



Association Between Physical Activity, Depression, and Diabetes in Urban-Dwelling People Living with HIV

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Physical activity (PA) may improve physical and mental health in people living with HIV (PLWH). However, the associations between PA participation and physical and mental health problems of PLWH in urban settings remain largely unknown. Our objective was to determine the relationships between PA and physical and mental health in urban-dwelling PLWH. There were 289 adult PLWH who responded to an electronic survey including questions on PA and current physical and mental health. The associations between physical and mental health and PA were investigated using linear and logistic regression. A large proportion of participants met recommended volumes of PA. Eighty-three percent of respondents reported symptoms of severe mental distress. Diabetes mellitus was associated with a lower total volume of PA ($p = .035$). Similarly, depression was negatively associated with muscle-strengthening exercise participation ($p = .030$). Sufficient amounts of aerobic activity and/or muscle strengthening exercise are associated with better physical and mental health.

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People living with HIV (PLWH) often experience physical and mental health complications in association with the progression of the disease and the

antiretroviral therapy (ART) used to treat HIV. Among these complications are depression (Arseniou, Arvaniti & Samakouri, 2014) and cardiometabolic diseases such as hypertension (De Socio et al., 2013), coronary heart disease, and diabetes mellitus (Willig & Overton, 2014), all of which can increase the risk of premature death.

Physical activity produces many health-related benefits for PLWH; these consist of greater life satisfaction and quality of life (Ramírez-Marrero, Smith, Meléndez-Brau, & Santana-Bagur, 2004), less depression (Blashill et al., 2013), better lipid profiles (Gavrila et al., 2003), and healthier body composition (Justina, Luiz, Maurici, & Schuelter-Trevisol, 2014). However, the majority of studies have used small sample sizes and/or selective recruitment from clinics and community center settings (Fillipas, Cicuttini, Holland, & Cherry, 2013; Ramirez-Marrero et al., 2004; Segatto et al., 2011), so the results have not been generalizable to larger populations of PLWH.

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Physical activity behaviors in PLWH residing in major urban settings, where the prevalence of HIV infection is disproportionately higher, is largely unknown. Data in the population show large variations in physical activity across neighborhoods in urban areas, and the neighborhoods with the highest poverty levels tend to have the lowest levels of physical activity (Wyker et al., 2013). HIV infection is concentrated in people in lower socioeconomic statuses, with many living in lower-resourced neighborhoods where there may be safety concerns, poorer public transportation, and fewer parks and attractive environments conducive to physical activity (Pellowski, Kalichman, Matthews, & Adler, 2013). Thus, it is possible that PLWH in urban areas may be less physically active when compared to their uninfected counterparts. However, to date, no studies have investigated physical activity behaviors of PLWH living in an urban setting. Furthermore, the relationships between physical activity and physical and mental health problems routinely occurring in PLWH have not been characterized in urban-dwelling PLWH. We hypothesized that there would be a positive relationship between physical activity, including muscular-strengthening exercise, and physical and mental health in PLWH.

The specific aims of our study were to (a) describe the leisure and nonleisure physical activity participation behaviors in urban-dwelling adult PLWH and (b) examine the associations between physical activity and physical and mental health in PLWH.

Methods

Study Design and Population

We used a cross-sectional observational design. There were 489 urban-dwelling men and women 18 years of age or older and living with HIV who responded to a 10- to 15-minute survey through announcements made available online from April 2015 to April 2016. Classified advertisements were placed on websites (e.g., Craigslist [Craigslist Inc., San Francisco, CA] and Backpage [Dallas, TX]), online fora and blogs for PLWH, social media (e.g., Facebook [Facebook Inc., Menlo Park, CA], Twitter [Twitter Inc., San Francisco, CA], and LinkedIn

[LinkedIn Corporation, Sunnyvale, CA]), and other online sites. Links to the survey were made available in 25 metropolitan areas of more than 500,000 residents with the highest rates of HIV as reported by the Centers for Disease Control and Prevention (CDC, 2013b).

Survey Data Collection

Participant inclusion criteria included being previously diagnosed with HIV, at least 18 years of age, living in an urban setting, and being willing and able to fill out questionnaires electronically. Eligible individuals who were interested in participating in the anonymous survey were directed to the SurveyMonkey survey system (SurveyMonkey, Inc., Palo Alto, CA; www.surveymonkey.com). After participants accessed the online survey, they provided informed consent before answering any of the survey questions as per the policies and procedures of the Teachers College, Columbia University Institutional Review Board, which approved the study. The respondent then answered two eligibility questions: *Have you previously tested positive for the HIV virus?* and *Are you an adult (i.e., ≥ 18 years old)?*. If the response was *yes* to each, the participant continued the anonymous survey; if *no* to one or both questions, the respondent was thanked and was ineligible to continue with the survey. Links to the survey were available for English and Spanish versions of the survey. Participants were eligible to participate in a drawing for one of 15 gift certificates worth \$20 USD at the end of the study, if they provided an e-mail that was not linked to the survey itself to protect anonymity.

Sociodemographics and Health

Participants provided information about sociodemographics, health-related lifestyle, and diagnosed diseases by self-report. Sociodemographic variables included age, gender, race, level of education, and household income. Race was categorized as White or Caucasian; Black or African American; and Hispanic or Latino; the remaining races or ethnicities were pooled into a category called Other. The question on education came from the 2013 Behavioral Risk Factor Surveillance System questionnaire (BRFSS; CDC, 2013a), and was further trichotomized into high school education or less, some college, or college

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