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Aerobic performance, mobility limitations and exercise in older adults with diabetes

Caroline Blaum, MD
Ann Arbor VAMC
Ann Arbor, Michigan

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BACKGROUND:

Type 2 diabetes is a growing problem among all older adults, particularly veterans and members of minority groups. It is strongly associated with impaired mobility disability, which has been shown to be multifactorial, related to peripheral neuropathy, obesity and vascular disease. Aerobic impairment (even in the absence of overt coronary artery disease or left ventricular systolic dysfunction) is also a physiologically plausible mechanism that may contribute to diabetes-related mobility disability, because diabetics are at high risk for conditions that may lead to compromised aerobic performance, such as heart and vascular disease. Aerobic impairment in diabetes, along with impairments in strength and balance due to multiple diabetes complications, is likely to be improved by exercise, an intervention which affects multiple physiological and biomechanical systems. In middle-aged diabetics, research has demonstrated disproportionate aerobic impairment, and its significant improvement with exercise, in diabetes patients compared to those without diabetes.

OBJECTIVES:

Therefore, the proposed research to be conducted in men and women aged 65 and older with diabetes, has two goals: 1) to rigorously test a practical exercise activity for its ability to improve aerobic function, mobility function, and reported activity levels and to explore its effect on quality of life and diabetes-related physician visits and hospitalizations; and (2) to use this intervention to investigate the mechanistic links between aerobic and mobility impairments, including evaluating the utility of a less burdensome method to assess aerobic function. Hypotheses are: 1 (Primary) a functional circuit training (FTC) group with home exercise program, compared to a similarly designed control flexibility and toning group (C), will show improvements in measures of functional mobility performance, peak aerobic capacity, submaximal oxygen uptake kinetics, and self-reported activity level. (Secondary) at 12 months the intervention will improve quality of life but not utilization; Hypothesis 2a/b: Aerobic impairment is independently related to mobility impairment at baseline and post intervention, even after accounting for other variables associated with mobility impairment such as vascular disease, neuropathy, strength and balance impairment, body composition, and metabolic/ inflammatory status; and 2c, submaximal measures of aerobic function have a similar or greater relationship to functional mobility performance than maximal measures of aerobic function.

Methods:

The proposed research will use a randomized clinical trial to test the 6 month FTC intervention (3 months) and home program (additional 3 months) vs. C flexibility and toning with subsequent home program, in 130 older adults with diabetes (65 intervention and 65 control) who meet explicit eligibility criteria. Recruitment will take into account the potential for high drop-out. The intervention requires simple equipment, is community based and simulates everyday activities. Both the FTC and C home program are monitored but multiple adherence enhancing activities are built into the FTC home program. Major outcomes to be tested are intervention-related improvements in functional mobility performance (measured by get-up and go test, 6-minute walk and other performance measures), aerobic performance (maximal and submaximal) and reported activity level, measured after the intervention (6 months). Disciplines involved in the research are geriatrics, cardiology, exercise physiology, biomechanics, physical therapy and biostatistics. This research will be done by a multidisciplinary research team experienced in high quality variable measurement and in exercise interventions in older adults.

Impact:
This work is highly relevant to RR&D priorities and to the VA health care mission because type 2 diabetes and its associated mobility impairment are major problems for veterans and older Americans. This research will test a moderately rigorous, practical exercise intervention in older adults with diabetes that is potentially an excellent model for community-based programs. It is inexpensive, can be done anywhere, has characteristics that promote adherence, and could be linked to ongoing diabetes primary care through diabetes disease management or care coordination.