

Physical Activity Guidelines Advisory Committee Meeting 2

Sponsored by the U.S. Department of Health and Human Services (HHS)

Held at

**The National Institutes of Health
Building 10, NIH Clinical Center, Masur Auditorium
9000 Rockville Pike
Bethesda, MD 20892
October 27-28, 2016**

Meeting Attendees

Physical Activity Guidelines Advisory Committee: Abby King, PhD (Co-Chair); Ken Powell, MD, MPH (Co-Chair); David Buchner, MD, MPH, FACSM; Wayne Campbell, PhD; Loretta DiPietro, PhD, MPH, FACSM; Kirk Erickson, PhD; Charles Hillman, PhD; John Jakicic, PhD; Kathleen Janz, EdD, FACSM; Peter Katzmarzyk, PhD; William Kraus, MD, FACSM; Richard Macko, MD; David Marquez, PhD, FACSM; Anne McTiernan, MD, PhD, FACSM (Not in Attendance Day 1); Russell Pate, PhD, FACSM; Linda Pescatello, PhD, FACSM; and Melicia Whitt-Glover, PhD, FACSM

Co- Executive Secretaries: Richard Olson, MD, MPH; Katrina Piercy, PhD, RD, ACSM-CEP; Janet Fulton, PhD, FACSM; Deb Galuska, PhD; Rachel Ballard, MD, MPH; Richard Troiano, PhD; and Shellie Pfohl, MS (Not in Attendance)

Federal Staff: Kellie Casavale, PhD, RD; Holly McPeak, MS; Alison Vaux Bjerke, MPH; Sarah Prowitt, MPH; Emily Bhutiani, MS; Stephanie George, PhD, MPH, MA; and Ahmed Islam

Other Participants: Anne Brown Rodgers, Scientific writer/editor; Bonny Bloodgood, MA ICF International (literature review team)

Day 1 Meeting Summary

Thursday, October 27th, 2016

(2:15pm)

Welcome

Dr. Olson, Designated Federal Officer, Office of Disease Prevention and Health Promotion (ODPHP), U.S. Department of Health and Human Services (HHS) welcomed the Committee members as he called to order day one of the second meeting of the Physical Activity Guidelines Advisory Committee. Dr. Olson reminded the public of the formation of nine subcommittees at the first public meeting and emphasized the rigorous nature of the literature review process.

Public Oral Testimony

Individuals from the public had the opportunity to address the Committee for three-minutes. Two individuals registered and provided public oral testimony to the Committee.

Device-based vs. Reported Measurement of Physical Activity Presentation and Discussion

Dr. Troiano, Co-Executive Secretary, National Cancer Institute (NCI), National Institutes of Health (NIH), HHS presented on device-based vs. self-reported measurement of physical activity. Dr. Troiano referenced previously published National Health and Nutrition Examination Survey (NHANES) data to demonstrate the differences between the two measurement techniques in terms of data-collection and interpretation. Dr. Troiano noted the value of both types of measures: self-reported data provide reports on the behavior as perceived and can give context for when and how physical activity is happening, while accelerometer data can provide an unbiased snapshot of the amount and intensity of physical activity-related movement performed.

The Committee then discussed how these two separate measurement techniques influence the evaluation of the physical activity and health literature. The Committee agreed that physical activity behavior and movement are related but not comparable constructs. However, both are relevant to the development of the Guidelines, which are intended to inform behavior. The Committee agreed that device-based and reported measures could supplement one another in evaluation of the data. Reported measures of physical activity can allow for evaluation of behavior and context that would not be measurable with a device; device-measured physical activity may provide a better assessment of the movement aspect of physical activity. Additionally, when considering consumer wearable devices, though the quantitative output may differ among devices, devices may be able to assess change in behavior (e.g., increasing activity levels). Thus, the Committee agreed that it might be more appropriate to look for patterns that are similar across studies that measure physical activity differently, though the magnitude of the patterns may not be directly comparable.

Committee Discussion

Special considerations for young adults (aged 18 – 35). Currently the *Guidelines* recommend 60 minutes or more of physical activity per day for individuals aged 6 to 17 and 150 minutes or more of moderate-to-vigorous physical activity (MVPA) for adults 18 and older. For adults, this guideline could be broken out into 30 minutes, 5 days a week. Therefore, the transition from the youth to the adult guideline essentially halves the recommended amount of physical activity at age 18. The Committee is interested in exploring this transition and agreed to take an approach to address age-related transitions across the lifespan that impact health and influence individuals' level of normal daily activity (e.g., transitions into young adulthood, middle-age, and older adulthood). All subcommittees intend to examine outcomes of interest addressed in their search (i.e., risk factors, disease, weight gain, etc.) for specific age ranges if the literature allows. Dr. Campbell volunteered to support efforts to synthesize health outcomes information for these transitions. Given that weight and weight gain are pertinent outcomes across the lifespan, these will serve as a starting point for outcomes to address across lifespan.

Musculoskeletal health. Dr. Janz gave a presentation on impact loading and its effect on bone architecture. She discussed existing methods used to evaluate aspects of bone health (i.e., strength and density) as well as noted that she will be consulting with international experts in the field of bone health for guidance on recent developments in the bone health literature, specifically for adults.

The Committee agreed that the literature on musculoskeletal health should be re-examined to determine if the existing *Guidelines* need to be updated. All Committee members agreed on the importance of addressing musculoskeletal health within certain subcommittees (in particular, Aging and Youth) as well as in the life transitions assessment.

Addressing ‘fitness’ as an outcome or as an exposure. To introduce the topic, Dr. Kraus noted that while cardiorespiratory fitness is one of the strongest predictors of health and is inversely related to mortality, it is a poor surrogate of physical activity given that only about 50% of the variation in fitness is attributable to physical activity. The Committee agreed that fitness would be explored as an outcome given that it reflects both physical and physiological function; thus, high fitness may represent a state that is desirable for achieving overall health. Fitness will also be addressed as a mediator or moderator of health outcomes. The Committee agreed that fitness would not be addressed as an exposure given the strong non-modifiable genetic component related to fitness.

Determining the continuum of physical activity The Committee discussed if sedentary behavior belongs on the continuum of physical activity (along with light, moderate, and vigorous intensity activity) or whether it is a separate construct to be addressed independent of light, moderate, and vigorous physical activity. The Committee did not reach a clear conclusion on whether or not to include sedentary behavior on the continuum and as such will discuss this topic further as the literature review process evolves.

Compiling uniform dose-response curves. Given the interest in light intensity activity and total physical activity exposure rather than MVPA alone, the Committee noted that total caloric expenditure may be a more appropriate independent variable in the dose-response curves than energy expenditure equivalent of MVPA as was used in 2008. The Committee will continue to discuss this topic throughout the literature search process.

Day 1 Adjourned

(4:50pm)

Day 2 Meeting Summary

Friday, October 28th, 2016

(8:02am)

Call to Order, Roll Call, and Opening Remarks

Dr. Olson, Designated Federal Officer, ODPHP, HHS, welcomed the Committee members as he called to order day two of the second meeting of the Physical Activity Guidelines Advisory Committee.

Introduction of Overarching Goals, Subcommittee Presentations, and Committee Discussion

Dr. King, Co-Chair of the Committee, introduced the agenda for the day and reminded the Committee members of the overarching criteria and principles for question prioritization. The question prioritization criteria include: 1) potential for the greatest public health impact; 2) potential to inform public health policy and programs; 3) existence of a mature scientific evidence base; and 4) generalizability of the findings.

Subcommittee Presentations

Each subcommittee chair presented his or her Subcommittee's priority questions and components of the preliminary search strategy for the first question. Following each presentation, the Committee participated in Q&A session.

SC 1 Aging. Dr. DiPietro presented the following priority questions for the Aging Subcommittee:

1. What is the relationship between physical activity and risk of injury due to a fall?
2. What is the relationship between physical activity and physical function?
3. What is the relationship between physical activity and risk of frailty?

Dr. DiPietro noted that the Aging Subcommittee would be looking at prevention of adverse health outcomes in a relatively healthy aging population. Within each of these questions, this Subcommittee will also be addressing the types of physical activity that are most effective for attaining positive health outcomes (i.e., aerobic, musculoskeletal, flexibility, and balance), and factors that modify the relationship between physical activity and these aging outcomes (e.g., BMI).

Dr. DiPietro clarified that the Aging Subcommittee has set the age of the target population to individuals 50 years old or older in order to capture transition into older adulthood where various age-related or factors related to decreased physical activity may increase risk of fall and risk of frailty. This Subcommittee plans to address the risk-to-benefit ratio of this population engaging in physical activity.

SC 2 Brain Health. Dr. Erickson presented the following priority questions for the Brain Health Subcommittee:

1. What is the relationship between physical activity and cognition and does such a relationship exist across the lifespan and include individuals with normal to impaired cognitive function (i.e., dementia)?
2. What is the relationship between physical activity and perceptions of well-being and quality-of-life in healthy and impaired populations?
3. What is the relationship between physical activity and affect and does a relationship exist across continuum of mood and affective disorders (i.e., depression)?
4. What is the relationship between physical activity and anxiety and does such a relationship exist across the continuum of anxiety disorders?
5. What is the relationship between physical activity and sleep and circadian rhythms that include normal to impaired sleep behaviors?
6. What is the relationship between physical activity and biomarkers of brain health?

Dr. Erikson noted that for the first question, 'cognition across the lifespan' refers to outcomes such as academic achievement in children up through impaired cognitive function in Alzheimer's disease. For each of these questions, this Subcommittee also intends to address the most beneficial mode of physical activity for a specified outcome.

Dr. Erikson clarified that 'biomarkers of the brain' refer to objective biological aspects of the brain (i.e., tissue type and connectivity) as opposed to subjective measures such as mood or affect. Further, he noted that while many outcomes overlap between adults and youth (e.g., executive function), some are specific to youth only (e.g., academic achievement), others are specific to adults only (Alzheimer's

disease), and others have different constructs or mechanisms between the two age populations (e.g., depression and anxiety). Dr. Erikson noted that this Subcommittee will have to determine the most appropriate way to examine fitness in the context of brain health given that it may be a moderator of physical activity and brain health outcomes or it may be predictive of cognitive decline over the lifespan.

SC 3 Cancer – Primary Prevention. Dr. McTiernan presented the following priority questions for the Cancer Subcommittee:

1. What is the relationship between physical activity and invasive cancer incidence?
2. What is the relationship between sedentary behavior and invasive cancer incidence?

Dr. McTiernan noted that the Cancer Subcommittee intends to include information on the common types of cancer but will develop criteria for not including information on specific cancer sites or sub-sites given that there are over 100 different types of cancer. She also clarified that this Subcommittee will be looking at adults aged 18 and older given that there is not much data about physical activity exposure and cancer incidence in children. For both of these questions, this Subcommittee will also examine whether the relationship between physical activity and the outcome of interest differs by specific cancer subtypes and whether the relationship is present in individuals at high risk (i.e., familial predisposition to cancer). Finally, Dr. McTiernan noted that while there is interest in exploring the relationship between physical activity and preventing the spread of cancer, she is uncertain of the robustness of such literature.

SC 4 Cardiometabolic Health and Weight Management. Dr. Jakicic presented the following priority questions for the Cardiometabolic Health and Weight Management Subcommittee:

1. Is there evidence that physical activity prevents or minimizes weight gain in adults?
2. Is there a relationship between physical activity and blood glucose control (incidence of impaired glucose tolerance or type 2 diabetes mellitus) in adults without diabetes?
3. Is there a relationship between physical activity and weight control during pregnancy and postpartum in adults?
4. Is there a relationship between physical activity and metabolic syndrome, and the components of metabolic syndrome (blood pressure, lipids, abdominal adiposity) in adults?
5. Does physical activity alter body composition (lean tissue, fat tissue, intramuscular fat) with weight loss in adults?
6. Is there a relationship between physical activity and weight change following clinically meaningful weight loss of at least 5% in adults?
7. Is there a relationship between physical activity and inflammatory markers in adults?
8. Is there evidence that physical activity adds to the magnitude of weight loss achieved with caloric restriction in adults?

Dr. Jakicic clarified that this Subcommittee will be looking at individuals without known chronic disease. This Subcommittee will also be including 'sedentary' search terms in their searches in order to capture literature on sedentary behavior and the specified outcomes. This information will then be forwarded to the Sedentary Behavior Subcommittee for analysis and synthesis. For each of these questions, this Subcommittee will also examine whether the relationship between physical activity and a specific outcome varies based on levels of physical activity; whether the relationship is influenced by diet (e.g., energy intake) or eating behavior; and whether the relationship varies by initial body weight.

Dr. Jakicic noted that the Subcommittee has decided to add waist circumference as a search term given that it is a common measure of adiposity. Further, he noted that body weight will need to be a primary or secondary outcome in the study for it to be included in the captured literature to avoid studies that simply report weight as a participant characteristic. Dr. Jakicic clarified that while the Subcommittee has not yet decided upon a specific minimum duration of intervention studies for inclusion, he foresees that studies will need to be at least 3 months long in order to see significant changes.

SC 5 Exposure (formerly Dose Response). Dr. Kraus presented the following priority questions for the Exposure Subcommittee:

1. What is the relationship between physical activity and all-cause mortality?
2. What is the relationship between physical activity and cardiovascular disease mortality?
3. What is the relation between physical activity and cardiovascular disease incidence?
4. What is the relation between step count per day and mortality (all-cause or cause-specific) or disease incidence (e.g., coronary heart disease, type 2 diabetes)? What is the relation between bout duration of continuous aerobic physical activity and cardiorespiratory fitness OR health outcomes?
5. What is the relation between high intensity interval training (HIIT) and reduction in cardiometabolic risk?
6. How does the declining basal level of activity influence the volume of physical activity (presumably MVPA) required to maintain a similar level of energy expenditure per day?
7. Is cardiorespiratory fitness a modifiable mediator of the benefits of physical activity? Should it be treated as an outcome?

Dr. Kraus emphasized the timely nature of topics such as ‘step counts per day’ and ‘HIIT’ and is confident the literature is robust enough at this time to address both topics. Dr. Kraus clarified that the Exposure Subcommittee will be in charge of synthesizing step count information for the various outcomes specified by other subcommittees to potentially determine a step count threshold for the most health benefit. Dr. Kraus also mentioned that this Subcommittee is unlikely to comprehensively address the exposure of resistance training and as such will rely on work led by Dr. Janz on musculoskeletal issues to complement the Exposure Subcommittee in addressing this topic.

SC 6 Individuals with Chronic Conditions. Dr. Buchner presented the following priority questions for the Individuals with Chronic Conditions Subcommittee:

1. Among cancer survivors, what is the relationship between physical activity and all-cause mortality, cancer-specific mortality, or risk of cancer recurrence?
2. In people with neuromotor disease, what is the relationship between physical activity and risk of cardiovascular disease, physical function, and risk of co-morbid conditions?
3. In people with osteoarthritis, what is the relationship between physical activity and progression of osteoarthritis, risk of co-morbid conditions, and physical function?
4. For other selected chronic conditions, can the relationship between physical activity and disease progression, risk of co-morbid conditions, physical function, and measures of quality of life be ascertained from existing systematic reviews of the literature?

Dr. Buchner noted that this Subcommittee would not be dealing with therapeutic physical activity, which is delivered as treatment for a specific disease by medical staff and is typically reimbursed by health insurance providers. This Subcommittee will consider disease prevention and prevention of

disease progression. For all of its questions, the Subcommittee will examine whether obesity modifies the effect of physical activity on the specified health outcome.

This Subcommittee will need to determine which chronic condition populations it will address in addition to cancer survivors, individuals with neuromotor disease, and individuals with osteoarthritis. To do so, Dr. Buchner proposed that ICF (literature review team) execute a preliminary search on number of existing reviews (systematic reviews and meta-analyses) to provide an estimate of the size of the literature on physical activity and each of additional chronic conditions proposed. This Subcommittee will then rank conditions based on prevalence and robustness of the literature, and the composite score of these two rankings will determine the priority chronic conditions that the Subcommittee will address. Dr. Bucher noted that the literature would guide the Subcommittee in terms of addressing any medical therapies that may moderate the relationship between physical activity and health outcomes in those with a specific chronic condition.

Break

SC 7 Promotion of Physical Activity. Dr. King presented the following priority questions for the Promotion of Physical Activity Subcommittee:

1. What types of physical activity interventions are effective for physical activity change at different levels of impact?
2. What are effective interventions for reducing sedentary behavior?

Dr. King noted that this Subcommittee will be taking a life-course approach to this topic and may identify and evaluate specific subgroups of interest depending on the robustness of the available literature for that subgroup. This Subcommittee will be examining physical activity interventions applied alone or as part of multiple behavioral intervention studies. Dr. Janz and Dr. Buchner recommended that Dr. King's Subcommittee assess the cost-benefit analysis of different interventions if the literature provides substantial evidence to do so. This Subcommittee will utilize resources such as the Physical Activity Guidelines Midcourse Report and existing Centers for Disease Control (CDC) reports to address these questions.

SC 8 Sedentary Behavior. Dr. Katzmarzyk presented the following priority questions for the Sedentary Behavior Subcommittee:

1. What is the relationship between sedentary behavior and all-cause mortality?
2. What is the relationship between sedentary behavior and mortality from cardiovascular disease?
3. What is the relationship between sedentary behavior and mortality from cancer?
4. What is the relationship between sedentary behavior and incidence of diabetes, obesity, cardiovascular disease, and cancer?
5. Is there a level of physical activity which negates the negative health effects of sedentary behavior?

Dr. Katzmarzyk noted that for cancer incidence, the Subcommittee will focus primarily on invasive cancer, but will also address site-specific cancers where there is available literature. He also clarified that sedentary behavior is defined as any waking behavior characterized by an energy expenditure less than 1.5 Metabolic Equivalents (METs); however, different publications operationalize sedentary

behavior differently. This Subcommittee will consider looking at how MVPA modifies the effects of sedentary behavior within each of its questions. It is unclear if the literature will allow this Subcommittee to examine fitness as a mediator or moderator of the relationship between sedentary behavior and specified health outcomes.

SC 9 Youth. Dr. Pate presented the following priority questions for the Youth Subcommittee:

1. In children younger than 6 years of age, what is the relationship between physical activity and health outcomes?
2. In youth, what is the relationship between physical activity and health outcomes?
 - Is there a dose-response relationship? If yes, what is the shape of the relationship?
 - Does the relationship vary by age, sex, race/ethnicity, or socio-economic status?
 - Does the relationship vary based on levels of light, moderate, or vigorous physical activity?
 - What is the relationship between physical activity and cardiorespiratory fitness, weight status, and other cardiometabolic risk factors?
 - Does physical activity prevent or reduce excessive weight gain that results in overweight or obesity?
 - What is the relationship between muscle-strengthening and bone-strengthening physical activity and musculoskeletal health?
3. Is sedentary behavior associated with health outcomes, including weight status/body composition, in youth?
4. Are the effects of sedentary behavior on health outcomes in youth independent of the effects of light, moderate, or vigorous physical activity on those outcomes?

Dr. Pate noted that this Subcommittee would be considering development of motor skills and other developmental milestones within the ages being addressed.

The Committee agreed that for each of its questions, all Subcommittees will also address the shape of the dose-response curve as well as factors that modify the effect of the exposure and specified outcomes including age, socioeconomic status, race, ethnicity, and gender.

Lunch Break

Overall Question Prioritization

Drs. King and Powell, Co-Chairs of the Committee, led the Committee in a discussion of how best to prioritize the Committee's research questions. This full Committee discussion built upon subgroup discussions of this topic from the day before. Dr. Powell explained that prioritizing the research questions was needed to ensure the most efficient use of ICF resources in conducting the systematic literature review searches. Dr. Powell informed the Committee that while ICF would likely be able to complete searches for most, if not all, identified questions, a prioritization of the searches is necessary in case resources do not allow for all questions to be addressed. Dr. Powell noted the prioritization criteria that had been decided upon by the Committee as a whole:

- Greatest public health impact
- Potential to inform public health policy and programs
- Existence of mature scientific evidence

- Potential generalizability to the population of interest.

Given that ICF resources may limit the number of searches that they will be able to conduct, the Committee decided that each subcommittee's first two priority questions will be automatically started through the ICF literature review process. Prioritization of all remaining questions will occur later in the Committee's process. When prioritizing the remaining questions, in addition to importance of the question itself, the Committee will consider if any questions may be grouped together and captured with a single search.

The Committee decided that nearly all subcommittees would be addressing fitness as a mediator or moderator of certain health outcomes. As such, ICF will identify studies that measure the exposure, fitness, and the specific outcome in the abstraction process so that subcommittees can provide this information to the Exposure Subcommittee for review and synthesis.

Committee Discussion

Special considerations for young adults (aged 18 – 35). The Committee re-visited this topic from the previous day's discussion. The Committee agreed that the young adult age group should comprise individuals age 18 to 35. All subcommittees except for Youth and Aging, will gather information on physical activity and health outcomes for this specific age group. Addressing this issue will likely involve collaboration between the Youth and Cardiometabolic and Weight Management Subcommittees given that these Subcommittees address health outcomes most pertinent to the young adult age group.

Pregnancy. The Committee discussed the need to address physical activity in pregnant women in the Advisory Committee report. Given that none of the subcommittees have identified 'pregnancy' as an exclusion criteria, the Committee will be capturing all the necessary literature on this topic and intend to subsequently summarize the literature to appropriately address pregnancy in its scientific report. The Committee also agreed to reach out a consultant for insight on the status of the current literature.

Adverse Events. The Committee discussed how best to re-examine and address adverse events related to participation in physical activity. The Committee decided that ICF would include a check-box for the abstraction which would identify studies that have reported adverse event information. Each subcommittee will then gather the appropriate adverse event information and forward it to Dr. Powell for synthesis and analysis.

Wrap Up and Next Steps

Drs. King and Powell, Co-Chairs of the Committee, noted that subcommittees will continue to meet frequently on conference calls and clearer solutions to topics addressed in the public meeting will be available as the Committee proceeds in the ICF literature review process.

Dr. Olson, Designated Federal Officer, ODPHP, HHS, adjourned the second meeting of the 2018 Physical Activity Guidelines Advisory Committee and stated that the Committee will reconvene in March 2017.

Meeting Adjourned

(2:03pm)