Research Note: The Factor Structure of Vocabulary Skills and Academic Reading Performance by Adult English Learners

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July 2011

1. Introduction

Although there has been a myriad of research conducted on receptive and expressive language skills in relation to reading achievement in children, little research has been conducted on the two different subskills (i.e., receptive and expressive modes) of language proficiency with adult English language learners (ELLs). The same is true for a reading model for the adult population, especially in academic reading. The lack of research with the adult population in these two areas in applied linguistics and second language acquisition (SLA) is the driving motivation for this study. This report includes two analyses: (1) confirmatory factor analysis (CFA) to test a model of receptive and expressive language skills demonstrated by adult ELLs and (2) CFA to examine the relationship among L2 inference, text analysis, verbal fluency, and listening proficiency in association with reading skills. The first analysis used a set of ELLs' test scores of academic English to identify the factor structure of the two modalities of language skills. Composite scores of *listening, reading,* and *listening/reading* skills were utilized as receptive skills, and those of *speaking, writing, listening/speaking, listening/writing, reading/writing,* and *reading/speaking* were entered into the model as expressive L2 skills. Grounded on the models of the simple view of reading (Gough & Tunmer, 1986), the convergent skills model of reading development (Vellutino, Tunmer, Jaccard, & Chen, 2007), the construction-integration model (Kintsch, 1994, 1998), and the direct and inferential mediation (DIME) model of reading comprehension (Cromley & Azevedo, 2007), the second analysis utilized L2 *inference*, *text analysis, verbal fluenc*y, and *listening* skills as exogenous latent constructs, and L2 *reading* ability as an endogenous latent factor.

2. Methodology

The database utilized for this study was Form 2 of the first field test administered by the Pearson Test of English Academic (PTE Academic). The participants were 585 adult students from 62 countries. Their mean age was 25 years, ranging from 17 to 59 years of age. Females accounted for 54.2% and males 45.8%. Analysis 1 focused on the factor structure of receptive and expressive English L2 skills. Analysis 2 attempted to map out a pathway to English L2 academic reading model.

3. Results

3.1 Analysis 1

On the basis of the theoretical foundation that receptive skills and expressive skills are critical factors in English comprehension in L1 (Bates, Bretheron, & Snyder, 1988) and L2 (Barnett, Yarosz, Thomas, Jung & Blanco, 2007; Lugo-Neris, Jackson, & Goldstein, 2010), a series of models, including one-factor, two-factor, and second-order-factor models, was tested. A two-factor model (i.e., receptive and expressive latent constructs) was chosen for a goodness-of-fit model based on the fit indices and theoretical consideration. Receptive skills were indicated by four observed variables, and the expressive skill factor was explained by five indicators. Through a model modification by adding error covariances, the two-factor model becomes tenable [χ^2 (19, N = 585) = 30.21, p > .05, CFI = 1.00, RMSEA = .032]. This indicates that the sample covariance matrix S was sufficiently reproduced by this theoretical model.

Table 1 displays the model's standardized parameter estimates for factor loadings as well as squared multiple correlation coefficients for each observed variable by the two latent constructs. The squared multiple correlation coefficients indicate that the observed variables serve well as the measures of the latent variables. All standardized factor loadings were statistically significant for both receptive-skill (values ranged from .71 to .79) and expressive-skill factors (values ranged from .56 to .94). The inter-factor correlation was also large and statistically significant (r = .98, p < .001).

Table 1. Standardized parameter estimates for factor loadings

Indicators	Receptive	Expressive	Error	SMC
Listening	.75		.09	.56
Reading	.71		.07	.50
Speaking		.56	.20	.31
Writing		.72	.06	.52
Listening & Speaking		.81	.48	.66
Listening &Reading	.79		.14	.63
Listening &Writing		.94	.37	.89
Reading &Writing		.77	.13	.60
Reading &Speaking		.60	.17	.36
Factor Correlation	.98			

Note: All loadings are significant (|t| > 1.96).
SMC = Squared multiple correlation

3.2 Analysis 2

The second analysis attempted to identify a path model for L2 academic reading which theoretically relied on the simple view of reading (Gough & Tunmer, 1986), the convergent skills model of reading development (Vellutino, Tunmer, Jaccard, & Chen, 2007), the construction-integration model (Kintsch, 1994, 1998), and the direct and inferential mediation (DIME) model of reading comprehension (Cromley & Azevedo, 2007). Given the theoretical support for *listening* proficiency in the reading model (i.e., the simple view of reading, Gough & Tunmer, 1986), the three listening subscores were included in the model to define *listening* latent construct. Specifically, the model including the three latent constructs (*inference,*

 text analysis, and *verbal fluency*) explained the nine indicators, and, in turn, the three constructs defined *listening* skills.   Reading ability was regressed on the three exogenous variables (*inference, text analysis,* and *verbal fluency*) and one endogenous variable (*listening*).

Figure 1 shows a hybrid path model including the measurement model and the structural model.   Reading abilities were defined by four latent factors of *inference, text analysis, verbal fluency,* and *listening* skills. The fit indices for the hybrid model indicated goodness of fit based on the ratio of chi-square and *df,* CFI, GFI, and RMSEA [χ^2 (62, N = 585) = 117.22, p = .000, $\chi 2/df$ = 1.89, CFI = .99, GFI = .97, RMSEA = .04], indicating that the observed variables adequately measured constructs as specified in the model.
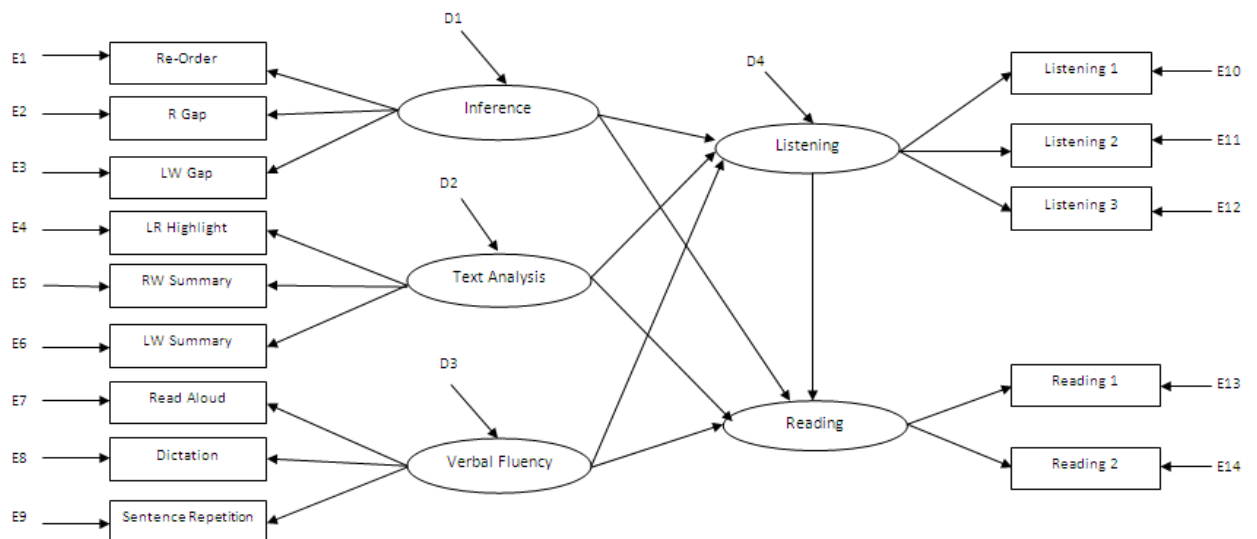

Figure 1. A Reading Model for Academic Reading by English Language Learners

4. Discussion

4.1 Receptive skills and expressive skills

The relationship of adult ELLs' receptive and expressive skills was examined using the composite scores of the four discrete-skill item types (i.e., *listening, speaking, reading,* and *writing*) and five shared-skill item types (i.e., *listening/speaking, listening/reading, listening/writing, reading/writing,* and *reading/speaking*). These nine observed indicators mapped well into the *a priori*-established two latent constructs—receptive skills and expressive skills. A correlated two-factor model was identified as a goodness-of-fit model without convergence problems. The indicators which were loaded onto the receptive factor showed more homogeneous factor loadings in magnitude than those loaded onto the expressive construct. This indicates that different indicators of receptive skills function in a similar way, compared to those of the expressive-skill construct. When it came to expressive skills, the range of factor loading produced by the indicators was wide, and the *speaking* indicator showed the lowest standardized factor loading, followed by the *reading/speaking* variable.   Since the expressive modality is active and productive in nature, a higher variability across ELLs may exist. The results of this study suggest greater linguistic receptive-skill crossover and dependent conceptual links among *listening*, *reading*, and *listening/reading* tasks, as these skills entail the cognitive processes which focus on internal recovery of conveyed messages in the oral and written form. Receptive skills and expressive skills may be different in terms of the primary perceptual processing units and the

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nature of representation of an individual's memory. This difference may result in a wider variability across expressive modalities than those of receptive skills.

In short, the findings of this study suggest that the viable theoretical basis lies in the closely interconnected networks in which L2 subskills are not constrained to one direction but are bidirectional, regardless of the modality of language skills or whether it is in print or speech. However, this structure did not predict symmetry with respect to how receptive skills affected expressive abilities, and how these skills impacted on overall L2 performance. Since the path structure among the variables does not specify the locus of the causal effect (Shumacker & Lomax, 2004), the asymmetric associations of the receptive and expressive skills to the indicators need to be further investigated.

4.2 Pathway to L2 academic reading

The relationships of the observed variables and the latent constructs provide a statistically significant and theoretically feasible explanation for L2 reading performance of the participants in this study. The results suggest that each of the latent variables accounts for a significant amount of the variance in the observed variables. On the basis of the multiple-subskill hypothesis (Bachman & Palmer, 1981, 1982; Bachman, Davidson, & Foulkes, 1990; Caroll, 1983; Haley, Cummins, Swain, & Allen, 1990; Sasaki, 1996; Shin, 2005), the four-factor model, which was the decomposed, distinguishable, skills model, was tested. Model testing identified statistically significant influences of the four separate trait factors on L2 academic reading. The *inference* construct exhibited the only nonsignificant factor loading to the *listening* factor, while the other two factors (*text analysis* and *verbal fluency*) showed direct effects on *listening* skills. The *listening* construct demonstrated both direct and indirect effects on L2 academic reading, which is consistent with the notion of the simple view of reading (Gough & Tunmer, 1986). The *inference*, *text analysis,* and *verbal fluency* factors showed a direct relationship to the *L2 academic reading* outcome. These findings were akin to those of Cromley and Azevedo's (2007) and Vellutino and his colleagues' (2007) studies.

A constellation of findings spanning children's L1 English reading to adults' L2 English reading has converged in support of L2 listening comprehension as a precursor to L2 academic reading. The results of this study shows support for previous studies. In addition to the importance of listening skills to reading achievement, other metalinguistic skills, such as *inference, text analysis,* and *verbal fluency,* are also robust predictors of efficient academic reading. This study confirms within-language interactional relationships of multicomponential skills.

From a theoretical perspective, one important finding from this study is that *dictation* subskill is a consistently robust indicator to the latent factor. The modification indices suggest that *dictation* is defined by the *listening* construct, and that the *sentence repetition* indicator is defined by *inference, text analysis,* and *listening* factors. Since this study attempted to test an *a priori* established theoretical model, double loadings were not allowed in the paths. A possibility of double loadings indicates possible overlaps between the factors, suggesting multiple relations of the *dictation* and *sentence repetition* indicators to other factors beyond the *a priori* paths. Although double loadings were not allowed in model specification, the modification indices also suggested that the *listening* construct defines *dictation* and *sentence repetition* indicators. In line with the notion of the simple view of reading is that listening comprehension is a crucial component of proficient reading. To summarize, the path model identified in this study suggests that L2 metalinguistic skills, such as *inference, text analysis,* and *verbal fluency*, are robust predictors of L2 English reading.

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