (see Garbe et al., 2016, p. 65; Laine, 2015). Maybe it is time to acknowledge that LESLLA reading is neither a reading or language problem (see Bernhardt, 1991, pp. 31-32). It is rather a social challenge, including aspects of reading and learning, calling for new ways of enhancing social inclusion to ensure that LESLLA learners receive the support they need to achieve basic literacy, "the ability to understand and employ printed information in daily activities, at home, at work and in the community – to achieve one's goals, and to develop one's knowledge and potential" (OECD, 2000, p. x). Tammelin-Laine, Nieminen and Martin (2013) remind the academic community of the challenge learning to read for the first time as adult immigrants poses for researchers, learners and teachers accordingly:

> For most researchers such a situation is totally beyond their realm. It is hard for us even to imagine how one could learn a language without the possibility of taking notes, seeing words in written form, or reading texts. And how do you learn to read if you do not know the language in which you must read? (Tammelin-Laine et al., 2013, p. 3)

To enhance literacy development as well as learner motivation and to avoid language fossilization, efficient and enjoyable literacy and language learning methods are urgently needed and computer-assisted language learning is seen to potentially answer the call of LESLLA researchers and teachers for more individualized learning (Malessa & Filimban, 2017, p.149). The critical role that literacy plays in today's societies is succinctly summarized by Miller and McKenna (2016) highlighting that:

> Never before has so much depended on literacy. This is a statement that one might be tempted to cast aside as a bland and self-evident bromide. But it is quite literally true in that the role played by literacy has come to be marked by differences in kind as well as degrees. As knowledge increasingly becomes a product as well as a tool, the economic welfare of any nation will be ultimately and inextricably tied to the literacy of its citizens. (Miller & McKenna, 2016, p. viii)

Overall, this study has shown that LESLLA researchers have successfully taken on the challenging task of making substantial contributions to the two significant research fields of SLA and literacy acquisition. Further studies regarding the role of CALL in LESLLA literacy training would be worthwhile. More research is needed to develop a deeper understanding of LESLLA learners' reading literacy acquisition.

In the future, it will be important to explore the potential of computer-assisted language learning opportunities for LESLLA learners and to extensively evaluate and empirically test suitable technology-enhanced applications. Knowledge is power. To empower LESLLA learners, more knowledge is needed. It is high time for more LESLLA research in Finland and the rest of the world.

Endnotes

[1] This article uses the term *non-literate* instead of *illiterate*, due to the pejorative meaning relating to the term illiteracy (Barton, 1994, p. 21).
[2] Two third of the female Iraqi population is non-literate and the literacy rate for the female population in Afghanistan is extremely low with only 24.2%. Whereas there is no data available for literacy in Somalia, 81% of Syrian women are reported to be to some extent literate in their first language (L1) (TWF, 2016; UNESCO-UIS, 2012, p. 6). See Bigelow and King (2015) for a report on the impact interrupted schooling can have on low print-literacy of female Somalis, exemplified by the case of 15-year old Ayan.
[3] As the LESLLA research forum is moving toward becoming a formal organization in 2018, the acronym LESLLA, previously known as *Low-Educated Second Language and Literacy Acquisition*, was renamed in 2017 (see www.leslla.org).
[4] Stage theories are based to varying degrees on Frith's (1985) original three-stage theory of initial child reading (Frith, 1985, p. 306) which is probably the most frequently used model (Lerkkanen, 2003, p.12).
[5] "The character "-" indicates a boundary between morphological elements (stems, endings). The codes after each word-form indicate morphological categories: case, number, possessive, and clitic particles. The cases are NOMinative, GENitive, ParTitiVe, ESSive, TRAnslative, INEssive, ELAtive, ILLative, ADEssive, ABLative, ALLative, ABEssive, and COMitative. The numbers are SinGular and PLural. The possessive endings are SG1 (1st person SG), SG2 (2nd person SG), PL1 (1st person PL), PL2 (2nd person PL), and SGPL3 (3rd person Sg and PL). The clitic endings are KIN, KAAN, PA, KO, HAN, S." (Karlsson, 1996).
[6] A preliminary search, employing the terms *lukutaidoton* 'non-literate', *maahanmuuttaja* 'immigrant', *aikuinen* 'adult' and *suomen kieli* 'Finnish language', in the Google Scholar database provided 309 results. These were first narrowed down to 287 (by adding *oppiminen* 'learning') and then to 249 (by adding *lukeminen* 'reading'). The results were analysed qualitatively and not language and learning related results with e.g. a specific focus on adult immigrants' social integration were discarded. The amount of results was reduced drastically to the following 13 relevant publications by Halme, 2008; Heikkinen, 2009; Kärki, 2014; Keski-Hirvelä, 2008; Määttänen, 2007; Mustaparta, 2015; Myllymäki, 2008; Noorzadeh, 2014; Pöyhönen et al., 2011; Tammelin-Laine, 2014a, 2014c, 2015; Vedenpää & Vierikko, 2013.
[7] Doria is a is a multi-institutional repository maintained by National Library of Finland (www.doria.fi), Finna search service entity providing free access to material from Finnish museums, libraries and archives. (www.finna.fi), Theseus is an Open Repository of theses and publications of the Universities of Applied Sciences in Finland (www.theseus.fi), Lauda is the University of Lapland's institutional repository (www. lauda.ulapland.fi), UEF Finna is the search service of University of Eastern Finland library's printed and electronic resources (www.uef.finna.fi), JYX is the University of Jyväskylä's institutional repository (www.jyx.jyu.fi), Oula-Finna is the online library catalogue of the Oulu University Library (www.oula.finna.fi), Journal is a new journal management and publishing service provided by the Federation of Finnish Learned Societies (www.journal.fi), TamPub is the open institutional repository of the University of Tampere (www.tampub.uta.fi), The Helka catalogue includes collections of Helsinki University Library, National Library, Institute for the Languages of

Finland, National Board of Antiquities Library, Finnish Literature Society, Library of the Labour Movement and Baltia-kirjasto (www.helka.finna.fi).

[8] The *GraphoLearn* learning game was earlier called the *GraphoGame* (*Ekapeli* in Finnish), and these names are found in earlier published papers. For more information and to test the software see info.grapholearn.com/ (in English) and http://www.lukimat.fi/lukeminen/materiaalit/ekapeli (in Finnish). *Ekapeli Alku* 'GraphoGame Start'is aimed at pre-literate L1 Finnish speaking children, aged 6-7, and children in need of extra literacy intervention support. *Ekapeli Maahanmuuttaja* 'GraphoGame Immigrant' is specifically designed for children with a L1 other than Finnish. There are currently versions for the following languages: English, Arabic, Kurdish, Chinese, Somali and Estonian.

[9] For more information, see http://diglin.eu/

[10] Cook and Bassetti (2005, p. 1) highlight that L2 literacy is a recent topic of interest starting at the beginning of the 21th century focusing on literate L2 learners.

[11] Recently, the focus of children's literacy acquisition research has shifted to include also Finnish L2 children's initial reading development (see Lehtinen, 2002; Voipio, 2003).

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