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Appendix A. Device-derived measures for mobility subdomains

Device-derived measures that did not reach consensus

Table A1: Walking (24 voters)

Principle	Votes	Percent
Proportion of walking that occurs in bouts (accumulation of steps) - Density * walking vs stepping ... purposeful vs. incidental (ambulation)	12	50%
Biomechanics/quality: Stride length, toe clearance, entropy, variability	10	42%
Safety of walking: falls during walking (stumbles, trips and near falls)	10	42%
Turning performance (speed, steps per turn)	8	33%
Assistance or accommodation devices used for walking	7	29%
Variability	7	29%
Walking indoor or outdoor	6	25%
Absolute intensity and relative intensity of walking and physical activity	4	17%

Table A2: Physical Activity (24 voters)

Principle	Votes	Percent
First round of voting		
Type/mode of exercise (e.g., strength, aerobic, balance)	18	75%
Volume of movement (total activity / day, week)	17	71 %
type/domain of activity (by type we mean strength, aerobic whereas a domain is the context)	15	63%
sedentary duration - consider aggregation period, frequency, duration, distribution of bouts, etc.	13	54%
step count	12	50%
incidental activity (random bouts) vs. purposeful exercise (counts, intensity, volume and duration)	10	42%
CRF: cardiorespiratory fitness	8	33%
Session of occupational activity (e.g., clusters of these activities, volunteering, caregiving)	6	25%
Second round of voting		
Domain of activity (by type we mean strength, aerobic whereas a domain is the context)	15	63%

* Went through the second round of discussion and reached consensus

Table A3: Body Poster (24 voters)

Principle	Votes	Percent
Measures of stability with different postures... sway, adjustments, relocation of centre of mass	14	58%
Differentiating between lying and sleeping	12	50%
Frequency of mobility assistive device use	11	46%
Postural abnormalities that affect mobility (i.e. kyphosis, lordosis, stooped posture)	8	33%
Posture aids used (e.g. using the arms of chair to stand up)	8	33%

Posture dwell time (The best posture is the next posture -> transition time)	4	17%

Table A4: Transitions (23 voters)

Principle	Votes	Percent
Transitioning from one level to another (Stair locomotion)	14	61%
Indoor - Outdoor	11	48%
Involuntary transitions (e.g., fall)	10	43%
Stability during transitions	10	43%
Architecture of movement (e.g., linear and simple movement, or complex high number of transitions)	9	39%
Assisted Transitions (Passive)	9	39%
Heart rate response to change (and other physiological responses)	9	39%
Transition from one direction to another (turning/ reorientation)	8	35%
Transition between modes of transportation	6	26%

Table A5: Life Space (24 voters)

Principle	Votes	Percent
Location based PA (where people perform activity)...Context of locations visited	16	67%
Farthest distance from home,	14	58%
Complexity of movement -> entropy of movement (architecture / fractal dimension of gps points)	13	54%
Total distance,	13	54%
Urban vs rural	11	46%
Community interaction/mobility (engaging with the larger community)	9	38%
In-home life space (indoor localization)	9	38%
Route travelled (path taken to get to destination)	9	38%
Floors climbed	7	29%
Buffered GPS trajectories	4	17%
Time spent driving	4	17%

Table A6: Transportation (23 voters)

Principle	Votes	Percent
First round of voting		
Time in passive or assisted travel (in vehicle, train, motorized wheel chair etc.)	16	70%
Degree of autonomy - independent (driver) and passive occupant	10	43%
Environmental context (road, grass, hills)	6	26%
Proximity to destination (Last 5 miles)	4	17%
Access, equity and transition to public transportation (for seniors) * policy influence on access, equity	2	9%
Second round of voting		
Time in active, passive or assisted travel (in vehicle, train, motorized wheelchair etc.)	15	63%

Appendix B. Guiding principles for optimal mobility measurement in older people

Guiding principles that did not reach consensus

Table B1: Pre-planning (22 voters)

Principle	Votes	Percent
Consider device attachment type (i.e. skin worn, belt worn, multiple options likely required to accommodate individual preferences and needs) & impact on data (i.e. skin worn = less movement artefact vs. belt worn ?)	17	77%
Participatory design: co designed with stakeholder representation (PPIE) pt populated involvement & engagement	16	73%
Wear location	16	73%
Consistent and clear communications up front: Clearly articulate to participants the "why" and explain expectations (i.e. for observational studies that we want usual behaviour etc.)	15	68%
Specify purpose of data collection (fit for purpose)	15	68%
Methods should consider diverse populations (e.g. cultural sensitivity, gender, stigma, aesthetic)	13	59%

Table B2: Choice of Device Features (22 voters)

Principle	Votes	Percent
First round of voting		
Consider tradeoffs with commercial device: A decision point to consider a commercially available device (vs. research device)*	17	77 %
The devices should be waterproof, lightweight, non-intrusive, suitable for sensitive skin	16	73%
User acceptability	16	73%
Wearable must have flexibility to switch off all the feedback (for research)*	16	73%
Multiple (wear-location appropriate) sensors in single device	15	68%
Simple, intuitive interfaces for older adults; low engagement requirements	15	68%
Data storage and transfer: ability to data log and upload when connection available, consider access	14	64%
Minimum engagement and usability burden	14	64%
Comparability of data captured by device	13	59%
Devices with no ceiling or floor effects / reliable across the full spectrum of the outcome	11	50%
Capability to capture multiple components of physical function (ambulation, balance, strength etc.)	9	41%
Most granular data available	8	36%
Device with little to no missing data	6	27%
Device is able to upload automatically	5	23%
Second round of voting		
Wearable must have flexibility to switch off all the feedback (for research)	18	78%

Data storage and transfer: ability to data log and upload when connection available, consider access	16	70%
Multiple sensors in single device is preferred	16	70%
The devices should be waterproof, lightweight, non-intrusive, suitable for sensitive skin	16	70%
Simple, intuitive interfaces for older adults; low engagement requirements	15	65%
Minimum engagement and usability burden	14	61%
Capability to capture multiple components of physical function (ambulation, balance, strength etc.)	13	57%
Comparability of data captured by device	13	57%
Most granular data available	11	48%
Devices with no ceiling or floor effects / reliable across the full spectrum of the outcome	9	39%
Device with little to no missing data	7	30%
Device is able to upload automatically	5	22%

* Went to a second round of discussion and reached consensus

Table B3: Data Collection (23 voters)

Principle	**Votes**	**Percent**
All sensor calibration needs to be assessed and adjusted	17	74%
Be aware of time synchronization and temporal resolution issues	17	74%
Wearables measurement does not jeopardize participation by any particular cohort	9	39%

Table B4: Processing (23 voters)

Principle	**Votes**	**Percent**
Avoid proprietary solutions where possible	17	74%
Request an independent technical quality validation	13	57%

Table B5: Analytics (23 voters)

Principle	**Votes**	**Percent**
First round of voting		
Analytical pipelines that are device agnostic*	18	78%
V3 Criteria - Analytic Validity, clinical validity, Verification	13	57%
Analytical pipelines are certified	3	13%

* Went to a second round of discussion and reached consensus

Table B6: Reporting (22 voters)

Principle	**Votes**	**Percent**
Recommend providing feedback to participants (where possible)	16	73%

Table B7: Question 2b. Brainstorming specific additional considerations for measurement via wearables.

Walking – considerations discussed
1. Analytics: should consider distributions (e.g. violin plot) - Should consider measures beyond central tendency - look at distributions
2. every study should define what a 'step' is
3. ensure sensor algorithm adequately detects slow steps - not excluded/filtered based on inappropriate speed threshold
4. consider impact of wear location on validity/reliability of step counts
5. don't assume participants prefer wrist location
6. Consider use of walking aids and how it will affect the measurement
7. use of walking aids, slower gait, and limited arm swing diminishes the reliability of measuring step count on the wrist
8. wear location at the trunk, thigh and lower limb is preferred for measuring walking
9. consider how to define bouts (n of steps, gap which defines the end of a bout)
10. Ensure algorithms can detect strides/stepping with gait impairments (e.g., asymmetry)
11. consider a minimum n of steps required to define spatial parameter measures
12. Provide definition for how gait events were identified and defined
Physical activity – considerations discussed
1. Improve activity intensity classification (i.e., move away from specific activity cut points and epoched data to describe physical activity)
2. Population specific validation for intensity - relative intensity (may add to 2.2)
3. Address and improve the validation of activity intensity quantification (for all sensor types and devices)
4. Ensuring there is a link between these unique PA outcomes and the activity related guidelines (e.g.. WHO, public health agencies)
5. Need to consider the impact of wear location (and different locations) on PA quantification
6. Ensure wear location affords 24-hour data collection (i.e., clothing fixed versus body fixed)
7. Sufficient duration is important to agree on (e.g. 12 hr. vs. 24 hr.?) - consider whether trying to assess "usual PA" or a more specific application - for guidelines compliance...
8. Consider adding other physiological sensors validation against benchmark datasets when possible
Body posture – considerations discussed
1. Time spent in different postures -> sitting, lying, standing, walking and running (? and swimming) - static standing vs dynamic standing - Time spent in culturally distinctive positions (time spent crouch, squat, kneeling, praying) - Longest sitting and standing duration
2. Measures of stability with different postures... sway, adjustments, relocation of centre of mass - postural sway - relocation of centre of mass while static

- Postural adjustments during standing

3. frequency, duration, distribution/pattern of posture bouts
4. Differentiating between lying and sleeping
5. Posture aids used (e.g. using the arms of chair to stand up)
6. Posture dwell time (The best posture is the next posture -> transition time)

Postural abnormalities that affect mobility (i.e. kyphosis, lordosis, stooped posture)

Transitions – considerations discussed

1. Number transitions (/day, /hour)
    - time-of-day (e.g., nighttime transitions)
    - Number of transitions (need to consider the monitoring period)
    - Number of transitions describe by time of day
2. Indoor – Outdoor
3. Changing body postures (Sit --> Stand // Stand --> Walk // Stand --> Sit // Walk --> Stand, laying to sitting etc.)
    - transitions between lying positions (e.g., supine to side-lying)
    - transitions from laying down to sitting
    - Variability of transitions (body posture changes, etc.)
4. Transition between modes of transportation
5. Transitioning from one level to another (Stair locomotion)
6. Architecture of movement (e.g., linear and simple movement, or complex high number of transitions)
7. Transition from one direction to another (turning/ reorientation)
8. heart rate response to change (and other physiological responses)
9. involuntary transitions (e.g., fall)
10. transition duration -> length of time to transition (e.g., laying to sitting)
    - Transition velocity (e.g. speed of sit-to-stand)
11. Stability during transitions

Assisted Transitions (Passive)

Life space – considerations discussed

1. Spatial areas (convex hull, ellipse area) and their variability/richness
    - farthest distance from home
    - consider day-to-day variability in measures of a max value over long periods (e.g., convex hull)
    - ellipse area
    - Convex hull
2. total distance
3. number of locations/trips
4. time at home (or time out of home)
5. outdoor time
6. Urban vs rural
7. location based PA (where people perform activity)...Context of locations visited
    - location characteristics as context for other measures in other domains (e.g., shopping mall walking)
    - Context of locations visited e.g. Density of amenities
8. route travelled (path taken to get to destination)
9. Time spent driving

10. Floors climbed
11. In-home life space (indoor localization)
12. Community interaction/mobility (engaging with the larger community)
13. buffered GPS trajectories - way to estimate the environment influences on peoples behaviour (climate, green, carbon, physical environment etc.)

complexity of movement -> entropy of movement (architecture / fractal dimension of gps points)

Transportation – considerations discussed

1. Distance travelled
2. Time spent in active travel (human power, for example, walking, biking, running, swimming, manual wheelchair)
3. trip frequency
4. Environmental context (road, grass, hills)
5. Mode of Transportation (e.g., walking, multi model travel, vehicle, train, bus, bike, walking)
    - transitions between mode
    - Number of modes per trip
6. time in passive or assisted travel (in vehicle, train, motorized wheel chair etc.)
7. Degree of autonomy - independent (driver) and passive occupant
8. Intervening events due to transportation incident (cessation of transportation due to car crashes)
9. Proximity to destination (Last 5 miles)

Access, equity and transition to public transportation (for seniors)

Appendix C. Priorities for future research on wearable technology in aging populations

Priorities were ranked: Percent represent the number of people who put each priority in their top six.

Table C1: 16 Priorities for Future Research Ranking Results (23 voters)

Priorities	Vote	Percent
Longitudinal Studies and Data Collection: Support the development of longitudinal datasets that link wearable data with health outcomes over time. This research should focus on understanding mobility trajectories, the impact of behaviors on health, and the effectiveness of interventions based on real-time data.	19	83%
Digital Biomarkers and Health Outcomes: Explore the identification and use of digital biomarkers (e.g., gait speed, balance metrics) for diagnosing and monitoring age-related diseases. Research should aim to clarify how these biomarkers can inform clinical practice and enhance understanding of disease progression	15	65%
Contextual Data Capture: Investigate methods for capturing contextual information related to mobility and activities in real time, such as location, social interactions, and environmental factors that may influence physical activity in older adults.	14	61%
Algorithm Development and Validation: Focus on creating and validating algorithms and standards tailored specifically for older adults with varying functional capacities. This includes ensuring the accuracy and clinical utility of wearable metrics.	12	52%
Integration with Healthcare Systems: Investigate methods for effectively integrating wearable technology data into existing healthcare systems. This includes exploring how wearable data can enhance clinical monitoring and decision-making processes.	11	48%
Standardization of Metrics and Protocols: Focus on establishing standardized protocols and metrics for measuring mobility and activity in older populations. This includes creating normative reference values based on age and sex, and ensuring consistency across studies for comparability.	10	43%
Creation and implementation of shared standard datasets that can be used to train, evaluate and harmonize algorithms.	8	35%
User-Centered Design and Usability: Emphasize the importance of co-designing wearable technologies with input from older adults and caregivers to ensure usability, accessibility, and acceptance. This includes addressing digital exclusion and ethical challenges.	8	35%
Develop data visualization methods that are meaningful, useful and translatable across all stakeholders (healthcare providers, industry, regulators, participants, general public etc.)	7	30%
Opportunity to develop minimum datasets for digital biomarkers	6	26%
Understanding Low-Intensity Movement: Research the health impacts of lower intensity physical activities (e.g., walking, LIPA) in older adults,	6	26%

including how these activities contribute to overall health outcomes and mobility.		
Discussion and collaboration with commercial wearable device manufacturers (explore integration of consumer and research grade wearables)	4	17%
For the field to move forward swiftly, Create or use existing collaborative and unified platforms that specialize in a) data sharing for algorithm development , refinement, updating, nd validation; b) standardization of data processing and analytic methods; c) consortia for pooling harmonized data from different studies, and making the pooled data resource available to the research community.	4	17%
Monetary value proposition for gain in mobility (HTA) - e.g. willingness of HC co. to pay for intervention in mobility	4	17%
Understanding algorithms may not always provide the answer. We know higher intensity physical activity is good for us. How do we push the scientific boundaries beyond this?	3	13%
Wearables to understand mobility after disablement (explore impairments that affect later life mobility)	3	13%

Table C2. Discussion summaries on the top five future research priorities: moving the field forward

Longitudinal studies and data collection
1. How often do measures need to be repeated (trajectories, change) **2.** Cohorts in new populations (LMIC) **3.** How can HIC support LMIC **4.** Understanding challenges in LMIC for wearable measurements **5.** How do these measures change over time **6.** Which measures can capture initial/early changes in mobility **7.** How can we support financial obligation for longitudinal studies (different countries, different funding opportunities) **8.** Need to capture the more rapid change present in older adults **9.** multi-country study, in older ages (70+), repeated measures - Global mobility panels (epidemiology transition that is now impacting LMIC, migration) **10.** Proposing a minimum dataset for longitudinal studies **11.** How to leverage both public and private sectors to support this work **12.** Creating consortia of multiple cohorts (a “ProPASS” for older people) **13.** Identify intervention points
Digital Biomarkers and Health Outcomes
1. Assess the effects of novel digital mobility biomarkers (e.g., variability ones) on health outcomes (development, monitoring, progression of disease) (and their interaction) **2.** Understand the shape of the associations between digital biomarkers and health outcomes in order to provide proper clinical advice/guidelines **3.** Robust norms to define "healthy/normal" to understand when individuals deviate? **4.** Understand the specific health/clinically important measure for deviation (may be disease/impairment specific) **5.** Using sensors to measure multiple aspects of physical function in a valid and reliable way

6. Conduct clinical trials AND analysis of observational data using causal methods (emulating RCTs) to provide evidence/based recommendations
7. Clustering mobility biomarkers to optimize prediction of age-related morbidity (frailty, falls, etc.)
8. CRF and musculoskeletal fitness as two separate measures to track/quantify capacity over behaviour
9. Define MIC#MCID for all of them and their clusters/combinations
10. Understanding how people can change habitual activity we can further understand people's capacity
11. Creating roles with digital specific expertise to develop new workforce into clinical space rather than adopting new technology in existing clinical roles (can elevate digital markers for health-related outcomes)
12. More sensitive tracking, early detection of disease/events, personalized treatments, reduction of adverse events and mortality
13. Improvement of quality of life for patients and carers
14. Cost effectiveness
15. Efficiency of data collection and capture
16. By identifying key clinical markers (of mobility) industry may drive innovation to include these outcomes and raise awareness and utility of these markers

Contextual Data Capture

1. Test hypothesis about environmental and social effects on mobility (above and beyond the individual)
2. Methods of collection: - Geofence triggers (Position) - Physical behavior triggers - Random triggers - Bluetooth connectivity to detect other devices nearby - Wifi network joined or that phone sees in range - Participant dyads (tethering participants together)
3. Multimodal sensing. Combining GPS with IMU
4. Looking at context inside and outside of the home
5. Looking at social environment
6. understanding how AI may be used to summarise/ identify themes in narrative contextual inputs (i.e. responses from EMAs)
7. Confounders. capture as accurately as possible all the variables that are confounders
8. Capture contextual information accurately to understand confounding factors - and in particular their influence on mobility
9. Understanding behaviour permits behavioural change interventions to be targeted to the individual and their environment - in particular the impact on mobility
10. Reducing uncertainty in the data
11. Removing noise from the data by giving context and aid/ enhance interpretation

Understanding main and interaction effects between the individual, the environment and the context

Algorithm development and validation

1. How can wearable wrist-worn devices be optimized to validate outcomes in cohorts and improve the accuracy of algorithms for tracking normal physical function and moderate-to-vigorous physical activity (MVPA)?
2. Is a wrist-worn IMU sufficient to support data validation in wearable studies, or is additional sensor data needed for more accurate outcomes (cardio monitor + IMU)?

3. How can we minimize data loss in wearable studies caused by the use of cut points (moving away from cut points)?
4. Need open label benchmark data for people to test on
5. We need interdisciplinarity to do this well e.g. human activity recognition
6. Improve the number of studies validating outcomes in the cohorts (arms of a big study). How do we develop algorithms for normal function? Would a wrist-worn IMU be enough to support data validation? We are confronting the utility of arm-worn devices in capturing wearable data. Run away from the cut point; we are missing data, missing information. Most MVPA comes from the arm and is not body-driven. One wear location with multi-sensors, like the chest (trunk motion).
7. More people are interested in developing algorithms, information sharing, resources to support people analytics, and open-source sharable pipelines.

Integration with healthcare systems

1. Encourage use of best classification tool (according to FDA framework)
2. Reduce cost of monitoring
3. Identify opportunities with immediate return (low hanging fruit)
4. Governance, skills, understanding of stakeholders
5. Undergraduate and post-graduate training
6. Identify local champions
7. Interoperability with existing infrastructure/systems/usability
8. Systems integration and compatibility
9. Reduce cost of monitoring
10. Context of healthcare delivery / commissioning
11. EDI - equity of access to service across SES, education, device access
12. What are incentives to include - what are the models or examples of utility that people will buy into, e.g., medication qualification based on EDSS status. how can they be incorporated into these existing models?
13. Knowledge translation - results counselling
14. Possibility of discharge home with wearable device monitoring
15. Immediate availability of outcome measures for hospital at home (potential for capacity reduction)
16. Scalability of implementation
17. Fit within clinical pathway to justify use, rather than availability
18. Stakeholder involvement in development of implementation of entire process
19. Integrate evaluation and implementation processes

guidelines for data collected from personal devices - part of medical history

20. Improves health of individuals and population
21. Improves personalized healthcare

Appendix D. Consensus Evaluation

Table D1: Consensus Evaluation Survey results

Item	Median	Q1-Q3	Mean	nSD	n	1	2	3	4	5
I agree with and am committed to what we have developed?	5	3-5	4.70	0.14	20	0	0	1	4	15
I understand what we have developed here?	5	2-5	4.55	0.20	20	0	1	1	4	14
I am satisfied with the discussion and covered what we needed to	4	2-4	4.05	0.20	20	0	1	3	10	6
I believe we will be successful in implementing these priorities	4	2-4	3.95	0.22	20	0	1	5	8	6
1 = Strongly Disagree | 2 = Somewhat Disagree | 3 = Neutral | 4 = Somewhat Agree | 5 = Strongly Agree										

Appendix E. Premeeting materials shared with attendees in advance

Defining mobility for the international consensus meeting

Pre-amble:

The objectives of the international consensus meeting on wearables for measuring mobility in aging populations are to 1) Determine the minimum standards that should be followed for measuring mobility and related behaviours with wearable technology in aging populations; and 2) Identify critical knowledge gaps and priorities for future research to advance the field of wearable technology for late-life mobility measurement.

The following terminology and definitions of healthy ageing and mobility will be used to ground our discussions throughout the 2-day meeting.

Healthy Ageing

The World Health Organization defined Healthy Ageing as "the process of developing and maintaining the *functional ability* that enables well-being in older age" in their 2015 World Report on Ageing and Health.[1] Functional ability encompasses a person's intrinsic capacity, the environment they interact with and the interaction between the two. Functional ability was further defined by identifying key domains or 'abilities' that are essential for older people to be able to do what they have reason to value:

Ability to meet their basic needs;
Ability to learn, grow and make decisions;
Ability to be mobile;
Ability to build and maintain relationships;
Ability to contribute.

Ability to be Mobile

In the 2015 report, the concept of mobility was developed from the definition provided by Satariano et al. in their 2012 paper on mobility and aging.[2] From this point onwards, the WHO has referred to mobility as:

> "Movement in all its forms, whether powered by the body (with or without an assistive device) or a vehicle. **Mobility includes getting up from a chair or moving from a bed to a chair, walking for leisure, exercising, completing daily tasks, driving a car and using public transport.** Mobility is necessary for doing things around the house; accessing shops, services and facilities in the community (such as parks); and participating in social and cultural activities."

These definitions and conceptualization have been carried forward into the Decade of Healthy Ageing: Baseline Report[3] and the resulting Unified Framework for the Measurement of Mobility in Older Persons.[4]

Proposed sub-domains of mobility based on the definition

To guide the in-person discussion on standards for wearable-derived measures of mobility and their associated collection methods, we propose the WHO definition encompasses the following **five sub-domains of mobility: 1) postural, 2) walking, 3) physical activity, 4) transportation, and 5) life-space**. Note that we have asked attendees to indicate if there are any sub-domains they think are missing from the above list as part of the pre-meeting survey and we will discuss this if needed during the meeting.

Related readings for your reference (*not required):

1. Chapter 6: Towards an age-friendly world from the 2015 World Report on Health and Ageing (specifically pages on ability to be mobile 179-184)
2. Annex 1: Description of Healthy Ageing – each component and its domains. From the Decade of Healthy Ageing: Baseline Report
3. Satariano WA, Guralnik JM, Jackson RJ, Marottoli RA, Phelan EA, Prohaska TR. Mobility and aging: new directions for public health action. Am J Public Health. 2012;102(8):1508-15

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1. World Health Organization. World Report on Ageing and Health Geneva, Switzerland: Geneva, Switzerland: World Health Organization, 2015; 2015 [Available from: http://apps.who.int/iris/bitstream/10665/186463/1/9789240694811%5Feng.pdf.
2. Satariano WA, Guralnik JM, Jackson RJ, Marottoli RA, Phelan EA, Prohaska TR. Mobility and aging: new directions for public health action. Am J Public Health. 2012;102(8):1508-15.
3. Decade of healthy aging: baseline report. Geneva: World Health Organization; 2020. Licence: CC BY-NC-SA 3.0 IGO.
4. Beauchamp MK, Hao Q, Kuspinar A, Amuthavalli Thiyagarajan J, Mikton C, Diaz T, et al. A unified framework for the measurement of mobility in older persons. Age Ageing. 2023;52(Suppl 4):iv82-iv5.

Consensus meeting recommended pre-readings

Using a combination of systematic searches in Medline, reference list screening, and consultation with experts, the following papers emerged as highly relevant for guiding our consensus meeting. Note that we have also attached these papers as pdfs in the shared folder and have invited the group to recommend others they feel are important as part of our pre-meeting survey.

1. Pulsford, R.M., Brocklebank, L., Fenton, S.A.M. *et al.* **The impact of selected methodological factors on data collection outcomes in observational studies of device-measured physical behaviour in adults: A systematic review**. *Int J Behav Nutr Phys Act* **20**, 26 (2023). https://doi.org/10.1186/s12966-022-01388-9
https://ijbnpa.biomedcentral.com/articles/10.1186/s12966-022-01388-9

2. Schrack JA, Cooper R, Koster A, Shiroma EJ, Murabito JM, Rejeski WJ, Ferrucci L, Harris TB. **Assessing Daily Physical Activity in Older Adults: Unraveling the Complexity of Monitors, Measures, and Methods.** J Gerontol A Biol Sci Med Sci. 2016 Aug;71(8):1039-48. doi: 10.1093/gerona/glw026. Epub 2016 Mar 8. PMID: 26957472; PMCID: PMC4945889.
https://academic.oup.com/biomedgerontology/article-abstract/71/8/1039/2465795?redirectedFrom=fulltext

3. Troiano RP, Stamatakis E, Bull FC. **How can global physical activity surveillance adapt to evolving physical activity guidelines? Needs, challenges and future directions.** Br J Sports Med. 2020 Dec;54(24):1468-1473. doi: 10.1136/bjsports-2020-102621. PMID: 33239352; PMCID: PMC7719905.
https://bjsm.bmj.com/content/54/24/1468.long

4. Chung J, Sargent L, Brown R, Gendron T, Wheeler D. **GPS Tracking Technologies to Measure Mobility-Related Behaviors in Community-Dwelling Older Adults: A Systematic Review**. J Appl Gerontol. 2021 May;40(5):547-557. doi: 10.1177/0733464820979801. Epub 2020 Dec 24. PMID: 33356769.
https://journals.sagepub.com/doi/10.1177/0733464820979801?url_ver=Z39.88-2003&rfr_id=ori:rid:crossref.org&rfr_dat=cr_pub%20%200pubmed

5. Suri A, VanSwearingen J, Dunlap P, Redfern MS, Rosso AL, Sejdić E. **Facilitators and barriers to real-life mobility in community-dwelling older adults: a narrative review of accelerometry- and global positioning system-based studies**. Aging Clin Exp Res. 2022 Aug;34(8):1733-1746. doi: 10.1007/s40520-022-02096-x. Epub 2022 Mar 11. PMID: 35275373; PMCID: PMC8913857.
Facilitators and barriers to real-life mobility in community-dwelling older adults: a narrative review of accelerometry- and global positioning system-based studies - PMC

6. Rochester L, Mazzà C, Mueller A, Caulfield B, McCarthy M, Becker C, Miller R, Piraino P, Viceconti M, Dartee WP, Garcia-Aymerich J, Aydemir AA, Vereijken B, Arnera V, Ammour N, Jackson M, Hache T, Roubenoff R. **A Roadmap to Inform Development, Validation and Approval of Digital Mobility Outcomes: The Mobilise-D Approach**. Digit Biomark. 2020 Nov 26;4(Suppl 1):13-27. doi: 10.1159/000512513. PMID: 33442578; PMCID: PMC7768123.
A Roadmap to Inform Development, Validation and Approval of Digital Mobility Outcomes: The Mobilise-D Approach - PMC