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(Laurea magistrale in Scienze dello sport e della prestazione fisica)

Metodologia delle misure delle attività sportive

Friday 23/11/2018 10:30÷12

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Second generation accelerometers

measures

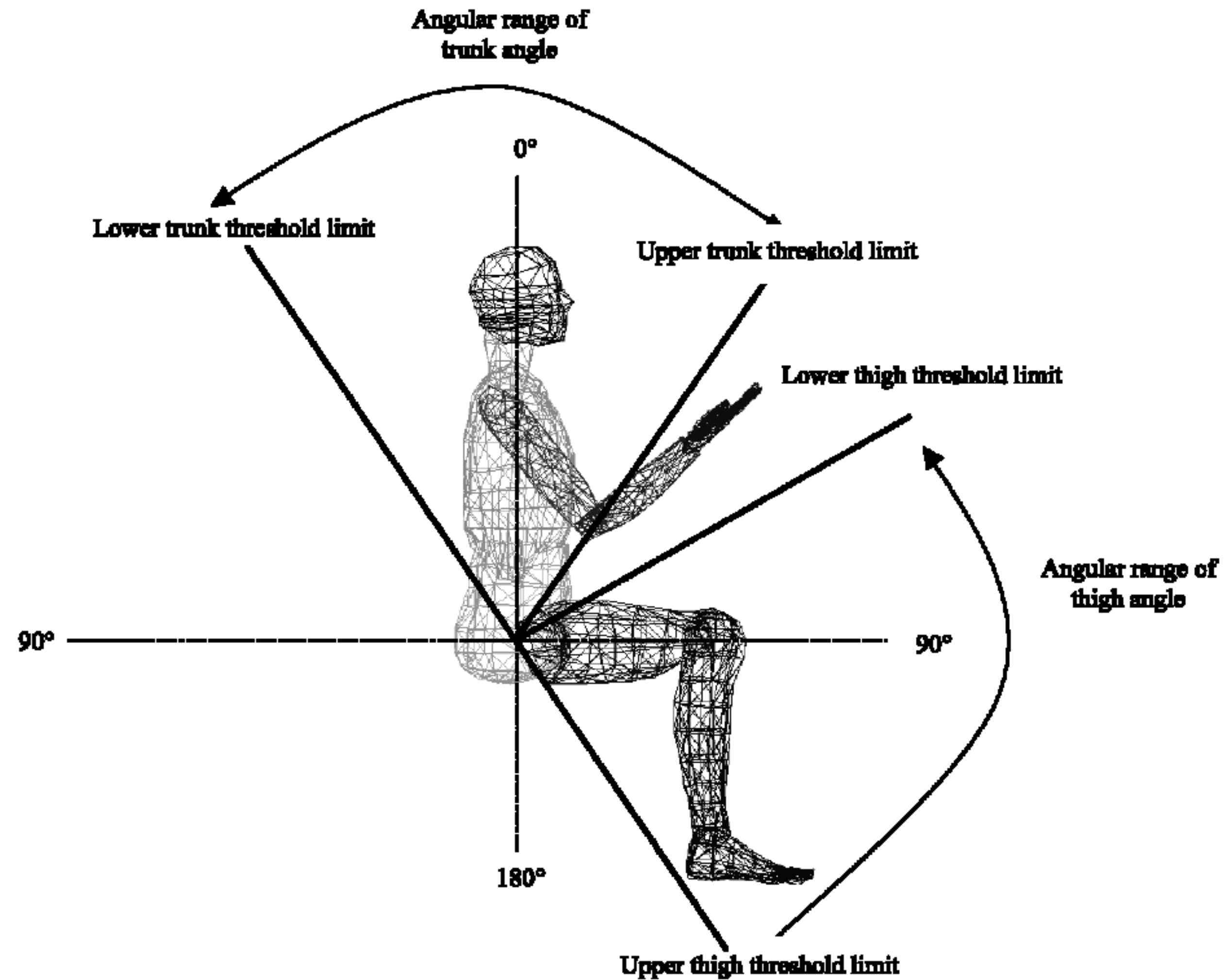
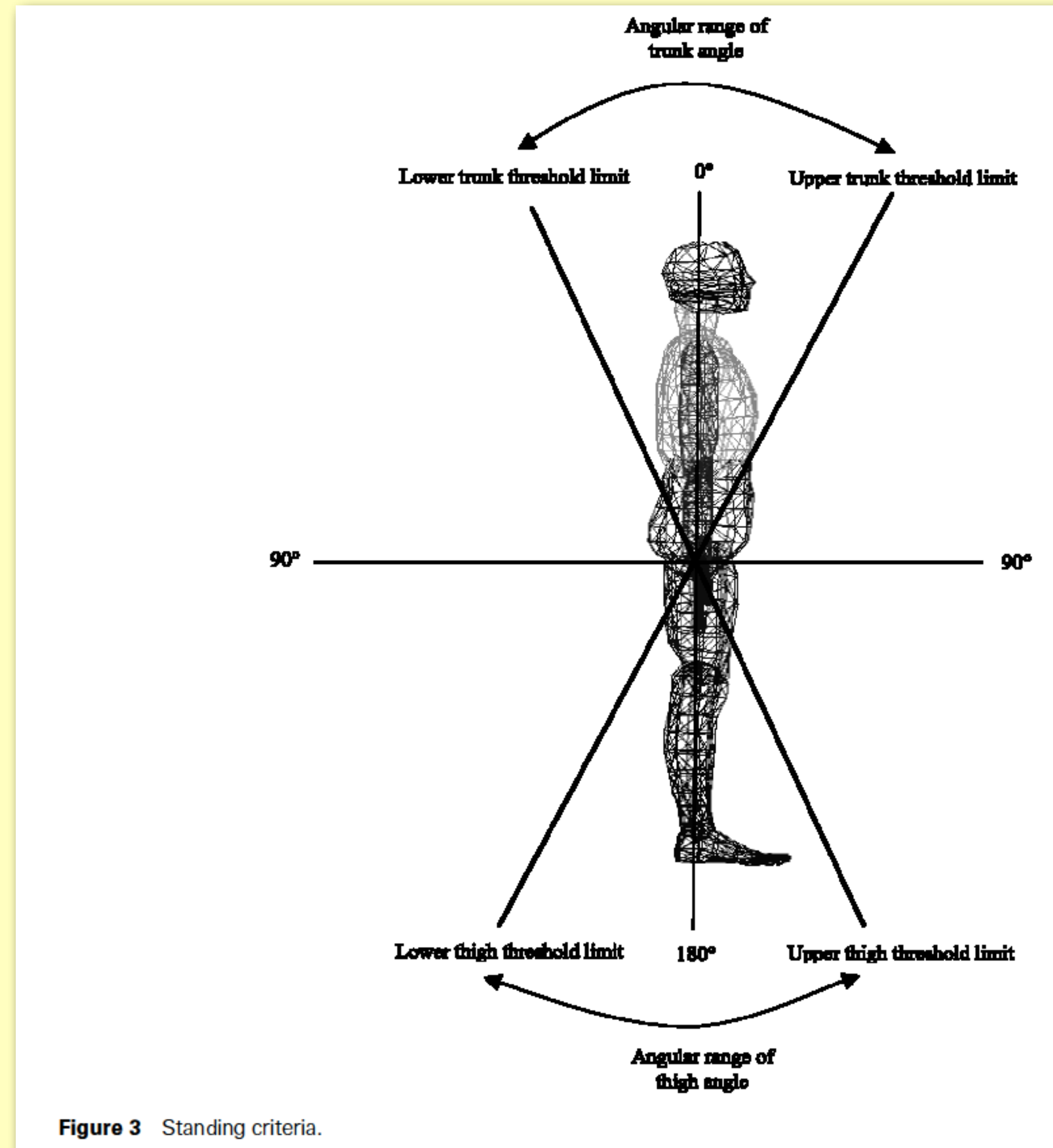


Figure 2 Sitting criteria.

Culhane et al., 2004

Second generation accelerometers

measures



Culhane et al., 2004

Second generation accelerometers

measures

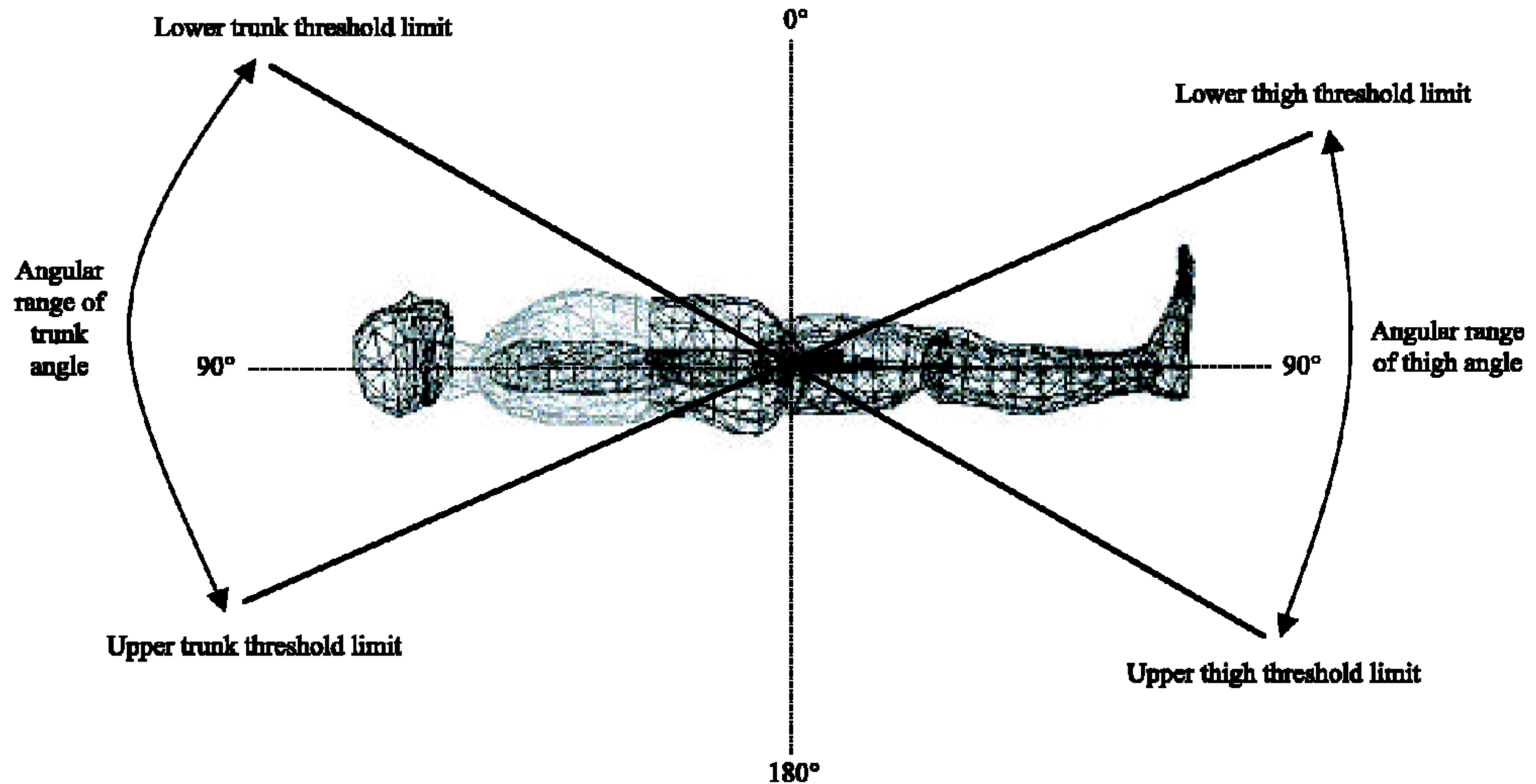


Figure 4 Lying criteria.

-> sitting, standing, lying, moving 83%
detection;

min. and max. predictive value and sensitivity per class

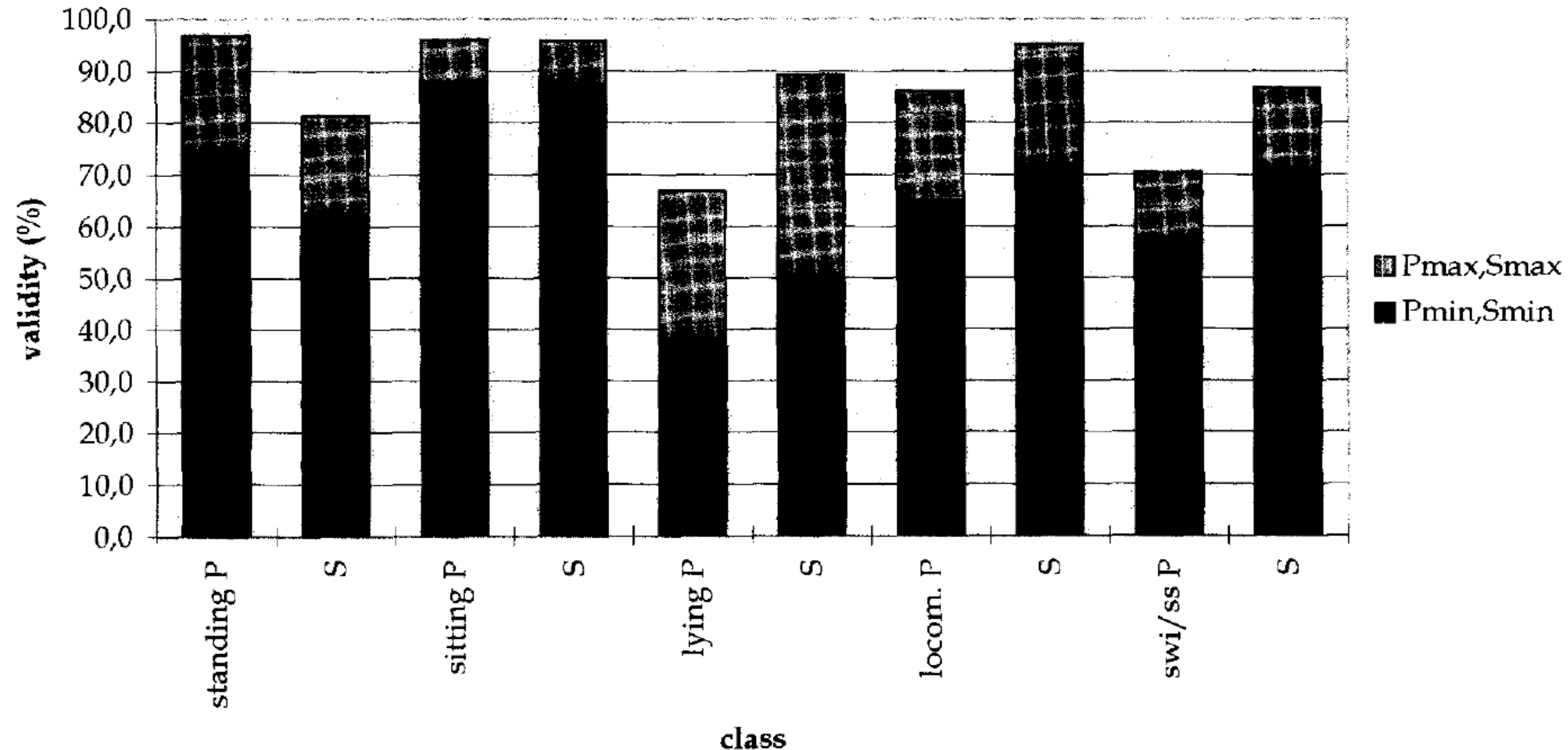


Figure 6 Minimal and maximal validity of the individual ADL categories based on the monitor's sensitivity (S_{min} and S_{max} , respectively) and predictive value (P_{min} and P_{max} , respectively). Sensitivity indicates how often the monitor recognizes a category; the predictive value indicates how often the decision of the monitor is correct. A lack of sensitivity indicates a false negative; a lack of predictive value indicates a false positive.

. uniaxial accelerometer (@front thigh) + 2 uniaxial accelerometer/digital data-logger (backpack) Busser et al., 1997 149
-> sitting, standing, lying, crawling, walking, running, going on a swing 73÷91% detection;

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- . three uniaxial accelerometers (2@sternum, front thigh) + digital recorder;
-> sitting, standing, lying, walking, climbing/going down stairs, cycling 80% detection (Veltink et al., 1996);
- . four biaxial accelerometers (@lateral thighs, sternum or front forearms) + HR monitor + digital recorder;
-> more than twenty different postures/locomotions 83÷88% detection;

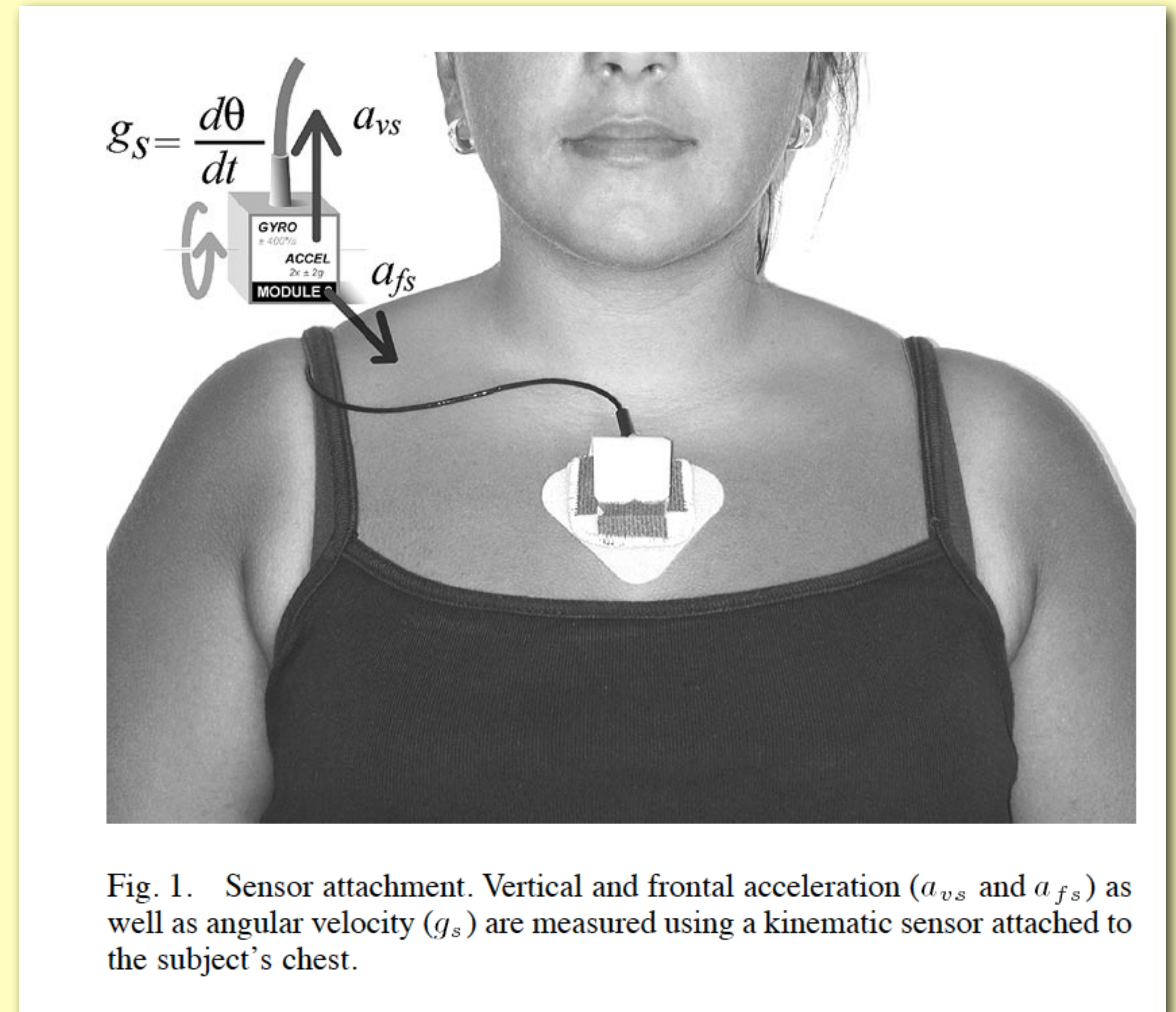


Figure 1. An extended configuration of the Activity Monitor, with accelerometers at the thighs, trunk, and lower arms.

Second generation accelerometers

measures

- Introduction of another type of physical sensor:
 - . (@sternum) two biaxial accelerometers + piezoelectric gyroscope + digital recorder (@wrist);



Second generation accelerometers

measures

TABLE II
OVERALL SENSITIVITY AND SPECIFICITY OF TRANSITION DETECTION
FOR THE 11 ELDERLY (FIRST STUDY)

# Test	Total PT*	Sensitivity, %					Specificity, %	
		PT	SiSt**	StSi	Lying	Walking	SiSt	StSi
1	40	100	100	100	100	95±4	100	100
2	66	98±5	100	97±10	-	97±3	95±12	100±0
3	58	100	97±10	63±29	-	-	63±29	97±10
4	58	100	88±25	75±29	-	-	75±29	88±25
5	64	96±9	89±18	86±19	-	-	86±19	94±13
6	57	100	85±19	72±24	-	-	72±24	85±19
Mean	57±9	99±2	93±7	82±15	100	96±1	82±15	94±6

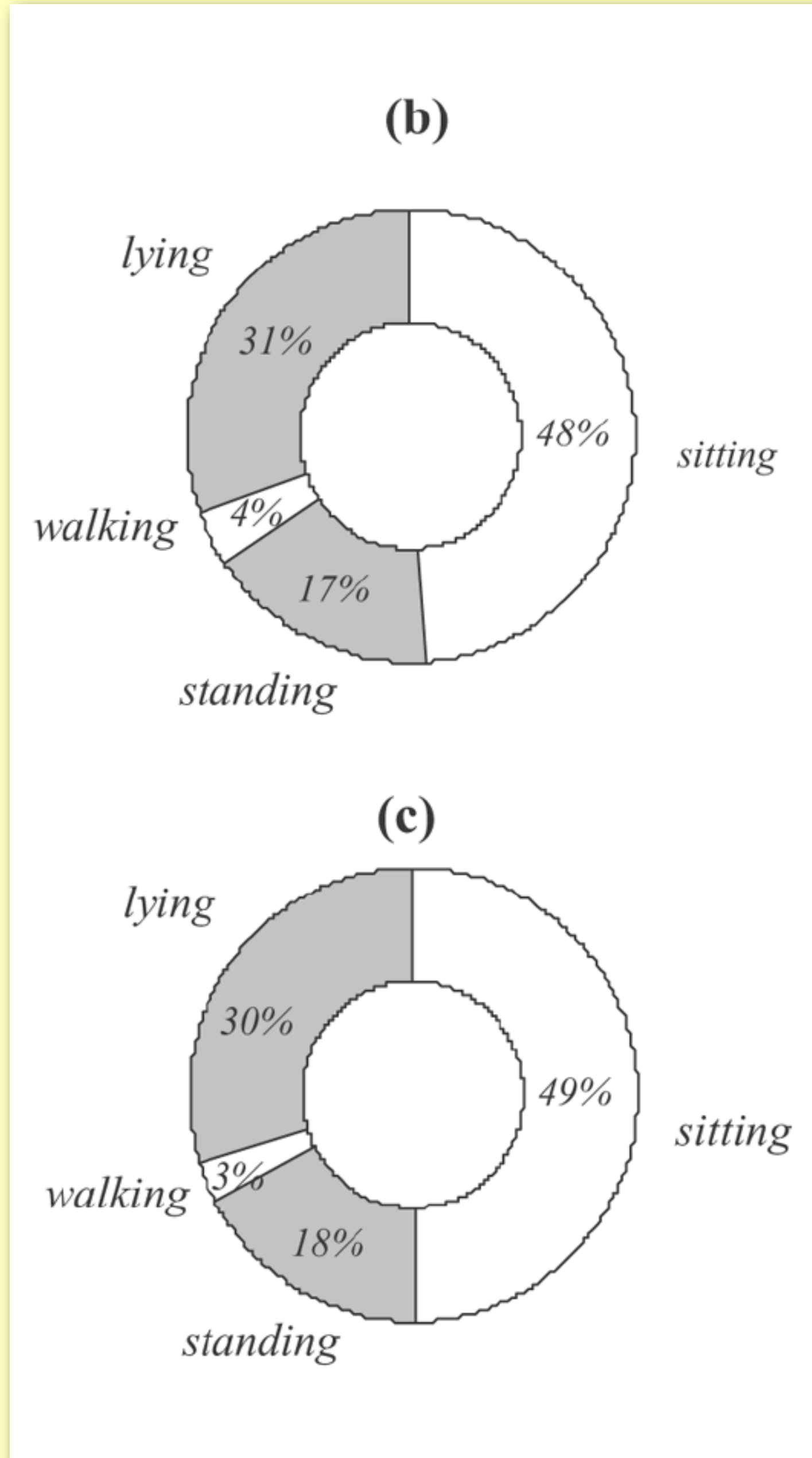
* PT: Postural transition.

** SiSt: sit-to-stand transition.

† StSi: stand-to-sit transition.

Najafi et al., 2003

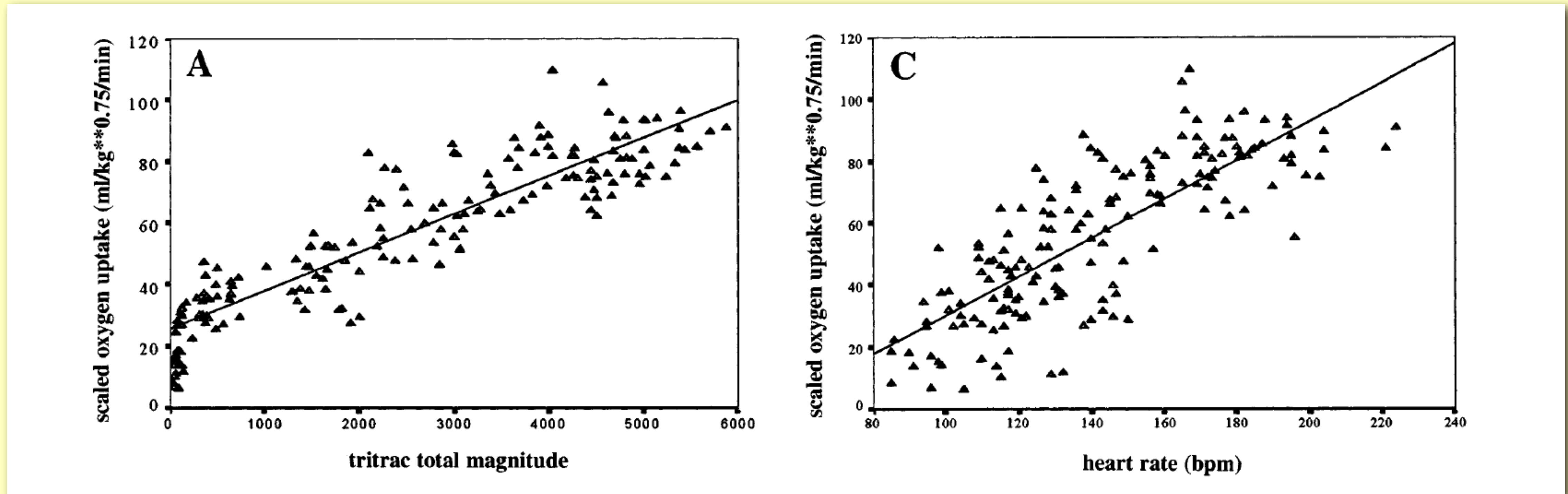
-> posture change, walking detection;



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- Accelerometry (-> movement) + physiological measure (e.g., HR measure, thermometry, ventilation measure):
 - . e.g., HR monitor (-> ME) + motion sensor(s) (-> motion-sensor-sensitive PA);
- accelerometers + inclinometers -> body position over time -> 85% unstructured exercise thermogenesis estimate:
 - . total internal heat produced \approx 75÷80% energy intake;
 - . partial internal heat produced <- sitting, standing, walking, working, any other unstructured exercise;
 - . proposal: (during the day) wearing motion sensor, (structured exercise) wearing HR monitor;
 - . i.e., motion sensor -> yes/not time to use HR monitor for ME estimate;

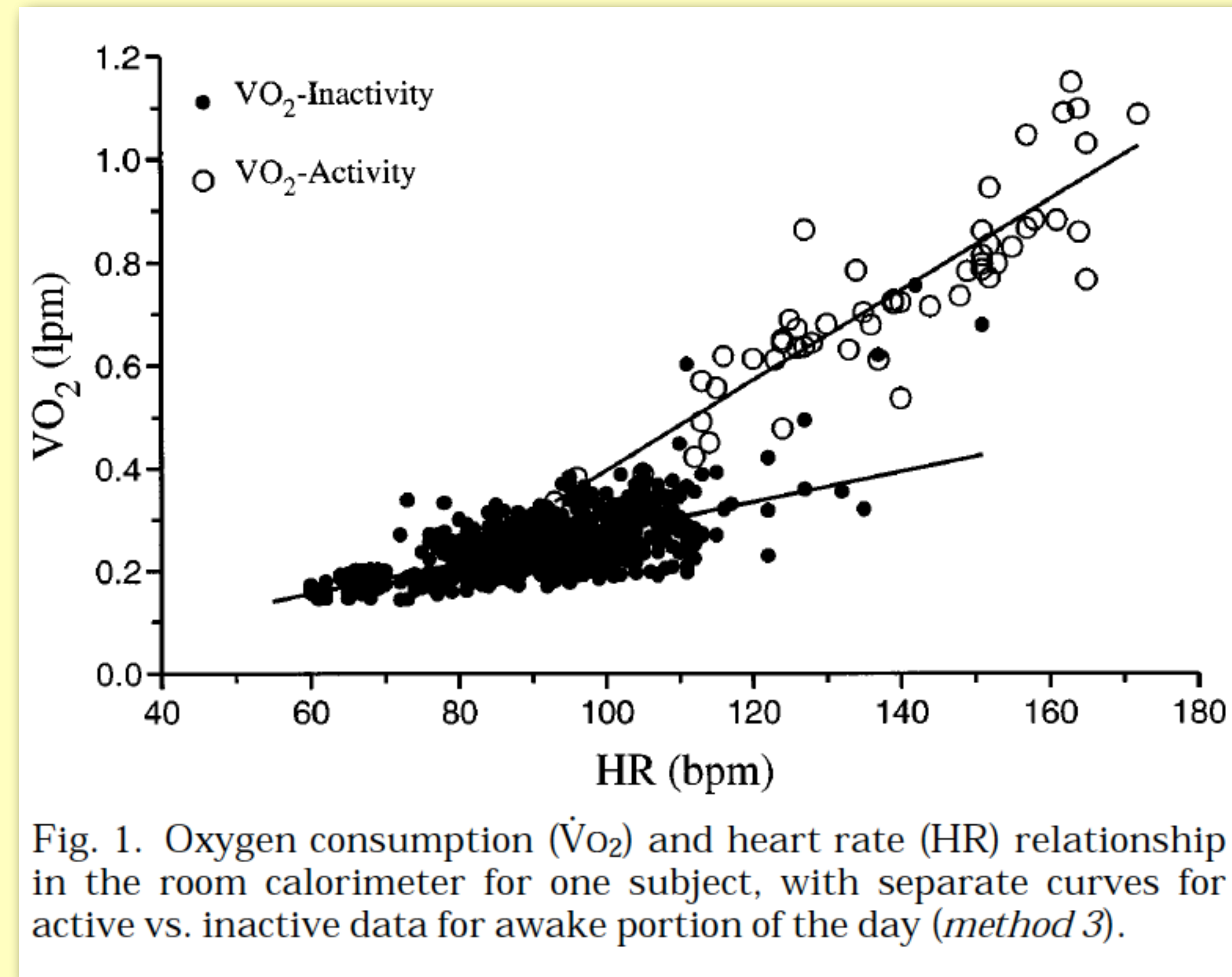
Second generation accelerometers



Eston et al., 1998

. exception: children (i.e., $\dot{V}O_2$ [ml O_2 /kg^{0.75} min] correlated w/both counts, HR, but w/counts $r^2 >$ w/HR r^2);

Second generation accelerometers (re: children HR)



Treuth et al., 1998

. solution: two different individual $\dot{V}O_2$ vs. HR relationships, one for inactivity, one for PA;