

INTRODUCTION

Children with developmental language disorder (DLD) struggle with the coordination of sequentially patterned features that structure language¹. Weaknesses in motor control, especially in manual dexterity and balance, are also observed in children with DLD in comparison to peers with typical language development (TLD)². In the current work we explore this motor component of DLD.

Hypothesis: Performance on specific fine and gross motor tasks that are linked to sequential pattern learning will correspond with phonological path accuracy and movement stability in the production of newly learned novel signs in young children with DLD.

We ask the following overarching questions:

1. Do children with DLD show weaknesses in fine and gross motor skill, as indicated by group differences in performance on a standardized test (MABC-2)?
2. Do children with DLD show weaknesses in their production of novel signs, as indicated by group differences in phonological path accuracy and movement stability?
3. Is there a relationship between performance on specific gross and fine motor tasks and the production of novel signs, specifically novel signs that require complex bimanual coordination?

Mixed-Model ANOVA Findings

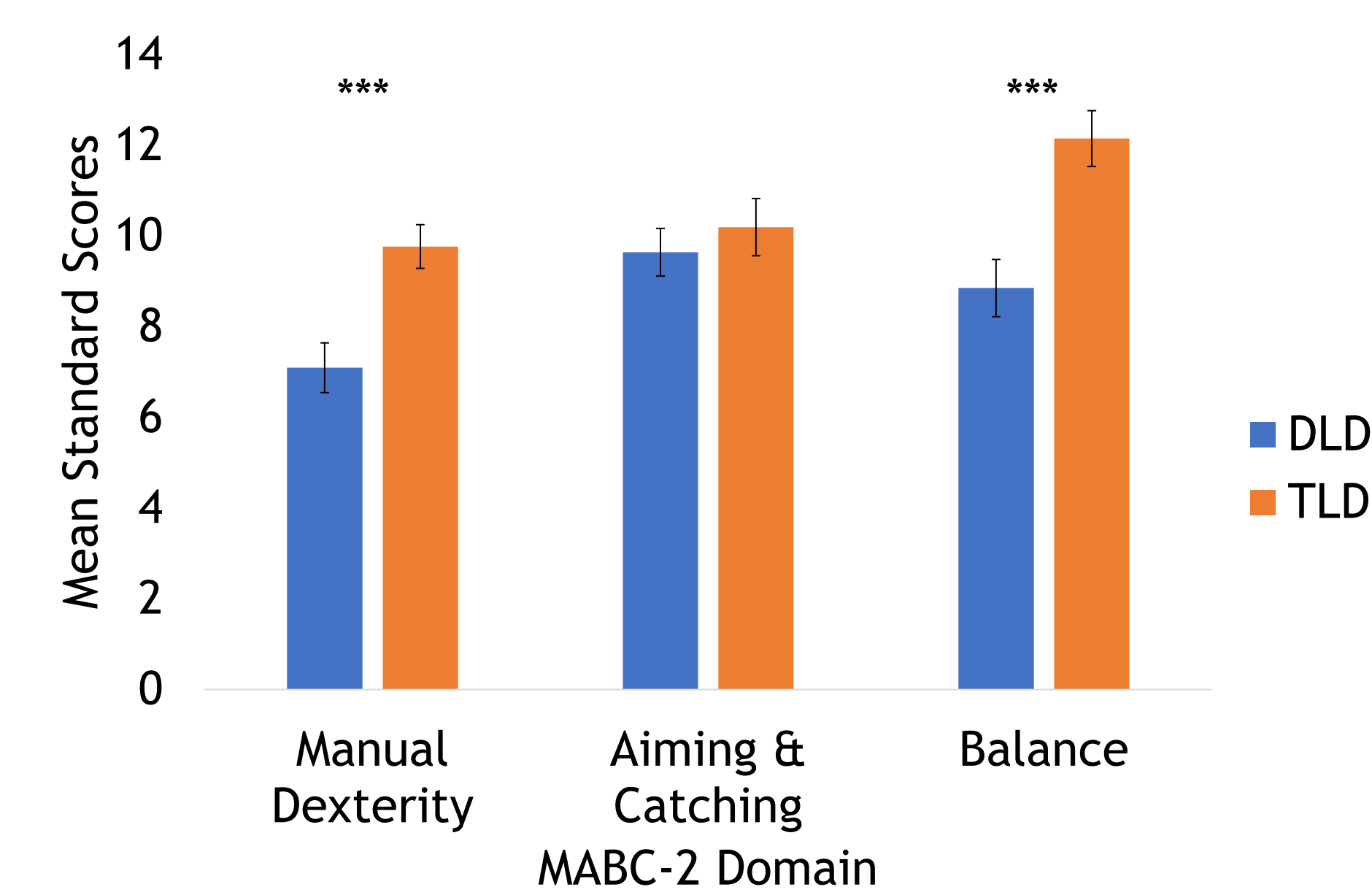


Figure 5. Between Group MABC-2 Performance with SE

Questions 1 and 2:

- Children with DLD demonstrate fine and gross motor deficits as indicated by a main effect of group, $p=.002$.
- In comparison to their TLD peers, children with DLD demonstrate phonological path, $p<.001$, and movement stability deficits, $p=.065$. While the group main effect of STI was marginal, the Group by Sign interaction, $p=.009$, revealed that the DLD group was significantly less stable when producing “empanada”, $p=.019$, which requires complex bimanual coordination.
- “Empanada” was produced by all children with high phonological path accuracy but was the least kinematically stable.

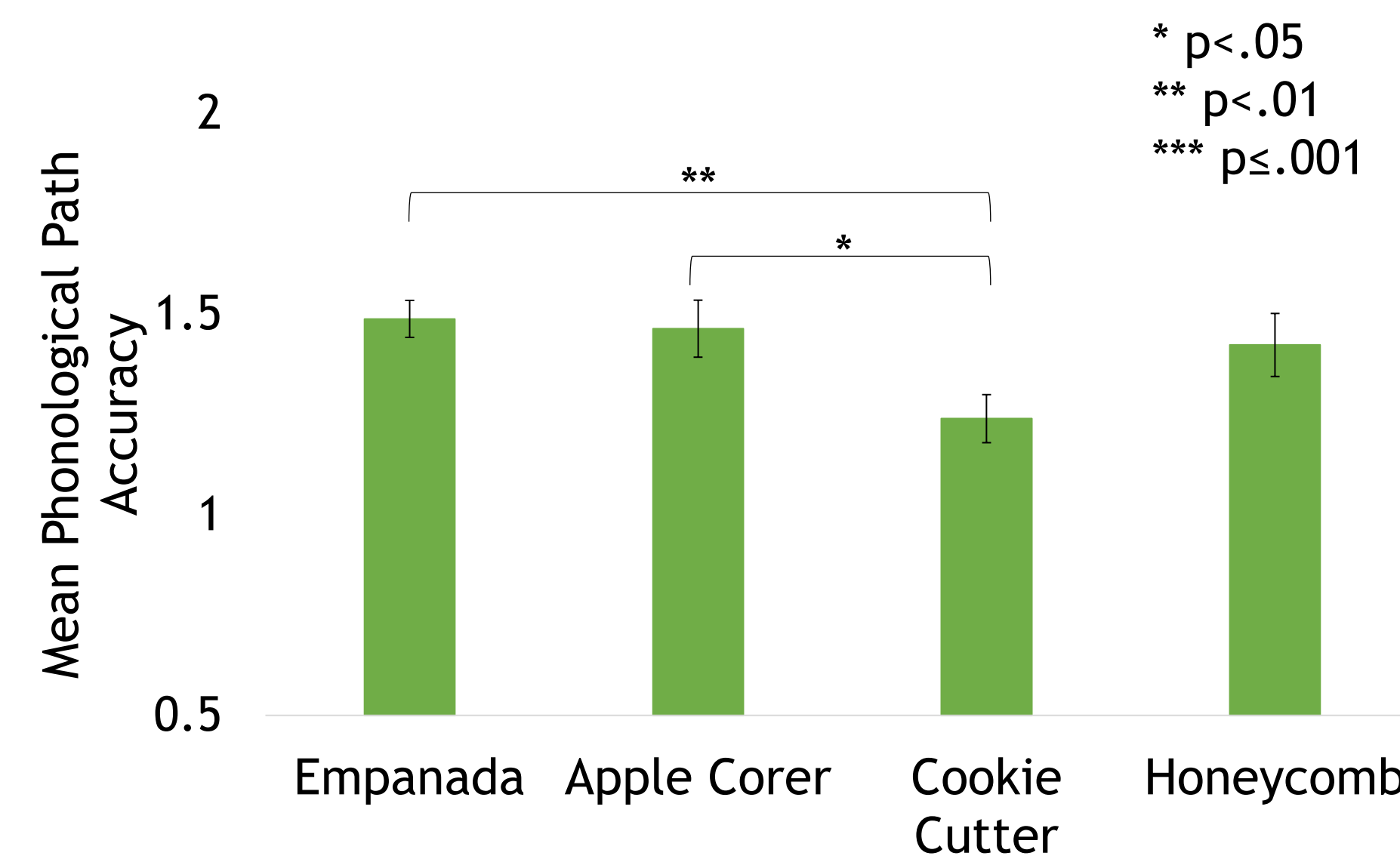


Figure 6. Between Sign Path Phonological Accuracy with SE (Groups Collapsed)

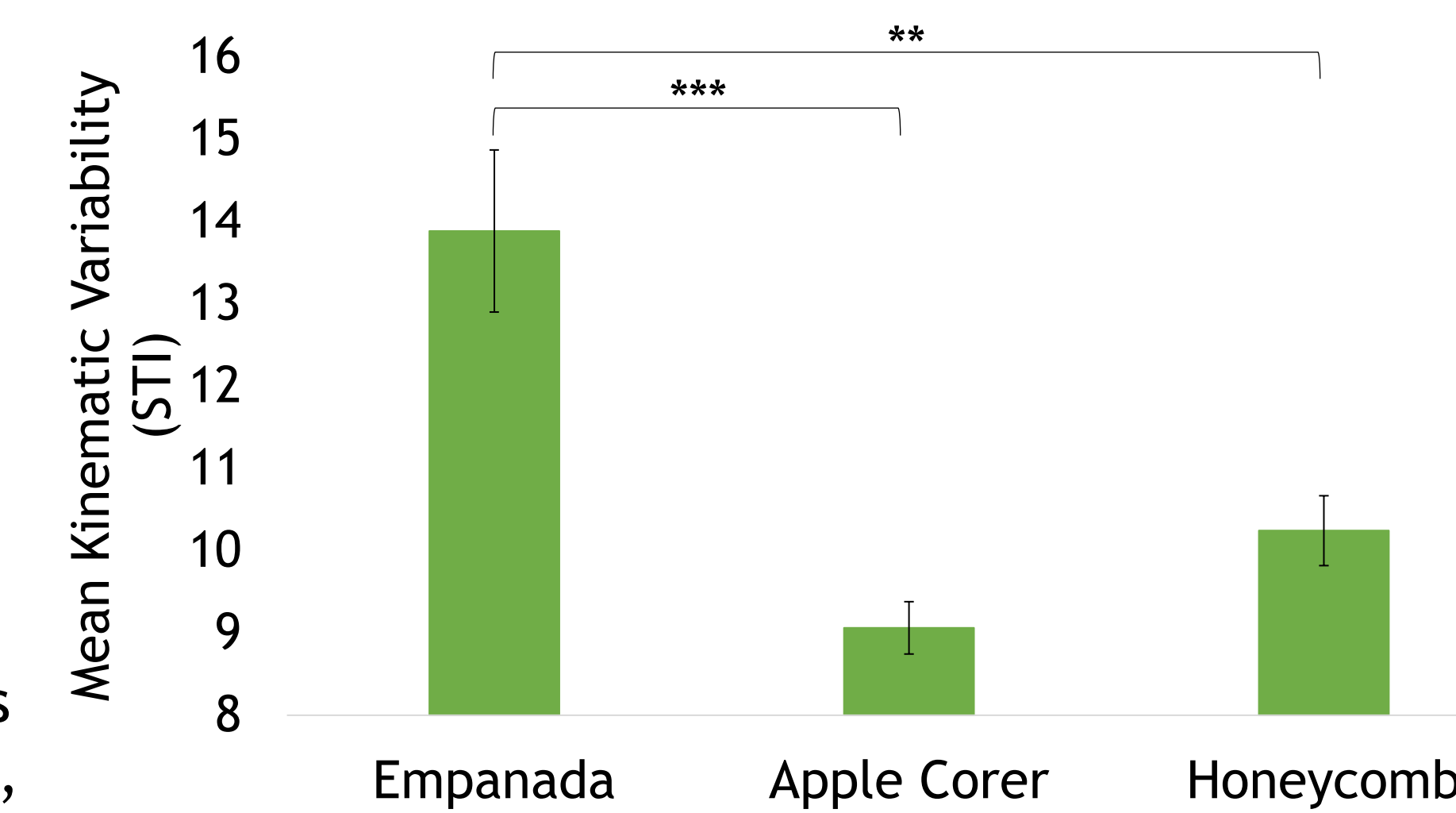


Figure 7. Between Sign STI with SE (Groups and Hands Collapsed)

METHOD

Participants

- 55 preschool-aged children
 - 34 with DLD
 - 21 with TLD
 - Not all children included in all analyses because of missing data

Variables

- Movement Assessment Battery for Children-2 (MABC-2)
 - Manual Dexterity and Balance Domains
- Novel Sign Phonological Path Accuracy
- Novel Sign Movement Stability (STI)
 - Dominant and Nondominant Hands

Figure 1. Novel Signs



Figure 2. MABC-2 Posting Coins and Walking Heels Raised

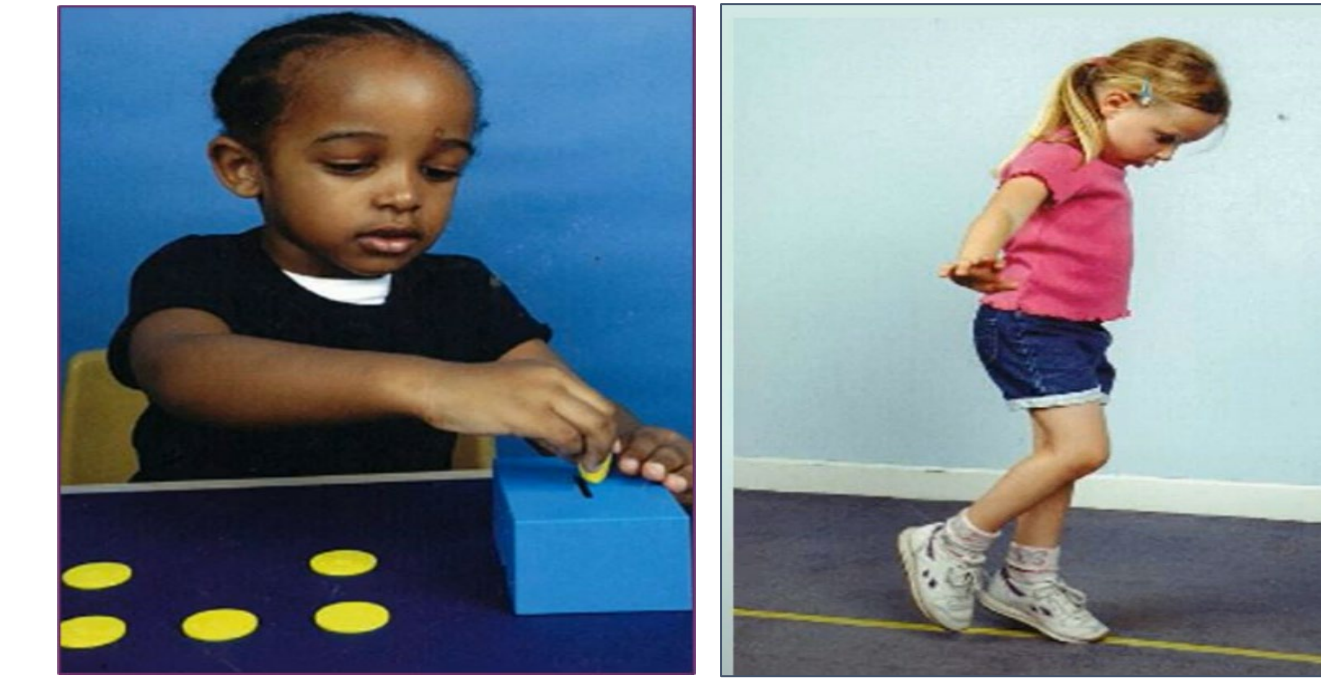
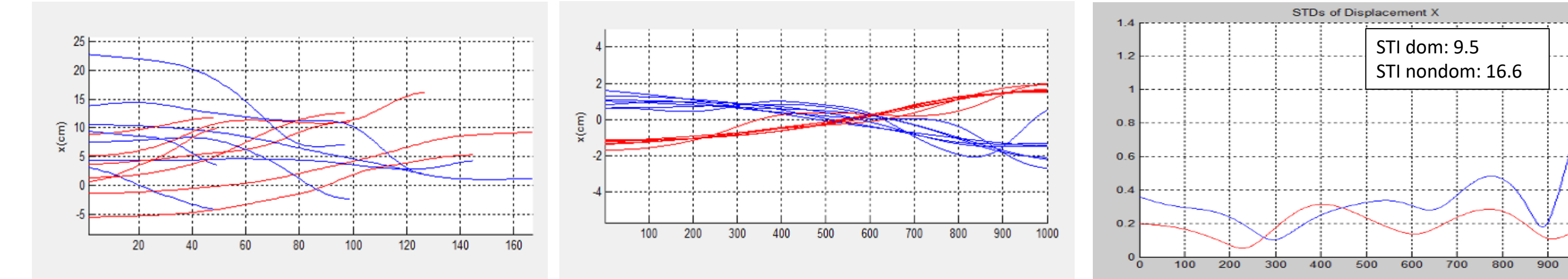


Figure 3. Novel Sign Learning



Figure 4. Movement Stability (STI) Calculations¹



Correlational Findings - Question 3: Is there a relationship between performance on specific fine and gross motor tasks and the production of novel signs?

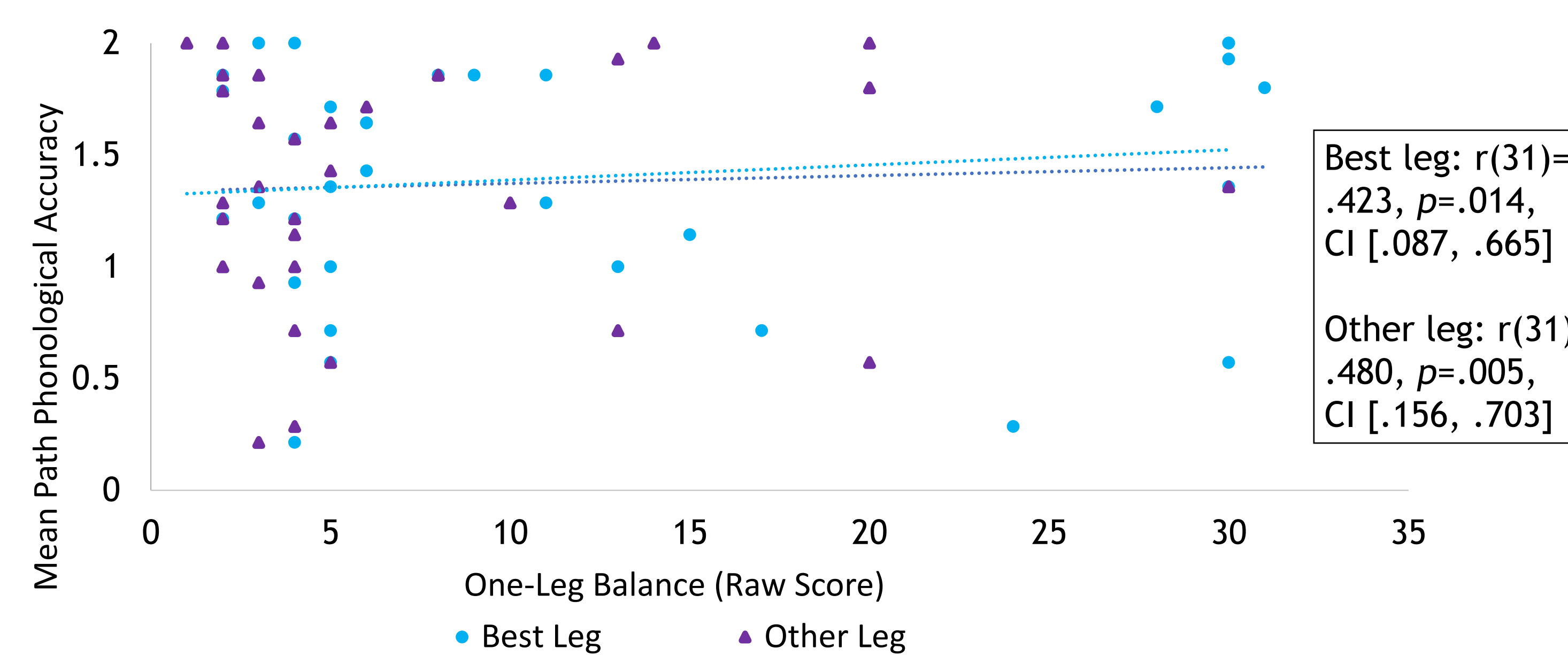


Figure 8. Apple Corer Mean Phonological Path Accuracy and One-Leg Balance for DLD Group

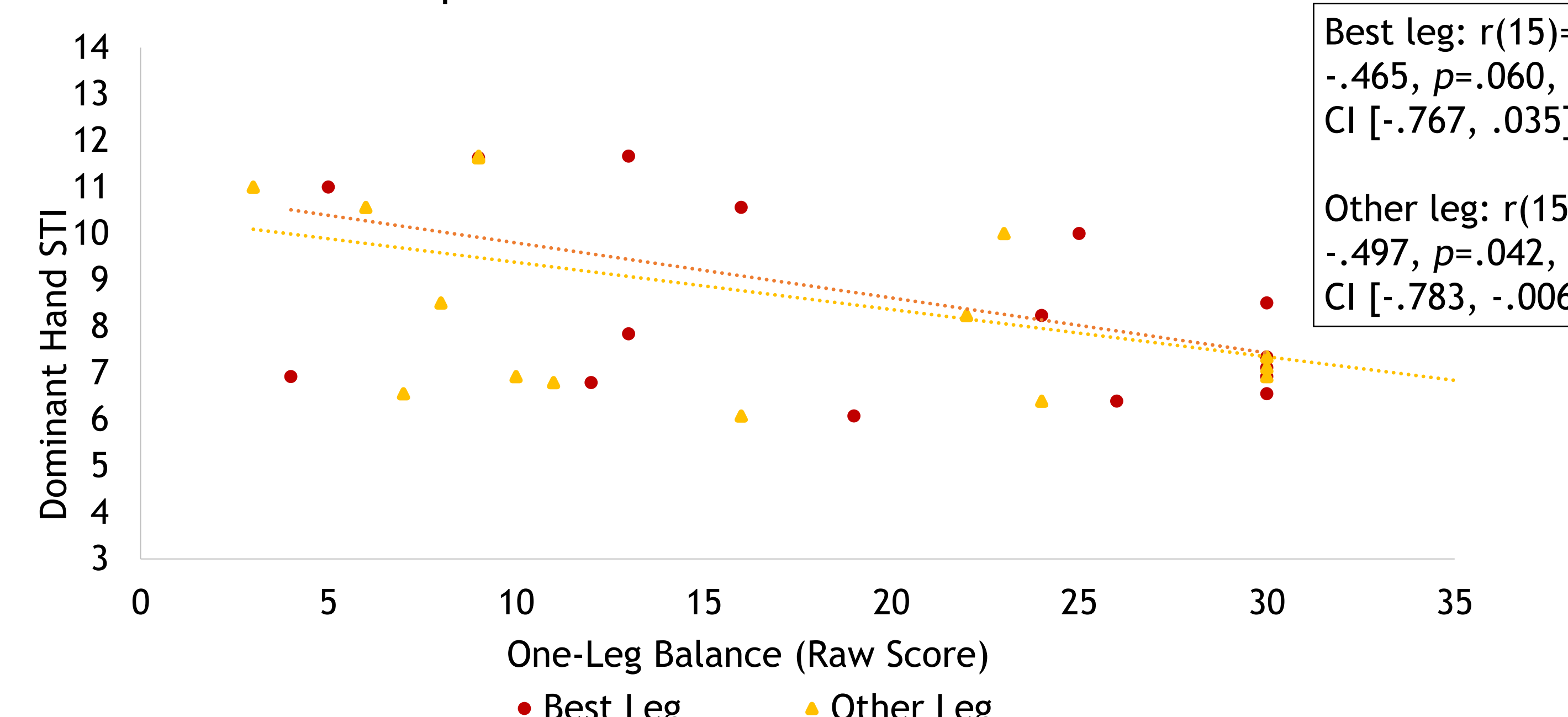


Figure 9. Apple Corer Dominant Hand STI and One-Leg Balance for TLD Group

RESULTS CONT.

Correlations were run to assess the third overarching question. Raw scores of the MABC-2 tasks were used for this purpose. These analyses yielded mixed results:

- Manual Dexterity and path phonological accuracy only produced one significant relationship between the novel sign “honeycomb” and Drawing Trails for the TLD group.
- Manual Dexterity and STI produced no significant relationships for either group.
- Balance and phonological path accuracy had one significant relationship involving One-Leg Balance, (Figure 8).
- Balance and STI yielded 3 significant relationships and a few other marginal relationships, all involving either Walking Heels Raised or One-Leg Balance (Figure 9).

DISCUSSION

- Group differences were noted as predicted, with the DLD group being weaker in gross and fine motor skills and in their production of novel signs.
- The novel sign for empanada demonstrates a dissociation between phonological accuracy and movement stability.
- There was no significant relationship between Manual Dexterity and STI scores. Manual stability in a language (novel sign) task and fine motor skill differed, replicating prior findings that STI and fine motor skill do not relate¹.
- The novel sign “empanada” requires bimanual coordination and thus was hypothesized to show strong relationships to specific MABC-2 subtasks. Findings showed that the novel sign “apple corer” had relationships with motor skill. Future work should investigate the nature of the relationship between motor skill and sign language production.
- Balance may be related to both phonological accuracy and movement stability.
- Targeted and nuanced motor tasks should be developed to assess specific relationships with sign production.

REFERENCES

- ¹Goffman, Factor, L., Barna, M., Cai, F., & Feld, I. (2023). Phonological and Articulatory Deficits in the Production of Novel Signs in Children With Developmental Language Disorder. *Journal of Speech, Language, and Hearing Research*, 66(3), 1051-1067. https://doi.org/10.1044/2022_JSLHR-22-00434
- ²Sanjeevan, T. & Mainela-Arnold, E. (2019). Characterizing the Motor Skills in Children with Specific Language Impairment. *Folia Phoniatrica et Logopaedica*, 71(1), 42-55. <https://doi.org/10.1159/000493262>

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