Efficacy of a Wearable-enabled Physical Activity Counselling Program for People with Knee Osteoarthritis

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Background

- Current guidelines emphasize an active lifestyle in the management of knee osteoarthritis (OA)
- Up to 90% of people with knee OA are inactive [1]

Objective

To assess the efficacy of a wearable-enabled physical activity counselling program for improving physical activity participation and disease status in people with knee OA.

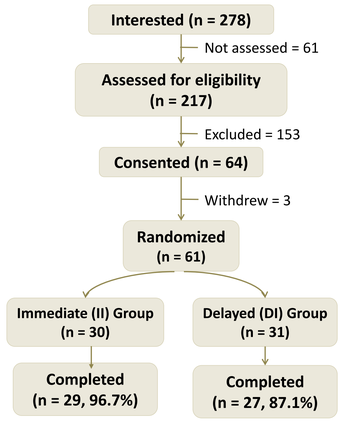
Methods

- A proof-of-concept randomized controlled trial
- **Intervention:** A 2-month Physical Activity Counselling Program

- **Inclusion criterion:**
  - Self-reported knee OA diagnosis or symptoms of knee OA based on a validated questionnaire
- **Exclusion criteria:**
  - Had inflammatory arthritis or connective tissue disease
  - Received or were on the waitlist for total knee arthroplasty
  - Had acute knee injury in the past six months
  - Had a body mass index (BMI) of $\geq$ 40 kg/m^2
  - Had a steroid or hyaluronate injection in the last six months
- **Analysis:** Mixed effects repeated measures analysis of variance (ANOVA) was used to evaluate the effects of group (via three contrasts)

Results

Figure 1: Study flow



- In 2015–16, we recruited 61 participants
- **Women.** *II*: 22 (73%); *DI*: 28 (90%)
- **Age.** *II:* 61.3 (SD 9.4) years; *DI*: 62.1 (SD 8.5) years
- **BMI.** *II*: 29.2 (SD 5.5); *DI*: 29.2 (SD 4.8)
- **University educated.** *II*: 14 (47%); *DI*: 16 (52%)

Table 1: Results of outcome measures

	Immediate Intervention (*II*) Group (n = 30)				Delayed Intervention (*DI*) Group (n = 31)				Group Effect *II* vs *DI* Coefficient (95% CI)		
	T0	T1	T2	T3	T0	T1	T2	T3	Contrast 1	Contrast 2	Contrast 3
Mean MVPA time [mins (SD), SenseWear]	62.1 (54.6)	75.5 (54.3)	62.6 (56.3)	65.6 (48.5)	65.3 (77.4)	50.0 (46.8)	60.1 (76.8)	70.7 (71.9)	*26.6 (4.0, 49.1)	25.5 (-2.4, 53.5)	*26.0 (3.1, 49.0)
Mean daily steps (SD) [SenseWear]	7,069.2 (3,375.3)	8,217.4 (3,095.5)	8,132.5 (3,420.7)	8,215.1 (3725.6)	7,556.6 (5,054.1)	6,713.6 (3,354.3)	7,631.9 (4,054.3)	7,573.6 (4,477.1)	*1,699.2 (349.0, 3,049.4)	*1,601.8 (38.7, 3,164.9)	*1,650.5 (332.3, 2,968.7)
Mean sedentary time [mins (SD), SenseWear]	464.1 (137.7)	437.6 (133.9)	505.9 (167.2)	435.8 (138.8)	497.4 (200.7)	503.0 (160.7)	508.9 (189.0)	496.9 (179.5)	-20.9 (-63.4, 21.5)	6.4 (-49.2, 61.9)	-7.3 (-50.4, 35.8)
KOOS (0-100)											
Symptoms	59.8 (16.1)	62.6 (15.6)	62.4 (14.7)	62.1 (15.3)	62.9 (17.2)	61.7 (14.5)	63.4 (16.7)	61.4 (19.8)	4.5 (-1.7, 10.7)	3.8 (-4.0, 11.5)	4.1 (-2.2, 10.4)
Pain	66.2 (17.5)	70.9 (17.0)	67.5 (15.5)	68.6 (17.5)	65.1 (17.9)	64.8 (14.6)	66.3 (15.2)	66.2 (16.4)	4.4 (-2.7, 11.6)	1.7 (-6.6, 10.0)	3.1 (-3.8, 10.0)
ADL	71.8 (17.5)	76.0 (16.1)	76.6 (17.5)	75.1 (15.9)	74.1 (17.6)	71.0 (16.5)	75.2 (17.2)	73.9 (15.8)	*6.9 (0.1, 13.7)	7.5 (-0.1, 15.1)	*7.2 (0.8, 13.6)
Sports & recreation	47.3 (26.6)	49.3 (24.9)	50.0 (25.6)	50.4 (26.3)	52.7 (27.7)	47.0 (23.3)	48.9 (27.7)	49.8 (29.2)	6.9 (-3.7, 17.5)	8.1 (-5.3, 21.4)	7.5 (-3.2, 18.2)
Quality of life	41.0 (19.8)	47.2 (18.9)	45.4 (17.6)	44.9 (17.9)	44.6 (16.3)	42.4 (16.8)	47.5 (13.6)	48.1 (19.1)	*7.4 (0.0, 14.7)	7.2 (-1.3, 15.8)	*7.3 (0.1, 14.6)

- **T0:** Baseline; **T1:** End of 2 months; **T2:** End of 4 months; **T3:** End of 6 months
- MVPA = Moderate/vigorous physical activity

Abbreviations: GTxy = value for Group X at Time Y ; Group 1 = *II*, Group 2 = *DI*

Contrast 1: (GT11-GT10)-(GT21-GT20)
Contrast 2: (GT22-GT21)-(GT21-GT20)
Contrast 3: Avg (GT11-GT10)-(GT21-GT20) & (GT22-GT21)-(GT21-GT20)

* $p < 0.05$

Figure 2a: Physical activity time

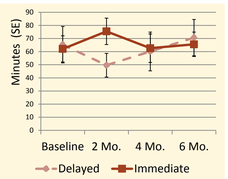


Figure 2b: Daily steps

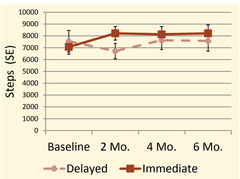


Figure 2c: Sedentary time

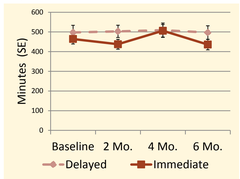


Figure 2d: KOOS activity of daily liv.

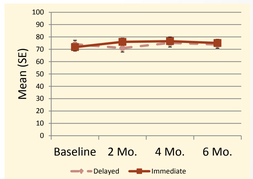
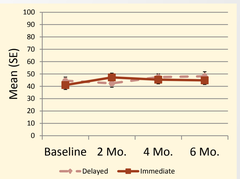


Figure 2e: KOOS quality of life



Conclusion

- This proof-of-concept study showed that our 2-month wearable-enabled counselling program improved physical activity participation (MVPA, step count), activity of daily living, and quality of life in people with a diagnosis or symptoms of knee OA.
- The finding is important since an active lifestyle is recognized as an important component of successful self-management.

Reference: 1) Dunlop DD et al. Objective physical activity measurement in the osteoarthritis initiative: Are guidelines being met? *Arthritis Rheum* 2011, 63: 3372-3382.

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