Force Accuracy and Force Stability in Children with Developmental Coordination Disorder Compared to Typically Developing Peers

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Summary

This study examined force accuracy and stability during low-level isometric handgrip contractions in 38 children (23 DCD, 15 TD). Participants aimed to maintain force within a target zone. Results showed TD children were significantly more accurate and stable overall. However, the findings of block-by-block comparisons suggest that force control deficits in DCD become more pronounced over time.

Introduction

DCD affects 5–6% of children [1] and is characterized by difficulties in learning and performing motor skills, including appropriate force control [2]. While the underlying causes remain unclear, children with DCD exhibit altered motor control strategies that may impact their ability to produce stable and accurate forces**.** Force stability and accuracy are critical for functional tasks, yet little research has explored how children with DCD regulate force output at the motor unit level [3]. This study examines force control during low-level isometric handgrip contractions in children with and without DCD, focusing on their ability to maintain consistent force levels. By investigating differences in force steadiness and accuracy, we aim to better understand the neuromuscular deficits contributing to motor difficulties in DCD.

Methods

38 participants, aged 7-12 years, were recruited. The DCD group consisted of 23 participants and the TD group consisted of 15 participants. Participants completed three maximum voluntary contractions (MVC). The force profile was presented to them on the screen. The highest MVC was used to set the target zone, 10% MVC ± 5%. Participants were asked to squeeze the dynamometer, so that the force trace remained, as steady as possible, within the target zone. A single block comprised 6×10-s-long contractions separated by 10s of rest. Ten blocks were completed in total, with 1 min rest between the blocks. Force accuracy was the percentage of time participants were able to keep their force output within the target zone. Force steadiness was defined as the coefficient of variance (CoV), calculated as the percentage of the force standard deviation to the mean force value for that contraction.

Results and Discussion

For the overall accuracy the TD (48±1.9) was significantly more accurate than the DCD (33±2.1) group $t(36)$=-2.25, p=.03. Block by block comparison showed that the TD became significantly more accurate from block 2 onwards (p<.05).

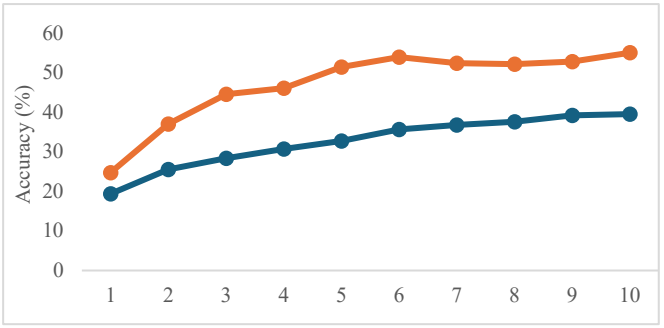

Figure 1: Accuracy for the DCD (blue) and TD (orange) groups

For the overall force stability the TD (9.2±4.0) was significantly more accurate than the DCD (15±9.3) group $t(36)$=-2.25, p=.03. Block by block comparison showed that the TD group was significantly more stable from block 5 onwards (p<.05).

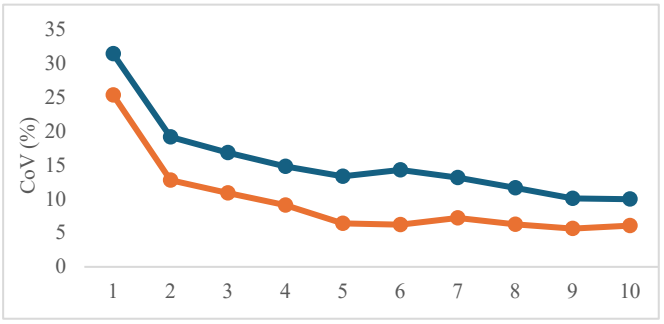

Figure 2: CoV for the DCD (blue) and TD (orange) groups

Conclusions

As expected, TD children exhibited greater force accuracy and stability overall than those with DCD. However, both groups performed similarly in early blocks, with differences emerging after block two for accuracy and block five for stability. These results suggest that DCD need more repetitions to produce appropriate force control.

Acknowledgments

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References

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