

Does a good night's sleep contribute to improving daytime physical activity? A daily process study in patients with chronic pain

Fatanah Ramlee & Nicole K. Y. Tang - University of Warwick, Coventry UK

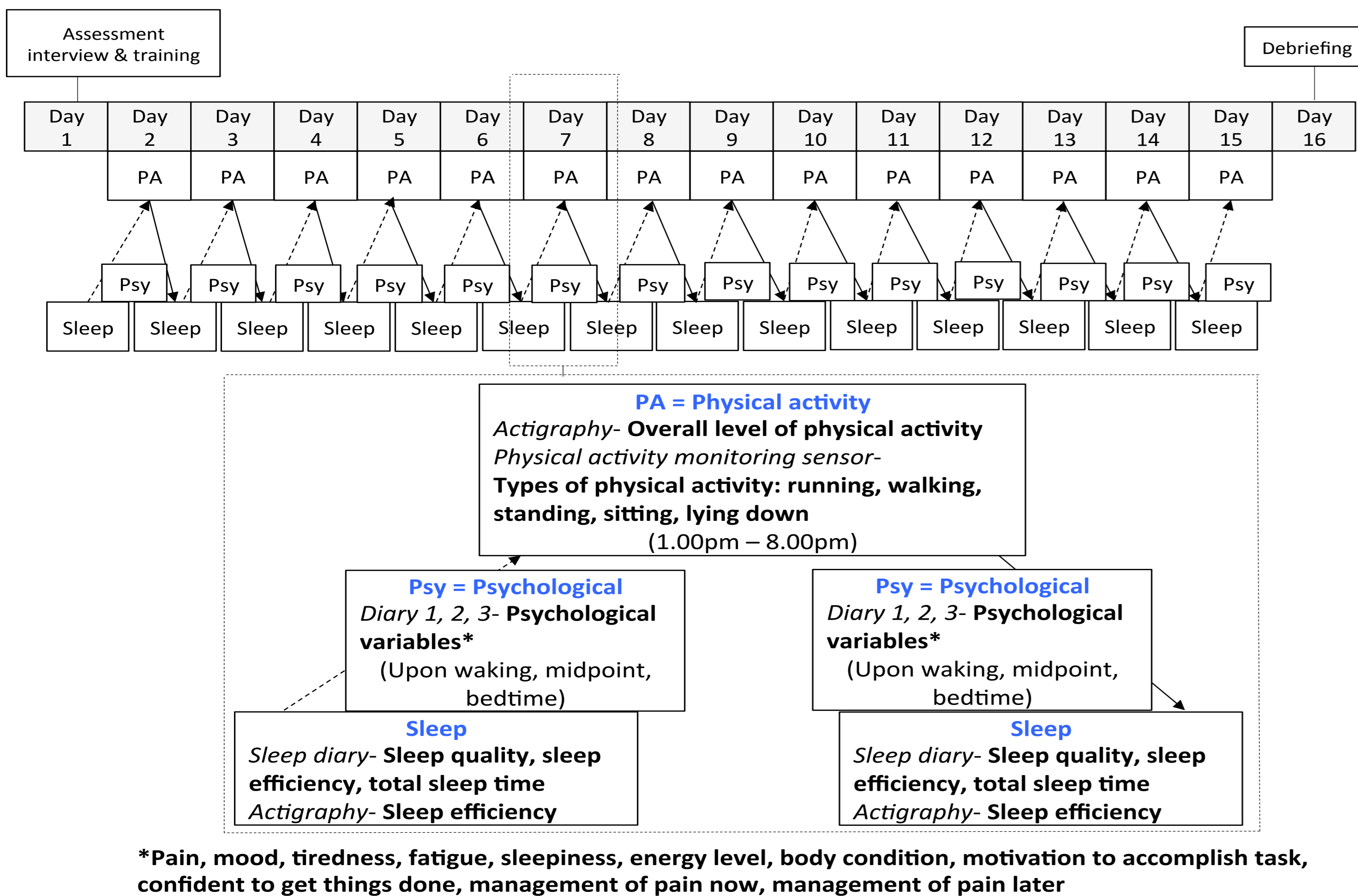
1. BACKGROUND

- Low physical activity level is a common consequence of chronic pain that significantly affects patients' quality of life.
- **Aims:** To examine the within-person temporal association between sleep and subsequent daytime physical activity

2. METHODS

- Participants: $n = 51$ chronic pain patients
- Design: Daily process study

Figure 1. Study design, measures and variables assessed



*Pain, mood, tiredness, fatigue, sleepiness, energy level, body condition, motivation to accomplish task, confident to get things done, management of pain now, management of pain later

Analysis: Multilevel models

- Data pooled from 51 participants, generating an aggregate data set of 714 observations
- 4 set of analysis:
 - (1) To examine the effect of sleep on physical activity the following day (36 models)
 - (2) To examine the effect of physical activity on the subsequent sleep (28 models).
 - (3) To examine the effect of psychological variables upon waking on the subsequent physical activity (72 models).
 - (4) To examine the effect of overall level of physical activity on the subsequent pain and mood (4 models).

3. RESULTS

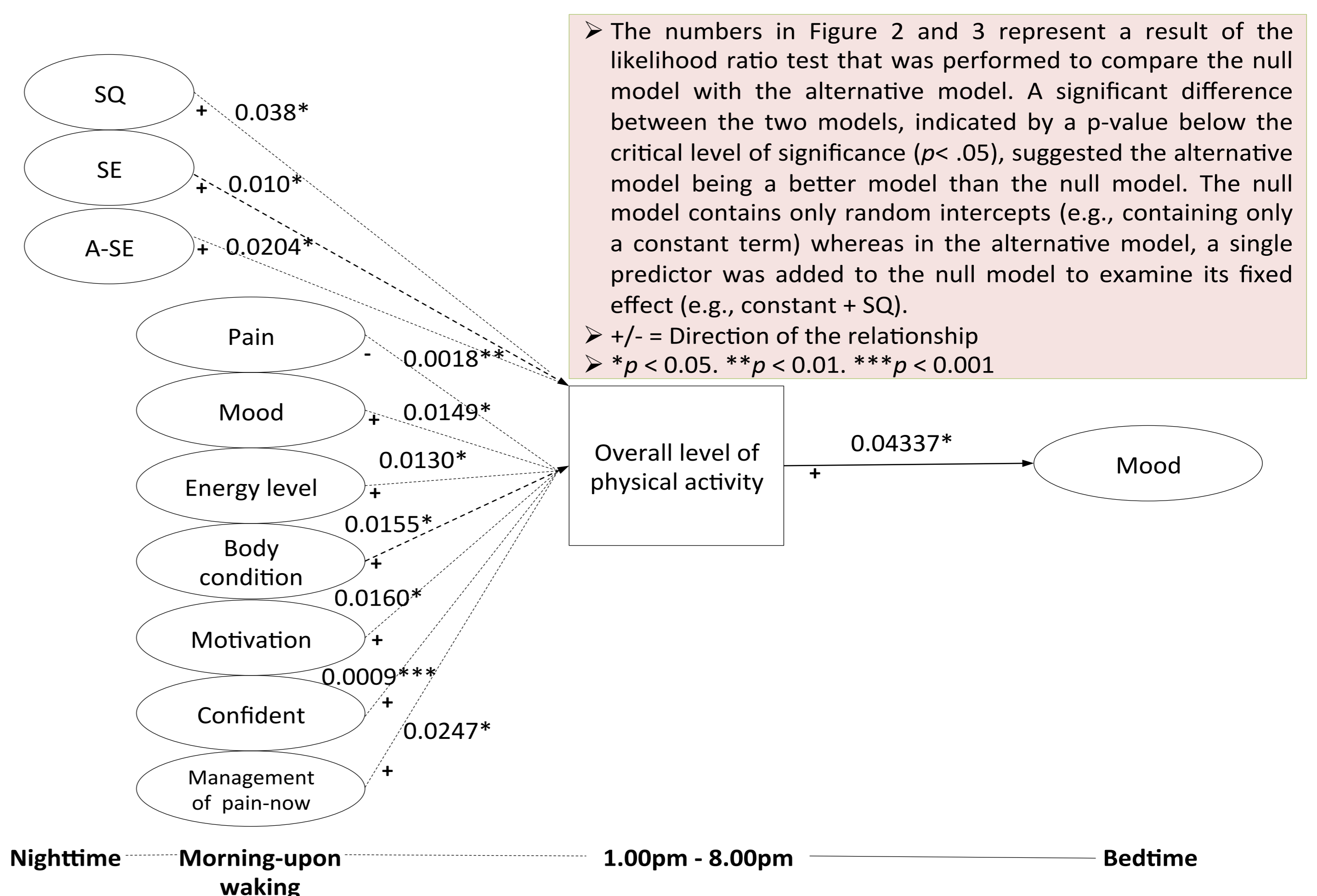
Table 1. Participant characteristics

		$n = 51$	%
Demographics characteristics			
Age (18-65 years)		37.16 (14.77)	
Body mass index		25.58 (6.42)	
Sex	Male	13	25.5
	Female	38	74.5
Ethnic origins	White	32	62.7
	Other	19	37.3
Employment status	Full-time employment	13	25.5
	On sick leave/ medically retired/ retired/ not working	13	25.5
	Other	25	49
Pain characteristics			
Pain complaints		24	47
	Fibromyalgia	11	21.5
	Knee pain	6	11.7
	Neck pain and headache	3	5.9
	Nerve damage	2	3.9
	Shoulder and neck pain	2	3.9
	Rheumatoid arthritis	1	2
	Joints pain	1	2
	Leg-feet pain	1	2
Pain duration (years)		10.85 (8.73)	
BPI	Pain severity	4.89 (1.65)	
	Pain interference	5.21 (2.23)	
Sleep characteristics			
Insomnia Severity Index		12.16 (8.37)	
Dysfunctional Beliefs and Attitudes about Sleep-16		5.19 (1.76)	
Pain-Related Beliefs and Attitudes about Sleep scale		5.49 (2.39)	
Psychological characteristics			
Hospital Anxiety and Depression Scale (Anxiety)		8.69 (3.69)	
Hospital Anxiety and Depression Scale (Depression)		6.82 (4.44)	
Multidimensional Fatigue Inventory		64.16 (15.03)	

Table 2. Participants' typical sleep patterns

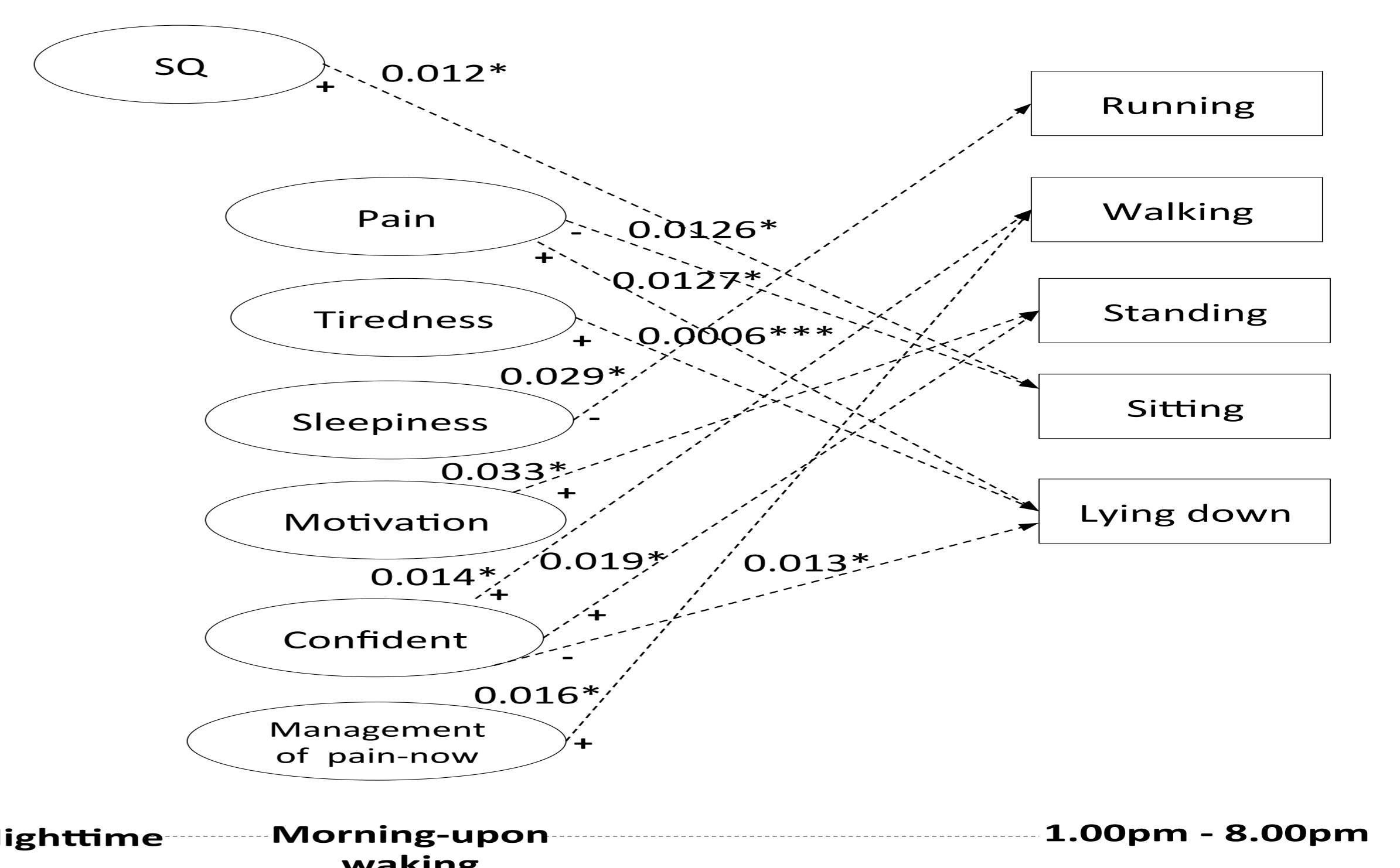
Variables	$n = 51$
Sleep measure	
Sleep Diary	Average SQ (0 very poor – 10 very good)
	5.66 (2.13)
	Average SE, in %
	85.38 (15.94)
	Average TST, in hour
	6.8 (1.91)
	Average SOL, in minutes
	34.75 (46.92)
	Average WASO, times
	3
	Average WASO duration, in minutes
	35.85 (58.34)
Actigraphy ($n = 45$)	Average A-SE, in %
	78.3 (19.42)

Figure 2. Results summary of the multilevel models for exploring the relationship from last night's sleep, psychological variables upon waking and subsequent overall level of PA, and from daytime overall level of physical activity to nighttime sleep, presleep pain and mood



► The numbers in Figure 2 and 3 represent a result of the likelihood ratio test that was performed to compare the null model with the alternative model. A significant difference between the two models, indicated by a p -value below the critical level of significance ($p < .05$), suggested the alternative model being a better model than the null model. The null model contains only random intercepts (e.g., containing only a constant term) whereas in the alternative model, a single predictor was added to the null model to examine its fixed effect (e.g., constant + SQ).
 ► +/- = Direction of the relationship
 ► * $p < 0.05$. ** $p < 0.01$. *** $p < 0.001$

Figure 3. Results summary of the multilevel models for exploring the relationship from last night's sleep, psychological variables upon waking and subsequent types of PA



4. CONCLUSIONS

- Better sleep quality and higher sleep efficiency but not total sleep time the previous night predicted overall level of physical activity
- Waking up with less pain and greater sleep quality were associated with more sitting during the day
- No significant association between daytime physical activity and subsequent sleep
- Better mood upon waking predicted higher overall level of physical activity, which in turn led to better presleep mood
- Regulating nighttime sleep in people with chronic pain may subsequently improve daytime physical activity particularly in physically inactive chronic pain patients.

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Contact: F.Ramlee@warwick.ac.uk

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