Intention, beliefs and mood from weekly diaries predict attendance at Cardiac Rehabilitation

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Background:

- Heart and circulatory disease are leading cause of morbidity and mortality in UK and across all established healthcare systems (BACPR, 2012)
- Currently, 2.6 million people live with coronary heart disease (CHD) in UK, with 73,000 deaths per year and generating significant healthcare cost (Allender et al, 2006; NHS 2014)
- Cardiac rehabilitation (CR) is highly effective in promoting physical and psychological recovery following Acute Cardiac Syndrome (ACS) (BACPR, 2012)
- Benefits of participating in such programmes includes decreased cardiac morbidity and mortality (Joliffe et al 2004)
- Despite this in the UK, only 42% of eligible patients take part (BACPR, 2012)
- Reasons for this are complex with social factors at least as important as clinical factors

Predictors of attendance at cardiac rehabilitation (CR)

- Predictors of CR attendance include
  - Socio-demographic characteristics, age, gender, social deprivation
  - Cardiac-related beliefs including illness perceptions (French et al 2006)
  - Treatment-related beliefs (Cooper et al, 2002)
  - Cardiac self-efficacy (Sullivan et al, 1998)
  - Mood (Whitmarsh et al, 2003)
- Intention and Intentional stability to attend CR key predictor of actual attendance (Conner et al, 2000)
- Intention is the most immediate predictor of attendance
- Predictors for attendance/non-attendance have been studied using retrospective methods with data often captured prior to hospital discharge

Use of growth modelling with latent variables:

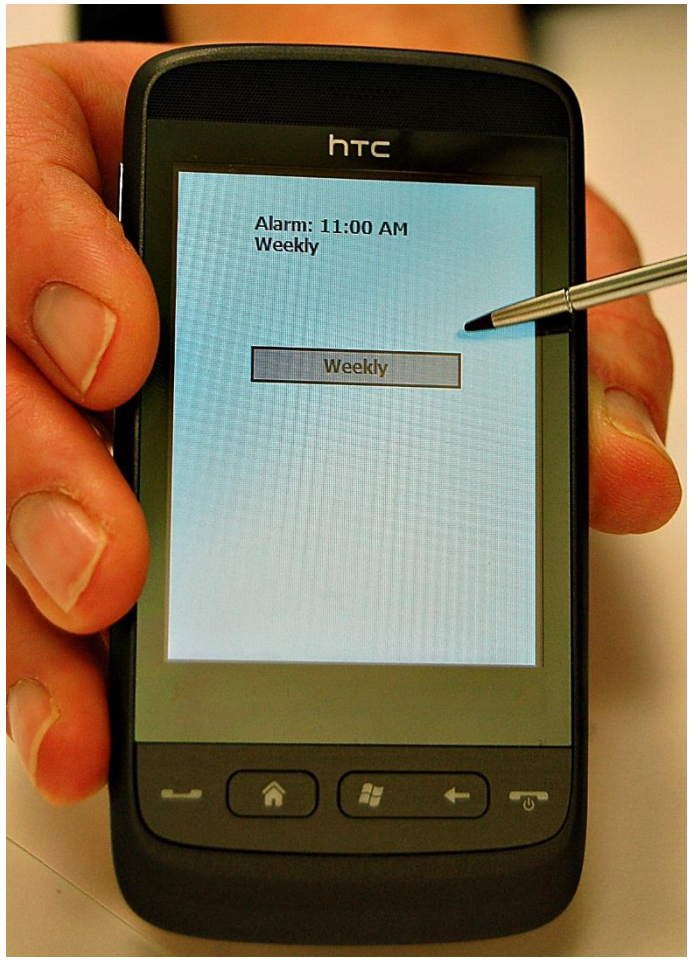
- Many of the studies in this field use analytic strategies that fail to detect the dynamic within-person changes in cardiac related perceptions often assumed by underpinning theoretical models.
- Data captured at hospital discharge may be too distant to capture much variance in attendance (e.g. French et al, 2006)
- There is a need to understand the influence in important predictors (such as intention) as they change nearer to actual attendance
- Estimate effects on attendance of (for example) baseline intention and change in intention using latent variables from growth model of intention (Steele et al., 2014)
- Such an approach can combine longitudinal data on cardiac-related beliefs and mood with time invariant variables, including demographics, to predict attendance

Aims of the study:

- Do starting levels(Q1a) and within-person changes (Q1b) in cardiac-related beliefs and mood over time following discharge predict attendance at outpatient CR?

- Q2: Is the relationship between cardiac-related beliefs and mood over time and CR attendance mediated by intention to attend?

Methods: Procedures



- 2 NHS Boards (Scotland), 3 acute care settings
- Ethics, R&D approval obtained
- Consecutive patients diagnosed with ACS were approached prior to discharge (March 12 to July 13)
- Battery of questionnaires at baseline including demographic/clinical items
- Participants carried a behavioural diary from baseline to start of CR
- A computerised weekly diary using psychometrically shortened standardised questionnaires
- Weekly data gathering, personalised signal bleep with text reminders

Methods:

- Measures
  - Baseline demographic and clinical indicators questionnaires including gender, diagnosis, DepCat, smoking history, exercise history.
  - Diary items including Illness perceptions (Sniehotta et al., 2010), Treatment beliefs (Cooper, et al., 2007), Cardiac Self-Efficacy (Sullivan et al., 1998), Positive and Negative Affect (Kamarck et al, 1998), Intention to attend CR (Maddison & Prapavessis 2004)
- Analysis
  - SPSS 21 for demographic variables
  - aML multi-level structural equation software
    - Basic growth model for cardiac-related beliefs & mood using latent variables
      - Intercept (e.g. intention at week one of diary)
      - Slope (e.g. change in intention from week 1 of diary to start of CR)
      - Weeks included to control for time effects
    - Logistic model for effect of intention intercept and slope on attendance
  - The mediation models were fitted using Mplus (Muthén and Muthén, 1998-2010)
  - Intention was reflected and applied log 10 transformation due to negative skew (DNI – Do not Intend)

Results:

- Of 488 eligible ACS patients (March 2012 to July 2013), 214 consented.
- 166 participants provided average of 5 weeks of diary entries before CR commenced (range 2 to 20 weeks)
- Mean age = 61.01 yrs (sd 11.02)
- Age range = 23.0 to 86.0 yrs

Results: Demographic and clinical

Gender	Frequency	Percentage
Male	133	79.9
Female	33	20.1
Total	166	100.0
Social Deprivation		
Category 1 (most)	22	14.2
Category 2	21	13.0
Category 3	31	18.3
Category 4	56	33.1
Category 5 (least)	36	21.3
Total	166	100.0
Diagnosis		
Stemi	63	37.8
Non-stemi	90	53.8
UAP	12	7.1
Total	165	98.7

Results: Demographic and clinical

Smoking history	Frequency	Percentage
Never smoked	57	34.3
Ex-smoker	62	36.7
Current smoker	47	29.0
Total	166	100.0
Exercise history		
no regular exercise	45	27.8
<20 mins x 3 weekly	19	11.2
>20 mins x 3 weekly	102	60.9
Total	166	100.0

Results: Growth model

- Within-person reliability was adequate for only half of the diary measures

- There was little consistency in the changes over time
  - only emotional representation (t=-3.02, p<.005),
  - cardiac self-efficacy-maintaining function (t=2.79, p<.005
  - and positive affect (t=1.96, p=.05) changing systematically.

- Over time
  - people became less concerned by their condition
  - reported more confidence in their capacity to self-manage their acute coronary syndrome
  - and became more positive and energised

Results: Logistic models of attendance: Effects of baseline and changes in cardiac-related beliefs and mood

	Timeline Acute/chronic		**Emotional representation**		**Perceived necessity**		**CSE_CS**	
Parameter	E	T	E	T	E	T	E	T
Constant	1.82	5.22	1.74	7.12	2.00	4.36	1.66	7.31
Baseline (intercept)	-0.28	-1.04	**-0.62**	**-2.83***	**0.93**	**2.94***	0.40	1.81
Change over time (slope)	-0.87	-1.39	0.14	0.29	0.75	0.73	0.15	0.30
	CSE _MF		**Do not Intend**		**Negative affect**		**Positive affect**	
Parameter	E	T	E	T	E	T	E	T
Constant	1.66	7.48	2.52	3.94	1.78	7.14	1.74	6.85
Baseline (intercept)	**0.46**	**2.07⁺**	**-1.32**	**-2.81***	**-0.66**	**-3.34#**	**0.57**	**2.66***
Change over time (slope)	n/a	n/a	**-1.72**	**-2.00⁺**	-0.29	-0.67	0.36	0.66

<.05⁺; <.005*;<.001#

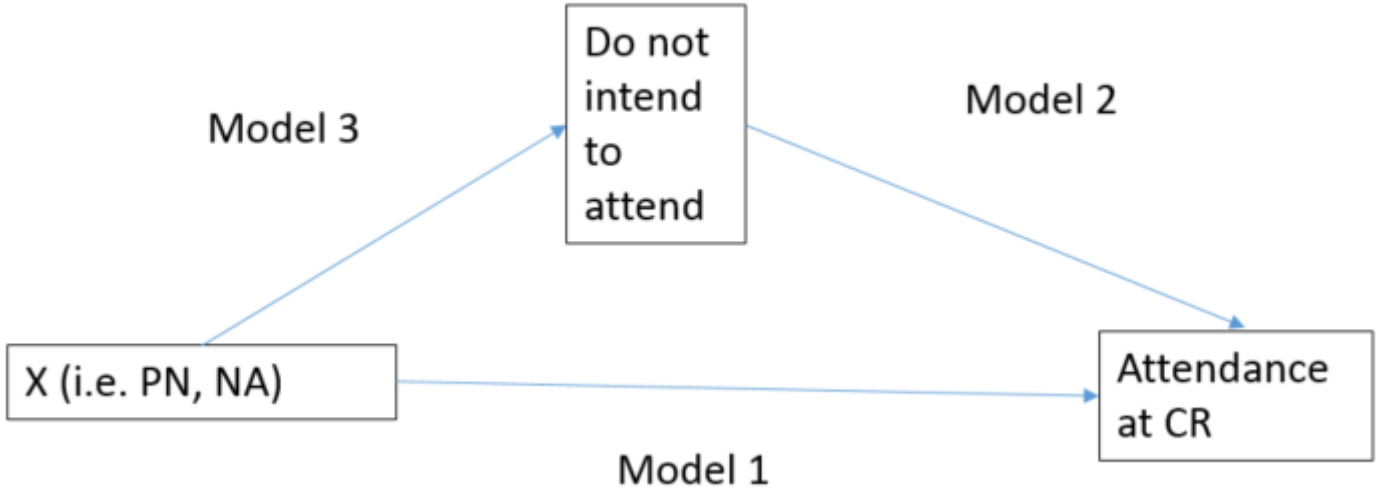
Results: Logistic models of attendance: Effects of baseline and changes in cardiac-related beliefs and mood with demographic controls

	Emotional representation		**Perceived Necessity**		**CSE_MF**	
Parameter	E	T	E	T	E	T
Constant	2.01	1.18	0.55	0.37	2.08	1.19
Baseline (intercept)	-0.34	-1.32	**0.93**	**2.80***	0.38	1.41
Change over time (slope)	0.18	0.26	0.64	0.62	-	-
SIMD5 (least deprived) vs SIMD1	**2.04**	**2.09⁺**	**2.29**	**2.28⁺**	**1.91**	**1.99⁺**

	Do not Intend		**Negative affect**		**Positive affect**	
Parameter	E	T	E	T	E	T
Constant	2.19	1.12	3.18	1.60	2.32	1.30
Baseline (intercept)	-1.34	**-2.53⁺**	-0.49	**-1.99⁺**	0.57	1.88
Change over time (slope)	-1.57	-1.56	-0.46	-0.78	0.46	0.67
SIMD5 (least deprived) vs SIMD1	**2.49**	**1.98⁺**	**1.95**	**1.98⁺**	**1.97**	**2.04⁺**

<.05⁺; <.005*;<.001#

Results: Mediating effect of “do not intend” (DNI) in relationship between perceived necessity (PNEC) and attendance (Q2):



Model 1: Higher perceived necessity was associated with higher chance of attendance (β=0.94, p<0.001)

Model 2: Adding the effects of “do not intend” intercept and slope on attendance reduced the effect of perceived necessity (β=0.79, p=0.03)

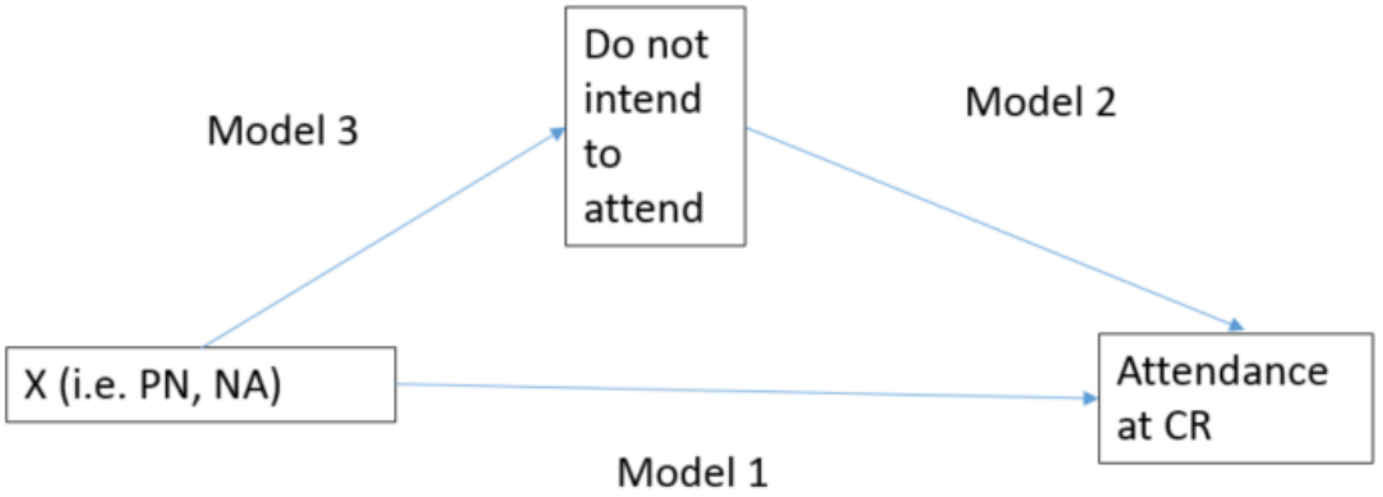
Model 3: the effect of perceived necessity on attendance was further reduced and became non-significant (β=0.70, p=0.08), by allowing for an indirect effect of perceived necessity on attendance through “do not intend”

Results: Mediating effect of "do not intend" (DNI) in relationship between perceived necessity (PNEC) and attendance: Selected parameter estimates from SEMs

	Model 1		Model 2		Model 3	
	E	T	E	T	E	T
Effects on log-odds of attendance						
PNEC intercept[a]	**0.94**	**3.83**[#]	**0.79**	**2.16**[+]	0.70	1.73
DNI baseline (intercept)[b]	-	-	**-1.05**	**-2.01**[+]	-0.92	-1.91
DNI change over time (slope)[b]	-	-	**-1.66**	**-1.96**[+]	-1.49	-1.83
Effect on DNI at week *t*						
PNEC at week *t*			-	-	-0.07	-1.94
Random effect correlations						
DNI intercept/ PNEC intercept	-	-	-	-	**-0.42**	**-4.68**[#]
DNI slope/ PNEC intercept	-	-	-	-	-0.14	-0.75
-Log-likelihood (No. parameters)	1479.6 (12)		1473.0 (14)		1444.4 (17)	
2 Δ log-likelihood, d.f (p-value)[c]	-		13.2, 2 (.001)		57.2, 3 (<.001)	

<.05[+]; <.005*;<.001[#]

Results: Mediating effect of “do not intend” (DNI) in relationship between negative affect (NA) and attendance (Q2):



Model 1: Higher negative affect at baseline was directly associated with lower probability of attendance (β=-0.75, p=0.002).

Model 2: The effect of negative affect reduced after controlling for “do not intend” intercept and slope (Model 2, β=-0.65, p=0.057).

Model 3: the effect of negative affect was further reduced and became non-significant (β=-0.40, p=0.32) after allowing for an association between “do not intend” and negative affect

Results: Mediating effect of “do not intend” (DNI) in relationship between negative affect (NA) and attendance: Selected parameter estimates from SEMs

	Model 1		Model 2		Model 3	
	E	T	E	T	E	T
Effects on log-odds of attendance						
NA intercept[a]	**-0.75**	**-3.14***	-0.65	-1.90	-0.40	-0.99
DNI baseline (intercept)[b]	-	-	**-1.29**	**-2.24+**	**-1.07**	**-2.47+**
DNI change over time (slope)[b]	-	-	**-1.72**	**-1.98+**	-1.25	-1.68
Effect on DNI at week t						
NA at week t			-	-	**0.07**	**2.52+**
Random effect correlations						
DNI intercept/ NA intercept	-	-	-	-	0.20	1.91
DNI slope/ NA intercept	-	-	-	-	**0.36**	**2.30+**
DNI intercept/ NA slope	-	-	-	-	-0.09	-0.57
DNI slope/ NA slope	-	-	-	-	-0.13	-0.49
-Log-likelihood (No. parameters)	1456.2 (14)		1447.3 (16)		1431.5 (21)	
2 Δ log-likelihood, d.f (p-value)[c]	-		17.8, 2 (<.001)		31.6, 5 (<.001)	

Discussion:

- Weekly diaries were gathered from ACS patients before CR commenced (range 2-20 weeks)
- Includes full diagnostic range of ACS patients, rather than AMI only
- High levels of perceived necessity and low negative affect at baseline were all significantly associated with CR attendance (Q1a).
- Only changes overtime in “do not attend” were related to CR attendance (Q1b)
- Higher reports of “do not intend” shortly after discharge and the more “do not intend” increased over time (i.e. intentional instability) the less likely a person was to attend CR.
- A patient was 73% and 82% less likely to attend CR with every 1 standard deviation increase in baseline (intercept) and change (slope) in “do not intend”

Discussion (continued)

- Mediational analysis revealed that “do not intend” entirely mediated the relationships between a) perceived necessity, b) negative affect and attendance (Q2).
- Perceived necessity at baseline was not, however, related to the increase in “do not intend” (change over time), i.e. was not related to a further weakening of intention or intentional instability.
- Patients experiencing high negative mood following discharge were more likely to report high “do not intend” scores at baseline and thereafter to report increasing levels of “do not intend” as their recovery progresses.
- Negative affect in the first weeks following discharge represents the key driver of subsequent intentional instability, i.e. a weakening of intention.

- Issues for intervention development
  - Effect of intention at baseline suggests early intervention
  - Early focus on patients’ views of the necessity and effectiveness of CR
  - Early and repeated focus on patient negative mood
  - Further explore effects of social deprivation

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