

# Examining the constructs and predictive validity of the COM-B for physical activity

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## Introduction

None of the existing behaviour change frameworks combine comprehensiveness, coherence, and a clear link to a model of behaviour change and therefore the previous frameworks were synthesised into the Behaviour Change Wheel (BCW), with the COM-B at the centre (Michie et al., 2011). The COM-B specifies capability (physical and psychological), opportunity (social and physical), and motivation (automatic and reflective) as the drivers of behaviour.

The Theoretical Domains Framework (TDF) summarises theories of behaviour that often contained overlapping constructs (Michie et al., 2005). The TDF can be directly mapped on to the COM-B (Cane et al., 2012). This study explores the usefulness of the TDF to represent the key COM-B drivers, capability, opportunity, and motivation. The constructs of the COM-B can vary considerably depending on the population and behaviour in question. The recent combination of Partial Least Squares (PLS) with Structural Equation Modelling (SEM) is ideal as it allows researchers to evaluate a proposed model of the COM-B and the predictive validity of the constructs with respect to physical activity.

The three main aims of this study therefore were:

- To explore which of the measures representing TDF domains would be important indicators of capability, opportunity, and motivation
- To examine the predictive validity of these constructs in relation to levels of MVPA
- To evaluate whether motivation is a mediator for capability and opportunity with respect to MVPA

Table 1. Sample demographics and descriptive statistics for MVPA (N = 186).

Characteristics	Level	Means (SD) <sup>a</sup> and frequencies (percentages) <sup>b</sup>
Age <sup>a</sup>		38.25 (14.12)
BMI <sup>a</sup>		24.58 (4.67)
Female <sup>a</sup>		132 (71%)
Smoker <sup>a</sup>		10 (5%)
Highest education level (or equivalent) <sup>b</sup> :		
	Up to A Level	43 (23%)
	Bachelors degree	60 (32%)
	Masters degree	62 (33%)
	PhD	22 (12%)
Employment status <sup>b</sup> :		
	Full-time work	88 (47%)
	Part-time work	30 (16%)
	Full-time student	37 (20%)
	Other	32 (17%)
Household Salary <sup>b</sup> :		
	£0-25000	22 (12%)
	£25-50000	63 (34%)
	£50-75000	34 (18%)
	Over £75000	32 (17%)
Marital Status <sup>b</sup> :		
	Married	81 (43%)
	Living with partner	32 (17%)
	Single	53 (28%)
	Other	21 (11%)
Vigorous Minutes per week <sup>a</sup>		95.49 (121.12)
Vigorous METS per week <sup>a</sup>		763.94 (968.98)
Moderate Minutes per week <sup>a</sup>		109.79 (170.71)
Moderate METS per week <sup>a</sup>		439.15 (682.84)
Total METS per week <sup>a</sup>		1203.09 (1147.07)

Table 2. Mapping of COM-B to the TDF domains, with the appropriate questionnaire measures representing key components.

COM-B component	TDF Domain	Measures
Capability	Psychological	Knowledge Physical activity guideline questions (3 items) Skills Covered by physical health Memory, attention and decision making No appropriate validated measures
	Physical	Skills Physical health (10 items; Ware & Sherbourne, 1992)
	Social	Social influences Social support (5 items; Sallis et al., 1987), subjective norms (3 items; Francis et al., 2004)
Opportunity	Physical	Environmental context and resources Neighbourhood environment (10 items; Echeverria et al., 2004), recreational facilities (6 items; Echeverria et al., 2004)
	Reflective	Social/professional role and identity Exercise self-identity (9 items; Anderson & Cychosz, 1994) Beliefs about capabilities Self-efficacy (5 items; Schwarzer & Renner, 2009, Perceived behavioural control; 4 item; Francis et al., 2004) Optimism Covered by exercise self-identity
Motivation	Automatic	Beliefs about consequences Attitudes (4 items; Francis et al., 2004) Intentions Intentions (3 items; Francis et al., 2004) Goals Covered by action planning
	Social/professional role and identity	Covered by exercise self-identity
	Optimism	Covered by exercise self-identity
	Reinforcement	No appropriate validated measures
	Emotion	Positive and negative affect (10 items; Thompson, 2007)

## Method

### Participants

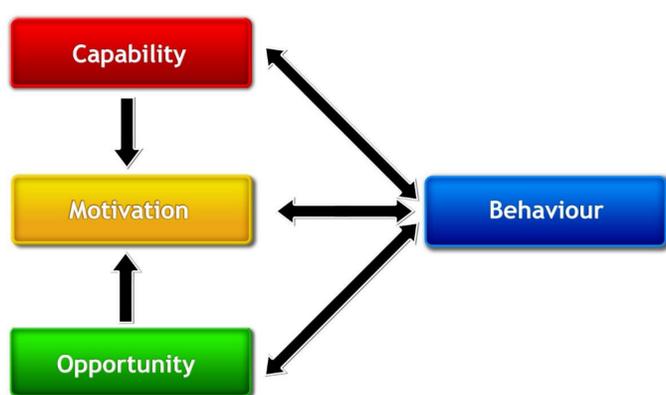
This study used a prospective design with the completion of questionnaires relating to the TDF completed at baseline and the assessment of MVPA over the next week. Participants (N = 186) were eligible as long as they had no conditions preventing them performing regular physical activity.

### Design and Measures

Measures were selected based on published components mapped onto the TDF (Cane et al., 2012) and whether there was an appropriate validated questionnaire available (Table 2). Physical activity was measured with the International Physical Activity Questionnaire (Craig et al., 2003), administered over the phone to limit overestimation, and measures for predictor variables are outlined in table 2.

### Procedure

A survey link was posted on social media sites, online, and distributed by email and online by colleagues and public health contacts. Participants gave their consent electronically and thereafter completed the questionnaires. One week later, participants were asked the IPAQ questions about their MVPA and debriefed.



The COM-B model

## Results

The results for the first PLS analysis of the initial model showed a good fit overall (SRMR = .06) (Figure 1a). There were a number of statistically unreliable indicators which were removed if non-significant ( $p > .10$ ). Each construct had one salient indicator with a substantial weight ( $> .50$ ); habits on capability; subjective norms on opportunity; exercise self-identity on motivation. The residuals in the final trimmed model were small (SRMR = .03; Figure 1b) and the cross loadings confirmed that each indicator was most strongly associated with its proposed construct.

The model explained 77% of the variance in motivation and 50% of the variance in MVPA. Opportunity only indirectly influenced MVPA via motivation and this effect was very small,  $IE = .06$ , 95% CI, .01 to .11,  $p = .032$ . By contrast, the indirect effect of capability on MVPA through motivation was substantial,  $IE = .37$ , 95% CI, .18 to .53,  $p < .001$ , and even larger than its direct effect ( $DE = .27$ ). The total effect of capability on MVPA was  $TS = .64$  making it the most important driver for MVPA, followed by motivation,  $TS = .46$ .

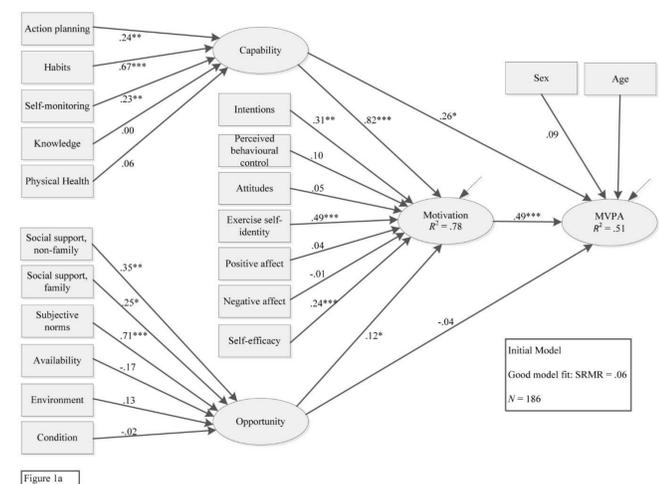


Figure 1a

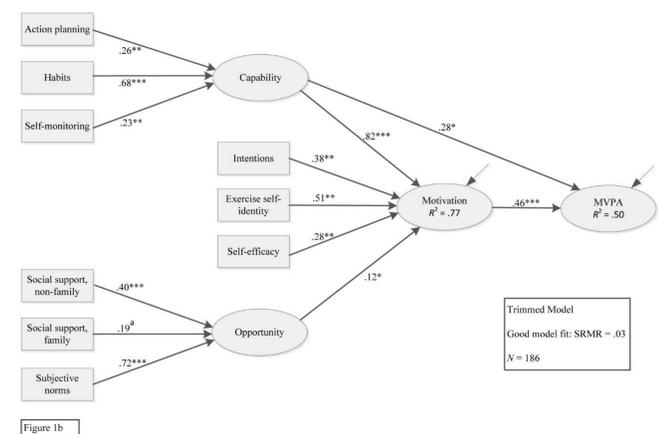


Figure 1b

Figure 1a. Specified formative measurement model of the COM-B. Constructs are represented by ovals and observed variables by rectangles. Outer weights of indicators and path coefficients are standardized. Figure 1b. Trimmed model after removing indicators with non-significant outer weights. Note: \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$ , <sup>a</sup> $p < .10$ .

## Discussion

Capability was defined by three measures (self-monitoring, habits, and action planning) all from the behavioural regulation domain of the TDF. Opportunity was formed by three measures (social support for friends and family, and subjective norms) representing the social influences domain of the TDF. The motivation construct was formed of intentions, exercise self-identity, and self-efficacy.

A major strength of this study was its novel approach to the modelling of the COM-B constructs based on the TDF. Motivation was an important mediator of the influence of capability which turned out to be the key driver of MVPA for healthy adults, and so both constructs should be promising targets for a physical activity intervention. It is important to note that our study used opportunistic sampling to recruit a healthy sample that enjoyed good access to exercise facilities. Furthermore, two TDF domains were not considered because of a lack of validated measures.

## Conclusions

- Psychological capability and reflective motivation were predictive of physical activity
- Research going forward should consider using this mapping of TDF domains to conceptualise the COM-B for distinct behaviours and populations
- This study has identified a number of TDF domains that should represent targets to address through relevant BCTs in order to change MVPA in future interventions

## Selected References

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