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Review Article

Physical activity, social support and socio-economic status amongst persons living with HIV and AIDS: a review

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Physical activity can be used for the effective and comprehensive management of HIV and AIDS. Social support and socio-economic status (SES) are two factors that shape physical activity behaviours. Individuals of low SES carry a disproportionate burden of the HIV and AIDS epidemic. In addition, limited resources constitute socio-ecological barriers predisposing such individuals to physical inactivity. The purpose of this narrative review is to examine the available literature on physical activity, social support and SES and to generate recommendations for designing and implementing physical activity interventions targeting people living with HIV and AIDS (PLWHA) of low SES. The review used literature from Google, Google Scholar and PubMed on physical activity of PLWHA, social support for physical activity, and SES and physical activity. Qualitative and quantitative studies in English were included from 1970 to 2016. The results show that social support plays a major role in promoting physical activity and counteracting the barriers to PA in PLWHA of low SES. The results on the role of social support and the influence of SES are integrated to help design appropriate physical activity interventions for PLWHA of low SES. Well-designed interventions should utilise social support and be contextualised for PLWHA of low SES, whose living conditions present multiple barriers to physical activity.

Keywords: aerobic exercise, anaerobic exercise, chronic disease, exercise, HIV/AIDS

Introduction

In 2016, an estimated 36.7 million people were living with HIV globally (UNAIDS, 2017). Even though sub-Saharan Africa accounts for only a small proportion (12%) of the global population, 71% of the worldwide burden of HIV originates in sub-Saharan Africa (Kharsany & Karim, 2016). A staggering 19.4 million people living with HIV and AIDS (PLWHA) are in Eastern and Southern Africa, with females accounting for more than 59% of people living with HIV and AIDS (PLWHA) (UNAIDS, 2017).

Even though highly active antiretroviral therapy (HAART) is considered the primary treatment for HIV and AIDS, it is still associated with numerous adverse effects (Soula, Maria, Elisabeth, & Louise, 2013). Adverse effects of HAART include disorders of lipid and glucose metabolism, and irregular distribution of body fat deposits (Jain, Ramteke, Raparti, & Kalra, 2012). Consequently, health practitioners involved in the management of HIV and AIDS are advised to monitor the side-effects of HAART (Kandi, 2016). Physical activity (PA) can be used to manage and ameliorate the adverse effects related to HAART (Farias, Dutra, Lima, & Voltarelli, 2016).

PA has been used as an adjunct therapy for several disorders, inclusive of psychiatric, neurological, metabolic,

cardiovascular, pulmonary and oncological conditions (Pedersen & Saltin, 2015). The World Health Organization (WHO) defines PA as any body movement produced by skeletal muscles that requires energy expenditure (Musumeci, 2016). Exercise, is defined as PA comprising planned, structured and repeated body movements carried out to enhance one or more components of health-related physical fitness, that is, body composition, cardiovascular and muscular fitness (American College of Sports Medicine, 2014). PA can be accrued in four spheres, namely leisure/recreation, transport, occupational/school and household activities.

In the African context, people of low socio-economic status (SES) carry the overwhelming burden of HIV/AIDS (Bhutta, Sommerfeld, Lassi, Salam, & Das, 2014). Furthermore, cardiovascular risk screening for PLWHA is usually overlooked in sub-Saharan African countries, often due to a lack of primary healthcare personnel and resources (Thienemann, Sliwa, & Rockstroch, 2013).

SES has a profound influence on PA behaviour in that it has an impact on access to societal resources and opportunities that, ultimately, influence health behaviours and health outcomes (Ferraro & Shipee, 2009; Umberson, Crosnoe, & Reczek, 2010). SES is defined as the aggregation of one's financial and social circumstances

(Baker, 2014). Indicators of SES include education, income and type of employment (Galobardes, Shaw, Lawlor, & Lynch, 2006). Individuals from low socio-economic neighbourhoods have limited resources, which have a negative impact on public health (Beltran, Harrison, Hall, & Dean, 2011). Societal barriers in such communities include low employment rates, living with a stigmatised disease and, *inter alia*, dealing with stress caused by financial insecurity (Webel, Moore, Hanson, & Salata, 2013).

PLWHA in low-income communities are associated with poorer health outcomes, such as poor mental health (Evans, 2016); increased risk of chronic disease such as diabetes (Shulman et al., 2016); and poor dietary habits (Konttinen, Sarlio-Lähteenkorva, Silventoinen, Männistö, & Haukkala, 2013). Baker (2014) reported that there is a positive relationship between SES and health.

Social support, like SES, is another important determinant of PA (Lindsay Smith, Banting, Eime, O'Sullivan, & van Uffelen, 2017). Social support can be thought of as an individual's perception of being cared for and appreciated by others (Whitaker-Azmitia, 2016). It has long been acknowledged that social support is a mediator of health outcomes (Lai & Ma, 2016). An enhanced health status is associated with positive and satisfactory social support (Wright, 2016). Social support is lacking when the members of a support network avoid communicating or providing satisfactory support (Gomes et al., 2016). This often occurs when an individual is seeking support for a stigmatised health condition, such as HIV and AIDS (Wright & Rains, 2013; Yi et al., 2015).

The significance of socio-ecological factors, such as SES and social support, in effective HIV/AIDS management has been recognised in research (Wegbreit, Bertozzi, De Maria, & Pardian, 2006). However, rarely have studies focused on the relationship between PA and low SES among PLWHA, and on the influence of social support on PA. This paper reviews the available literature on PA, social support and SES of PLWHA with a view to inform the design of effective PA interventions for PLWHA of low SES.

Methods

A narrative literature review was adopted to cover the topic comprehensively (Collins & Fauser, 2005). Qualitative and/or quantitative studies in English only from 1970 to 2016 were included. The review used relevant available literature from Google, Google Scholar and PubMed. The search included studies that contained the following key terms: "HIV" or "AIDS", "physical activity", "exercise", "social support", "resource-poor", "low-income", "underserved" and "socioeconomic status". Studies included in the review must have involved PLWHA, persons of low SES, social support and PA.

Results

The review included a variety of sources including peer-reviewed journal articles, books, fact sheets and reports. In total, 94 sources were analysed using the review procedure described in the Methods section. From these studies, 62 dealt with PLWHA, 62 with issues pertaining

to PA, 29 with issues pertaining to social support and 16 with issues pertaining to SES. In addition, 27 literature reviews were included of which 7 were systematic reviews; 1 was a meta-analysis (Dishman, Oldenburg, O'Neal, & Shepard, 1998); 1 was a systematic review and meta-analysis (O'Brien, Tynan, Nixon, & Glazier, 2016); and 19 were narrative literature reviews. Thirteen studies were cross-sectional, 16 were randomised controlled trials (RCTs) and 10 were peer-reviewed articles on African participants. Three of the sources were from books and other sources were either fact sheets or reports.

Discussion

The benefits of PA in the general population include reducing mortality, preventing chronic disease and enhancing psychological health or quality of life (McKinney et al., 2016). A longitudinal study with more than 11 000 PLWHA has shown that PA is associated with increased CD4 count, improved lipid and glucose levels, and minimal prevalence of heart disease and comorbidities (Willig et al., 2016). Such findings have prompted researchers to recommend PA as effective treatment for metabolic and cardiovascular syndromes associated with HAART (Mocumbi, 2015). Using PA is especially relevant in sub-Saharan Africa, where the prevalence of HIV is the highest globally (UNAIDS, 2016) and alternative strategies of self-care are warranted, especially for those of low SES (Chang, Wang, & Fang, 2017).

A recent meta-analysis showed that resistance exercise was effective in improving muscular strength and CD4 count among PLWHA (Poton, Polito, & Farinatti, 2016). In older adults (>60 years), sedentary and living with HIV, a one-year resistance exercise programme increased muscle strength (Souza, Jacob-Filho, Santarem, Zomignan, & Burattini, 2011). A systematic review of RCTs showed that resistance exercise safely increased body weight and limb girth (Fillipas, Cherry, Cicuttini, Smirneos, & Holland, 2015). Also, muscle strength and physical function increased following an 8-week programme of progressive resistance exercise (3 days per week, 1 hour per day, and at 80% of one-repetition maximum (1-RM)) in individuals infected with HIV (Roubenoff et al., 1999; Strawford et al., 1999). Progressive resistance exercise in a 12-week RCT also significantly improved health-related quality of life in PLWHA (Mkandla, Myezwa & Musenge, 2016). Safe exercise intensities for resistance training in PLWHA often start at 50–60% of 1-RM, and gradually increase to 75–80% of 1-RM after 4–12 weeks of training (Grace, Semple, & Combrink, 2015). These results suggest that properly planned resistance exercise can increase muscle mass in HIV-infected individuals, and may be a useful adjunct therapy for restoring lean muscle mass in patients with HIV-wasting.

Similar to resistance training, aerobic exercise has also been investigated in PLWHA. An RCT with 30 age-matched PLWHA over 8 weeks of moderate intensity aerobic exercise (60–79% heart rate reserve) found a significant effect on blood pressure (both systolic and diastolic), maximal oxygen consumption ($\dot{V}O_{2max}$) and CD4 count (Ezema et al., 2014). The benefits of aerobic exercise were also shown for cardiorespiratory fitness over 12 weeks (Jaggers

& Hand, 2016), and for exercise intensity ranging from 40–60% oxygen reserve ($\dot{V}O_{2R}$) (Grace et al., 2015). Aerobic exercise performed five times per week is safe, and can enhance cardiorespiratory fitness, muscular strength, body composition, and quality of life of PLWHA (O'Brien et al., 2016). Therefore, for medically stable adults infected with HIV, aerobic exercise is also a safe and appropriate adjunct therapy for managing the disease (O'Brien et al., 2016).

Furthermore, concurrent resistance training and aerobic exercise were also investigated. Twenty weeks of combined aerobic and resistance training showed an increase in CD4 count in PLWHA (Garcia et al., 2014). Concurrent aerobic (walking at 67% to 70% of maximum heart rate) and resistance training at 65% 1-RM performed three times weekly over 12 weeks showed that participants improved in cardiorespiratory endurance (6-minute walk test), LDL

cholesterol, body mass index (BMI), bone mineral density and waist circumference (Bonato et al., 2012). Concurrent strength and endurance training was also effective in improving overall health, quality of life and cardiopulmonary status in PLWHA (Gomes Neto, Ogalha, Andrade, & Brites, 2013). Thus, a combination of moderate intensity aerobic and resistance training that involves using large muscles, such as walking, cycling, jogging, playing certain sports/games and routine gardening, may all be recommended for PLWHA (Jaggers & Hand, 2016; Yarasheski et al., 2001). Table 1 shows the physiological and psychological benefits of PA for PLWHA.

Notwithstanding the beneficial effects of PA for PLWHA, some precautions need to be considered when prescribing exercise (Grace et al., 2015). Exercise should not be too intense ($>80\% \dot{V}O_{2max}$) or last beyond 90 minutes, due

Table 1: Physiological and psychological benefits of physical activity for PLWHA

Physiological improvements for PLWHA	Psychological improvements for PLWHA
Regular PA is known to improve health by affecting the clinical course of several diseases through potentiating both the immune system and the metabolic processes (Gleeson et al., 2011)	D'Ettoire et al. (2014) assert that the pleasure derived from engaging in PA relates to three main factors: the production of endorphins, the production of catecholamines, and the changes in brain function. Endorphins cause feelings of pleasure and greater pain tolerance (d'Ettoire et al., 2014). Catecholamines elevate cardiac output, increase the release of glucose into the blood and, together with endorphins, reduce anxiety and psychological stress (d'Ettoire et al., 2014)
Regular moderate intensity aerobic exercise is related to a decreased occurrence of metabolic diseases (d'Ettoire et al., 2014)	Aerobic exercise reduces depression (Neidig et al., 2003)
Regular PA is related to a decrease in fat mass, resting heart rate, waist circumference, and serum glucose, as well as an increase in muscle mass, CD4 ⁺ cells and metabolic markers (Ogalha et al., 2011)	Aerobic and resistance training increase cognitive function (Fillipas et al., 2006)
Regular moderate intensity exercise (i.e., brisk walking), leads to a significant improvement in fitness and immune activation (Longo, Bonato, & Bossolasco, 2014)	Moderate intensity aerobic exercise improves the mental health of PLWHA (Neidig et al., 2003)
Regular PA improves muscle mass in order to preserve muscle trophism and functional status (d'Ettoire et al., 2014) by improving muscle strength (Sakkas et al., 2009)	Moderate-intensity aerobic exercise is associated with significant reductions in anxiety and depression (Schlenzing, Jager, Rieder, Hammel, & Popescu, 1989)
Thoni et al. (2002) showed that aerobic exercise has a beneficial impact on lipid disorders and the build-up of central adipose tissue in PLWHA, because it causes a significant reduction in visceral adipose tissue, total abdominal fat, total cholesterol, high-density lipoprotein cholesterol (HDL-C), triglycerides (TG) and TG/HDL-C ratio. Additionally, cardiovascular risk at 10 years decreased from 1.12 to 0.97	Galantino et al. (2005) reports that combined aerobic and resistance training can alleviate confusion, bewilderment, and tension anxiety on the profile of mood states of PLWHA
Progressive strength and aerobic training increase cross-sectional muscle area (Grinspoon et al., 2000)	Fillipas et al. (2006) report that HIV-infected men who participate in combined aerobic and resistance training improve in self-efficacy
Regular aerobic exercise lowers the time to fatigue and reduces BMI and fat mass (Smith et al., 2001)	Aerobic exercise improves quality of life (Perez-Moreno et al., 2007)
Light intensity aerobic exercise increases VO_2 peak and HDL and reduces fat, cholesterol and triglycerides (Thoni et al., 2002)	
Progressive strength and aerobic training increase muscular endurance and total muscle mass (Hand et al., 2008)	
Aerobic and resistance training increase muscular strength (Dolan et al., 2006)	
Aerobic and resistance training increase cardiorespiratory fitness (Fillipas, Oldmeadow, Bailey, & Cherry, 2006).	
Progressive strength and aerobic training cause an acute increase in growth hormone and soluble tumour necrosis factor receptor 2 and an acute decrease in cortisol (Dudgeon et al., 2010)	
Resistance and aerobic training cause improvements in insulin sensitivity (Yarasheski et al., 1985)	
Aerobic and resistance training cause increases in lean muscle mass, glucose uptake, HDL cholesterol and reduce total cholesterol, C-reactive protein, interleukin-6 and triglycerides (Lindgaard et al., 2008)	

to its immunosuppressive effects (Derman et al., 2010). Ultimately, the training programme needs to be tailored and specific for each individual depending on the disease progression, the current health risks and available resources (Farias et al., 2016).

Living with a condition such as HIV reduces the number and quality of social interactions (Radley, 1994). HIV and AIDS progress faster due to reduced social support, and are associated with higher levels of stress (Yi et al., 2015). Major sources of social support, such as employment, financial security and societal care from family and friends might be lost when they concern PLWHA (Bechtel & Swartzberg, 1993; Hall, 1999; Roberts-Pittman, 2006). PLWHA are reported to have low levels of emotional social support (Li, Lin, Liang, & Ji, 2016).

Women living with HIV are reported to receive far lower levels of emotional and social support than men (Li et al., 2016). An inverse relationship was reported between social support and the reported barriers to PA participation amongst pregnant women (Da Costa & Ireland, 2013). Amongst pregnant women, social support from family and friends was vital in easing the challenges of participating in PA (Cioffi et al., 2010). These findings among women are in line with the perception that women are bound to rely more on social support than men (McLaughlin, Vagenas, Pachana, Begum, & Dobson, 2010).

Social support is critical for enhancing and maintaining PA (Sternfeld, Ainsworth, & Quesenberg, 1999) as well as health-related quality of life of PLWHA in resource-poor settings (Paxton, 2002; Schönnesson, 2002). Among adults in community-based PA interventions, evidence exists of the effectiveness of social support for increasing PA and physical fitness (Kouvonen et al., 2012). For example, middle-aged women who participated in a weight loss programme involving PA, and who got social support from family and friends were more likely to lose weight (Kiernan et al., 2012). Three functions of social support were posited by Kahn (1979) and adapted by Biddle and Mutrie (2008), as illustrated in Table 2.

Community-based PA interventions that include group activities are cost-effective and useful, particularly where participants know each other, share ideas about PA, and motivate each other to engage in or maintain PA (Anderson, Bovard, Wang, Beebe, & Murad, 2016; Roux et al., 2008). Social support provided by friends was strongly associated with leisure-related PA in older adults (Orsega-Smith, Payne, Mowen, & Godbey, 2007). Community facilities, such as churches or community centres, can be ideal settings for PA programmes, especially in low SES communities (CDC, 2011). Such facilities provide a readily available infrastructure for PA where individuals can participate as a cohesive group, as well as a means of support from social workers, pastors etc. (CDC, 2011). A positive relationship

was reported between church-based social support and participating in PA (Kanu, Baker, & Brownson, 2008).

A strong association between marital status and PA reinforces the value of spousal support or support from significant others in promoting PA (King, Kierman, Ahn, & Wilcox, 1998). Consequently, PA interventions targeting PLWHA of low SES should attempt to recruit couples rather than a single partner to facilitate participation and adherence (Barnett, Guell, & Ogilvie, 2013). Furthermore, PA practitioners need to develop interventions that recruit family members and friends to promote PA participation, especially among PLWHA (Simonik et al., 2016). Family support is particularly vital for promoting moderate-to-vigorous PA and in reducing physical inactivity (Hsu et al., 2011).

An important mechanism by which social support works to enhance PA is through social bonds and being part of a social network, which plays an important part in enhancing psychological wellbeing (Qiao, Nie, Tucker, Rennie, & Li, 2015). Psychological wellbeing increases health-related self-care, which includes regularly engaging in PA (Kawachi & Berkman, 2001). Increased social support can elevate self-esteem, self-efficacy and perceived control of the environment (Hajloo, 2014). According to Social Learning Theory, social support strengthens self-efficacy and assists individuals overcome impediments to behaviour change (Bandura, 1977). Therefore, PA interventions for persons of low SES should be informed by behaviour change theories that embrace social support and self-efficacy.

A systematic literature review by Mabweazara, Ley and Leach (2016) provides evidence of the effectiveness of Social Cognitive Theory and the Transtheoretical Model of behaviour change in fostering successful PA interventions for persons of low SES. These theories include social support and self-efficacy, thus showing the importance of psychosocial constructs in assisting persons of low SES to adopt regular PA (Mabweazara et al., 2016).

Forouzan, Jorjoran Shushtari, Sajjadi, Salimi and Dejman (2013) state that HIV and AIDS do not only have a negative impact on physical health, but also on psychosocial wellbeing, because of the associated negative attitude, discrimination, and stigmatisation. This is particularly apparent in developing countries, such as those in sub-Saharan Africa (Peltzer & Ramlagan, 2011). The inclusion of HIV education in PA interventions may lead to more people being tested and disclosing their HIV status, increased social support and the associated benefits (Khamarko & Myers, 2013).

Among PLWHA, low educational levels and stigmatisation are significantly associated with lower social support (Lifson et al., 2015). The implication is that PA interventions aimed at PLWHA of low SES should strive to enhance social support as a health management strategy. Thus, understanding the role of social support in promoting PA

Table 2: Possible roles of different social support dimensions in the promotion of physical activity

Type of social support	Example
Emotional support	Empathy from others to be physically active; you feel that they "are on your side"
Informational support	Information and advice given by others concerning exercise, such as details of a local running event
Instrumental support	Direct help provided by others, such as driving someone to a sports centre or buying them a bicycle for transportation

Adapted from: Biddle & Mutrie (2008)

amongst PLWHA can assist researchers to design context-sensitive interventions to enhance the health-related quality of life of the participants (Ley, Barrio, & Leach, 2015).

Socio-economic factors are not only major determinants of health, but also influence participation patterns in PA (WHO, 2003). Levels of participation in PA differ widely depending on SES (Collins, 2004). Several studies show that PA levels tend to be low in socio-economically disadvantaged groups, and that it is not easy to promote PA in such groups (WHO, 2013). Amongst PLWHA of low SES, the inability to meet the recommended daily PA requirements for adults is, amongst other factors, usually related to caregiver responsibilities, time dedicated to child care, unsafe neighbourhoods, strict work schedules and living in temporary dwellings (Seefeldt, Malina, & Clark, 2002). PA interventions are generally not suitable for PLWHA who are socio-economically disadvantaged, because of the barriers related to employment, financial constraints, stigmatisation, and inaccessible or absent transportation (Jaggers et al., 2013).

The determinants of PA amongst persons of lower SES include greater awareness and advocacy, access to transportation, increased health education (especially of the health benefits of PA), strong social norms that promote active leisure behaviour, and a conducive environment for PA (Dishman et al., 1998).

As such, PA interventions aimed at engaging persons of low SES, should have an educational component, where participants are taught cost-effective, home-based exercises and activities that can be performed independently (Clegg, Barber, Young, Forster, & Iliffe, 2012). Such interventions should also be gender sensitive and culturally appropriate, especially since women of low SES are less physically active than men (Crespo, Ainsworth, Keteyian, Heath, & Smit, 1999).

As such, standard PA interventions cannot be applied to persons of low SES with the assurance that they will work uniformly (Mabweazara et al., 2016). PA interventions for PLWHA of low SES should therefore be contextualised so that they are appropriate and relevant.

Lessons learned and implications for PA interventions for PLWHA of low SES

PA interventions should preferably include a combination of moderate intensity aerobic and resistance exercises that involve large muscles, such as walking, cycling, jogging, carefully selected sports/games and routine gardening (Jaggers & Hand, 2016).

PA interventions for PLWHA should utilise and enhance social support, for example, using group activities such as group aerobics (Anderson et al., 2016). Community centres and churches are ideal settings for PA programmes, as they already have suitable infrastructure in place encouraging for PA, as well as the professional support, for example, social workers, dieticians, ministers etc. Furthermore, active participation of the spouse, family, friends and workmates should be encouraged in promoting PA (Cioffi et al., 2010).

PA interventions need to be considered within the context of the individual's activities of daily living, because physical inactivity is usually related to caregiver responsibilities,

time dedicated to child care, and manual labour as an occupation (Seefeldt et al., 2002). PA interventions should be affordable (e.g., home-based or walking interventions) and not financially burdensome (Bonato et al., 2012; Ogalha et al., 2011).

Persons of low SES are usually less educated and in need of knowledge that supports PA participation (Knox, Esliger, Biddle, & Sherar, 2013). Therefore health education needs to be included (e.g., pertaining to the health benefits of PA and mitigating the barriers to PA) (Dishman et al., 1998). Additionally, PA interventions should be gender (Crespo et al., 1999) and SES sensitive (Everson-Hock et al., 2013). The use of anti-stigma campaigns and HIV education may lead to more people being tested and disclosing their HIV status, increased social support and access to the associated benefits (Khamarko & Myers, 2013).

Equally important, PA programmes should be theoretically-based. The Social Cognitive Theory and the Transtheoretical Model of behaviour change were found to be effective in enhancing social support and regular PA for individuals of low SES (Mabweazara et al., 2016).

Conclusion


The review shows that regular PA is safe and beneficial for PLWHA of low SES. Low SES has a profound influence on PA behaviour in that it has an impact on access to societal resources and opportunities that, ultimately, influence health behaviours and health outcomes. Enhanced social support can be beneficial for the adoption of healthy behaviours such as engaging in regular PA. Social support lacks in individuals with a stigmatised health condition, such as HIV and AIDS. As such, there is an urgent need for PA promotion interventions that target PLWHA of low SES and teach strategies for garnering social support whilst encouraging cost-free activities which are not a financial burden such as brisk walking. This review synthesised the current literature regarding the benefits of PA for PLWHA, the role of social support for enhancing PA, and the influence of SES on PA, in order to design appropriate PA interventions for PLWHA of low SES.

Recommendations

Researchers are encouraged to develop cost-free PA interventions that are not financially burdensome. These should preferably include a combination of moderate intensity aerobic and resistance exercises that involve large and small muscles. PA interventions for PLWHA should utilise social and enhance social support, for example, using group activities such as group aerobics. Community centres and churches are ideal settings for PA programmes, as they already have suitable infrastructure in place which is encouraging for PA. These settings also have professional support, for example, social workers, dieticians, ministers etc. Equally important, PA programmes should be theoretically informed. The Social Cognitive Theory and the Transtheoretical Model of behaviour change may be effective in enhancing social support and regular PA for PLWHA of low SES.

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