High Speed Cycling and the Law of Initial Values in Parkinson’s Disease

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Wilder (1958) described the law of initial values (LIV) as a phenomenon of increased excitation due to stimuli when initial values are low, and vice versa. Our research program is focused on exercise interventions for people with Parkinson’s disease (PD) and the size of the training effect appears to vary based on the subject’s baseline fitness. PURPOSE: To determine the extent to which the LIV is expressed in functional data obtained from people with PD who were part of an interval-based exercise intervention. It was hypothesized that subjects with poorer initial values would show the greatest increase in fitness. METHODS: 31 people with PD exercised on stationary recumbent bicycles twice per week in a six-week program. High speed and low pedaling resistance emphasized neural activation while reducing musculoskeletal and cardiovascular strain. 30-min. sessions included five min. of warm-up and cool-down at preferred pedaling cadence. In the middle 20 min., subjects executed 20, 15-s fast intervals. Maximum revolutions per minute (RPM-max) were obtained for the first and last training sessions. Timed up and go test (TUG), Activities-specific Balance Confidence Scale (ABC), 36-item Short Form Survey (SF36), and dominant hand isometric grip strength (DGrip) were administered pre-and post-training. ANCOVA and Pearson correlation coefficients describe relationships between pre-training scores and change scores on these five measures. RESULTS: There were moderate-strong negative correlations between pre-training scores and change scores (TUG r= -.385, p= .035, n=30; ABC r= -.492, p= .006, n=28; SF36 r= -.294, p= .121, n=28; DGrip r= -.386, p= .029, n=31; RPM-max r= -.462, p= .020, n=25). When corrected mathematically for initial values (ANCOVA, Microsoft Excel), the correlations all become zero, indicating that the size of the effect was indeed related to baseline fitness. CONCLUSION: As hypothesized, the LIV is expressed in this population such that baseline status predicts a meaningful amount of variance in training effects. The indication that a low-fit person has a greater capacity for physical improvement compared with a high-fit person supports our idea that this intervention is meant for the onset of an exercise regimen that will eventually follow the principles of progression, overload, and specificity.

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