INTRODUCTION

Individuals with PD show deficits in modifying postural responses which impair balance.

- Individuals with PD do not show as much decrease in muscle activation upon changing from free stance to supported stance, from narrow to a wide stance [2], compared to healthy older adults.
- The relatively high muscle activation retained in wide stance is destabilizing; a greater reduction in activity upon switching from narrow to wide stance would represent an improvement in balance control [2].

Adapted Tango (AT), an exercise-based rehabilitation program, is effective at improving clinical measures of balance [5-7].

It is unknown whether successful completion of AT is associated with an improved ability to modify postural response magnitude across stance widths.

- Postural response scaling was assessed only for loaded muscles.
- The relatively high muscle activation retained in wide stance is destabilizing; a greater reduction in activity upon switching from narrow to wide stance would represent an improvement in balance control [2].

METHODS

9 participants with mild to moderate idiopathic PD were tested in a reactive balance paradigm before and after a high-volume AT program.

RESULTS

Individuals with PD scaled their postural responses, exhibiting less muscle activity at wide stance compared to narrow stance.

- Before AT, the difference between postural response magnitude in narrow and wide stances ranged from 35% to 89% of response magnitude in narrow stance. After AT, the difference ranged from 29% to 78%.

In this cohort, AT did not significantly alter the ability to scale postural responses across stance widths.

- Difference between EMG magnitude in narrow and wide stance was 62% of narrow stance magnitude before AT and 57% after AT.
- No significant interaction effect of stance width and observation (p=0.14).

In this cohort, AT may have had different effects on individual muscles.

- Postural response scaling increased after AT in gluteus medius, rectus femoris, and rectus abdominis, but decreased in other muscles.
- No clear trend in which muscles increased postural response magnitude; increases and decreases were both seen in the torso, upper leg, and lower leg.
- The interaction effect of stance width and observation was only significant (p=0.09) for erector spinae.

Background EMG scaling increased after AT in this cohort.

- Across 16 muscles, the difference between baseline and post AT at narrow and wide stances was -10% of EMG magnitude in narrow stance before Adapted Tango and 45% after Adapted Tango.
- Significant interaction effect of stance width and observation before AT (p=0.002).

Postural response scaling calculated with background activity retained showed a significant difference before and after AT.

- Across 16 muscles, the difference between baseline and post AT at narrow and wide stances was 43% of EMG magnitude in narrow stance before Adapted Tango and 45% after Adapted Tango.
- Significant interaction effect of stance width and observation (before/after AT) in this cohort (p=0.002).
- This approach, in which background activity is retained, differs from the methods of Dimitrova [2] and Carpenter [11].

DISCUSSION

The magnitude of postural response scaling may be influenced by disease severity, medication state, and PD clinical phenotype.

- The current study found large amounts of modification than Dimitrova [2]; erector spinae (76% vs. -39%), rectus abdominis (73% vs. -30%), tensor fasciae latae (86% vs. -40%), and soleus (78% vs. -20%).
- The current study features participants with milder disease severity (Hoehn and Yahr 2.2, 2.5, and 3) assessed in the ON medication state, whereas the participants recruited by Dimitrova had levels of disease severity (Hoehn and Yahr 3, 3.5, and 4) and were assessed in the OFF medication state. These disease aspects may lead to participants having more severe postural disturbances. In addition, participants recruited by Dimitrova and colleagues were selected to have minimal levels of tremor, which may result in more participants with the postural instability and gait disorder subtype of PD.

Scaling of postural responses between narrow and wide stances while ON medications did not change after AT; an investigation featuring OFF medication assessment is needed in this cohort (p=0.16).

Background muscle activity scaling increased after AT, which may reflect reduced tremor or an increase in modulated central set (central set refers to the influence of expectations, experience, and physical feedback on subsequent actions).

- Dimitrova [12] previously found that individuals with PD have lower horizontal forces than individuals without PD. In the present study, participants retained 100-450 ms after perturbation onset (p<0.001).

REFERENCES

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