

From single to multiple behaviour change approaches in implementation science

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d'Ottawa
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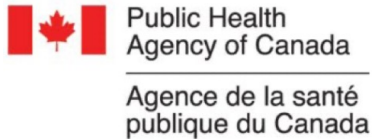
Inspired by research. Inspiré par la recherche.
Driven by compassion. Guidé par la compassion.

Affiliated with Affilié à



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Research Funding



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Colleagues who have been instrumental with this research

Jeremy Grimshaw

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Nicola McCleary

Noah Ivers

Carolina Silva

Zack van Allen

Winnie Gebhardt

Brian Little

Marie Johnston

Marta Marques

Martin Eccles

Ottawa – Canada



Implementation Science in Ottawa: Centre for Implementation Research

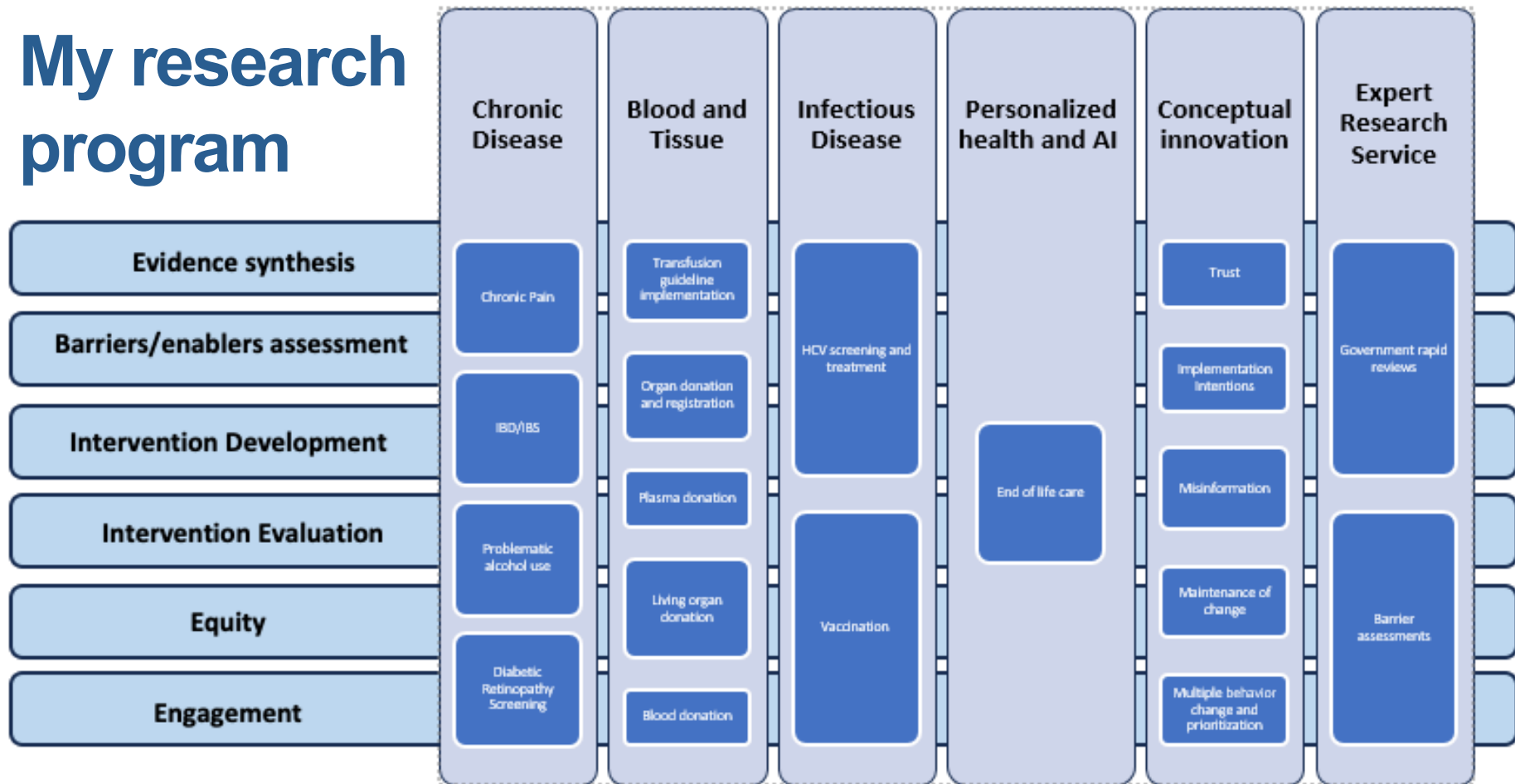
13 faculty and their teams focused on **advancing research into developing and applying Implementation Science** in health settings to improve health-care and health

Multidisciplinary Fields

- Cognitive psychology
- Epidemiology
- Health economics
- Health psychology
- Health services research
- Knowledge translation science
- Medical sociology
- Medicine
- Nursing
- Population health
- Statistics
- Other health and behavioural sciences



My research program



Overview

- Behaviour as a foundational unit of interest in implementation science
- Build a case for moving from single behaviour to multiple behaviour paradigm in implementation science with insight from our work in:
 1. Methods for specifying behaviour
 2. Interventions to change >1 behaviour
 3. Exploring how behaviours are inter-connected
 4. Trying to advance theory
- Open questions and future directions

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Behaviour as a fundamental unit of analysis in ImplSci

Behaviour as a fundamental unit of analysis in ImplSci



Guideline
Technique
Medication
Intervention
Policy
Technology



Someone in the healthcare system's **behaviour** need(s) to change

Implementation can be viewed through the lens of **behaviours** of those who need to change

- ✓ The question can then become: *who*, at *what level*, needs to change what they do
- ✓ My interest: exploring interface between behavioural science and implementation science

Behaviour underpins gaps between research evidence and routine care

Research ■ Health services

Inappropriate use of clinical practices in Canada: a systematic review

Janet E. Squires RN PhD, Danielle Cho-Young RN MScN, Laura D. Aloisio RN MScN, Robert Bell MD, Stephen Bornstein PhD, Susan E. Brien PhD, Simon Decary PT PhD, Melissa Demery Varin RN MScN, Mark Dobrow PhD, Carole A. Estabrooks RN PhD, Ian D. Graham PhD, Megan Greenough RN MScN, Doris Grinspun RN PhD, Michael Hillmer PhD, Tanya Horsley PhD, Jiale Hu RN PhD, Alan Katz MBChB MSc, Christina Krause MSc, John Lavis MD PhD, Wendy Levinson MD, Adrian Levy PhD, Michelina Mancuso PT MSc, Steve Morgan PhD, Letitia Nadalin-Penno RN PhD, Andrew Neuner MBA, Tamara Rader MLIS, Wilmer J. Santos RN MScN, Gary Teare DVM PhD, Joshua Tepper MD eMBA, Amanda Vandyk RN PhD, Michael Wilson PhD, Jeremy M. Grimshaw MBChB PhD

Overuse of outdated practice and underuse of evidenced in Canada
174 studies representing 228 clinical practices and covering 2.9m patients

Median proportion of inappropriate care: 30% (IQR 12-57%)

Underuse: 44% (IQR 24-66%)
Overuse: 14% (IQR 3-31%)

Gaps between research evidence and routine care involve behaviour

Types of underused and overused clinical practices

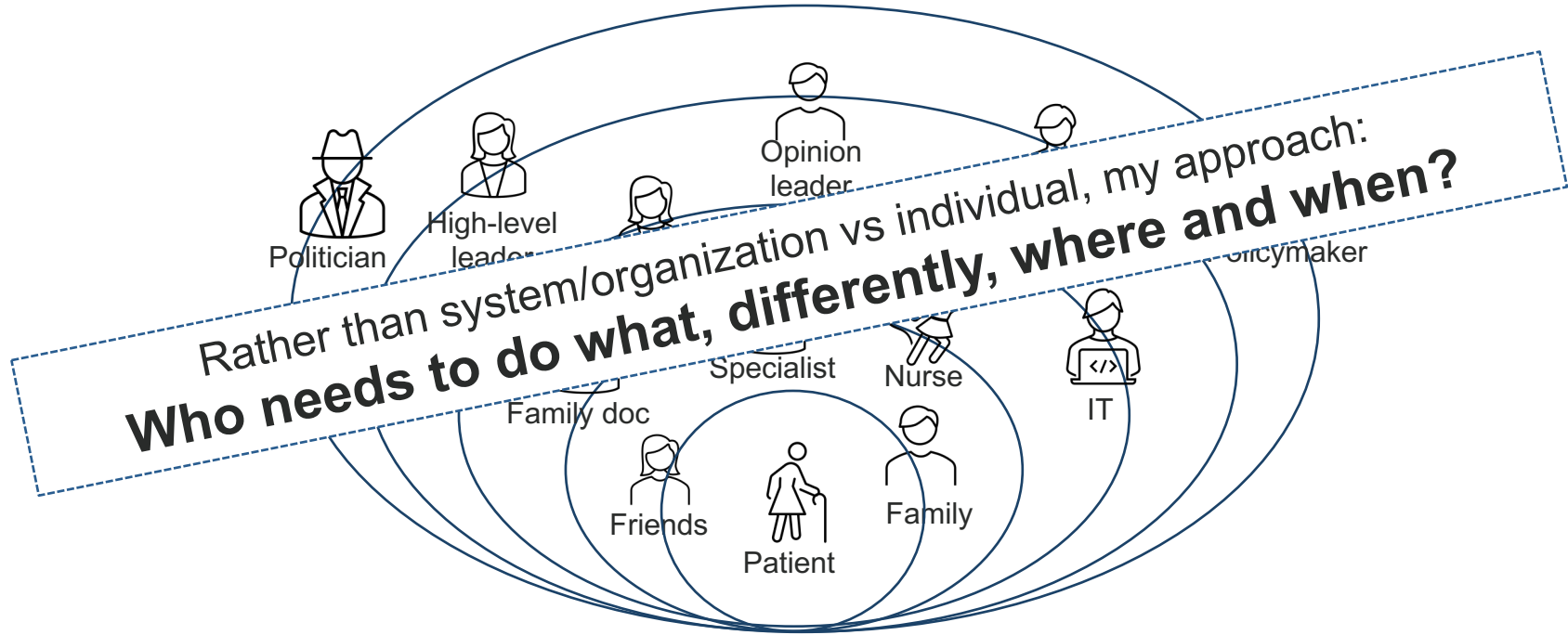
- Lab tests
- Referrals
- Assessments
- Screening
- Blood tests
- Imaging
- Acute procedures
- Biophysical therapy
- Psychosocial therapy
- Medication

Diseases/conditions

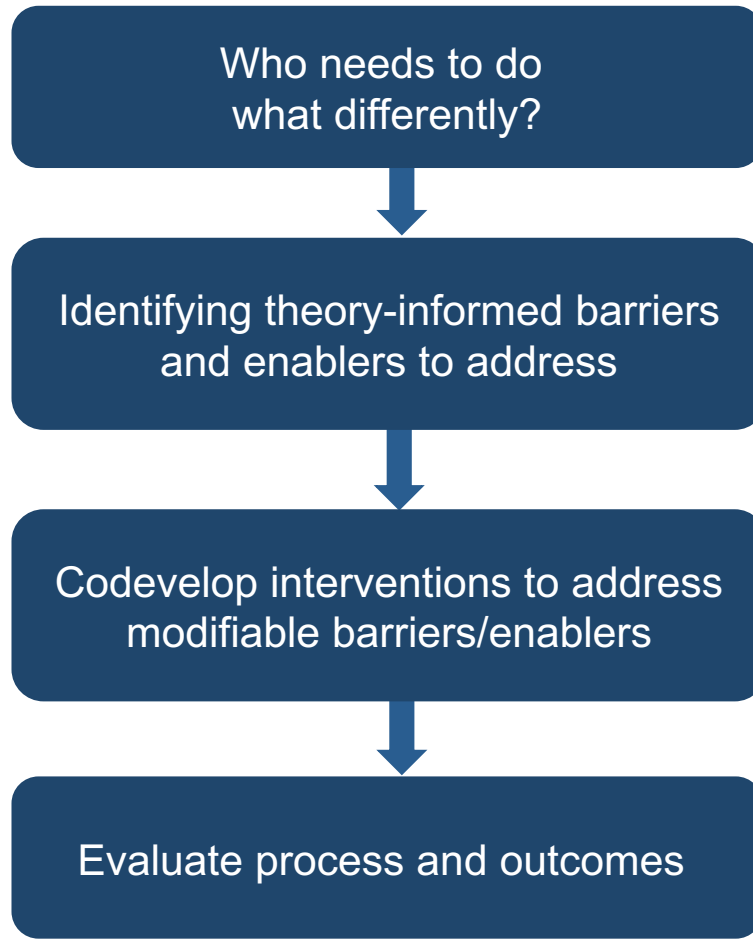
- Diabetes
- Chronic kidney disease
- COPD
- Cancers (breast, prostate, colorectal, cervical, skin, bladder, bone, oral)
- CVD
- Asthma
- Osteoporosis
- Hypertension

The Behaviour System: whose behaviour, at what level?

People, at every level, are making decisions and engaging in behaviours that impact themselves and those around them now and into the future



My toolkit:
Theories, Models,
and Frameworks
of behavioural
approaches to
ImplSci



Tools
AACTT ¹ Process Mapping ²
TDF ^{3,4,5} Dual process models ⁶
BCTTv1 ⁷ BCTO ⁸ BCW ⁹
RCTs Quasi experiments Process Evals ¹⁰

¹Presseau et al 2019; ²Best et al 2023 ³Michie et al., 2005; ⁴Cane et al., 2012; ⁵Atkins et al 2017; ⁶Potthoff et al 2022; ⁷Michie et al. 2013; ⁸Marques et al 2023; ⁹Michie et al 2011; ¹⁰Wolfenden et al. 2021

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**A case to move from single to
multiple behaviour approaches**

A typical approach

Who needs to do what differently?

Gap in care identified (e.g., hand hygiene suboptimal); a target behaviour specified in detail

Identifying theory-informed barriers and enablers to address

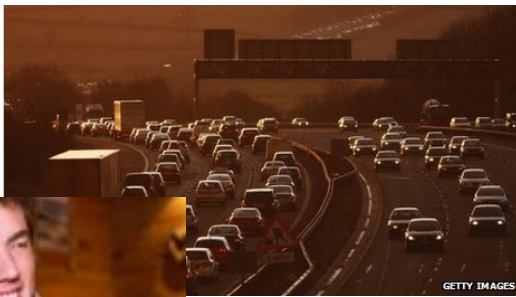
Theory-informed barrier/enabler study (qual or survey) + synthesis of existing barrier/enabler studies: identifies clear targets for intervention development to improve hand hygiene behaviour

Codevelop interventions to address modifiable barriers/enablers

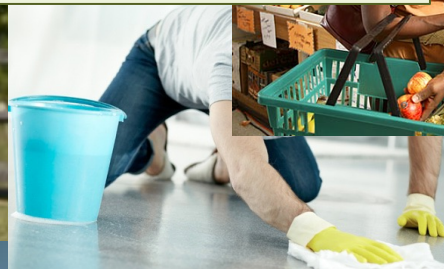
Map implementation/behaviour change strategies to barriers/enablers; bring together healthcare professionals to co-develop intervention content

Evaluate process and outcomes

Pilot for feasibility and acceptability then run cluster randomized trial with theory-based process evaluation focused on hand hygiene behaviour



Everyday life is characterised by multiple behaviours competing for our limited resources





Answer patient questions

Manage infections without antibiotics

Discussing health risks

Discuss prescribing options

Update history

Adjust meds to achieve <math><140/80\text{ mmHg}</math>

Hand hygiene

Shared decision about treatment

Exercise advice

Nutrition advice

Check A1c

Ask about stress

Adjust meds if Hb1c is >math>8\%</math>

Referring to nurse

Refer for eye screening

Provide self-management advice

Maintain rapport

Provide weight advice

See next patient

Examine feet

Attend CPD event

Limits of single behaviour approaches

- **Questionable ecological validity:** the contexts in which we aim to change behaviour are characterized by a range of behaviours vying for our limited motivation
- **Insufficient theory:** Predominant behavioural models, theories and frameworks applied in ImplSci (and HSR more generally) focus on one behaviour on which to understand, develop interventions and evaluation change
- **Whack-A-Mole risk (spillover effects):** a given intervention that successfully improves one behaviour may do so at the expense of other existing behaviours
- **Missed opportunity for synergy (knock-on effects and tipping points):** a given intervention that successfully improves one behaviour also has potential to positively impact on other behaviours

Moving to a multiple behaviour paradigm can address each of these limitations

Insights gleaned by moving to a multiple behaviour perspectives

1. Ways of specifying behaviour(s)
2. Interventions to change >1 behaviour
3. Investigating how behaviours are interconnected
4. Integrating multiple behaviour perspectives in existing theories/models/frameworks

**Multiple behaviour
insight**

1

Specifying a target behaviour

1

Identifying who needs to do what, differently: a multiple behaviour approach

- Proposed a framework to enhance the specificity of description of a target behaviour

METHODOLOGY

[Open Access](#)

Action, actor, context, target, time (AACTT): a framework for specifying behaviour

Justin Preseau^{1,2,3*}, Nicola McCleary^{1,2}, Fabiana Lorencatto⁴, Andrea M. Patey¹, Jeremy M. Grimshaw^{1,2,5} and Jill J. Francis⁶


Action

Behaviour(s) that needs to change

Actor

Person/people that do/could do the Action

Context

Physical location or social setting of Action

Target

Person/people for whom Action is performed

Time

When the Action is performed (time/date/freq)

Designed to be helpful to:

- ✓ Identify who needs to do what, differently, when and where
- ✓ Inform a more specific barrier/enabler assessment and tighter measures
- ✓ Select implementation intervention components
- ✓ Measure change in the AACTT-specified behaviour

1 Specifying the AACTT: a multiple behaviour approach

Often used to specify a single AACTT – but designed to work with multiple behaviour specification in mind too!

Single behaviour AACTT

Action Specify the *behaviour* that needs to change, in terms that can be observed or measured

Use alcohol-based hand gel

Actor Specify the person/people that *do(es)* or *could* do the action targeted

Staff physicians, nurses and residents

Context Specify the physical location, emotional context, or social setting *in which* the action is performed

In patient rooms

Target Specify the person/people *with/for whom* the action is performed

Patients receiving care at the hospital

Time Specify *when* the action is performed (the time/date/frequency)

Before and after touching a patient

Multi-Actor, Multi-behaviour AACTT

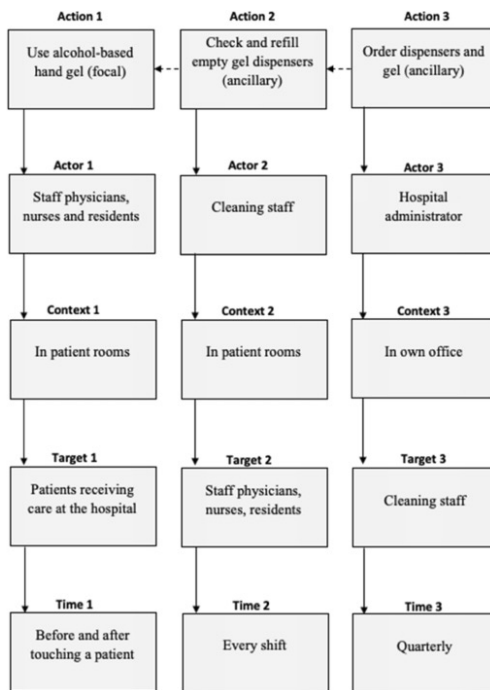
Action
Specify the *behaviours* that needs to change, in terms that can be observed or measured

Actor
Specify each person/people that *do(es)* or *could* do each of the actions targeted

Context
Specify the physical location, emotional context, or social setting *in which* the action is performed

Target
Specify the person/people *with/for whom* the action is performed

Time
Specify *when* the action is performed (the time/date/frequency)



Single Actor, Multi-behaviour AACTT

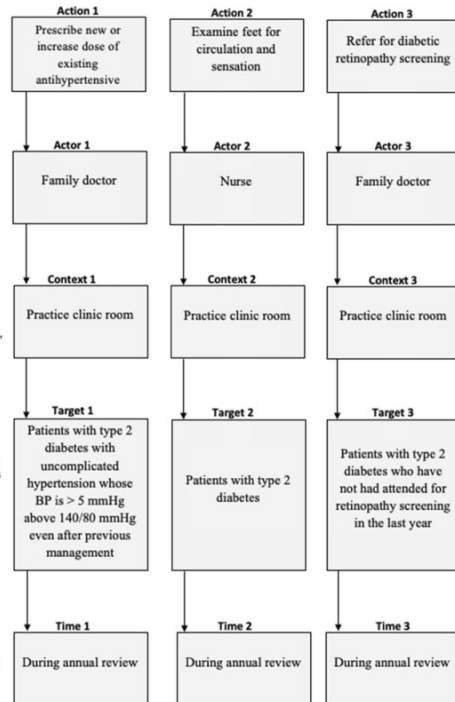
Action
Specify the *behaviours* that needs to change, in terms that can be observed or measured

Actor
Specify each person/people that *do(es)* or *could* do each of the actions targeted

Context
Specify the physical location, emotional context, or social setting *in which* the action is performed

Target
Specify the person/people *with/for whom* the action is performed

Time
Specify *when* the action is performed (the time/date/frequency)



1

An example of multi-actor, multi-behaviour AACTT specification for intervention description

STUDY PROTOCOL

Open Access



Assessing the feasibility, acceptability, and fidelity of a tele-retinopathy-based intervention to encourage greater attendance to diabetic retinopathy screening in immigrants living with diabetes from China and African-Caribbean countries in Ottawa, Canada: a protocol

Valerie Umaefulam¹, Mackenzie Wilson¹, Marie Carole Boucher², Michael H. Brent³, Maman Joyce Dogba^{4,5}, Olivia Drescher⁴, Jeremy M. Grimshaw^{1,6}, Noah M. Ivers^{7,8}, John G. Lawrenson⁹, Fabiana Lorencatto¹⁰, David Maberley¹¹, Nicola McCleary^{11,12}, Sheena McHugh¹³, Olivera Sutakovic³, Kednapa Thavorn^{1,12}, Holly O. Witteman⁴, Catherine Yu^{14,15}, Hao Cheng¹⁶, Wei Han¹⁶, Yu Hong¹⁶, Balkissa Idrissa¹⁶, Tina Leech¹⁷, Joffre Malette¹⁷, Isabelle Mongeon¹⁷, Zawadi Mugisho¹⁶, Marlyse Mbakop Nguebou⁴, Sara Pabla¹⁷, Siffan Rahman¹⁷, Azaratou Samandoulougou¹⁶, Hasina Visram¹⁹, Richard You¹⁶, Junqiang Zhao¹⁹ and Justin Presseau^{1,12,20}

RESEARCH

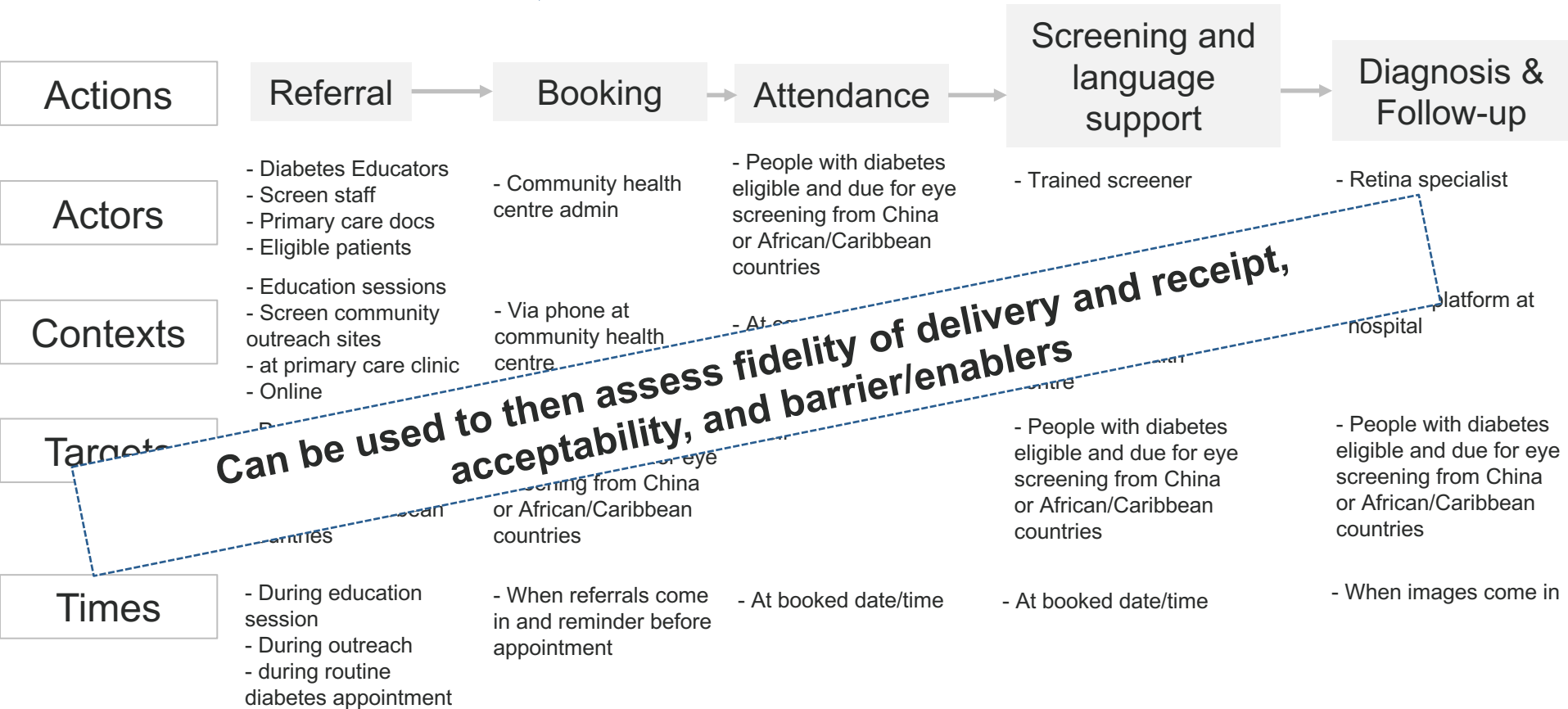
Open Access



The co-development of a linguistic and culturally tailored tele-retinopathy screening intervention for immigrants living with diabetes from China and African-Caribbean countries in Ottawa, Canada

Valerie Umaefulam^{1*}, Mackenzie Wilson¹, Marie Carole Boucher², Michael H. Brent^{3,4}, Maman Joyce Dogba^{5,6}, Olivia Drescher⁴, Jeremy M. Grimshaw^{1,7}, Noah M. Ivers^{8,9}, John G. Lawrenson¹⁰, Fabiana Lorencatto¹¹, David Maberley¹², Nicola McCleary^{11,12}, Sheena McHugh¹³, Olivera Sutakovic³, Kednapa Thavorn^{1,12}, Holly O. Witteman⁴, Catherine Yu^{14,15}, Hao Cheng¹⁶, Wei Han¹⁷, Yu Hong¹⁷, Balkissa Idrissa¹⁷, Tina Leech¹⁸, Joffre Malette¹⁸, Isabelle Mongeon¹⁸, Zawadi Mugisho¹⁷, Marlyse Mbakop Nguebou⁵, Sara Pabla¹⁸, Siffan Rahman¹⁸, Azaratou Samandoulougou¹⁷, Hasina Visram¹⁹, Richard You¹⁷, Junqiang Zhao²⁰ and Justin Presseau^{1,12,21}

More than 'just' attending screening: A multi-behaviour, multi-actor intervention



Multiple behaviour
insight

2

Interventions to change >1 behaviour

2 What do we know about interventions to change >1 behaviour?

Two systematic reviews looking at:

1. Effectiveness of interventions targeting >1 *health behaviour* to manage of chronic disease in **patients/public**
 2. Effectiveness of interventions targeting >1 ***clinician behaviour*** to manage chronic disease
- Synthesizing the change techniques/strategies used within interventions targeting multiple behaviours



Carolina Silva
Doctoral student

2

A systematic review of multiple health behaviour change interventions for patients with chronic conditions

Inclusion Criteria:

- **Population:** Individuals with chronic conditions
- **Intervention:** Any multiple health behaviour change
- **Comparators:** Any control group
- **Outcomes:** health behaviours
- **Study design:** RCTs in the healthcare context, including digital

3696 studies screened
k=61 studies included

Of included studies:

- 25 Cardiovascular diseases
- 10 Type 2 Diabetes
- 9 Hypertension
- 7 Cancer
- 3 Multiple conditions
- 1 One or more chronic conditions

2 Intervention characteristics

- Number of behaviours targeted: 2 to 5 ($M = 3$)
- Most frequently targeted behaviours: Physical activity ($k = 60$, 98%) and diet ($k = 56$, 92%)
- 10 clusters of multiple behaviours identified
 - Most frequent behavioural clusters: 'Physical Activity, diet and smoking' ($k = 20$, 33%) and 'Physical Activity and diet' ($k = 16$, 27%)
- Order of multiple behaviour change: Simultaneous ($k = 46$, 75%), Sequential ($k = 8$, 13%), unclear ($k = 10$, 16%)
- $K = 43$ included in meta-analyses

2

Meta-analyses of effects of interventions targeting >1 behaviour on specific health behaviours

	Diet: Fruit & Veg Consumption	Diet: Fat Consumption	PA: Physical Activity	PA: Sedentary behaviour	Smoking Cessation	Alcohol Consumption	Medication Adherence
Subjective & Continuous	$d = .23$ $CI = .013$ to $.452$ $I^2 = 86.04\%$ $k = 8$	$d = .44$ $CI = .20$ to $.67$ $I^2 = 85.47\%$ $k = 10$	$d = .18$ $CI = .09$ to $.26$ $I^2 = 50.95\%$ $k = 20$	$d = 2.00$ $CI = N/A$ $I^2 = N/A$ $k = 1$	$d = -.02$ $CI = -.21$ to $.17$ $I^2 = 19.41\%$ $k = 4$	$d = .08$ $CI = -.05$ to $.21$ $I^2 = 15.35\%$ $k = 6$	$d = .37$ $CI = .19$ to $.56$ $I^2 = 3.67\%$ $k = 4$
Subjective & Dichotomous	$RR = 1.33$ $CI = 1.04$ to 1.69 $I^2 = 87.93\%$ $k = 7$	$RR = 1.29$ $CI = .90$ to 1.85 $I^2 = 64.56\%$ $k = 3$	$RR = 1.66$ $CI = 1.40$ to 1.98 $I^2 = 85.66\%$ $k = 12$	$RR = 2.00$ $CI = N/A$ $I^2 = N/A$ $k = 1$	$RR = 1.10$ $CI = 1.02$ to 1.19 $I^2 = 77.63\%$ $k = 12$	$RR = 1.03$ $CI = .94$ to 1.13 $I^2 = 55.11\%$ $k = 5$	$RR = 1.05$ $CI = N/A$ $I^2 = N/A$ $k = 2$
Objective & Continuous			$d = .36$ $CI = -.07$ to $.79$ $I^2 = 87.22\%$ $k = 3$				
Objective & Dichotomous					$RR = 1.25$ $CI = 1.02$ to 1.54 $I^2 = 65.35\%$ $k = 4$		

2

A systematic review of interventions to change >1 *health care professional* behaviour

Inclusion Criteria:

- **Population:** Any health care professional
- **Intervention:** Aiming to change two or more clinical behaviors (at least one focused on health behaviour change advice)
- **Comparators:** Any
- **Outcomes:** clinician behaviours
- **Study design:** RCTs

6703 studies screened
k=17 studies included

Included studies targeted:

- MDs (n=8)
- Nurses (n=2)
- Physiotherapist (n=1)
- Combo of HCPs (n=6)

- 4 were theory based
- 9 delivered the intervention through a combination of in person and remote contacts
- 5 had a duration of 1 day

2

Preliminary descriptive results to date *analyses ongoing

Types of HCP behaviours targeted:

	Provision of advice	Screening/assessment	Prescription	Referral	Treatment	Diagnosis	History taking
Provision of advice	17						
Screening/assessment	7	6					
Prescription	6	3	5				
Referral	5	3	4	5			
Treatment	3	1	3	2	3		
Diagnosis	1	1				1	
History taking	1	1				1	1

**Multiple behaviour
insight**

3

**How are behaviours
interconnected?**

3

Exploring how multiple intentions and behaviours are linked

- Relationship between **intention** and **behaviour** among the strongest and most consistently observed
- Almost everything we know about intention-behaviour is based within the single-behaviour paradigm
- People tend to have lots of intentions and engage in many behaviours

Research Questions

- How many behaviours do individuals intend to enact at any given time?
- Does the number of intentions relate to the success or failure in following through to enacting behaviours?
- Does the number of intended behaviours, and success/fail rate in enacting them, correlate with QoL?

“You Can’t Always Get What You Want”: A Novel Research Paradigm to Explore the Relationship between Multiple Intentions and Behaviours

Falko F. Sniehotta*

Newcastle University, UK

Fuse: The UK CRC Centre of Excellence for Translational Research in Public Health, Newcastle University, UK

Justin Presseau

Newcastle University, UK

Ottawa University, Canada

Julia Allan

Aberdeen University, UK

Vera Araújo-Soares

Newcastle University, UK

3

Design

- N=116 students completed a baseline and 1-week follow-up questionnaires
- Extracted every intention measure from 185 papers in systematic review of Theory of Planned Behaviour studies (Armitage & Conner, 2001); removed duplicates, those n/a to adults or that do not have a 1-week time-frame
- Baseline: Intention items for 51 different behaviours adjusted to have same time-frame (“in the next 7 days, I intend...”); + age & sex
- Follow-up: behaviours measured as self-report at follow-up for all 51; QoL (WHOQOL)
- Dichotomised intention responses into “intenders” and “non-intenders” then for each respondent, computed:
 - Total number of intentions out of 51;
 - Number successfully translated into behaviour in subsequent week;
 - Number of intentions failed to translate

3

Results

M= 18 (SD=8) intentions out of 51 possible options for the next week
Of those:

- M=13 (SD=6) were successfully translated into behaviour
- M=5 (SD=4) failed to be translated into behaviour

Bivariate correlations

	<i>Intentions</i>	<i>Failed</i>	<i>Succeeded</i>
Intentions		.698**	.891**
Failed			.297**
Succeeded			
Percentage			
Sex	.103	-.038	.162
Age	.097	.004	.127
QOL rate	.273**	.268**	.194*
QOL enjoylife	.305**	.227*	.263**
QOL meaningfullife	.281**	.216*	.238*
QOL selfsatisfaction	.233*	.234*	.162
QOL depression	-.047	-.081	-.016

- ✓ Having more intentions associated with more success translation into behaviour and more failed attempts at behaviour
- ✓ Having more intentions, successfully translating them, and failing at some all associated with greater QoL

3 Behaviour network analysis?

- Social network analysis has provided insight into how people are interconnected
- What if applied such approaches to the behaviours that people engage in?
 - Each **behaviour** = a **node** in a person's behavioural network
 - Each **node** is potentially linked to each other **node** (a tie)
 - Possible to think of each individual as having their own behavioural network

3

Establishing the methods for behavioural network analysis

Modelling co-occurring and co-varying health behaviours: applications of network psychometrics and machine learning¹

- **Co-occurrence:** an individual engaging in 2+ behaviours
- **Covariation:** association between the behaviours that an individual engages in



Dr Zack van Allen

3

Co-occurrence and covariation in multiple behaviours

Co-occurrence = person centered

Categorize people into groups based on their behaviours they share

(cluster analysis)

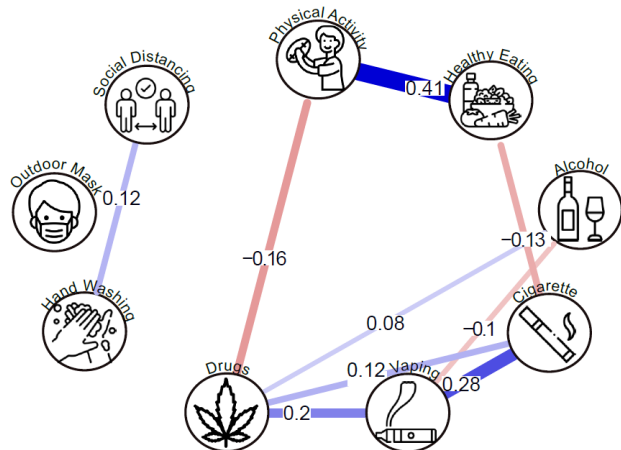
Group 1: People who smoke, drink regularly, walk, and eat moderately healthily

Group 2: People who don't smoke, drink occasionally, exercise regularly and eat healthily

Co-variation = behaviour centered

Examine the relationship amongst the behaviours that people engage in

(network analysis)



3 Clustering of multiple behaviours

Canadian Longitudinal Study on Aging (CLSA), nationally representative survey (2010-2033) of 50,000+ individuals ages of 45-85



Clustering of Health Behaviors in Canadians: A Multiple Behavior Analysis of Data from the Canadian Longitudinal Study on Aging

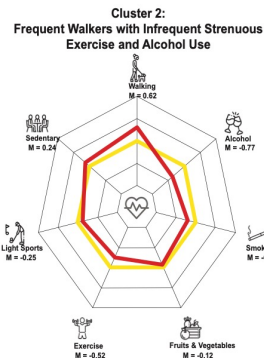
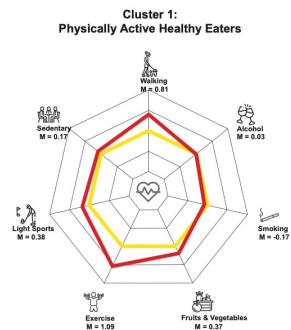
Zack van Allen^{1,2} · Simon L. Bacon^{3,4} · Paquito Bernard^{5,6} · Heather Brown⁷ · Sophie Desroches⁸ · Monika Kastner⁹ · Kim L. Lavoie^{4,10} · Marta M. Marques¹¹ · Nicola McCleary^{1,12} · Sharon Straus^{13,14} · Monica Taljaard^{1,12} · Kednapa Thavorn^{1,12} · Jennifer R. Tomason¹⁵ · Justin Presseau^{1,2,12}

Health Behaviours	Response Prompt
Sedentary Behaviour	
Walking	report on activity levels over the previous 7 days: 1 (never) to 4 (often, 5-7 days)
Physical Activity	
Exercise	
Fruit / Vegetable Intake	How many per day? 1 (less than two) to 7 (seven or more)
Smoking	Have you smoked occasionally, daily, or not at all during a 30-day window
Alcohol Use	Drinks in last year 1 (almost every day) to 7 (less than once a week)

3

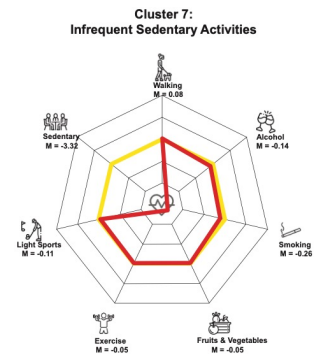
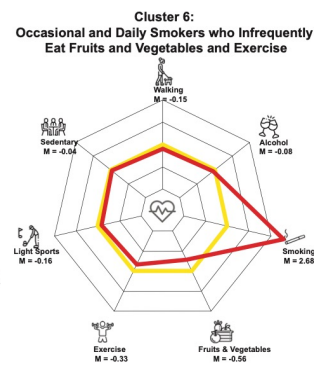
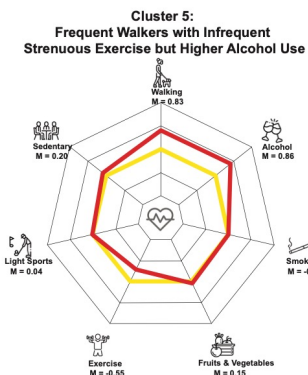
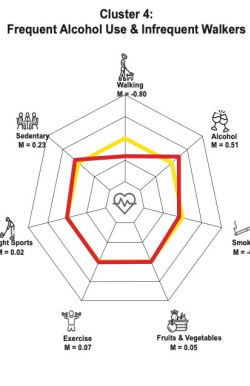
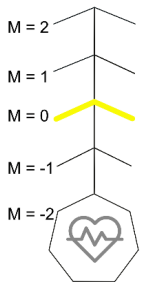
Results

7 Clusters people defined by the extent to which they engage in measured behaviours



Legend

- Yellow line: Standardized mean for all participants
- Red line: Standardized mean for cluster



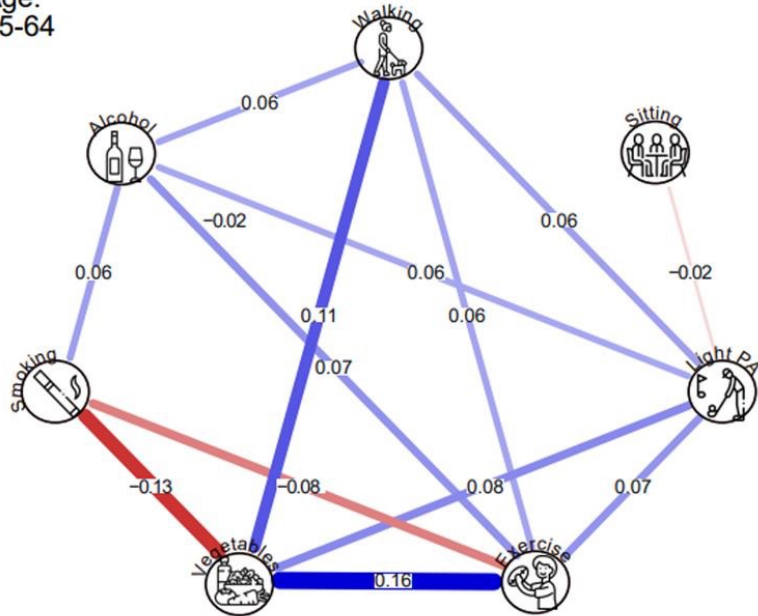
3 Covariation of multiple behaviours: a network analysis perspective

- Secondary analysis of two large datasets:
 - Canadian Longitudinal Study on Aging (n=40,268) including 7 behaviours
 - iCARE data focused on health behaviours during the COVID-19 pandemic (n=23,168)
- Used Graphical Gaussian Model (GGM) to model and visualize the network of polychoric partial correlations between behaviours (Epskamp & Fried, 2018)

3 Covariation: 2 datasets

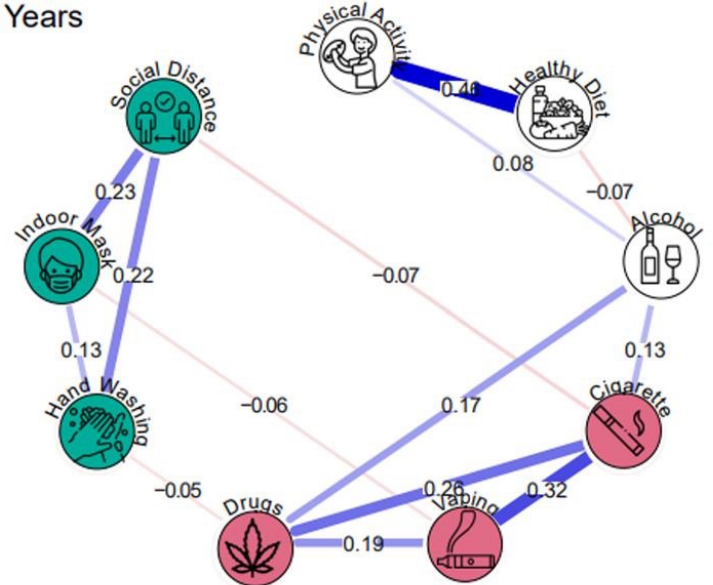
CLSA dataset

Age:
45-64



iCARE dataset (survey 5-10)

Age:
< 46 Years



3 Implications

- Co-occurrence (behaviour clusters) and covariation (behaviour networks) demonstrate how behaviour systems can be mapped
 - ✓ Identifying clusters of similar co-occurring behaviours: opportunities for tailoring to multiple behaviours
 - ✓ Identifying covarying behaviours (+ & -) provides opportunity to leverage or evaluate knock-on/spillover effects in interventions

Next steps: Testing in healthcare provider behaviour network (leverage routinely collected data)

3 Implications

Mapping the behaviour system opens new research questions:

- What happens to **other** behaviours in the behaviour network when one behaviour is changed (increased, decreased), added (new behaviour) or stopped (de-implemented)?
- Which behaviours are **most central**? Are our target behaviours central? (measure of priority). How many degrees of separation between central and peripheral behaviours?
- Can we focus on a central behaviour to promote a **knock-on (spillover) effect** to our target behaviour?

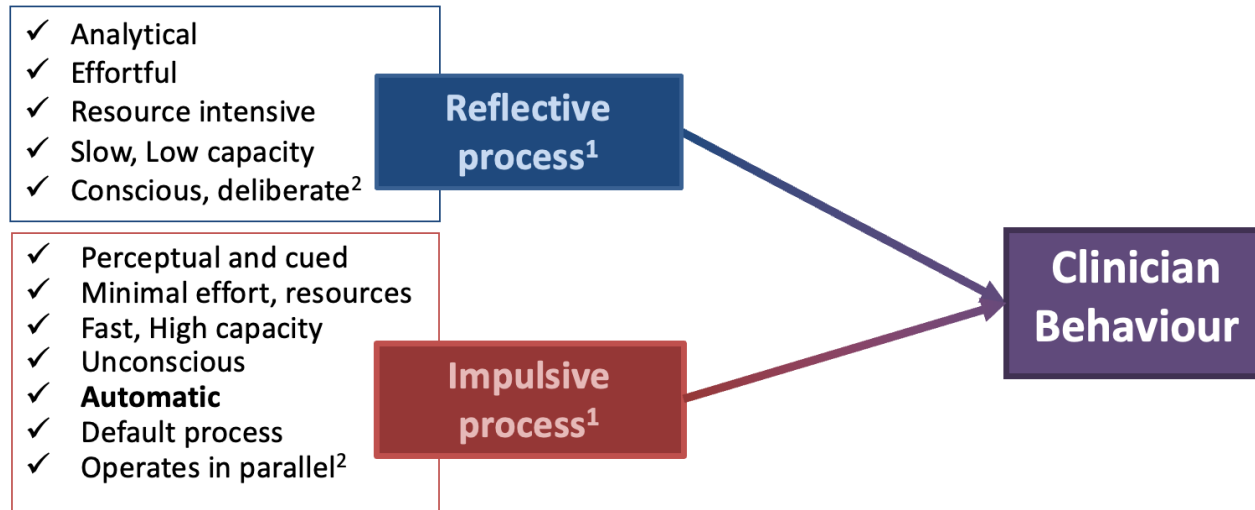
**Multiple behaviour
insight**

4

**Integrating multiple behaviour
perspectives into existing theory**

4 Theory testing across >1 clinical behaviour

Dual process models suggest that behaviour is determined by two interacting processes¹

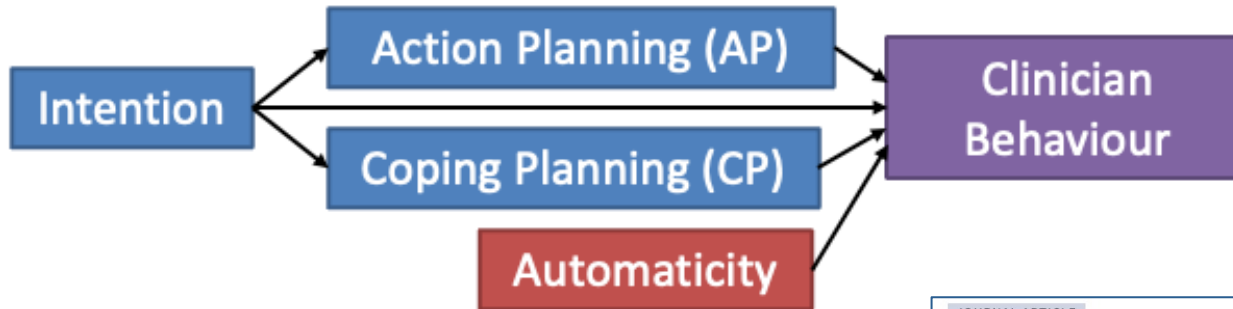


- Dual process approach provides an opportunity to jointly account for
 - Skilled decision-making involving behaviours with highly salient consequences (**reflective process**)
 - Automatic responses to environmental cues in stable contexts (**impulsive process**)

4

Theory testing across >1 clinical behaviour

Tested a dual process model predicting six clinical behaviours in same sample



JOURNAL ARTICLE

Reflective and Automatic Processes in Health Care Professional Behaviour: a Dual Process Model Tested Across Multiple Behaviours ^{FREE}

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Author Notes

Annals of Behavioral Medicine, Volume 48, Issue 3, December 2014, Pages 347–358,

4

Design

- Prospective predictive design¹. Postal questionnaires sent at baseline and 12 months to GPs and nurses across the UK
- **Main outcome:** Six clinician self-reported diabetes management behaviours @12 months follow-up

Six nested studies

N=335 Prescribing for blood pressure (140/80mmHg)

N=288 Prescribing for HbA1c (>8%)

N=417 Providing weight management advice (BMI>30)

N=332 Providing diabetes self-management advice

N=346 Providing diabetes education

N=218 Examining feet

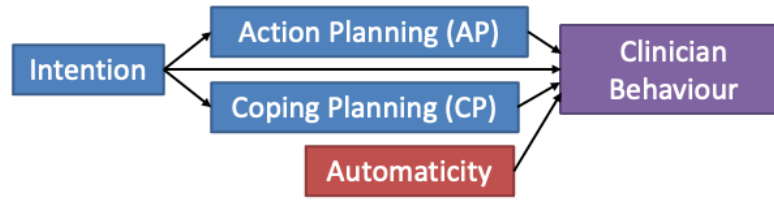
Baseline: 843
questionnaire sent (99
practices)

489 returned completed
(58% baseline response)

12-month follow-up: 427
returned completed
(51% cumulative
response)

¹Eccles et al (2011). *Implementation Science*.

4 Results



Clinical Behaviour	Reflective process		Impulsive Process (Automaticity)	R^2
	Indirect effect (via AP or CP)	Direct intention effect		
1. Prescribing (BP)	via AP; B=.11 (95% CI .00, .24)	B'=.49**	B=.32**	0.14
2. Prescribing (HbA1c)	ns	B'=.36*	B=.25*	0.14
3. Advising (self-management)	via CP; B=.14 (95%CI .02,.29)	B'=.49*	B=.13	0.24
4. Advising (weight management)	via CP; B=.08 (95%CI .01,.16)	B'=.09	B=.41**	0.23
5. Advising (general education)	via AP; B=.36 (95%CI .11, .65)	B'=.38**	B=.02	0.28
6. Examining (feet)	ns	B=.76**	B=.48**	0.55

4

Summary

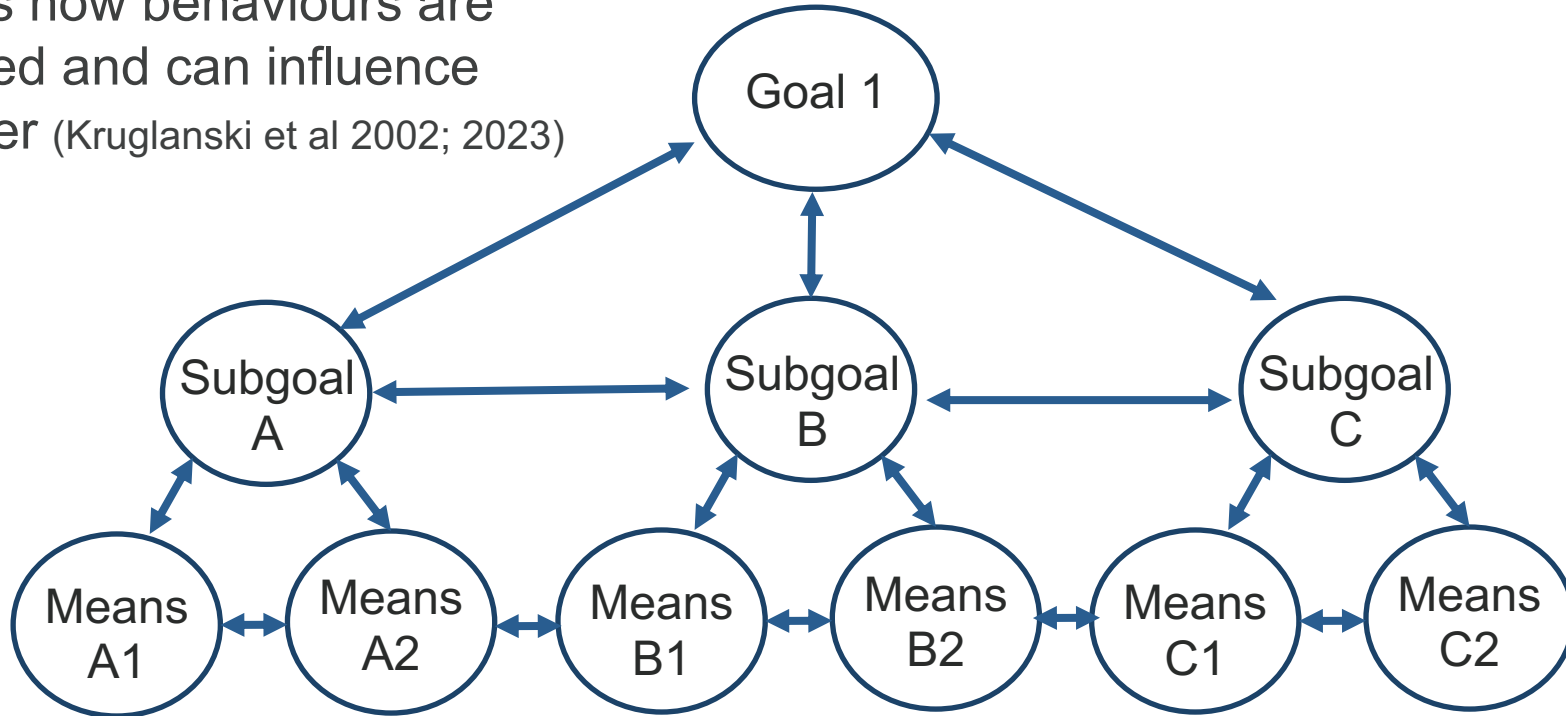
- ✓ Both **reflective** and **impulsive** processes involved in predicting clinician behaviours
 - ✓ **Impulsive process** involved in **prescribing, examining and advising**, though not without the input of the **reflective process**

Testing theory across **multiple behaviours** provides internal replication and robust hypothesis testing

4

Drawing from Goal Systems Theory

An integrative theory that describes how behaviours are inter-linked and can influence each other (Kruglanski et al 2002; 2023)



4

Multiple behaviour approaches = opportunity to draw in factors that describe the relationship between behaviours

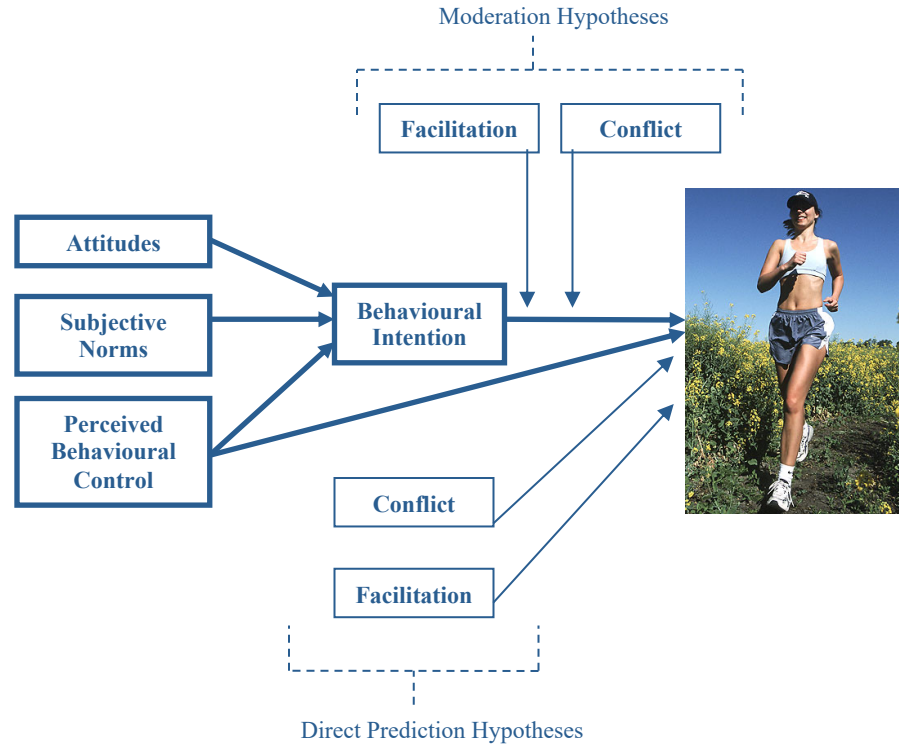
Opportunity to better account for and address multiple competing demands

- ✓ **Behaviour Conflict:** Behaviour A may *interfere with* Behaviour B, making it less likely that Behaviour B will be pursued by accounting for (limited) available resources
- ✓ **Behaviour Facilitation:** Behaviour A may *help* Behaviour B, making it more likely that Behaviour B will be pursued
- ✓ **Behaviour Priority:** Behaviour A may have an absolute or context-specific *importance* over Behaviour B

Do these factors add value in understanding behaviour above and beyond “classic” MTFs?

4

Study 1: Do behavioural facilitation and conflict predict physical activity beyond a 'classic' theory?



4 Methods

- Procedure
 - Time 1 (N=260): Theory of Planned Behaviour + Personal Projects Analysis
 - Elicit goal-directed behaviours characterising their daily life ('personal projects') then add 'participate in regular PA' to their list
 - TPB questionnaire for Physical Activity
 - Goal conflict and goal facilitation rating
 - Time 2 (N=137): short self-report follow-up (online) eight weeks later
- Participants: Mean: 21.3 years old (sd=6.89); 79% women; 55% psychology students

4 Results: adding conflict

	ΔR^2	β	B	p
Step 1	.15			<.01
Perceived Behavioural Control		.15	.28	.13
Intention		.28	.60	<.01
Step 2	<.01			.49
Perceived Behavioural Control		.14	.26	.16
Intention		.28	.61	<.01
Conflict		-.06	-.07	.49
Step 3	<.01			.41
Perceived Behavioural Control		--	.26	.45
Intention		--	.61	<.01
Conflict		--	-.07	.47
Intention X Conflict		--	-.07	.41

X no direct relationship with behaviour

X no interaction

4 Results: adding facilitation

	ΔR^2	β	B	p
Step 1	.15			< .01
Perceived Behavioural Control		.15	.28	.13
Intention		.28	.60	.006
Step 2	.03			.02
Perceived Behavioural Control		.10	.19	.30
Intention		.26	.57	< .01
Facilitation		.19	.23	.02
✓ direct relationship with behaviour				
Step 3	.02			.09
Perceived Behavioural Control		--	.20	.28
Intention		--	.66	< .01
Facilitation		--	.24	.02
Intention X Facilitation		--	.13	.09
X no interaction				

4

Study 2: Do behavioural facilitation and conflict predict physical activity beyond a 'classic' theory in community sample?

Do **goal conflict** and **goal facilitation** account for variability in walking in people with diabetes *beyond...*

- Demographic
- Motivational and volitional factors from the Health Action Process Approach (Schwarzer et al)
- Methods: Cross-sectional survey with people with diabetes across Scotland; n=356 (mean age: 65.24)



Dr Masoumeh
Namadian

4

Results: do demographic and motivation constructs predict walking?



Variables	Med R^2	Med ΔR^2	Unstandardised coefficients		Sig.
			B	SE	
Step 1 – Demographics Factors& Predictors of Intention	0.04				
BMI**			-0.74	0.24	<0.01
Age*			-0.28	0.13	0.04
Sex			3.86	2.50	0.12
Outcome Expectations			0.06	1.93	0.98
Social Support			-0.02	0.88	0.98
Risk Perceptions			-0.84	0.89	0.35
Step 2 – Predictors of Motivation	0.07	0.03			
BMI**			-0.70	0.23	<0.01
Age*			-0.29	0.13	0.03
Sex			3.43	2.49	0.17
Outcome Expectations			-3.06	2.23	0.17
Social Support			-0.73	0.93	0.44
Risk Perceptions			-0.67	0.90	0.46
Intention**			5.61	2.08	0.01
Self-efficacy*			-3.59	1.83	0.05

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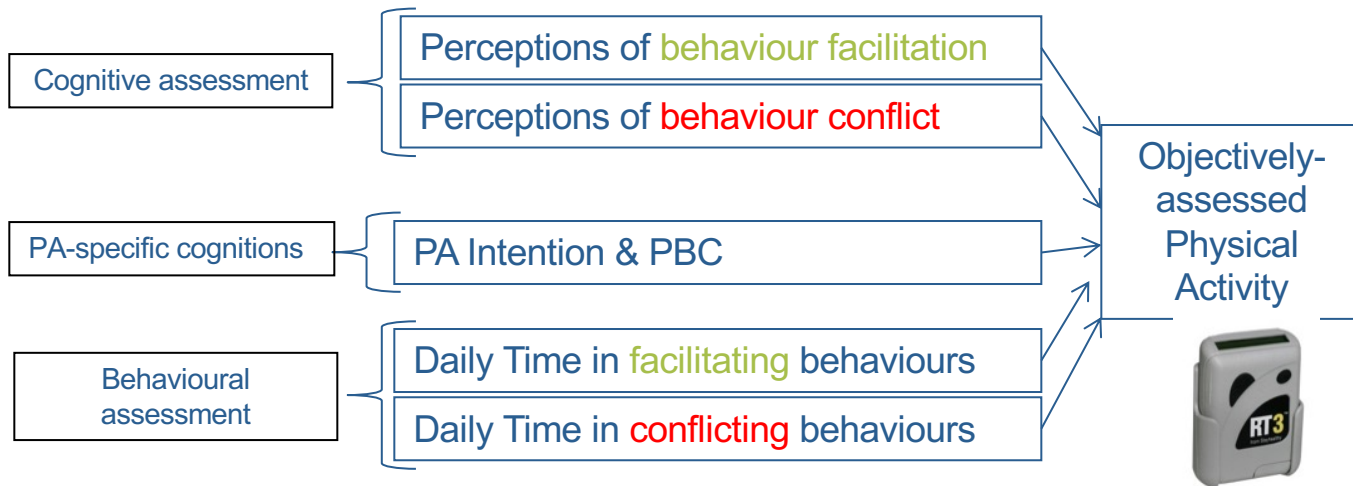
Results: do volitional or multiple goal constructs add?

Variables	Med R^2	Med ΔR^2	Unstandardised coefficients		Sig.
			<i>B</i>	<i>SE</i>	
Step 3 – Predictors of Volition	0.08	0.01			
BMI**			-0.72	0.23	<0.01
Age*			-0.32	0.13	0.01
Sex			3.12	2.48	0.21
Outcome Expectations			-3.20	2.22	0.15
Social Support			-1.00	0.98	0.31
Risk Perceptions			-0.87	0.91	0.34
Intention			3.18	2.40	0.19
Self-efficacy			-3.42	1.84	0.06
Action Planning			2.38	2.61	0.36
Action Control*			4.97	2.37	0.04
Step 4- Multiple Goals	0.15	0.07			
BMI*			-0.57	0.22	0.01
Age**			-0.34	0.13	0.01
Sex			3.62	2.40	0.13
Outcome Expectations			-1.64	2.23	0.46
Social Support			-1.17	0.99	0.25
Risk Perceptions			-1.00	0.88	0.26
Intention			4.11	2.31	0.08
Self-efficacy			-3.47	1.78	0.052
Action Planning			1.64	2.50	0.51
Action Control			0.81	2.42	0.74
Goal Facilitation**			7.78	1.57	<0.01
Goal Conflict			-1.46	1.50	0.33

4

Study 3: Ok, what about predicting objectively-assessed behaviour?

- Do **behaviour facilitation** and **behaviour conflict** predict objectively assessed PA?
- Does daily resource use in **facilitating** and **conflicting behaviours** contribute to predicting?



4 Study 3: Design

- Design: Prospective study with daily objective assessment of physical activity
 - **Baseline:** *Microsoft Excel*-based procedure^{1,2,3} sent and returned by email including intention and self-efficacy items, and personal goal elicitation, **behaviour conflict** and **behaviour facilitation** ratings
 - **Follow-up:** Day Reconstruction-based 7-day diary, and research-grade accelerometer
- Participants: 123 students sent baseline materials, 118 completed all measures (29 men, 89 women), mean age 23.4 years. Final sample: $n=106$

4

Study 3: Follow-up

- Modified **Day Reconstruction Method**¹ daily diary for 7 days: “Think of today as a continuous series of scenes or episodes in a film”
 - Episode name
 - Start and end time
 - Activities involved
 - Interaction partners
 - Which personal projects is each episode related to (if any?)
- **Behavioural measure** of **behaviour conflict** and **behaviour facilitation**: Daily time spent in **conflicting** and **facilitating** behaviours computed from daily diaries
- Wore RT3 tri-axial accelerometer² for 7 days.
 - Daily time spent in moderate to vigorous (MV)PA as main outcome. Raw accelerometer data filtered using recommended procedures³ and cut-offs⁴ for MVPA



4 Study 3: Follow-up

Multilevel Model Testing the Prediction of MVPA From Cognitively Assessed (Hypothesis 1) and Behaviorally Assessed (Hypothesis 2) Goal Facilitation and Goal Conflict

Parameters	Hypothesis 1			Hypothesis 2		
	β	<i>B</i> (<i>SE</i>)	<i>p</i>	β	<i>B</i> (<i>SE</i>)	<i>p</i>
Fixed effects level 2						
Intercept	.37	102.93 (6.08)	<.01	.37	101.74 (6.46)	<.01
Age	-.17	-1.61 (.46)	<.01	-.16	-1.50 (.47)	<.01
Gender	-.50	-32.45 (7.18)	<.01	-.49	-31.02 (7.35)	<.01
Number of projects	.06	1.38 (1.38)	.32	.07	1.50 (1.42)	.29
Intention	-.09	-4.58 (2.99)	.13	-.10	-5.07 (3.05)	.10
Perceived behavioral control	.15	7.59 (2.97)	.01	.14	6.87 (3.03)	.02
Perceived goal facilitation	.12	.40 (.19)	.04	.10	.30 (.21)	.16
Perceived goal conflict	.05	.18 (.20)	.38	.10	.37 (.22)	.09
Fixed effects level 1						
Daily time wearing accelerometer	.40	.14 (0.01)	<.01	.41	.14 (0.01)	<.01
Daily pursuit of facilitating goals	—	—	—	.10	.03 (.01)	.06
Daily pursuit of conflicting goals	—	—	—	-.16	-.04 (.01)	<.01
Random effects						
Level 2 variance ($\sigma_{\eta_0}^2$, <i>SE</i>)		290.59 (178.18)	.10		330.07 (178.65)	.06
Level 1 variance (σ_{ϵ}^2 , <i>SE</i>)		2755.71 (211.80)	<.01		2673.20 (204.42)	<.01
α (autocorrelation parameter)		521.30 (210.10)	.01		510.40 (205.90)	.01

Note. *B* = unstandardized coefficients; β = standardized coefficients; *SE* = standard error; MVPA = moderate to vigorous physical activity. All *p* values are two-tailed.

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Study 3: summary

- **Replication:** *Perceptions* of **behaviour facilitation**, but not **behaviour conflict**, predict objectively measured PA over and above intention and perceived control
- **Extension:** *behavioural assessment* of **goal conflict** but not **goal facilitation** negatively predicted PA over intention and perceived control
 - Less objectively-assessed physical activity on days when spent more time in conflicting behaviours, controlling for intention and perceived control towards physical activity

A photograph of a doctor with grey hair, wearing a white lab coat and a stethoscope, sitting at a desk and talking to a patient. The patient is wearing a white hospital gown and is sitting on a blue examination table. The room has a large window in the background showing a view of a city. The image is overlaid with several blue text boxes containing medical tasks and patient management goals.

Capability

Opportunity

Motivation

Prescribe for blood pressure to achieve <140/80 mmHg

Prescribe for glycemic control when Hb1c is >8%

Provide diabetes-related education

Provide self-management advice

Examine feet

Provide weight advice

Update history

Measure BP

Address patient agenda

Manage infections without antibiotics

Discussing health risks

Discuss prescribing options

Shared decision about treatment

Exercise advice

Nutrition advice

Ask about stress

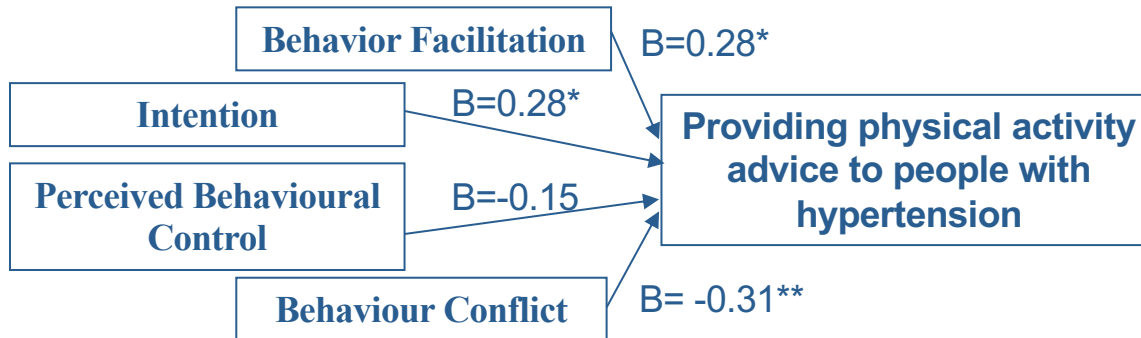
Referring to nurse

Stay on time

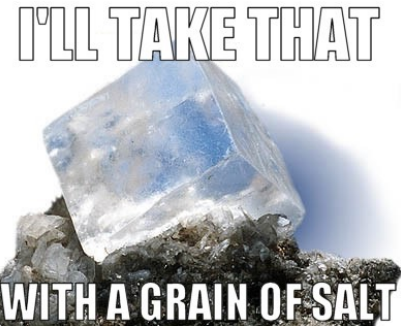
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Study 4: Do these perspectives extend to healthcare professionals?

- Questionnaire study using a predictive design w/ 6 month follow-up of behaviour in Scotland
- 53 GPs and nurses (out of 606) from 40 practices (out of 153) responded to both time points



* $p < .05$; ** $p < .01$



Insights gleaned by moving to a multiple behaviour perspectives

Summary

Summary and take homes

- ✓ Behaviour is a fundamental unit of analysis in implementation science
- ✓ Shifting from a single behaviour to a multiple behaviour paradigm can help to:
 - ✓ Describe the AACTT sequences of people at multiple levels who need to do things differently
 - ✓ Identify clusters of people engaging in similar levels of multiple behaviours: tailoring
 - ✓ Model the behaviour system using network analysis to visualize the interconnections and potentially serve to explore knock-on effects in interventions
- ✓ Interventions addressing >1 behaviour at a time are being developed and evaluated; intervention strategies that go beyond treating each behaviour as independent are likely needed
- ✓ Multi-method theory integration and testing needed to continue to build a cumulative evidence-base to inform the multiple behaviour paradigm
 - ✓ Building behaviour facilitation and address behaviour conflict (or for de-implementation, introducing behaviour conflict or reducing facilitation)

Future outlook

- Opportunity to leverage routinely collected data of multiple behaviours
- Linking behavioural network analysis to social network analysis to map how our own behaviour and those of others inter-connect
- A multiple behaviour paradigm has implications for key areas in implementation science:
 - Implementation/De-implementation
 - Equity-focused implementation science
 - Sustainment over time
 - Scale and spread
- Keen to collaborate with anyone interested in exploring this further; please reach out if interested

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