Poster Presentations

Impact of wearable physical activity monitoring devices with exercise prescription or advice in the maintenance phase of cardiac rehabilitation: systematic review and meta-analysis

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Background: Continual engagement in physical activity (PA) is required to maintain cardiovascular benefits and wearable PA monitoring devices (WPAM) may increase PA. We investigated the effect of wearables on cardiorespiratory fitness (CRF), step count and intensity, and collated reasons for drop out and adverse events.

Methods: A systematic search was completed, followed by a narrative synthesis, meta-analysis and qualitative analysis.

Results: Nine studies involving 1,352 participants were included. CRF was improved to a greater extent in participant using WPAM with exercise prescription or advice compared with controls (MD 1.65 mL/kg/min;95% confidence interval [CI; 0.64–2.66]; $p = 0.001$; $I^2 = 0\%$). In 70% of studies, step count was greater in participants using a WPAM with exercise prescription or advice, however the overall effect was not significant (SMD 0.45;95% [CI; – 0.17-1.07] $p = 0.15$; $I^2 = 81\%$). A sensitivity analysis resulted in significantly greater step counts in participants using a WPAM and reduced the heterogeneity from 81 to 0% (SMD 0.78;95% [CI;0.54–1.02]; $p < 0.001$; $I^2 = 0\%$). Three out of four studies reporting on intensity, found significantly increased time in moderate and moderate-vigorous intensity PA for WPAM. No cardiac adverse events, related to PA, were reported. Reasons for dropping out included medical conditions, lack of motivation and technical difficulties.

Conclusions: WPAM with exercise prescription or advice are superior to no device in improving CRF in the maintenance phase of CR and our qualitative analysis favoured WPAM for CRF and step count. No cardiac adverse events were reported with WPAM use.

Feedback Training Improves Ability to Follow Sternal Precaution Guidelines During Functional Mobility

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To prevent complications after median, upper extremity (UE) activity limitations are often prescribed to promote bone healing. Weighted UE movements 〉 10 lb (4.5 kg) are often restricted which can limit patients in many daily tasks. Teaching patients appropriate arm use is important for optimal recovery and functional independence.

The purposes of this study were to: 1) assess how accurately patients can estimate using 〈 10 lb of UE weight bearing force and 2) determine the efficacy of feedback training to improve the modulation of UE weight bearing force and pectoralis major (PM) muscle activation during transfers and walker ambulation.

An instrumented walker was used to measure UE weight bearing force and electromyography (EMG) was used to measure PM muscle activity during 4 functional tasks in study participants (n = 30) 〉 65 years old. After baseline testing, study participants completed a session of visual and auditory feedback training. Immediately and 2 hours later, UE force and PM muscle EMG activity were measured again.

Mean values during all tasks were 〉 10 lb, the limit commonly prescribed with sternal precautions. During a majority of the trials (92%), study participants incorrectly estimated and used too much UE force. Immediately after feedback training, UE force and PM muscle EMG activity were both significantly reduced. No significant differences were found between force or EMG values immediately following feedback training and 2 hours later. Findings suggest older patients recovering from median sternotomy may benefit from feedback training via an instrumented walker especially during the early stages of rehabilitation.

Table. Peak Force (lb) and Pectoralis Major Muscle EMG (%MVIC) Descriptive Data (Mean ±SD and Range).

Peak Force	Pre-feedback Training	Walking Boot	Post-feedback Training	Follow-up Retention
Standard Walker	**30.6 ± 16.5** (9.6 – 72.0)	**28.4 ± 15.4** (6.9 – 69.3)	**13.2 ± 5.8**$^{+}$ (5.4 – 25.0)	**13.3 ± 7.1** (5.4 – 35.2)
FW Walker	**20.0 ± 10.3**$^{\#}$ (3.2 – 45.8)	**23.2 ± 9.6**$^{\#+}$ (5.4 – 46.4)	**10.6 ± 3.5**$^{+}$ (5.0 – 18.7)	**9.9 ± 3.8** (3.0 – 21.7)
Sit to Stand	**39.7 ± 13.6*** (14.2 – 68.4)	**39.0 ± 14.8*** (10.8 – 75.9)	**21.3 ± 10.0**$^{\#*+}$ (7.6 – 49.8)	**22.0 ± 12.1**$^{\#*}$ (4.0 – 54.1)
Stand to Sit	**37.3 ± 14.9*** (8.8 – 64.8)	**33.4 ± 14.5**$^{*+}$ (9.3 – 64.2)	**18.8 ± 9.7**$^{\#*+}$ 3.0 – 51.0)	**20.7 ± 11.8**$^{\#*}$ (4.9 – 51.3)
EMG	**Pre-feedback Training**	**Walking Boot**	**Post-feedback Training**	**Follow-up Retention**
Standard Walker	**14.8 ± 9.3%** (3.9 – 36.8%)	**14.5 ± 9.2%** (4.5 – 40.7%)	**10.0 ± 7.3%**$^{+}$ (2.9 – 26.8%)	**8.8 ± 6.0%** (2.3 – 21.0%)
FW Walker	**13.6 ± 9.9%** (2.8 + 38.3%)	**16.0 ± 10.1** 41 – 34.3%)	**9.8 ± 8.3%**$^{+}$ (1.5 – 32.3%)	**9.2 ± 8.7%** 1.1 – 32.3%)
Sit to Stand	**22.1 ± 14.3%*** (6.2 – 67.0%)	**24.2 ± 12.0%**$^{\#*}$ (8.7 – 56.5%)	**14.9 ± 12.3%**$^{+}$ (1.7 – 51.9%)	**12.9 ± 8.2%** (1.9 – 31.6%)
Stand to Sit	**19.8 ± 13.8%** (3.7 – 64.2%)	**19.0 ± 11.5%** (6.0 – 52.6%)	**13.1 ± 10.2%**$^{+}$ (1.8 – 44.8%)	**12.4 ± 9.0%** (3.0 – 32.4%)

Significantly different from: $^{\#}$Standard Walker, *FW Walker, $^{+}$Pre-feedback Training (P〈1.05)

EMG = electromyography, MVIC = maximal voluntary isometric contractions; FW = front wheeled

Sternal Precautions: Factors That Influence Upper Extremity Weight Bearing Force During Functional Tasks

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Commonly, sternal precautions involve limiting upper extremity (UE) weight bearing force which is particularly difficult for older patients who need assistance sitting down/standing up or need to use a walker for ambulation. The purposes of this study were to: 1) examine the influence of leg impairment on UE weight bearing force and 2) evaluate factors/characteristics that are associated with degree of UE weight bearing force during functional tasks in older patients.

An instrumented walker was used to measure UE force and electromyography (EMG) was used to measure pectoralis muscle (PM) muscle activity during 4 functional tasks in study participants (n=30) 〉65 years old. Baseline measurements were obtained and then repeated again while the study participants wore a walking cast to simulate a leg impairment. Baseline function was assessed using outcome measures of strength, balance, and health-related quality of life (QoL).

While wearing a walking cast, UE force was greater during front wheeled walker ambulation and stand-to-sit transfers as compared to baseline. There were no significant differences between PM muscle EMG activity wearing a walking cast compared to baseline. Moderate correlations (r = 025-0.50) were found between walker ambulation and QoL and between sit-stand transfers and QoL, balance, and body mass index.

Leg impairment translated to an increase in UE force (3.2-4.9 lb) during some functional activities but had no significant effect of PM muscle recruitment. Health-related QoL, balance, and body mass index may have some prognostic value for patients at risk for excessive UE force use.

Table. Correlations Between Functional Scores and Arm Force.

	Standard Walker	FW Walker	Sit to Stand	Stand to Sit
4 Square Step Test	-0.33	-0.35	-0.04	-0.04
COG A-P Stability Index	0.21	0.23	0.31	0.32
SF-36 RL Physical	-0.32	-0.04	-0.22	-0.12
SF-36 RL Emotional	-0.33	-0.29	-0.31	-0.30
SF-36 Social Functioning	-0.38	-0.38	-0.24	-0.24
Body Mass Index (kg/m^2)	0.17	0.16	0.27	0.35
SW = Standard walker; FWW = Front wheeled walker; COG = Center of gravity; A-P = Anterior-posterior; SF-36 = RAND SF-36 Health Survey; RL = Role Limitation due to				

Tobacco Smoking Cessation Success after a Cardiac Event

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Background: Tobacco smoking is a modifiable risk factor for coronary heart disease, the largest single contributor to the disease burden in Australia. Cardiac Rehabilitation (CR) aims to reduce the risk of a future cardiac event by managing modifiable risk factors. We investigated the medium-term success of abrupt tobacco smoking cessation compared to use of evidence-based nicotine replacement therapy (NRT).

Method: Patients enrolled in CR in 2017 and 2018 who identified as current smokers at time of cardiac event were contacted. A phone survey was carried out after program discharge to explore tobacco smoking cessation success and the motivation, barriers and resources used.

Outcomes: A greater number of adults were current tobacco smokers in CR (17.4%) compared to in the Central and Eastern Sydney Primary Health Network (11.5%). All 61 current tobacco smokers ceased smoking at time of cardiac event. Successful follow up contact was made with 28 (46%) individuals, 16 chose the abrupt cessation strategy (10 successful) and 6 chose the NRT strategy (3 successful).

Implications: Following a cardiac event abrupt smoking cessation is more popular than evidence-based NRT as a self-selected strategy. While the NSW Health policy is to provide NRT during hospitalisation, it is essential for CR assessments to provide support for self-selected strategies for successful outcomes.

Conclusions: Individuals who are current smokers at time of cardiac event may be successful using the abrupt tobacco smoking strategy. Further research is required into why tobacco smokers choose the abrupt cessation strategy over evidence-based NRT after a cardiac event.

Outcomes: Fewer adults were current tobacco smokers in CR (11.6%) compared to in the South Eastern Sydney Local Health District (15.5%). Of the 84 current tobacco smokers, 82 ceased smoking at time of cardiac event. Successful follow up contact was made with 30 (35.7%) individuals, 17 chose the abrupt cessation strategy (10 successful) and 7 chose the NRT strategy (4 successful).

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