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Physical activity among colorectal cancer patients: assessment, biological correlates and potential for intervention

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The aims of this thesis were to (i) review the literature on accelerometry wear methods and correlations with questionnaires, (ii) to measure physical activity and evaluate feasibility of repeat physical activity measurement by accelerometry in colorectal cancer patients, (iii) to assess the effects of physical activity monitoring by accelerometry and pedometry over a period of 10 days, (iv) to compare both methods and (v) to assess the associations between physical activity levels and 25(OH)D levels. The presented thesis was conducted in three parts.

The aim of the first part of the thesis was to evaluate accelerometer wear methods and correlations between accelerometry and physical activity questionnaire data. Forty-six articles were reviewed, accelerometer wear methods were compared across studies and correlation coefficients between accelerometers and questionnaires, as well as differences between genders, age- and BMI categories were assessed. In most investigations, the requested wear-time was seven days during waking hours. Devices were attached on hips. A minimum of four valid days with wear-time of at least ten hours per day was required in most studies. Due to inconsistent results in correlations, different aspects measured by each method, and differences in the dimensions studied, it is advised that studies use both questionnaires and accelerometers to gain the most complementary information.

The aim of the second part of this thesis was to evaluate feasibility of physical activity measurement by accelerometry in colorectal cancer patients at 6, 12 and 24 months after

surgery and to compare results to pedometers. Colorectal cancer patients were offered to wear an accelerometer and a pedometer for 10 consecutive days 6, 12 and 24 months post-surgery. Participants completed a feedback questionnaire about the acceptance of the accelerometer measurement. The course of moderate-to-vigorous physical activity over the 10 days was investigated. Additionally, daily step counts from accelerometers and pedometers were compared. The results suggest that accelerometry is a practicable method to assess physical activity in free-living colorectal cancer patients and that three valid days of physical activity measurement are sufficient in this study.

The aim of the third part of this thesis was to assess plasma 25(OH)D₃ levels of colorectal cancer patients at 6, 12, and 24 months post-surgery and to investigate correlations with physical activity measures derived from accelerometry and questionnaires. Additionally to the accelerometry and questionnaires, at each follow-up visit, blood samples were taken. Out of 156 individual follow-up visits from the above mentioned second part of the thesis, 25(OH)D₃ levels were available at 137 times. Within each follow-up time point (6,12,24) over 60% of the plasma samples revealed a vitamin D deficiency (25(OH)D₃ ≤20ng/mL) and less than 16% were vitamin D sufficient (25(OH)D₃ ≥30ng/mL). After adjustment for season, age and BMI, significant correlations could be observed for accelerometry derived moderate-to-vigorous physical activity ($\rho=0.40$, $p=0.002$) only at 6 months. The multiple linear regression analysis showed that season, accelerometer moderate and moderate-to-vigorous physical activity were significant predictors for 25(OH)D₃ levels at 6 months post-surgery. No statistically significant results could be observed at 12 or 24 months post-surgery. Besides its known biological mechanisms on gene expression, these results suggest that 25(OH)D₃ is, to some extent, a biomarker for physical activity in colorectal cancer patients.