## Exploring Subgroups of Preschool Academic Abillity: A Strengths-Based Perspective of Billingual Development

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## Background

- Nearly a third of preschoolers are dual language learners (DLLs), $60 \%$ of whom are Spanish-English learners (Park et al., 2018),
- Preschool is a critical period of academic development (Weiland \& Yoshikawa et al., 2013). Children's early grammar, vocabulary, phonologica awareness, letter knowledge, and quantitative reasoning skills are strong predictors of their outcomes in reading and math (Duncan et al., 2007; NASEM, 2017).
- DLLs' academic development varies between their two languages and across skill areas (Pearson et al., 1997; Oller \& Eilers, 2002; Hammer et al., 2012). - Understanding variability within DLLs is essential for promoting their academic success (Castro, 2011; Goldenberg et al., 2013; NASEM, 2017). - Identifying meaningful subgroups of preschool DLLs can help inform appropriate educational supports for children's different academic strengths and needs (Beltrán, 2012; Escobar \& Tamis-Lemonda, 2017).


## Latent Profile Analysis

- Latent profile analysis (LPA) is a useful approach for identifying subgroups of young DLLs characterized by intra-individual patterns of variability in development across academic skills in each language (Lonigan et al., 2017; Halpin et al., 2021; López \& Foster, 2021).
- While latent profiles provide detailed information about DLLs' academic strengths and needs at a given point of time, further investigation of changes in latent profiles is needed to better understand children's development over time.


## Research Questions

1. What are the profiles of bilingual academic development in preschool DLLs during the fall and spring prior to kindergarten entry?
2. Does bilingual academic profile membership change from fall to spring in preschool DLLs?

| Participants |  |
| :--- | :---: |
| - 344 Latino Spanish-English DLLs. |  |
| - All children were typically developing, had been exposed to Spanish |  |
| since birth, in preschool, and were receiving English-only instruction. |  |
|  | $\mathbf{N}=\mathbf{3 4 4}$ |
| Child Gender | $43 \%$ male |
|  | $57 \%$ female |
| Child Age at Fall (in months) | $m=53.62(s d=4.61)$ |
| Child Age at Spring (in months) | $m=56.51(s d=5.54)$ |
| Length of Bilingual Exposure (in months) | $m=47.54(s d=15.99)$ |
| $\quad$ Maternal Education |  |
| < High School | $60 \%$ |
| High School/GED | $26 \%$ |
| Some Post-Secondary | $14 \%$ |
| College/Graduate Degree | $0 \%$ |

## Measures \& Procedure

Demographic Variables - Researcher created questionnaire (66 items) Child Bilingual Academic Skills

- Clinical Evaluation of Language Fundamentals-Preschool $2^{\text {nd }}$ Edition (CELF-P2) \& CELF-P2 Spanish
- Sentence Structure (SS)
- Expressive Vocabulary (EV)
- Phonological Awareness (PA)
- Woodcock-Johnson Tests of Achievement III (WJ-III) \& Batería III
- Letter-Word Identification (LWI)
- Applied Problems (AP)

Data Collection - preschool year prior to kindergarten entry

- Time 1 - Fall: demographic questionnaire \& child assessments
- Time 2 - Spring: child assessments


## Data Analysis

RQ1) Two latent profile analyses were conducted for the fall and spring timepoints using children's academic scores in Spanish and English. - Post-hoc pairwise comparisons using the Benjamini-Hochberg procedure to control for Type I error inflation assessed

- within-profile differences between Spanish and English scores - between-profile differences across academic scores RQ2) A latent transition analysis (LTA) was conducted to examine the stability of individual children's profile membership from fall to spring.


## Results

RQ1) Goodness-of-fit indices for both LPAs indicated that the fourprofile model best fit the data on preschool DLLs' Spanish and English academic development in the fall and spring.

|  | Fall PreK |  |  |  |  |
| :--- | :---: | :---: | :---: | :---: | :---: |
| Model | BIC | $\Delta$ BIC | Entropy | VLMR |  |
| 2-Profile | 15460.365 | N/A | 0.770 | 471.911 |  |
| 3-Profile | 15343.799 | -116.566 | 0.816 | 180.814 |  |
| 4-Profile | $\mathbf{1 5 2 2 2 . 1 4 9}$ | $\mathbf{- 1 2 1 . 6 5 0}$ | $\mathbf{0 . 8 2 4}$ | $\mathbf{1 8 5 . 8 9 7}$ |  |
| 5-Profile | 15175.443 | -46.706 | 0.842 | 110.953 |  |
| 6-Profile | 15170.463 | -4.980 | 0.857 | 69.227 |  |
|  | Spring PreK |  |  |  |  |
| Model | BIC | $\Delta$ BIC | Entropy | VLMR |  |
| 2-Profile | 15481.153 | N/A | 0.739 | 471.271 |  |
| 3-Profile | 15322.899 | -158.254 | 0.829 | 222.501 |  |
| 4-Profile | $\mathbf{1 5 1 8 9 . 9 5 3}$ | $\mathbf{- 1 3 2 . 9 4 6}$ | $\mathbf{0 . 8 5 5}$ | $\mathbf{1 9 7 . 1 9 3}$ |  |
| 5-Profile | 15163.688 | -26.265 | 0.817 | 90.512 |  |
| 6-Profile | 15125.878 | -37.810 | 0.833 | 102.056 |  |
| Note. BIC $=$ Bayesian Information Criterion, VLMR $=$ Vuong-Lo-Mendell-Rubin |  |  |  |  |  |
| $\dagger$ Final model fit statistics in bold to facilitate interpretation. |  |  |  |  |  |
|  |  |  |  |  |  |

## Results Continued

RQ1) Post-hoc pairwise comparisons distinguished profiles by their patterns of bilingual balance and academic ability, based on within-profile and between-profile variability, respectively, in Spanish and English academic scores.

| Fall Academic Subtest | Profile 1Spanish-Balanced, Low |  | Profile 2Balanced-Spanish, Average |  | Profile 3Mostly English, Average |  | Profile 4 <br> Mixed Balance, High |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  |  |  |  |  |
| Sentence Structure | Spanish | $t=6.43^{* * *}$ | Spanish | $t=10.136 * * *$ | Balanced | $t=1.388$ | Spanish | $t=7.344^{* * *}$ |
| Expressive Vocabulary | Spanish | $t=7.01$ *** | Spanish | $t=9.435 * * *$ | English | $t=6.031 * * *$ | Spanish | $t=4.156 * * *$ |
| Phonological Awareness | Balanced | $t=1.00$ | Balanced | $t=1.293$ | English | $t=2.940^{* *}$ | English | $t=3.645^{* * *}$ |
| Letter-Word Identification | Spanish | $t=4.14^{* * *}$ | Balanced | $t=1.457$ | English | $t=2.944 * *$ | English | $t=2.934^{* *}$ |
| Applied Problems | Balanced | $t=0.95$ | Balanced | $t=1.460$ | English | $t=7.751^{* * *}$ | Balanced | $t=1.995$ |
|  | Mixed Balance, Low |  | Mixed Palance, Average |  |  | Profile 3 |  | ofile 4 |
| Spring Academic Subtest |  |  | English Dominant, Average | Mostly English, High |  |  |  |
| Sentence Structure | Spanish | $\mathrm{t}=5.354^{* * *}$ |  |  | Spanish | $\mathrm{t}=11.721^{* * *}$ | English | $\mathrm{t}=3.978 * * *$ | Spanish | $\mathrm{t}=2.822^{* *}$ |
| Expressive Vocabulary | Spanish | $t=3.664 * * *$ | Spanish | $\mathrm{t}=5.792^{* * *}$ | English | $\mathrm{t}=8.038^{* * *}$ | English | $\mathrm{t}=3.446^{* *}$ |
| Phonological Awareness | Balanced | $\mathrm{t}=0.831$ | Balanced | $\mathrm{t}=1.345$ | English | $\mathrm{t}=4.162^{* * *}$ | English | $\mathrm{t}=4.431^{* * *}$ |
| Letter-Word Identification | Balanced | $\mathrm{t}=0.614$ | English | $\mathrm{t}=6.486^{* * *}$ | English | $\mathrm{t}=6.035^{* * *}$ | English | $\mathrm{t}=5.440^{* * *}$ |
| Applied Problems | English | $\mathrm{t}=3.245^{* *}$ | English | $\mathrm{t}=4.413^{* * *}$ | English | $\mathrm{t}=7.413^{* * *}$ | English | $\mathrm{t}=3.344^{* *}$ | Applied Problems $\quad$ Englich

> Fall Bilingual Profiles


RQ2) Latent transition probabilities for all profiles indicated that the odds of individual children remaining in the same profile from fall to spring were high.

|  | Latent Status |  |  |  |
| :--- | :---: | :---: | :---: | :---: |
| Latent Status Prevalence | Mixed Balance, Low | Mixed Balance, Average | English Dominant, Average | Mostly English, High |
| Fall | $25 \%$ | $44 \%$ | $11 \%$ | $20 \%$ |
| Spring | $22 \%$ | $48 \%$ | $11 \%$ | $19 \%$ |
| Fall-Spring $\Delta$ | $-3 \%$ | $+4 \%$ | $0 \%$ | $-1 \%$ |
|  | Probability of transitioning to Spring status... |  |  |  |
| ..Conditional on Fall status | Mixed Balance, Low | Mixed Balance, Average | English Dominant, Average | Mostly English, High |
| Balanced-Spanish, Low | $\mathbf{0 . 8 7 4}$ | 0.101 | 0.004 | 0.020 |
| Spanish-Balanced, Average | 0.000 | $\mathbf{0 . 9 8 8}$ | 0.012 | 0.000 |
| Mostly English, Average | 0.011 | 0.045 | $\mathbf{0 . 9 4 4}$ | 0.000 |
| Mixed Balance, High | 0.000 | 0.056 | 0.000 | $\mathbf{0 . 9 4 4}$ |

$\dagger$ Diagonal transition probabilities in bold to facilitate interpretation.

## Discussion

- The four-profile model solutions were consistent with findings from previous studies (Halpin et al., 2021; López \& Foster, 2021). - The patterns of profile transitions aligned with evidence that latent profiles distinguish DLLs' growth (Lonigan et al., 2017), Profiles capture the unique academic strengths and needs in subgroups of preschool DLLs that may not be detected in studies examining DLLs as a homogenous population (Escobar \& Tamis-Lemonda, 2017). This may be useful in distinguishing the different types of academic supports that are beneficial to different types of DLLs.

