CAN FUNCTIONAL PERFORMANCE PREDICT LONG-TERM MORTALITY POST HIP FRACTURE IN OLDER ADULTS (65–100 YEARS OF AGE)?

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Functional performance measures (grip strength, Short Physical Performance Battery (SPPB), and 3-meter gait speed) represent underlying disease progression and predict mortality. However, there is little information regarding whether these measures assessed at 2-months post-hip fracture predict long-term mortality (10-year follow-up). To address this gap, a longitudinal analysis of Baltimore Hip Studies-7 cohort, with mortality verified by National Death Index, was conducted. Mean difference in 2-month functional performance measures (n=242, men n=121, female n=121) among those who survived and did not survive over 10 years was determined using t-test. Prediction of mortality by these measures, overall and by sex, was estimated using cox proportional hazard models, for which Hazard ratios (HR) with 95% confidence intervals (CI) were estimated. We found that, gait speed [0.47(standard deviation,SD=0.39) versus 0.31(SD=0.27)] and SPPB score [4.89(SD=3.31) versus 2.83(SD=2.24)] were significantly higher at 2 months among those surviving compared to those who did not. Adjusting for covariates, functional performance predicted long-term mortality in men and women. Increase in gait speed by 0.1m/s predicted 15% decrease in mortality for men [HR=0.85(0.55-0.96)] and 17% for women [HR=0.83 (0.74-0.93)]. Increase in SPPB by 1 unit predicted decrease in mortality by 14% for men [HR=0.86(0.77-0.95)] and 17% for women [HR=0.83(0.74-0.93). Increase in grip strength by 1 kg predicted 5% decrease in mortality for men [HR=0.94(0.92-0.97)] and 9% for women [HR=0.90(0.86-0.95)]. Functional performance measured at 2-months post-hip fracture predicted long-term mortality. Those with poor functional performance at 2-months can be referred for further assessment to optimize their care to promote survival.

HIGHER-LEVEL COGNITIVE FUNCTION AND OBSTACLE ATTRIBUTES: AN FNIRS STUDY IN OLDER ADULTS WITH PARKINSON'S DISEASE

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Older adults with Parkinson's disease (PD) rely on prefrontal activation to compensate for impaired motor function during the performance of complex mobility-related activities such as obstacle negotiation. However, the influence of the properties of the obstacles on prefrontal activation has not been systematically evaluated. Here, we examined the effects of obstacle height and anticipation time on prefrontal activation in patients with PD and older adults. 34 patients with PD (age: 67.4±5.7 years; 14 women) and 26 older adult controls (age: 71.3±8.9 years; 11 women) walked in an obstacle course while negotiating anticipated and unanticipated obstacles at heights of 50 mm and 100 mm. Prefrontal activation was measured using functional Near-Infrared Spectroscopy (fNIRS); obstacle negotiation performance was measured using Kinect cameras. PD patients showed greater increases in prefrontal activation during and after obstacle crossing compared to the older adults ($p<0.001$). Obstacle height affected prefrontal activity only when crossing anticipated obstacles (time x height interaction, $p=0.011$); in that case, higher obstacles were accompanied by higher prefrontal activity. PD patients showed higher levels of activation during unanticipated obstacles, compared to anticipated obstacles ($p=0.015$). Different correlations between prefrontal activation and obstacle negotiation strategies were observed in the patients and the controls. These results point to the use of prefrontal activation as a compensatory mechanism in PD. Moreover, the higher activation of prefrontal regions during more challenging obstacles suggests that there is a greater reliance on cognitive resources in these demanding situations that may contribute to the higher risk of falls in patients with PD.

MACHINE LEARNING IN AGING: AN EXAMPLE OF DEVELOPING PREDICTION MODELS FOR SERIOUS FALL INJURY IN OLDER ADULTS

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Advances in computational algorithms and the availability of large datasets with clinically relevant characteristics provide an opportunity to develop machine learning prediction models to aid in diagnosis, prognosis, and treatment of older adults. Some studies have employed machine learning methods for prediction modeling, but skepticism of these methods remains due to lack of reproducibility and difficulty understanding the complex algorithms behind models. We aim to provide an overview of two common machine learning methods: decision tree and random forest. We focus on these methods because they provide a high degree of interpretability. We discuss the underlying algorithms of decision tree and random forest methods and present a tutorial for developing prediction models for serious fall injury using data from the Lifestyle Interventions and Independence for Elders (LIFE) study. Decision tree is a machine learning method that produces a model resembling a flow chart. Random forest consists of a collection of many decision trees whose results are aggregated. In the tutorial example, we discuss evaluation metrics and interpretation for these models. Illustrated in data from the LIFE study, prediction models for serious fall injury were moderate at best (area under the receiver operating curve of 0.54 for decision tree and 0.66 for random forest). Machine learning methods may offer improved performance compared to traditional models for modeling outcomes in aging, but their use should be justified and output should be carefully described. Models should be assessed by clinical experts to ensure compatibility with clinical practice.