



## Characteristics associated with non-participation in 7-day accelerometry

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### ABSTRACT

**Objective.** To assess levels of physical activity the use of objective physical activity measures like accelerometers is promising. We investigated characteristics associated with non-participation in accelerometry within an apparently healthy sample.

**Methods.** Among German participants of a cardiovascular examination program (CEP; 2012–2013), 470 participants aged 40–75 years were invited to wear an accelerometer for 7 days. We used multivariate logistic regression to estimate the association between non-participation and the following characteristics of participants: sex, age, education, smoking, setting of recruitment for the CEP (general medical practices, job agencies, statutory health insurance), self-reported general health, and objective health criteria such as cardiorespiratory fitness and absolute number of cardiometabolic risk factors (elevated waist circumference, blood pressure, triglycerides, blood glucose, and reduced high-density lipoprotein). Subsequently, we stratified this analysis by sex.

**Results.** Among all invited individuals,  $N = 235$  (60.0% women) gave consent to participate in accelerometry. Women were more likely to decline participation (odds ratio, 1.7; 95% confidence interval, 1.1–2.7) compared to men. Stratified analyses revealed the absolute number of risk factors as predictor of non-participation for men (1.4; 1.01–2.0), while there was no predictor found in women.

**Conclusion.** We found a self-selection bias in participation in accelerometry. Women declined study participation more likely than men. The number of cardiometabolic risk factors decreased compliance only in men. Future studies should consider strategies to reduce this bias.

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### Introduction

Measurement of physical activity is relevant for a variety of studies such as intervention studies aiming to enhance physical activity to reduce cardiovascular risks. Self-reported levels of physical activity differ substantially from directly measured levels of physical activity (Prince et al., 2008; Troiano et al., 2008). To assess physical activity accurately within populations or to evaluate precisely the effectiveness of interventions addressing physical activity the use of objective physical activity measures is seen as optimal by now (Davis and Fox, 2007; Prince et al., 2008; Reilly et al., 2008).

Objective measures, like accelerometric motion sensors, have the advantages to reduce reporting bias (Reilly et al., 2008) and recall

bias (Brown and Werner, 2008). However, disadvantages include the possibility to increase selection bias, the self-selection of individuals to participate in a study. The use of accelerometers as assessment tools implies, for example, a higher burden for study participants compared to surveys and may lead to non-participation for different groups. So far only few studies investigated characteristics associated with consent to participate in an accelerometer study (Harris et al., 2008) or associated with valid participation in wearing an accelerometer according to the study protocol (4–7 days, 10 h per day; Inoue et al., 2010; Roth and Mindell, 2013). Analyses from Harris et al. (2008) revealed that participants 65 years of age or older who agreed to participate in an accelerometer study are more likely to be male, to have higher levels of physical activity, and to report poorer health, e.g., chronic pain or chronic diseases. To our knowledge, no study investigated differences between participants who agreed to participate in an accelerometer study and non-participants with respect to objectively assessed health criteria such as cardiorespiratory fitness (CRF) and the presence of cardiometabolic risk factors. Lower CRF measured as peak oxygen uptake

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during standardized exercise testing is associated with lower self-reported physical activity and a higher likelihood to show an unfavorable cardiovascular risk profile (Aspenes et al., 2011). Cardiometabolic risk factors that are also considered for the definition of the metabolic syndrome, such as elevated waist circumference, blood pressure, triglycerides, or blood glucose, and reduced high-density lipoprotein, are associated with a high risk for cardiovascular diseases (CVD) (Grundey et al., 2005).

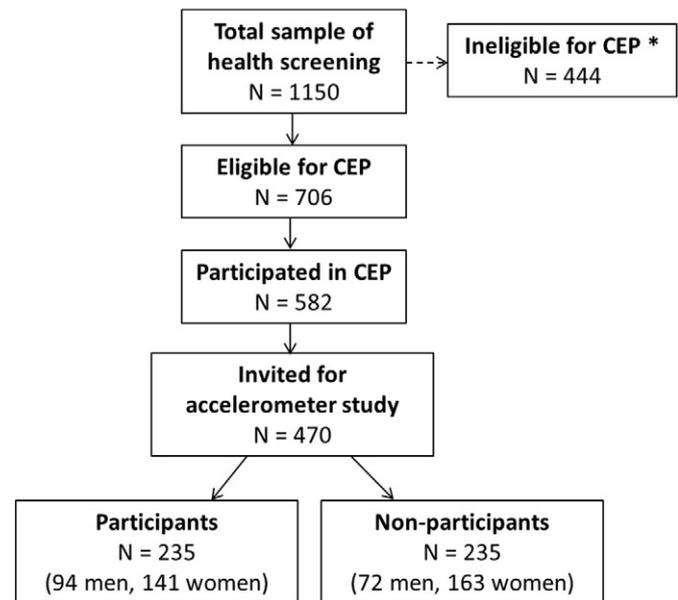
Our purpose was to identify variables that are associated with non-participation in wearing an accelerometer for 7 days in a sample of subjects recruited from the general population, who already participated in a cardiovascular examination program. We considered objective health criteria such as objectively measurable cardiometabolic risk factors and CRF as well as parameters that have been previously considered as predictors for non-participation in accelerometer studies such as self-reported general health, smoking status, and socio-demographic variables.

## Methods

### Study population and design

This study was part in a series of studies to investigate reach of different German population groups (Glasgow et al., 1999) within a stepwise provided screening and examination program addressing cardiovascular health. Participants were recruited between June 2012 and December 2013 by different strategies in three settings (personal contact between study nurses and patients aged 40–75 years in general practices, clients aged 40–65 years in job agencies; at random invitation by letter of a statutory health insurer in a health insured population aged 40–75 years). The settings are described more precisely below. Recruitment of study participants included three steps. A total of 1150 individuals participated in a health screening (step 1) and completed a computerized questionnaire on cardiovascular risk factors, followed by facultative blood pressure measurement and blood sample taking. Furthermore, participants with characteristics as listed below were eligible for a cardiovascular examination program (CEP; step 2): no history of cardiovascular events (myocardial infarction, stroke), vascular interventions, or diabetes mellitus as well as self-reported body mass index (BMI)  $\leq 35$  kg/m<sup>2</sup>, no previous Methicillin-resistant *Staphylococcus aureus* (MRSA) infection and resident in a pre-defined zip-code area.

A total of 706 participants of the health screening were eligible for the CEP. Of these, 582 individuals (82.4%) participated in the CEP. It was conducted at the University hospital by trained study nurses and was supervised by study physicians. At the beginning of the CEP participants were informed about the modules of examination (e.g., blood pressure measurement, blood taking), data storage, and about the handling of potential medical findings. Accelerometry was offered as a further examination (step 3). Participants were provided with the information that physical activity would be recorded for 7 days by an acceleration sensor (ActiGraph, GT3X+), a small box on a belt that would have to be worn around the hip. Additionally, they were informed that a physical activity diary would have to be filled out during accelerometer wear time (capturing activity, time interval, and perceived effort). Finally, participants received the information that a written feedback about their physical activity would be provided. All individuals gave written informed consent for each examination separately. Detailed information concerning accelerometry, such as instructions for wearing the accelerometer, was given at the end of the CEP when participants received the device. Due to organizational reasons the accelerometer study was implemented with a temporal delay. Therefore, accelerometry was only offered to 470 participants (see Fig. 1). For each step of the study, participants could choose one of different gift vouchers for different shopping facilities worth €5 (step 1), €15 (step 2), and €15 (step 3). Participants in the accelerometer study had to return their accelerometer and the physical activity diary at the university hospital to receive



**Fig. 1.** Flow of participation; CEP, cardiovascular examination program (Germany, 2012–2013). \*Ineligibility criteria: history of cardiovascular events (myocardial infarction, stroke), vascular interventions, diabetes mellitus, self-reported body mass index (BMI)  $> 35$  kg/m<sup>2</sup>, previous Methicillin-resistant *Staphylococcus aureus* (MRSA) infection, no resident in a pre-defined zip-code area.

their last gift voucher. This study was approved by the clinical ethical committee of the University Medicine Greifswald (protocol number BB64/07).

### Settings of recruitment

Participants were recruited in three different settings: in general practices, in job agencies, and by a statutory health insurance. In Germany, job agencies are responsible for the implementation of basic security benefits for job seekers following the social security code. Regarding our statutory health insurance population, in Germany, employees up to a certain income limit (in 2013: 52,200 € gross annual income) are obliged to insure themselves in a statutory health insurance of their own choice. People who are not employed, e.g., self-employed persons, have the option to insure themselves in a statutory or in a private health insurance.

## Measures

### Socio-demographics and smoking

We collected information about sex, age, school education (common German types of school education; categorized as  $< 10$  years, 10 years,  $> 10$  years for international comparability), and current smoking (yes/no).

### Self-reported general health

Self-reported general health was measured with the first item of the SF-36 Health Survey “In general, would you say your health is ...” using a 5-point scale (excellent, very good, good, fair, poor) (McHorney et al., 1994).

### Cardiorespiratory fitness

Cardiorespiratory fitness (CRF) was assessed on a cycle ergometer (Ergoselect 100; Ergoline, Bitz, Germany) via standardized cardiopulmonary exercise testing according to the Jones protocol (Jones et al., 1985). CRF was defined by peak oxygen uptake ( $\dot{V}O_{2peak}$ ).

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