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Accuracy Of Behavioral Assessment With A Wearable Camera in Semi-structured And Free Living Conditions In Older Adults.

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PURPOSE: To examine the congruency of wearable cameras (WC) and direct observation (DO) to identify posture, activity category, and type during semi-structured (Semi) and free-living (Free) conditions in older adults.
METHODS: 824 observations were analyzed (n=8; 5 female; 69±5.1 y; 169.1±5.2 cm; 69.5±12.5 kg) over a 20-minute Semi bout of activity (sit, stand, walk) while video recorded. Videos were analyzed by DO. An independent sample of 1499 observations were analyzed (n=5; 3 female, 71±5.1 y; 162.1±5.1 cm; 64.5±10.6 kg) during a three-hour bout of community-dwelling Free activity while a researcher performed DO. Both groups wore a WC placed at the sternum. WC images and DO were annotated independently for posture (sedentary, standing, movement), activity category (sedentary, walking, household, exercise/sport), and type (laundry, dishes, cooking, general cleaning). Cross tabs and Kappa statistics were run to assess accuracy between the WC images and the DO results across both conditions for observations. Time spent in each attribute was tested with the Wilcoxon signed-rank test.
RESULTS: Posture had a 96.4% (Kappa=0.93; SE=0.10; p<0.0001) and 93.1% (Kappa=0.89; SE=0.07; p<0.0001) agreement between the WC and DO during the Semi and Free conditions, respectively. For activity category, there was 76.7% (Kappa=0.45; SE=0.10; p<0.0001) and 94.6% (Kappa=0.92; SE=0.08; p<0.0001) agreement between the WC and DO during the Semi and Free conditions, respectively. For activity type, obtained from Free only, there was 100% (Kappa=1.0; SE=0.20; p<0.0001) agreement across measures. WC total time spent in seconds was not significantly different to that obtained from the DO for posture during Semi (186±47 vs. 199±50, z=0.9342) or Free conditions (1341±414 vs. 1400±418, z=0.3170). For activity category, time spent across each measurement type did not significantly differ for Semi (WC = 162±38 vs. DO = 171±44, z=0.7348) or Free conditions (WC = 1082±322 vs. DO = 1256±342, z=0.4806). For activity type, time estimates for Free only were not statistically different 827±333 for WC and 145±70 for DO, z=0.7459.
CONCLUSIONS: Results from this study suggest that there is high congruency between wearable cameras and direct observation for behavioral observations and time spent in posture, activity category and type.

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Metabolic Cost Of Resistance Exercise

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PURPOSE: Determine if the Total O_2 cost (TO_2) of RE differs during & following RE as a function of RE type & relative intensity (RI) & Determine if TO2, during & following RE, differs across 3 RI, when the volume of Work is held constant.
METHODS: 8 Ss, 6 female, volunteered. Ss underwent testing for VO_2Max, body composition, & 1-RM for Chest Press (CP) & Leg Press (LP). RI were 33, 50, & 75% 1-RM, with 22, 15, & 10 reps performed, respectively to control for volume of work during RE. RE consisted of: 5min Rest, followed by RE, & 10min Post RE Rest; RE & Post RE Rest were repeated for RE type (LP & CP) & RI. RE & RI were counterbalanced. Metabolic measures & HR were recorded using a Cosmed K4b[2]. Body composition was measured with BodPod.
RESULTS: Age=21.5±0.5, Height=166.5±6.2, Mass=65.4±11.7, BMI=23.5±3.7, BodyFat%=20.7±7.5, FatMass=13.8±7.5, LeanMass=51.5±7.7, VO_2max=46.4±8.4, RERmax=1.13±0.03, & HRmax=200±6.2. TO_2 cost was measured as the O_2 used during exercise & through 10min Post RERest using Integral estimation of breath-by-breath intervals. TO_2 cost during RE & 10 min Post RE Rest was significantly greater for LP when compared to CP at each corresponding RI: LP75-CP75 p=0.005, CI95%(6.72,13.58); LP50-CP50 p=0.003, CI95%(4.12,13.98); LP33-CP33 p=0.005, CI95%(1.81,7.33). TO_2 cost was significantly (p<0.02) greater for LP75 & LP50 when compared to LP33. TO_2 cost for CP was not significantly different at any RI. LP & CP RE times differed significantly for RI: LP75-50 p=0.000, LP75-33 p=0.001, LP50-33 p=0.016, CP75-50 p=0.007, CP75-33 p=0.000, CP50-33 p=0.002. TO_2 cost for LP75 & CP75 returned to Pre RE Rest at min 3.
CONCLUSIONS: Results suggest TO_2 cost is related to RE type, muscle mass activated, O_2 deficit incurred during RE, & O_2 debt repaid during recovery. Further, the O_2 cost during recovery from LP75 & LP50 is greater when compared to LP33 even though Work was held constant. This suggests factors other than the O_2 deficit contribute to the O_2 debt.

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A Comparison Between Actual Energy Expenditure Measurements And A System Dynamics Model Output

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(No relationships reported)

Portable metabolic units afford a practical utility for field measurements of energy expenditure (EE). This methodology has proven useful to assess EE related to terrain, intensity, and duration during a single event. Similarly, system dynamics (SD) modeling has been used to describe the relationship between exercise and obesity as it relates to EE. However, there is paucity of literature that report SD to predict EE in real time.
PURPOSE: To compare actual EE from a portable metabolic unit to predicted EE from a System Dynamics model.
METHODS: Seven subjects (4 males, 3 females; 24.4 +/- 1.71) walked selected routes of varied terrain paced by a metronome at 2.7 mph. EE was measured using a Cosmed K4b2 portable metabolic unit with each subject completing four trials per route. An integrated GPS receiver recorded latitude and longitude coordinates of each route. The modeling software STELLA was used to design the SD model which incorporates subjects' weight, walking pace, route elevation profile and distance. Pandolf's et al (1977)) prediction equation for EE was run in the model to compare with the real-time K4b2 data.
RESULTS: In simulation modeling parameters (stocks and flows) are adjusted to increase accuracy. Model parameters were adjusted to provide agreement for EE to within +/- 1% of the actual total EE as measured by the Cosmed K4b2 unit. A paired t-test comparing the actual versus the SD model predictions of total EE were not significantly different (p =.034).
CONCLUSION: It appears that SD modeling can be an effective tool to predict EE of individuals walking on varied terrain. Once user parameters have been entered, simulation modeling can provide feedback on EE with suitable accuracy of a selected route. Compared to a single event measurement, SD allow users to compare EE of multiple defined routes simultaneously. Feedback has been identified as a critical component of adherence and motivation for physical activity. In this case of SD modeling, accurate feedback and route selection may encourage users to engage in regular physical activity.
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