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ORIGINAL ARTICLE

Self-reported and objective physical activity measurement by active youth

Mesures auto-rapportées et objectives de l'activité physique chez les jeunes actifs

A. Van Hoyer, V. Nicaise, P. Sarrazin*

Univ. Grenoble Alpes, SENS, 1741, rue de la Piscine, 38400 Saint-Martin-d'Hères - Gières, France

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Summary Health-related physical activity recommendations are now widely known. To achieve benefits for their health, youth have to accumulate at least 60 minutes of moderate to vigorous intensity activity per day. The accuracy of field measure of physical activity is a complex question and no Gold standard exist. This study compares the data of two accelerometers (Actigraph, GT3X®; Bodymedia, SP3 Armband®), two diaries (assessing respectively self-reported activity and self-reported intensity) and a recall questionnaire. Furthermore, a focus on participants' comfort during data collection was carried out to help to decrease the high dropout rates in these studies. Eighteen young people with a mean age of 11.9 years ($SD = 1.97$) practicing 3.54 ($SD = 2.19$) hours of sport per week have worn the two accelerometers, filled self-reported measures in during 7 days. Results showed moderate to high correlations between accelerometer data with nevertheless some difference in time spent to light, moderate or vigorous physical activity (PA). Given (1) that self-reported data were systematically closer to those of the GT3X than those of the SP3 and (2) that GT3X was more appreciated by the participants in terms of wearing comfort and aesthetic, we recommend the use of the GT3X. On the whole data extracted from the self-reported intensity, diary were more correlated with accelerometer data than those of the self-reported activities diary. Such easy to use tool should be preferred to assess PA of physically active young people. Finally, the recall questionnaire does not have proved to be a valid tool.

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MOTS CLÉS

Mesure de l'activité physique ;

Résumé Les recommandations en matière d'activités physiques bénéfiques pour la santé sont maintenant largement connues. Afin d'obtenir des bénéfices pour leur santé, les jeunes doivent accumuler au moins 60 minutes d'activité physique modérée à intense chaque jour. La question de la précision des mesures de terrain d'activité physique est complexe et il n'existe pas

* Corresponding author.

E-mail address: philippe.sarrazin@ujf-grenoble.fr (P. Sarrazin).

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d'étalon or en la matière. Cette étude compare les données de deux accéléromètres (Actigraph, GT3X® ; Bodymedia, SP3 Armband®), de deux journaux de bord (mesurant respectivement de manière auto-rapportée les activités et leur intensité) et d'un questionnaire de remémoration. En outre, une analyse du confort des participants a été réalisée afin de récolter des informations susceptibles de diminuer le taux d'abandons dans ces études. Dix-huit jeunes âgés de 11,9 ($ET=1,97$) ans et pratiquant 3,54 ($ET=2,19$) heures de sport par semaine ont porté les deux accéléromètres et rempli les mesures auto-rapportées pendant sept jours. Les résultats ont fait apparaître des corrélations moyennes à élevées entre les données des accéléromètres, avec néanmoins des différences dans le temps passé à faire des activités physiques légères, modérées ou intenses. Étant donné (1) que les données auto-rapportées étaient systématiquement plus proches de celles du GT3X que de celles du SP3 et (2) que le GT3X a été plus apprécié par les participants au niveau du confort et de l'esthétisme, nous recommandons l'utilisation du GT3X. Dans l'ensemble, les données extraites du journal rapportant l'intensité des activités étaient davantage corrélées aux données des accéléromètres que cela n'était le cas du journal rapportant le type d'activité réalisée. Un tel outil, plus facile à utiliser, devrait être privilégié pour mesurer l'activité physique des jeunes physiquement actifs. Enfin, le questionnaire de remémoration ne s'est pas avéré être un outil valide.

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1. Introduction

Health-related physical activity (PA) recommendations are now widely known to achieve benefits for their health, individuals have to accumulate at least 30 (for the 18–64 years old) or 60 (for the 5–17 years old) minutes of moderate to vigorous intensity activity each day [1].

Both from health promotion (i.e., do the individuals reach the recommendations?) and research (i.e., what are the PA determinants?) perspectives, it is important to have tools that allow accurate measurement of PA, in particular its frequency, duration and intensity [1–3]. Measuring PA is relatively complex. No single measurement technique provides accurate results in all dimensions of PA and no Gold standard for field measurement exists [4,5]. Two types of measurements are widely used: objective (i.e., accelerometers, heart rate monitors, pedometers) and self-reported (i.e., diary/log, questionnaire, and interview) [2,3,6]. Accelerometers are increasingly used in PA research on the PA of youth [2,7]. Several types of accelerometers exist and their validity depends on the type of exercise performed and the location where they are worn [6,8,9]. The recognized limitations are the inability to discern increases in energy cost due to walking/running up an incline, static work, carrying loads, or upper-body movements when the device is worn in the belt [6]. Although this technology provides accurate and reliable data, it is however expensive and requires logistical support to manage, particularly with youth [10,11]. Despite these limitations, Actigraph GT3X® and BodyMedia SP3 Armband® are two devices widely used by the researchers, but to our knowledge, their outcome variables were not compared, except the first versions of tools [12]. Consequently, less is known about the degree of measurement's agreement between the two instruments in a field study estimating PA level, and specifically among active young people.

Self-reported measurements on the other hand are inexpensive and consequently more suitable for large samples [13–15]. They can take various forms according to participants targeted or research objectives [16]. Some are very short, like the Patient Assessment and Council for Exercise

(PACE) validated in large adolescent samples [17]. Composed by only two items, the PACE identifies the number of days spent at least 60 minutes at moderate to vigorous physical activity (MVPA) [18]. By contrast, activity diaries are more demanding for participants, but provide more comprehensive data [13,19]. With such a tool, participants generally have to specify PA they made for each period of 15 or 30 minutes during the last 3 to 7 days [5,13,20].

Two forms of diaries are generally used. In the first type, participants are asked to report what type of activities they made at the various moments of the day (i.e., sitting, watching TV, walking, and cycling). Then, researchers categorize these activities according to intensity and/or convert them in metabolic equivalent (MET) values [21,22]. In the second type, participants are asked to directly report the intensity of PA they made (i.e., sedentary, light, moderate, and vigorous). A number of average METs is then allotted to each of these intensities. The recognized limitations of self-reported PA tools are social desirability, misunderstanding, memory bias, and individual characteristics which all could affect individual estimates of PA level [23,24].

In short, the two types of tools have advantages and disadvantages. Confronting both methodologies using methodological quality, studies are still needed to improve accuracy, validity and reliability of PA measurement [25]. Consequently, the purposes of this study were:

- to compare field measures of intensity level of PA from two accelerometers (Actigraph GT3X® and BodyMedia SP3 Armband®) during 7 consecutive days ;
- and to assess the validity of three self-reported instruments (i.e., the PACE and the two types of diaries), by comparing the PA level with accelerometers values, analyzing their sensitivity (i.e., the probability that the tool correctly classifies a sufficiently active person as an active person) and specificity (i.e., the probability that the tool correctly classifies a person not sufficiently active as not enough physically active).

A complementary objective was added to determine perceived comfort of wearing and using both accelerometers.

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