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Measurement of Physical Activity by Self-Report in Low- and Middle-Income Countries: More of the Same Is not Enough

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In spite of the growing use of motion sensors, particularly accelerometers, for the measurement of physical activity in high-income countries,[1] virtually all population-based physical activity studies from low- and middle-income countries (LMICs) still rely on self-report.[2,3] In addition to the well known financial aspect of this inequality, availability of trained personnel is another challenge in LMICs. Also, less widely known barriers, such as importation regulations also play a role.[4]

The measurement of physical activity in LMICs is particularly challenging. First, literacy issues need to be taken into account; low literacy makes self-administration of instruments in population-based samples virtually impossible. Second, the low coverage of telephone lines in several areas makes it unfeasible to conduct phone survey; for example, the Brazilian phone surveillance system takes place in state capitals only. Third, internet access is still a luxury in several parts of the world, and therefore, computer-based instruments are unlikely to be appropriate for large scale studies in LMICs.[5]

Over the last years, a series of papers tried to highlight underlying principles of physical activity measurement. However, most were developed in high-income countries and very little was said on the measurement of physical activity in LMICs. Some aspects that deserve special consideration are

1. **Administering existing physical activity questionnaires is preferred as compared to creating new instruments.** Otherwise, the field will continue to struggle at comparing data from different studies. This is particularly problematic in LMICs, because due to lower research capacity, investigators are often tempted to use standardized questionnaires developed in high-income countries without an in-depth evaluation of its applicability to LMICs. The creation of new instruments should be restricted to studies with very particular aims that are not addressable with existing self-report methods.
2. **Care should be exercised before stating that a given self-reported method is valid and reliable.** There is a need to discuss which reliability and validity scores are considered minimally acceptable; it is not rare to locate validation studies with very low validity and reliability scores concluding that the instruments are appropriate. Particularly in LMICs, even valid and reliable instruments from high-income countries may not present the same psychometric properties when administered to LMICs populations. Finally, statistical approaches of validation studies in the field need to be refined; again capacity building is needed in order to increase the number of researchers from LMICs with statistical skills[6,7]
3. **Before using an instrument, the researcher must double check that it allows generating the variable of interest.** Several questionnaires (eg, Baecke), although widely used and appropriate for some research questions,[8] are not able to estimate the proportion of individuals complying with the current physical activity recommendation of 150 minutes per week.[9] If that is the aim of the study, this questionnaire is obviously inappropriate. Even similar questionnaires (eg, short and long IPAQ) do not generate the same variables.
4. **It is not recommended to validate physical activity questionnaires against measures of physical fitness.** The constructs are different and it is expected, in advance, that the agreement will be low. While physical activity is a behavior, physical fitness is an attribute, which is partially determined by the behavior, but also related to other factors, such as genetics, for example. Use of accelerometers is recommended for this purpose.
5. **Utilization of the same physical activity questionnaire in every situation is inadequate.** Different study designs and research questions are likely to require different physical activity questionnaires. Repeated measures of physical activity are in most cases needed for studying the long-term effect of physical activity on health outcomes, particularly complex non-communicable chronic diseases. For surveillance purposes, however, single measures

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are often sufficient. After the International Physical Activity Questionnaire (IPAQ) was launched, there was a rapid increase in its utilization. Unfortunately, it is still frequent to find studies using IPAQ in situations different than the ones the questionnaire was developed for (eg, for measuring the impact of interventions; studies with children).

6. **In LMICs, the proportion of total physical activity that is practiced at work and at the household are much higher as compared to high-income countries, where leisure time physical activity is more frequent.** Unfortunately for researchers from LMICs, the most inaccurate sections of standardized instruments, such as IPAQ, are the occupational and household ones. Therefore, it is needed to discuss which instruments are able to provide reliable and valid estimates of physical activity levels in these 2 domains. Measures of sedentary behavior should also be included in the self-report questionnaires when possible.
7. **Because self-report is likely to continue being the dominant mode of physical activity measurement in LMICs, it is needed to agree on suitable instruments for measuring preschool children's activity levels.** Probably due to the paucity of instruments for measuring physical activity in this age group, review studies show that preschool children are clearly underrepresented in the literature on physical activity in LMICs.[3] Validation studies are urgently required in this age group.
8. **Translating a questionnaire that was developed in high-income countries for use in LMICs countries is more than simply administering exactly the same questions in another language.** Cultural adaptation and use of relevant examples are needed. Patterns of physical activity are different in LMICs and compared to high-income ones, and instruments must be able to capture these differences. For example, a questionnaire developed in a Scandinavian country is likely to have been designed for capturing indoor physical activities. Simply translating the questions into a different language will not be enough for adequately characterizing physical activity levels of a LMICs population with a much warmer climate, for example.
9. **Due to increase awareness on the importance of physical activity for health, the magnitude of the social desirability bias is likely to increase over time.** People in LMICs are now aware that being active is desirable.[10] More importantly, intervention studies in which knowledge is a key component of the intervention should exercise care at using self-reported physical activity instruments. Those who received the intervention will likely know they are supposed to be more active after some time. As a consequence of the increased problem of social desirability, validation studies will likely need to be replicated (eg, every 5 years) on a regular basis.
10. **The widespread use of weekly recalls for physical activity assessment is likely to be appropriate for several research questions, but not all.** For example, studies may need to use longer recall periods due to seasonality. Even weekly recalls can be based on the last 7 days or a typical week. For occupational, housework, and commuting physical activity, a typical week is likely to be more representative of regular behavior as compared to the last week, whereas in terms of leisure time physical activity, the opposite is likely to be true because people tend to over report "socially acceptable" behaviors when asked about a typical week.[2,11,12]

In conclusion, measurement of physical activity by self-report is far from dying in LMICs, but more of the same is not enough. Investigators should avoid the temptation of creating new instruments for each study, but use of the same instrument for all studies is just as inadequate. Capacity building is urgent so that investigators will be able to go beyond simply administering questionnaires that are widely used in high-income countries. As a consequence, appropriate adaptation exercises and validation studies are likely to increase in LMICs. The costs and bureaucratic barriers for obtaining accelerometers should not impede their utilization in validation studies; use of physical fitness as a 'gold standard' for physical activity is highly inappropriate; accelerometry is the best alternative in such cases. Additionally, studies comparing the performance of different physical activity questionnaires should acknowledge that in the lack of accelerometry data, no questionnaires are to be assumed as the 'reference method.'

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