Recommending Physical Activity in the Context of HIV & Substance Use

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https://exercisеprescription.online.uconn.edu/


NORTH ENTRANCE


2016
2015
2014
2013
2010
2009
2004
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2002
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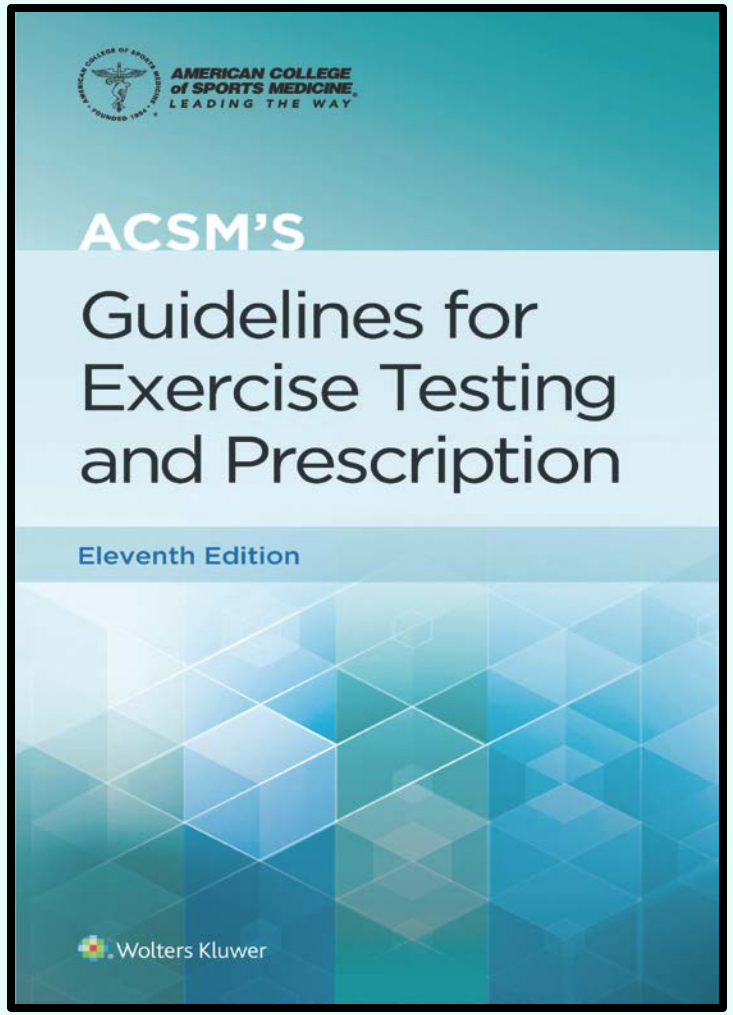
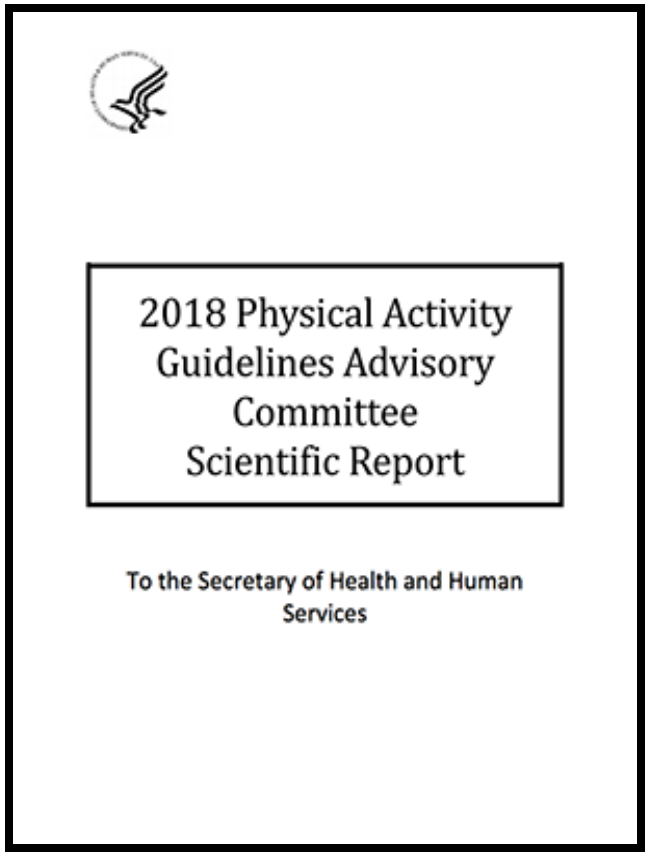
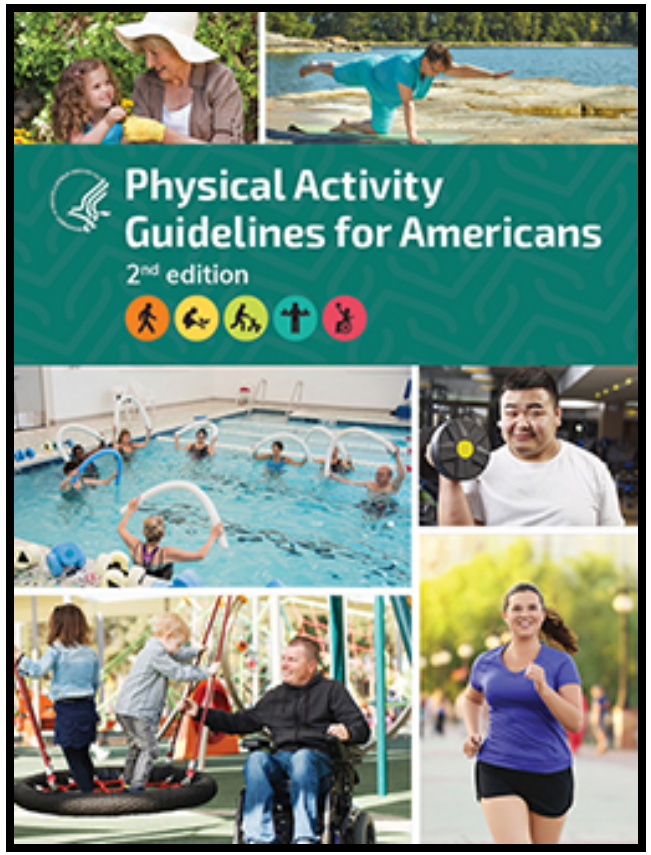
1995



American College of Sports Medicine's Guidelines for Exercise Testing and Prescription (ACSM GETP)





2018 Physical Activity Guidelines Advisory Committee Scientific Report

www.health.gov/paguidelines

https://www.acsm.org/acsm-positions-policy/physical-activity-guidelines-for-americans

- The U.S. Physical Activity Guidelines Advisory Committee Report—Introduction
- Daily Step Counts for Measuring Physical Activity Exposure and Its Relation to Health
- Association between Bout Duration of Physical Activity and Health: Systematic Review
- High-Intensity Interval Training (HIIT) for Cardiometabolic Disease Prevention
- Sedentary Behavior and Health: Update from the 2018 Physical Activity Guidelines Advisory Committee
- Physical Activity, Cognition and Brain Outcomes: A Review of the 2018 Physical Activity Guidelines
- Physical Activity in Cancer Prevention and Survival: A Systematic Review
- Physical Activity and the Prevention of Weight Gain in Adults: A Systematic Review
- Physical Activity, All-Cause and Cardiovascular Mortality, and Cardiovascular Disease
- Physical Activity and Health in Children under 6 Years of Age: A Systematic Review
- Benefits of Physical Activity during Pregnancy and Postpartum: An Umbrella Review
- Physical Activity, Injurious Falls and Physical Function in Aging: An Umbrella Review
- Physical Activity to Prevent and Treat Hypertension: A Systematic Review
- Effects of Physical Activity in Knee and Hip Osteoarthritis: A Systematic Umbrella Review
- Physical Activity Promotion: Highlights from the 2018 PAGAC Systematic Review

Recommending Physical Activity in the Context of HIV & Substance Use

- Overview basic definitions & concepts in exercise prescription (ExR_x)
- Discuss an ExR_x that *FITTs* people living with HIV (PLWH) & substance use (SU)
- Deliberate special considerations in ExR_x for PLWH & SU

Physical Activity and Fitness Terminology

Physical Activity (Behavior)

- Any bodily movement produced by the contraction of skeletal muscles that results in increases in caloric requirements over resting energy expenditure

Exercise

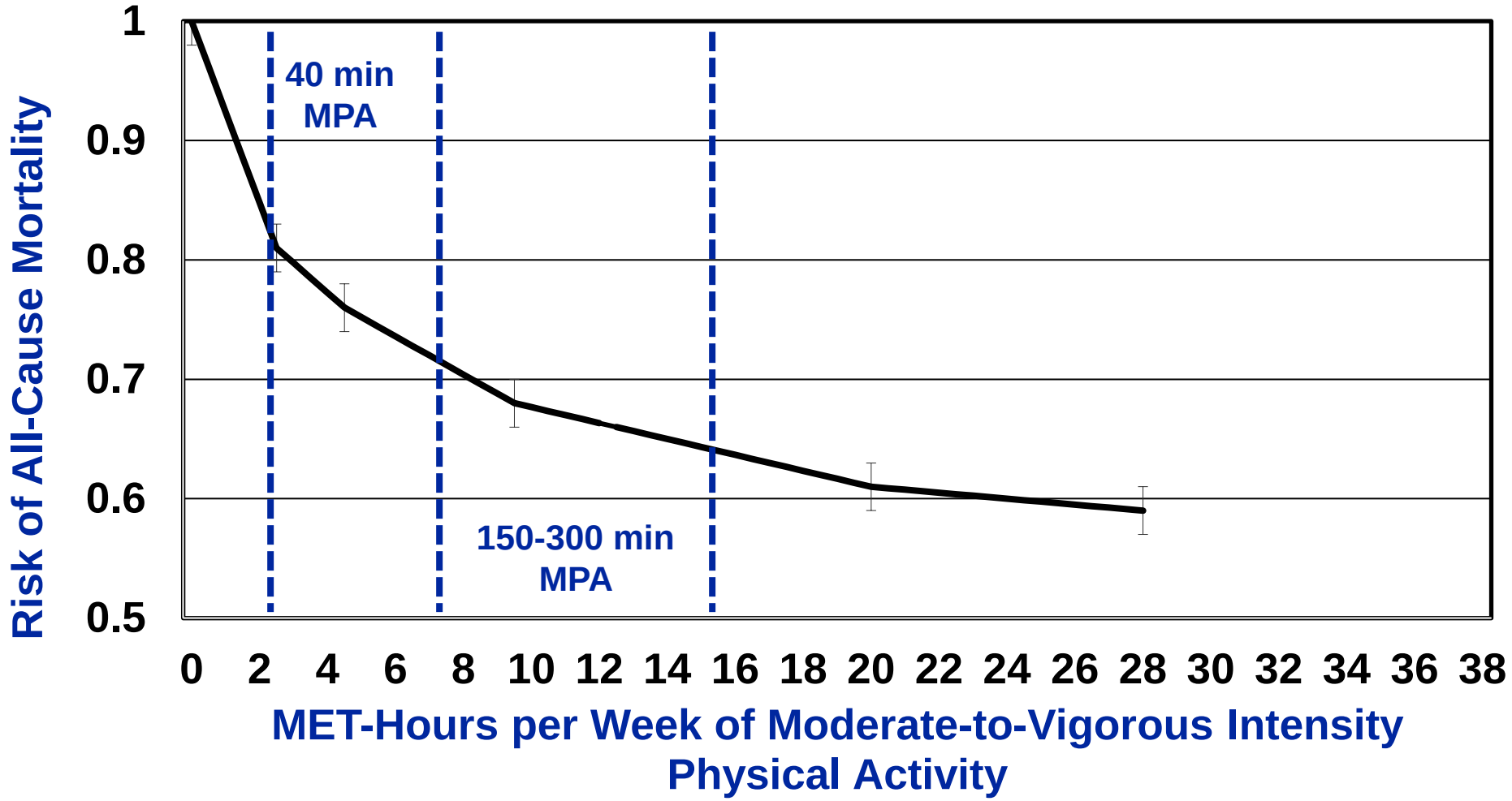
- A subset of physical activity consisting of planned, structured, and repetitive bodily movement done to improve &/or maintain one or more components of physical fitness

Physical Activity and Fitness Terminology

Physical Fitness

- A set of attributes or characteristics that individuals have or strive to achieve that relates to their ability to exercise

. . . the quantity of exercise needed to reduce disease risk (*improve health*) is considerably less than that needed to develop and maintain high levels of physical fitness

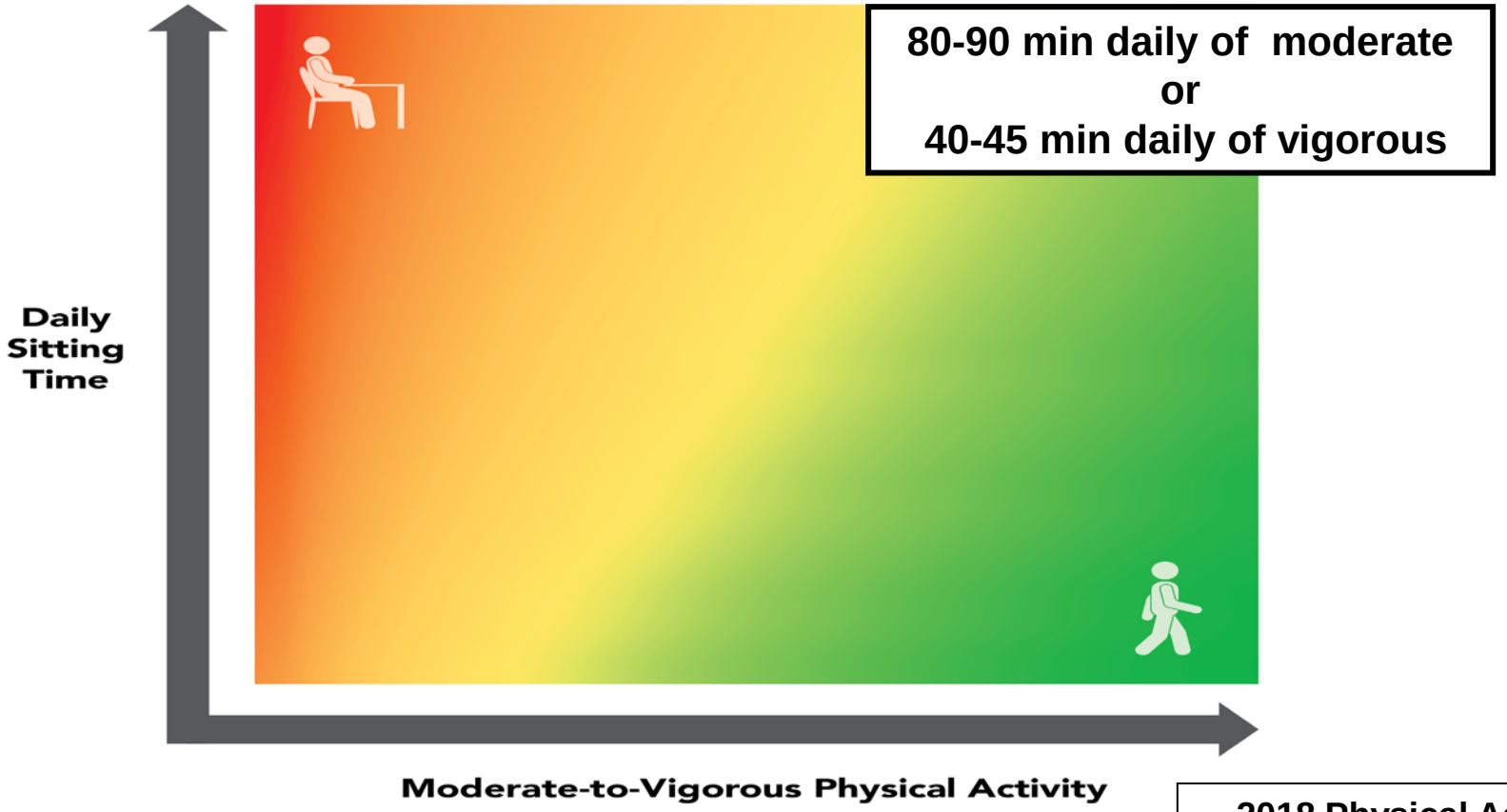


- **Steep early slope**
- **No lower threshold**
- **Diminishing returns**

2018 Physical Activity Guidelines Advisory Committee Scientific Report

Relationship Among Moderate-to-Vigorous Physical Activity, Sitting Time, and Risk of All-Cause Mortality

Relationship among moderate-to-vigorous physical activity, sitting time, and all-cause mortality



Risk of all-cause mortality decreases as one moves from red to green. Underlying data in the figure are based on results from Ekelund, et al. (2016).

2018 Physical Activity Guidelines Advisory Committee Scientific Report

Ekelund U, Steene-Johannessen J, Brown WJ, et al. Does physical activity attenuate, or even eliminate, the detrimental association of sitting time with mortality? A harmonised meta-analysis of data from more than 1 million men and women. Lancet. 2016;388(10051):1302-1310. doi:10.1016/S0140-6736(16)30370-1.

Disease Prevention Benefits from Regular MVPA

10 Leading Causes of Death	10 Most Prevalent Chronic Conditions	10 Most Expensive Medical Conditions
Heart disease	***Hypertension***	***Heart conditions***
Cancer	***Hyperlipidemia***	**Trauma disorders**
Chronic lung diseases	Upper respiratory conditions	***Cancer***
Unintentional injuries	**Arthritis**	***Mental health disorders***
Stroke	***Mood disorders***	Asthma/COPD
Alzheimer's disease	***Diabetes***	***Hypertension***
Diabetes	***Anxiety disorders***	***Type 2 Diabetes***
Influenza and pneumonia	Asthma	**Arthritis**
Kidney disease	***Coronary artery disease***	Back problems
Suicide	Thyroid disorders	**Normal childbirth**

Powell et al. *J Phys Act Health* 2018

Recommending Physical Activity in the Context of HIV & Substance Use

- Overview basic definitions & concepts in exercise prescription (ExR_x)
- Discuss an ExR_x that *FITTs* people living with HIV (PLWH) & substance use (SU)

What is an ExR_x?

- The process whereby the recommended amount of physical activity is designed in a ***systematic*** and ***individualized*** manner in terms of the *FITT* principle:
  - *F*requency (How Often?)
  - *I*ntensity (How Hard?)
  - *T*ime (Duration or How Long?)
  - *T*ype (Modality or What Kind?)

The FIT*T* Principle of ExR_x

An ExR_x should include these ***T***ypes of exercise

- **Aerobic (Cardiorespiratory Endurance)**
  - Involves the major muscle groups, are continuous & repetitive, & maintains or improves cardiorespiratory fitness
- **Resistance (Muscle Fitness)**
  - Involves major muscles groups to maintain or improve muscular *strength* (how much resistance can be moved), *endurance* (how many times or for how long resistance can be moved), or *power* (how fast the resistance can be moved)
- **Flexibility**
  - Involves “stretching” to improve the range & ease of movement around a joint
- **Neuromotor**
  - Involves motor skills to improve balance, agility, gait, & coordination

FITT RECOMMENDATIONS FOR INDIVIDUALS WITH HUMAN IMMUNODEFICIENCY VIRUS

FITT

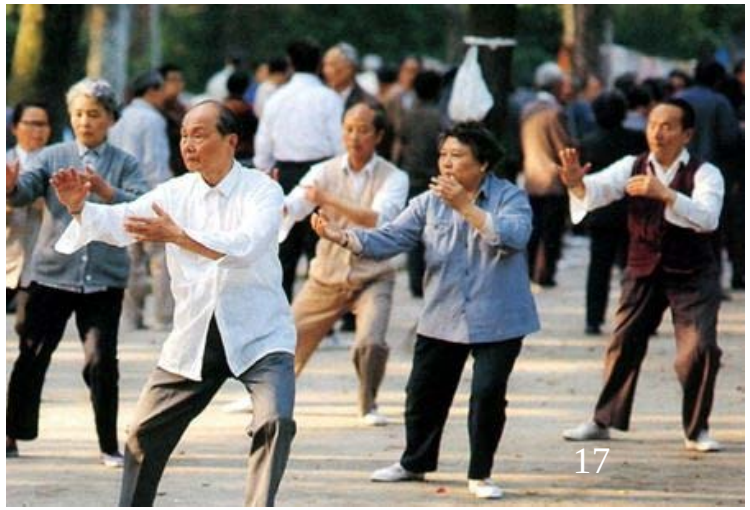
	Aerobic	Resistance	Flexibility
Frequency	3–5 d · wk^{-1}	2–3 d · wk^{-1}	≥2–3 d · wk^{-1}
Intensity	Begin at light intensity (30%–39% $\dot{V}O_2R$ or HRR). Gradually progress to moderate intensity (40%–59% $\dot{V}O_2R$ or HRR).	Begin a light intensity with goal of gradual progression to 60% 1-RM.	Stretch to the point of tightness or slight discomfort.
Time	Begin with 10 min and progress to 30–60 min · d^{-1}.	1–2 sets, with gradual progression to 3 sets of 8–10 repetitions	Hold static stretch for 10–30 s; 2–4 repetitions of each exercise
Type	Modality will vary with the health status and interests of the individual. Presence of osteopenia will require weight-bearing physical activities.	Machine weights are safe and effective without supervision; free weights can be used for experienced lifters and/or under supervision.	Static, dynamic, and/or PNF stretching

1-RM, one repetition maximum; HRR, heart rate reserve; PNF, proprioceptive neuromuscular facilitation; $\dot{V}O_2R$, oxygen uptake reserve.

ACSM GETP

Neuromotor

- *Frequency* ≥2-3 $d \cdot wk^{-1}$
- *Intensity* Light to Moderate
- *Time* ≥20-30 $min \bullet d^{-1}$
- *Type* Exercise involving motor skills



Physical Activity Guidelines for Americans

2nd edition

150-min/week of moderate intensity aerobic PA

or

75-min/week of vigorous intensity aerobic PA

or

an equivalent combination of the two

Plus

two days of muscle-strengthening PA

TABLE 5.2 • Methods of Estimating Intensity of Cardiorespiratory Exercise

	Cardiorespiratory Endurance Exercise										
	Relative Intensity				Intensity (%$\dot{V}O_{2max}$) Relative to Maximal Exercise Capacity in MET			Absolute Intensity	Absolute Intensity (MET) by Age		
Intensity	%HRR or %$\dot{V}O_2R$	%HR_{max}	%$\dot{V}O_{2max}$	Perceived Exertion (Rating on 6–20 RPE Scale)	20 METs %$\dot{V}O_{2max}$	10 METs %$\dot{V}O_{2max}$	5 METs %$\dot{V}O_{2max}$	METs	Young (20–39 yr)	Middle Age (40–64 yr)	Older (≥65 yr)
Very light	<30	<57	<37	Very light (RPE <9)	<34	<37	<44	<2.0	<2.4	<2.0	<1.6
Light	30–39	57–63	37–45	Very light to fairly light (RPE 9–11)	34–42	37–45	44–51	2.0–2.9	2.4–4.7	2.0–3.9	1.6–3.1
Moderate	40–59	64–76	46–63	Fairly light to some-what hard (RPE 12–13)	43–61	46–63	52–67	3.0–5.9	4.8–7.1	4.0–5.9	3.2–4.7
Vigorous	60–89	77–95	64–90	Somewhat hard to very hard (RPE 14–17)	62–90	64–90	68–91	6.0–8.7	7.2–10.1	6.0–8.4	4.8–6.7
Near-maximal to maximal	≥90	≥96	≥91	≥ Very hard (RPE ≥18)	≥91	≥91	≥92	≥8.8	≥10.2	≥8.5	≥6.8

HR_{max}, maximal heart rate; HRR, heart rate reserve; MET, metabolic equivalent; RPE, rating of perceived exertion; $\dot{V}O_{2max}$, maximal volume of oxygen consumed per unit time; $\dot{V}O_2R$, oxygen uptake reserve.
Adapted from (3).

Methods of Estimating Exercise Intensity

TABLE 6.2

Commonly Used Equations for Estimating Maximal Heart Rate

Author	Equation	Population
Fox et al. (35)	$HR_{max} = 220 - age$	Small group of men and women
Astrand (8)	$HR_{max} = 216.6 - (0.84 \times age)$	Men and women age 4–34 yr
Tanaka et al. (101)	$HR_{max} = 208 - (0.7 \times age)$	Healthy men and women
Gellish et al. (38)	$HR_{max} = 207 - (0.7 \times age)$	Men and women participants in an adult fitness program with broad range of age and fitness levels
Gulati et al. (47)	$HR_{max} = 206 - (0.88 \times age)$	Asymptomatic middle-aged women referred for stress testing

HR_{max}, maximal heart rate.

Methods of Estimating Exercise Intensity "The Talk Test"

Light

- A level of physical exertion that causes slight increases in heart rate & breathing during which you can talk & sing (e.g., warm up with dynamic flexibility, cool down with slow aerobic movements, & static stretching at an RPE 9-11)

Moderate

- A level of physical exertion that causes increases in heart rate & breathing during which you can talk but not sing (e.g., brisk walking & weight training at a RPE 12-13)

Vigorous

- A level of physical exertion that causes substantial increases in heart rate and breathing during which you cannot talk (e.g., running & weight training at a RPE of 14-17)

Physical Activity Guidelines for Americans

2nd edit

~70%

150-min/w aerobic PA

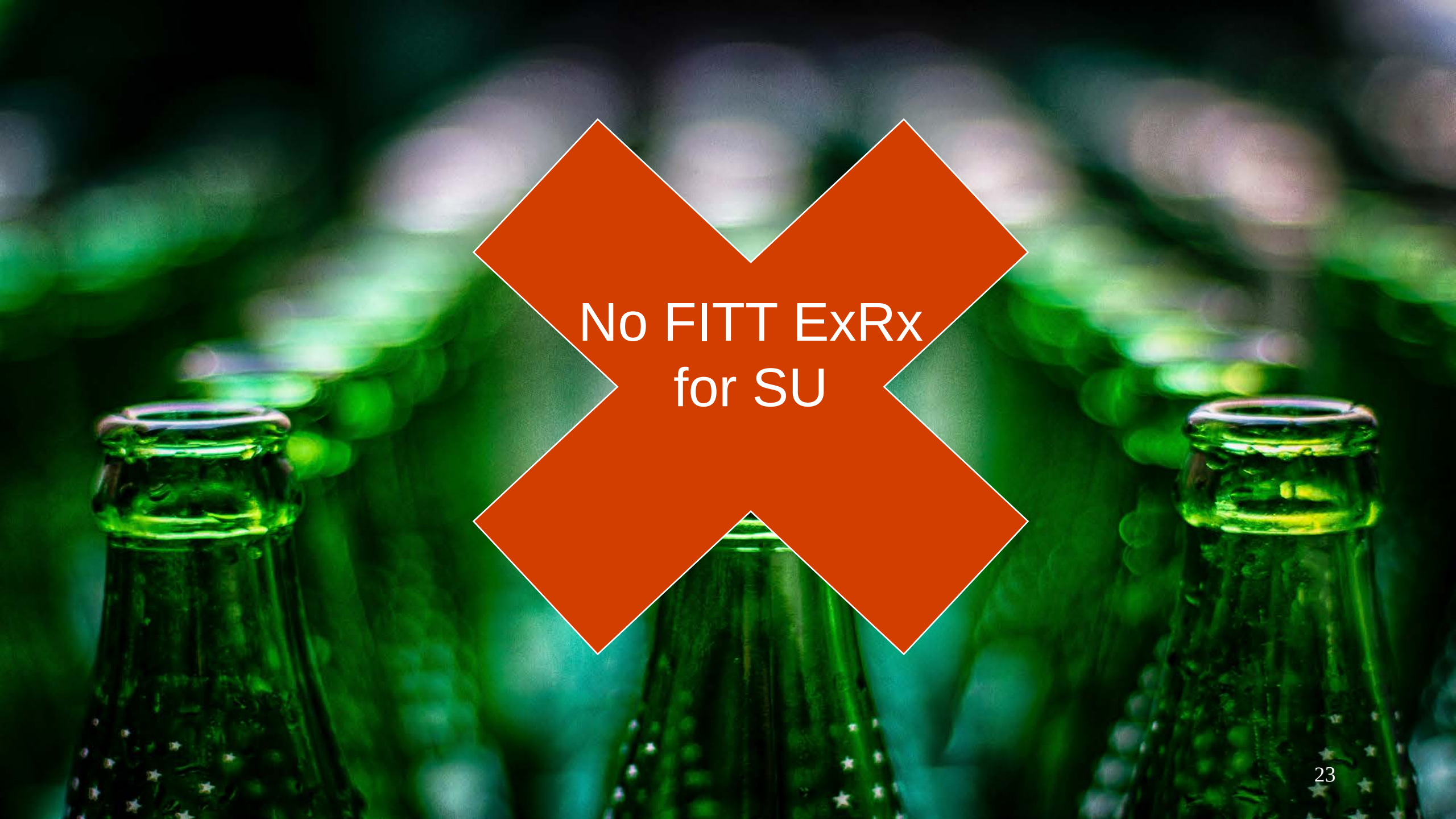
75-mi brous obic PA

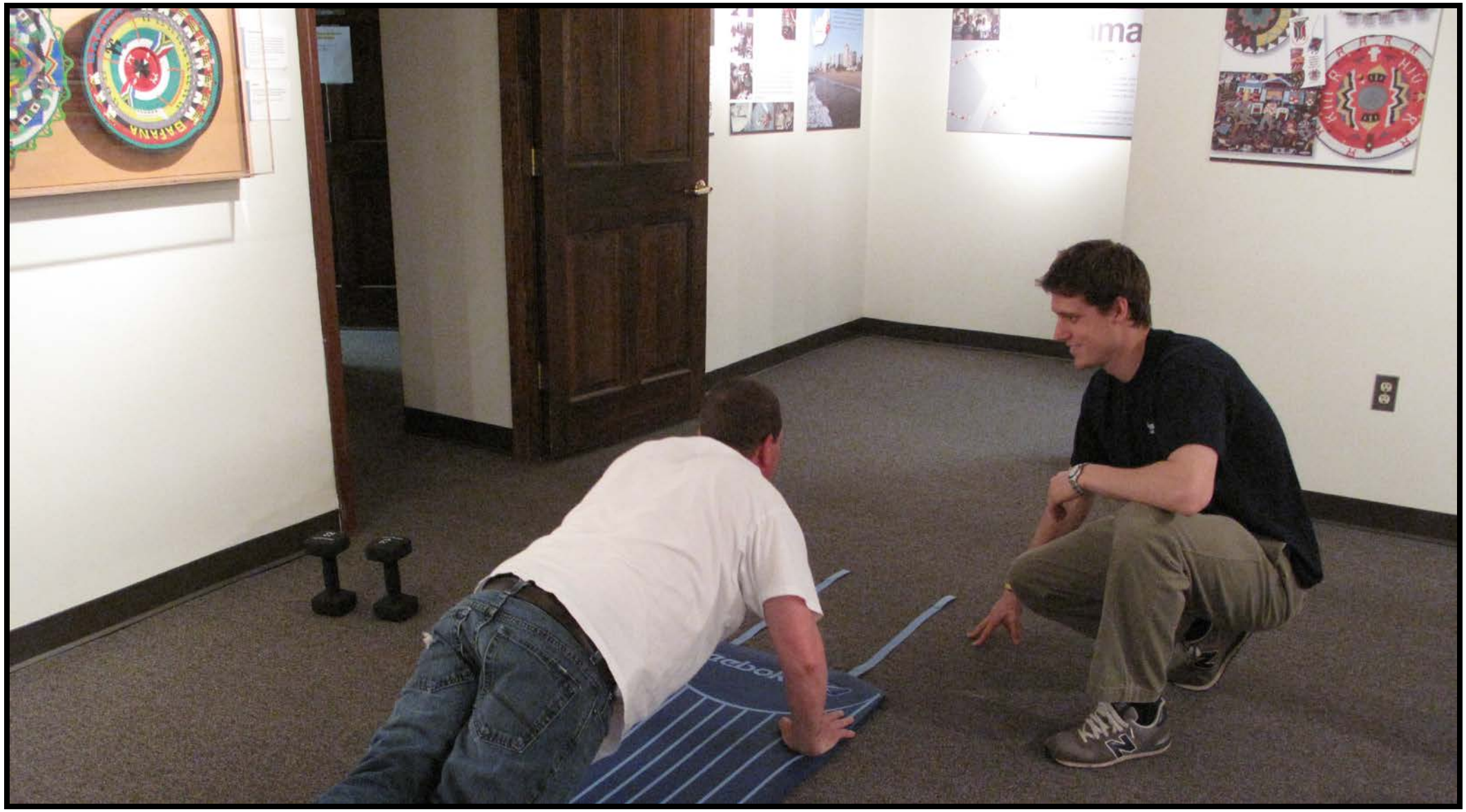
or

an equi ent combinatio of the two

Plus

two days of muscle-strengthening PA


No FITT ExRx
for SU



Weinstock et al. 2014, 2016, & 2020; Alessi et al. 2021

Physical Activity Guidelines for Americans

2nd edition

150-min/week of moderate intensity aerobic, resistance, and flexibility exercise

or

75-min/week of vigorous intensity aerobic, resistance, and flexibility exercise

or

an equivalent combination of the two

Plus

Lifestyle physical activities such as household, occupational, and leisure activities & chores

Planned and short bouts (10 min) of exercising to cope with cravings

What FITT ExR_x Is Needed for Therapeutic Benefit???

- Mental and Physical Health Outcomes?
  - Exercise/physical activity improve mental & physical health outcomes among PLWH &/or SU☺
    - Total and MVPA volume, cardiorespiratory & muscle endurance, self-efficacy & motivation to exercise, QOL, negative emotional states, & cardiometabolic & skeletal health indicators
- SU Outcomes?
  - Exercise/physical activity are associated with improvements in SU outcomes among adults with SU☺
    - Reduced substance use & related behaviors and problems
- The SU outcome improvements do not appear to be directly related to changes in exercise☹

Weinstock et al. 2014, 2016, & 2020; Alessi et al. 2021

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- Deliberate special considerations in ExR_x for PLWH & SU

PLWH & SU Special Considerations
The Basics

- Screen for co-morbidities
- Note medications & their side effects, particularly as they affect the exercise response
  - Antiretroviral therapy (ART) drugs are associated with cardiometabolic health conditions including hypertension, dyslipidemia, abnormal distribution of body fat, & insulin resistance as well as muscle wasting and weakness (i.e., sarcopenia), & osteopenia / osteoporosis

PLWH & SU Special Considerations
The Basics

- If chronic conditions limit physical activity, perform physical activity as tolerated to avoid being sedentary
- Deliberate individualizing the FITT ExR_x for the chronic disease/condition that is most limiting, puts the PLWH at greatest risk, &/or encompasses other chronic diseases/conditions
- Performing low to moderate intensity exercise will not suppress immune function in PLWH; thus, exercise should not be avoided out of fear of exercise-related immunosuppressive effects
- Exercise should be postponed in PLWH with acute infections

Pescatello LS et al. *Mayo Clin Proc Innov Qual Outcomes*. 2020

PLWH & SU Special Considerations
The Basics

- A varied clinical presentation requires a flexible approach
  - The FITT ExR_x should be adjusted based on the PLWH's current health status & age
- PLWH will require a higher level of biomarker monitoring
  - Blood pressure, blood glucose, fatigue, rating of perceived exertion during exercise, & physical activity trackers
- HIV will reduce exercise time, cardiorespiratory fitness & muscle fitness
- Integrate multicomponent exercise that consist of aerobic, resistance, flexibility, &/or balance exercise rolled into one (e.g., yoga, tai chi, video games, & circuit training)

ACSM GETP

PLWH & SU Special Considerations
The Basics

- Contact and high-risk (*e.g.*, skateboarding, rock climbing) sports are not recommended because of risk of bleeding
- Start low & Go slow
- Consider the warm-up & cool-down as part of the exercise session
- Doing something is better than doing nothing
- All movement counts & it adds up!
- Long-term exercise goals for PLWH should be to achieve the ACSM FITT principle of ExR_x recommendations for healthy adults

PLWH & SU Special Considerations
Co-Morbidities in PLWH & *SU*

- Pre- to Established Diabetes Mellitus
- Dyslipidemia
- Hypertension
- Anxiety
- Depression

FITT

FITT RECOMMENDATIONS FOR INDIVIDUALS WITH DIABETES (29,40,41)

	Aerobic	Resistance	Flexibility
Frequency	3–7 d · wk^{-1}	A minimum of 2 nonconsecutive d · wk^{-1}, but preferably 3	≥2–3 d · wk^{-1}
Intensity	Moderate (40%–59% $\dot{V}O_2R$ or 11–12 RPE rating) to vigorous (60%–89% $\dot{V}O_2R$ or 14–17 RPE rating)	Moderate (50%–69% of 1-RM) to vigorous (70%–85% of 1-RM)	Stretch to the point of tightness or slight discomfort.
Time	T1DM: 150 min · wk^{-1} at moderate intensity or 75 min · wk^{-1} at vigorous intensity or combination T2DM: 150 min · wk^{-1} at moderate-to-vigorous intensity	At least 8–10 exercises with 1–3 sets of 10–15 repetitions to near fatigue per set early in training. Gradually progress to heavier weights using 1–3 sets of 8–10 repetitions.	Hold static stretch for 10–30 s; 2–4 repetitions of each exercise
Type	Prolonged, rhythmic activities using large muscle groups (*e.g.*, walking, cycling, swimming)	Resistance machines and free weights	Static, dynamic, and/or PNF stretching

1-RM, one repetition maximum; PNF, proprioceptive neuromuscular facilitation; RPE, rating of perceived exertion; $\dot{V}O_2R$, oxygen uptake reserve.

PLWH & SU Special Considerations

Pre- to Established Diabetes Mellitus

- Blood glucose monitoring is recommended when beginning an exercise program or when there is a history of unstable blood glucose during exercise
  - Consider as a self-regulation behavioral strategy to increase exercise adherence
- The presence of peripheral neuropathy necessitates proper foot care & more non-weight bearing exercise
- In the presence of autonomic neuropathy, the rating of perceived exertion or the talk test should be used to monitor exercise intensity
- Resistance exercise confers similar metabolic benefits to aerobic exercise
- Combined aerobic & resistance exercise may improve blood glucose control more than either modality alone

FITT

FITT RECOMMENDATIONS FOR INDIVIDUALS WITH DYSLIPIDEMIA (15,37,48)

	Aerobic	Resistance	Flexibility
Frequency	≥5 d · wk^{-1} to maximize caloric expenditure	2–3 d · wk^{-1}	≥2–3 d · wk^{-1}
Intensity	40%–75% $\dot{V}O_2R$ or HRR	Moderate (50%–69% of 1-RM) to vigorous (70%–85% of 1-RM) to improve strength; <50% 1-RM to improve muscle endurance	Stretch to the point of tightness or slight discomfort.
Time	30–60 min · d^{-1}. To promote or maintain weight loss, 50–60 min · d^{-1} or more of daily exercise is recommended.	2–4 sets, 8–12 repetitions for strength; ≤2 sets, 12–20 repetitions for muscular endurance	Hold static stretch for 10–30 s; 2–4 repetitions of each exercise
Type	Prolonged, rhythmic activities using large muscle groups (*e.g.*, walking, cycling, swimming)	Resistance machines, free weights and/or body weight	Static, dynamic, and/or PNF stretching

1-RM, one repetition maximum; HRR, heart rate reserve; PNF, proprioceptive neuromuscular facilitation; $\dot{V}O_2R$, oxygen uptake reserve.

PLWH & SU Special Considerations

Dyslipidemia

- Defined by the presence of elevated levels of total cholesterol ($\geq$200 mg·dL^{-1}), *low-density lipoprotein (LDL-C, $\geq$130 mg·dL^{-1}),* or triglycerides (TG, $\geq$200 mg·dL^{-1}), or low levels of high-density lipoprotein (HDL-C, <40 mg·dL^{-1} men, <50 mg·dL^{-1} women)
- Aerobic exercise lowers LDL-C 3-6 mg·dL^{-1}
- High volumes of aerobic exercise appear necessary to increase HDL-C and lower TG
- Resistance exercise reduces LDL-C & TG by 6–9 mg·dL^{-1}
- Combined aerobic & resistance exercise appears to be the most prudent modality for adults with dyslipidemia because it can increase HDL-C & lower TG and LDL-C simultaneously

ACSM GETP

Table. The New ACSM FITT Recommendations for Hypertension (adapted from 6, 9)

	Aerobic and/or Resistance		Neuromotor**	Flexibility	The New ACSM FITT Exercise Recommendations
Frequency	≥2-3 sessions per week	≥2-3 sessions per week	≥2-3 session per week	≥2-3 sessions per week with daily being most effective	***On most, preferably all, days of the week
Intensity	*Moderate (i.e., 40% - 59% VO2R or HRR; RPE 12-13 on a 6–20 scale to Vigorous (i.e., 60% - 80% VO2R or HRR; RPE 14-16 on a 6–20 scale)	Moderate (i.e., 60% - 70% 1-RM; may progress to 80% 1-RM. For older adults and novice exercisers begin with 40-50% 1RM)	Low to Moderate	Stretch to the point of feeling tightness or slight discomfort	Low, Moderate, or Vigorous with an emphasis on Moderate
Time	≥20-30 min per session of continuous or accumulated exercise of any duration	2-4 sets of 8-12 repetitions of 8-10 resistance exercises of each of the major muscle groups per session to total ≥20 min per session with rest days interspersed depending on the muscle groups being exercised	≥20-30 min per session	Hold static stretch for 10-30 s with 2-4 repetitions of each exercise targeting the major muscle tendon units to total 60 s of total stretching time for each exercise; ≤10 min per session	≥20 to 30 min per day to total ≥90 to 150+ min per week of continuous or accumulated exercise of any duration
Type	Prolonged, rhythmic activities using large muscle groups (e.g., walking, cycling, swimming)	Resistance machines, free weights, resistance bands, and/or functional body weight exercise	Exercise involving motor skills and/or functional body weight and flexibility exercise such as yoga, pilates, and tai chi	Static, dynamic, and/or proprioceptive neuromuscular facilitation	An emphasis on aerobic or resistance exercise alone or combined in addition to neuromotor and flexibility depending on personal preference

VO_2R=oxygen uptake reserve; HRR= heart rate reserve; RPE=rating of perceived exertion; 1-RM=one repetition maximum.

* The magnitude of the BP reductions resulting from aerobic exercise are directly proportional to intensity such that the greatest BP reductions occur after vigorous intensity exercise if the patient/client is willing and able to perform vigorous intensity exercise (4).

** Neuromotor functional body weight exercise can be substituted for resistance exercise, and depending on the amount of flexibility exercise integrated into a session, neuromotor flexibility exercise can be substituted for flexibility exercise depending on patient/client preference. The evidence is promising but limited for neuromotor exercise to be recommended alongside aerobic and resistance exercise as a primary exercise modality at this time (6).

*** The frequency recommendation is made due to the immediate blood pressure lowering effects of exercise, termed *postexercise hypotension* (4).

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LEADING THE WAY

PLWH & SU Special Considerations
Hypertension

- A systolic blood pressure (SBP)≥130 mmHg &/or diastolic blood pressure (DBP)≥80 mmHg
- Note antihypertensive medication side effects
  - β-Blockers effect blood glucose, heart rate, & exercising in the heat
  - Extend the cool down period due to medication hypotensive effects upon the abrupt termination of exercise (i.e., calcium channel blockers, α-blockers)
- Aerobic, resistance, & neuromotor exercise alone or combined lower BP
- Any intensity lowers BP
- Regularly monitor BP with a home BP monitor
- Utilize the immediate BP reductions that occur after a single exercise session that can be sustained for 24 hours, termed *postexercise hypotension*, as a self-regulation behavioral strategy to increase exercise adherence

PLWH & SU Special Considerations
Anxiety

- Note medications & their side effects
- Aerobic, resistance, & neuromotor exercise reduce symptoms, with aerobic exercise perhaps the better option for clinical populations
- High intensity aerobic exercise (i.e., 60%–90% HR_{max}) may have greater effects for decreasing anxiety than lower intensities
- State anxiety is reduced after an ~30 min acute exercise session, while 60-90 min acute sessions may be even more effective
- For optimal effects, the exercise program should last 3-12 wk
- Individuals with known panic disorders should be advised they may experience panic-like symptoms as a normal response to higher exercise intensity
- Reduced sensitivity to rewards may create challenges for exercise adherence

PLWH & SU Special Considerations
Depression

- Aerobic, resistance, & neuromotor exercise reduce depressive symptoms, with combined approaches appearing more effective
- Note medications & their side effects
- Any intensity appears to be effective
- Acute exercise sessions lasting ~20 min reduce depressive symptoms in those without depressive disorders; for those with depressive disorders, acute exercise sessions lasting ~45 min are recommended
- For optimal effects, the exercise program should consist of ≥13 days
- Reduced sensitivity to rewards may create challenges for exercise adherence
- Consider supplementing exercise with support for self-regulation

ACSM GETP; Suls J et al. *Health Psychol Rev* 2020

The Art of ExR_x

- ✓Substitute *F*requency & *T*ime for *I*ntensity because from a public health perspective, the total volume of physical activity is most important for health
- ✓All movement counts & it adds up!
- ✓Doing something is better than doing nothing
- ✓Start low & Go slow
- ✓Devise creative strategies to reduce the time to meet the recommendations (e.g, multicomponent exercise)
- ✓ Use behavioral theories and strategies to improve exercise adherence (i.e., goal setting, *self-regulation*, motivational interviewing, and contingency management)
- ✓ Practice good clinical judgement & consult with the team

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FITT

FITT RECOMMENDATIONS FOR INDIVIDUALS WITH OVERWEIGHT AND OBESITY (37,85)

	Aerobic	Resistance	Flexibility
Frequency	≥5 d · wk^{-1}	2–3 d · wk^{-1}	≥2–3 d · wk^{-1}
Intensity	Initial intensity should be moderate (40%–59% $\dot{V}O_2R$ or HRR); progress to vigorous (≥60% $\dot{V}O_2R$ or HRR) for greater health benefits.	60%–70% of 1-RM; gradually increase to enhance strength and muscle mass.	Stretch to the point of feeling tightness or slight discomfort.
Time	30 min · d^{-1} (150 min · wk^{-1}); increase to 60 min · d^{-1} or more (250–300 min · wk^{-1}).	2–4 sets of 8–12 repetitions for each of the major muscle groups	Hold static stretch for 10–30 s; 2–4 repetitions of each exercise
Type	Prolonged, rhythmic activities using large muscle groups (*e.g.*, walking, cycling, swimming)	Resistance machines and/or free weights	Static, dynamic, and/or PNF

1-RM, one repetition maximum; HRR, heart rate reserve; PNF, proprioceptive neuromuscular facilitation; $\dot{V}O_2R$, oxygen uptake reserve.

ACSM GETP

FITT

FITT RECOMMENDATIONS FOR OLDER ADULTS (9,46,85)

	Aerobic	Resistance	Flexibility
Frequency	≥5 d · wk^{-1} for moderate intensity; ≥3 d · wk^{-1} for vigorous intensity; 3–5 d · wk^{-1} for a combination of moderate and vigorous intensity	≥2 d · wk^{-1}	≥2 d · wk^{-1}
Intensity	On a scale of 0–10 for level of physical exertion, 5–6 for moderate intensity and 7–8 for vigorous intensity	Light intensity (*i.e.*, 40%–50% 1-RM) for beginners; progress to moderate-to-vigorous intensity (60%–80% 1-RM); alternatively, moderate (5–6) to vigorous (7–8) intensity on a 0–10 scale	Stretch to the point of feeling tightness or slight discomfort.
Time	30–60 min · d^{-1} of moderate intensity exercise; 20–30 min · d^{-1} of vigorous intensity exercise; or an equivalent combination of moderate and vigorous intensity exercise; may be accumulated in bouts of at least 10 min each	8–10 exercises involving the major muscle groups; 1–3 sets of 8–12 repetitions each	Hold stretch for 30–60 s.
Type	Any modality that does not impose excessive orthopedic stress such as walking. Aquatic exercise and stationary cycle exercise may be advantageous for those with limited tolerance for weight-bearing activity.	Progressive weight-training programs or weight-bearing calisthenics, stair climbing, and other strengthening activities that use the major muscle groups	Any physical activities that maintain or increase flexibility using slow movements that terminate in static stretches for each muscle group rather than rapid ballistic movements.

1-RM, one repetition maximum

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FITT RECOMMENDATIONS FOR INDIVIDUALS WITH OSTEOPOROSIS (6,99)

FITT

	Aerobic	Resistance	Flexibility
Frequency	4–5 d · wk^{-1}	Start with 1–2 non-consecutive d · wk^{-1}; may progress to 2–3 d · wk^{-1}	5–7 d · wk^{-1}
Intensity	Moderate intensity (40%–59% $\dot{V}O_2R$ or HRR). Use of the CR-10 scale (0–10) with ratings of 3–4 might be a more appropriate method of establishing intensity.	Adjust resistance so that last 2 repetitions are challenging to perform. High intensity training is beneficial in those who can tolerate it.	Stretch to the point of tightness or slight discomfort.
Time	Begin with 20 min; gradually progress to a minimum of 30 min (with a maximum of 45–60 min).	Begin with 1 set of 8–12 repetitions; increase to 2 sets after ~2 wk; no more than 8–10 exercises per session	Hold static stretch for 10–30 s; 2–4 repetitions of each exercise
Type	Walking, cycling, or other individually appropriate aerobic activity (weight bearing preferred)	Standard equipment can be used with adequate instruction and safety considerations.	Static stretching of all major joints

HRR, heart rate reserve; $\dot{V}O_2R$, oxygen uptake reserve.

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https://exercisepresciption.uconn.edu/

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