

# EVALUATION OF A THEORY-DRIVEN PHYSICAL ACTIVITY INTERVENTION FOR INDIVIDUALS WITH WHIPLASH ASSOCIATED DISORDERS USING A SINGLE CASE EXPERIMENTAL DESIGN

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## Background

Individuals with whiplash associated disorder (WAD) experience considerable variations in physical impairment, psychological distress, social dysfunction and recovery. In addition, individuals with WAD are frequently insufficiently active for good health, increasing their risk of morbidity, and compounding the effects of the whiplash injury. To date, interventions have focussed on impairment or remediation in a rehabilitation setting with the aim of improving pain and disability. Trial results are equivocal and optimal treatment continues to be a challenge.

The aim of this study was to evaluate the effect of a community-located intervention using evidence-based behaviour change strategies on participation in physical activity and perceived interference of neck pain on daily activity.

### Step 1: Pre-Participation Activities

- Pre-Participation Assessment
- Stage of Change (SOC) Assessment
- Information Sharing: shared understanding of physical activity and exercise

### Step 2: Implementation of Stage-Matched Individualised Behaviour Change Strategies

#### SOC 1 or 2 Strategies

- Information sharing
- Motivational Interviewing (Value Card Sort Activity, Importance and Confidence Rulers, Decisional Balance Sheet)
- Build self-efficacy
- Build social support
- Modelling
- Personal time audit
- Physical activity monitoring
- Identify activities of interest
- Barrier identification and resolution

#### SOC 3

- Support self-efficacy
- Foster social support
- Personal time audit
- Physical activity monitoring
- Barrier identification and resolution
- Identify activities of interest
- Foster enjoyment
- Goal setting
- Reward systems
- Prompting/ reminders

### Step 3: Develop Structured Exercise and/or Lifestyle Physical Activity Program

**Exercise** to improve one or more components of physical fitness (e.g., resistance training exercises, targeted aerobic activities)

**Lifestyle physical activity** to accumulate at least 30 minutes of self-selected activities each day including all leisure, occupational, household or sport related activities

### Step 4: Tailored Relapse-Prevention Strategies

Develop strategies to optimise ongoing participation and planning for high risk situations

Figure 1: The 4-step Adapted Physical Activity Program (APAP).

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## Methods

- Single-case, multiple-baseline design across participants with replication.
- 6 individuals with chronic WAD were randomised to 1 of 2 groups and then to 1 of 3 baseline periods (e.g. tiers: usual physical activity for 5, 8 or 11 week) (**Table 1**).
- Adapted physical activity program (APAP) intervention (**Figure 1**):
  - 12 sessions with an exercise physiologist in the home/work/community over 16-weeks .
  - tailored to the individual's knowledge, beliefs, values, perceived ability, and motivational readiness for regular PA.

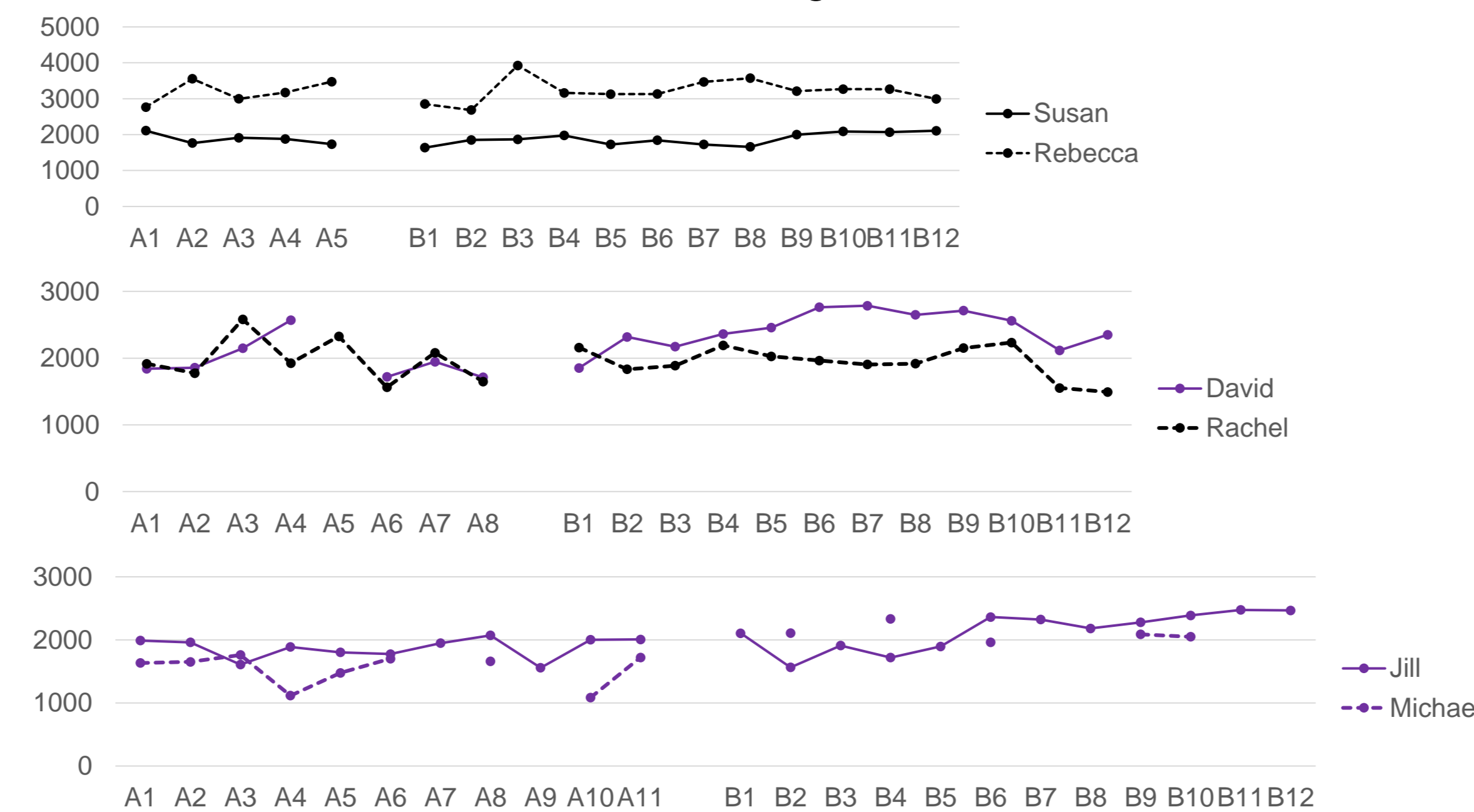


Figure 2: Mean counts/minute/week for participants in group 1 (solid) and 2 (dashed) with 5, 8, 11 week baseline phase (A). Purple indicates significant change at intervention phase (B).

	Group	Tier	Age	NRS		NDI (0-100)		SF12 Physical		SF12 Mental		PCS		PSE	
				Baseline	Post	Baseline	Post	Baseline	Post	Baseline	Post	Baseline	Post	Baseline	Post
Susan	1	5wk	53	2	2	32	16	49.4	52.2	48.0	56.5*	15	13	52	56
David	1	8wk	50	4	2	58	42	32.3	37.1*	45.9	63.4*	32	18*	11	30*
Michael	1	11wk	44	5	5	40	24	34.4	43.1*	42.0	50.6*	23	22	23	22
Rebecca	2	5wk	33	2	2	32	10	43.6	52.1*	43.8	56.8*	13	13	55	59
Rachel	2	8wk	32	5	4	32	36	38.9	40.8	27.7	29.7	16	15	40	49
Jill	2	11wk	60	5	5	68	58	28.4	40*	52.2	57.7*	37	21*	23	26

Table 1: Baseline and post-intervention results for generalisation measures. NRS: <3 recovered; NDI: <10 recovered; SF12: >50 healthy, above population norms; PCS: <24 low level of pain catastrophizing; PSE: >40 confidence in managing pain. \* minimal clinically important difference.

## References:

- 1: Pool et al. 2007. Spine 32(260) 3047-51.
- 2: Diaz-Arribaset al. 2017. Spine 42(24) 1908-16.
- 3: Suzuki et al. 2020. PlosOne15(3): ee0229228.

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## Results

- Target behaviours: measured weekly and analysed through a structured visual analysis supplemented with Tau-U statistical analyses:
  - **Physical activity (PA)**: wrist-worn accelerometer counts per minute of PA were significantly increased in 3 participants (*David, Michael, Jill*) with moderate to large effect sizes (ES) (>0.5). Weighted Tau-U across tiers was significant for Group 1 (z=2.43, p<0.02) (**Figure 2**).
  - **Pain interference**: a total score from 3 of the PROMIS-Pain Interference Scale questions was significantly reduced for another participant (*Susan*) with very large ES (>0.7) and weighted Tau-U across tiers significant (z=-2.11, p<0.035).
- Generalisation measures assessed at baseline and post-APAP included: Neck pain (*NRS*), neck disability index (*NDI*), quality of life (*SF12 physical, SF12 mental*), pain catastrophizing scale (*PCS*), pain self-efficacy (*PSE*). Minimal clinically important differences for NDI (>-20/100)<sup>1</sup>; SF12 (>+4.0)<sup>2</sup>; PCS (>-7)<sup>3</sup>; PSE (>+7)<sup>3</sup> are shown in **Table 1**.

Conclusion: A theory based intervention increased accelerometer measured PA for 2 participants, and significantly reduced the perception that day to day activities may be hindered by pain in 2 other participants. Clinically important improvements in quality of life were found in 5 of 6 Participants. Due to the heterogeneous nature of the WAD population, the use of a single case experimental design was advantageous because it enabled individual level analysis not possible with typical group level Designs. Further research is needed to verify these results.

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