Name: Leanna Ross

Dissertation title: The association of changes in cardiorespiratory fitness with changes in cardiometabolic risk factors

Cardiorespiratory fitness (CRF) is well established as having a strong inverse association with numerous cardiovascular disease (CVD) risk factors and mortality. As CVD remains the number one cause of death in America, the detrimental effects of low CRF present a substantial health threat. The studies presented in this dissertation syndicate both epidemiologic and clinical data that will enrich the knowledge base regarding the magnitude of change in CRF in relation to CVD risk factors.

Recently, the American Heart Association established a new construct termed ideal cardiovascular health (CVH), which is characterized by seven metrics known as Life's Simple 7. The concept emphasizes seven positive health factors and behaviors. The promotion of achieving and retaining these metrics at an ideal level serves to improve CVH and decrease public health burden and CVD mortality. This first study of this dissertation found that higher levels of CRF are strongly associated with better CVH profiles, which was demonstrated by individuals with moderate and high CRF exhibiting almost 11 and 40 times greater odds of having average or optimum CVH scores, respectively, compared to low fit individuals. Additionally, longitudinal analyses showed that improvements in CRF over time are associated with significant improvements in CVH score. These findings support the vital role CRF plays in public health efforts aiming to prevent the development of CVD and reduce CVD mortality risk.

Secondly, this dissertation investigated the responsiveness of CRF, as measured by maximal oxygen consumption ($\dot{V}O_{2max}$), and CVD risk factors following aerobic exercise intervention. Aerobic exercise interventions are used to increase CRF in order

to help combat the detrimental effects of low CRF. However, relying solely upon group mean changes can be misleading as considerable inter-individual variation exists in the ability to improve CRF and CVD risk factors to standardized interventions. This study is likely the first to establish cutpoints to assess $\dot{V}O_{2max}$ responsiveness that allowed for the evaluation of the prevalence of low $\dot{V}O_{2max}$ response across 14 diverse exercise training studies. This study found that all 14 exercise interventions produced significant mean increases in $\dot{V}O_{2max}$. However, upon evaluation of individual changes in $\dot{V}O_{2max}$, 34% of the total sample was considered low $\dot{V}O_{2max}$ responsive. Within studies that employed multiple exercise interventions, a trend emerged. As exercise amount and intensity increased within studies, prevalence of low $\dot{V}O_{2max}$ response decreased. The establishment of these responsiveness cutpoints helps to provide a better understanding of the inter-individual variation in response to exercise training to enhance our ability to provide personalized exercise prescription for improved health and attenuated CVD risk.