The Use of Wearable Technology to Measure Energy Expenditure, Physical Activity and Sleep Patterns in Dementia

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Project Description Unexplained weight loss is frequently observed in dementia leading to further cognitive decline, frailty and disability. Apparent mechanisms that could lead to weight loss (lower energy intake and/or higher expenditure) remain unresolved and may be different in the various stages and types of dementia. During the progression of the illness, the extent to which altered sleep duration and variable physical activity patterns (intermittent or constant pacing/lying down) could affect weight loss is unknown. We have used an innovative light weight physical activity monitor (Sensewear ^{TM} Armband ,Body Media, Pittsburgh, PA)) to objectively determine total energy expenditure (TEE), sleep duration, physical activity and number of steps in people with dementia living in care homes. The armband was placed around the left upper triceps for up to 7 days. The device measures tri-axial acceleration, skin temperature, galvanic skin response and heat flux and has been shown to be valid in resting, exercise and free-living conditions in older people. The mean age of the residents (n=20) was 78.5 (58-99) years, 50% were women with confirmed diagnosis of a range of dementia types. Body Mass Index (BMI) was 23.0 (range 13.7-30.0) kg/m^2 with 40% classified as underweight, 50% normal range, 10% overweight. Duration of sleeping ranged from 0.4-12.5 (mean 5.9) hrs/d and time spent lying down was 1.0-16.0 (8.1) hrs/d. On average residents spent 17.4 (6.0-23.7) hrs/d undertaking sedentary activity. Sleeping duration was inversely related to body weight (r= -0.46, p<0.05) and TEE (r= -0.59, P<0.01). There was an inverse association between time lying down for both body weight (r= -0.45, p<0.05) and TEE (r= -0.62, p<0.01).TEE was positively correlated with number of steps per day (r= 0.45, p<0.05). There was no relationship between TEE or BMI and the amount of physical activity. Variable patterns of physical activity and sleep duration demonstrates the need to recognise the influence of these factors on meeting energy requirements and the challenge of providing appropriate food and nutrition within the care home environment. Thus wearable technology has the potential to offer real-time feedback to support better nutritional management and improve efforts to prevent weight loss in dementia.