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Research Article

Why are there different versions of the COM-B model diagram?

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The Capability, Opportunity, Motivation-Behaviour (COM-B) model is used to understand and predict human behaviour, and develop interventions aimed at influencing behaviour. It has been presented in several different diagrams, varying in the specification of the causal links between capability, opportunity, motivation and behaviour. The differences arise from the different levels of elaboration of the model. For many purposes the simplest version as set out in the original paper describing the model is sufficient. This version represents causal influences from capability and opportunity to motivation and bidirectional influences between these and behaviour. However, in principle there can also be causal influences from motivation to capability and opportunity, and for greater precision the diagram can show capability and opportunity influencing the relationship between motivation and behaviour rather than behaviour directly. There may be occasions when it is useful to include one or more of these additional causal specifications in the COM-B model diagram.

Introduction

The Capability, Opportunity, Motivation-Behaviour (COM-B) model (sometimes referred to as the COM-B system, COM-B framework or COM-B theory) is a general, transdisciplinary model of human behaviour^{[1][2]}. Its central tenet is that for a behaviour to be enacted by a person at a given moment they must have the psychological and physical capability to do it and the physical and social opportunity to do it, and they must be more motivated at that moment to enact that behaviour than any potentially competing behaviours. Different versions of the diagram representing the COM-B model have appeared in the

literature and this has led to calls for the differences to be explained, which is the purpose of this paper.

COM-B constructs

The precise definitions of the constructs in the COM-B model have evolved with usage. Table 1 shows definitions in the Behaviour Change Intervention Ontology (BCIO)^[3]. It shows formal ontological definitions (see West and Michie^[4] for an explanation of what ontological definitions are and why they are important in science) and informal definitions which are less technical. We also include the BCIO label where this label is different from the COM-B term (ontology labels need to be more precise).

COM-B label (Ontology label in the BCIO)	Formal ontological definition	Informal definition
Capability (Behavioural capability) ^[5]	<i>A personal capability^[6] that includes behaviour in its realisation.</i>	A person's characteristics that are needed for a behaviour or that facilitate it.
Physical capability (Physical behavioural capability) ^[7]	<i>A behavioural capability that involves sensory or musculoskeletal abilities.</i>	A person's sensory and physical abilities that are needed for a behaviour or that facilitate it.
Psychological capability (Psychological behavioural capability)	<i>A behavioural capability that involves psychological abilities.</i>	A person's social, emotional and intellectual understanding, and reasoning and self-regulation abilities that are needed for a behaviour or that facilitate it.
Opportunity (Behavioural opportunity) ^[8]	<i>An environmental disposition^[9] that is required for or facilitates a behaviour.</i>	Characteristics of a person's environment that are needed for a behaviour or that facilitate it.
Physical opportunity (Physical behavioural opportunity) ^[10]	<i>A behavioural opportunity that involves time and parts of the environmental system that do not involve people or organisations.</i>	Characteristics of a person's physical (rather than social) environment that are needed for a behaviour or that facilitate it.
Social opportunity (Social behavioural opportunity) ^[9]	<i>A behavioural opportunity that involves the social environmental system.</i>	Characteristics of a person's social environment that are needed for a behaviour or that facilitate it.
Motivation (Behavioural motivation) ^[11]	<i>A mental process^[12] that energises and directs a behaviour.</i>	Thoughts, feelings, impulses and inhibitory processes that energise and direct a behaviour.
Reflective motivation (Reflective behavioural motivation)	<i>A behavioural motivation that involves the realisation of evaluative beliefs or mental plans.</i>	Motivation to enact a behaviour that involves judgements, intentions or plans.
Automatic motivation (Automatic behavioural motivation) ^[13]	<i>A behavioural motivation that involves impulses, inhibition of impulses, subjective wants and subjective needs.</i>	Motivation that involves wants and needs, impulses and opposing impulses.
Behaviour (Individual human behaviour) ^[14]	<i>Individual human activity that involves co-ordinated contraction of striated muscles controlled by the brain.</i>	Physical actions that are controlled by the brain.

Table 1. Constructs in the COM-B model

Note: Superscripts link to ontology classes in the Behaviour Change Intervention Ontology or other ontologies where these are available. The formal ontological definitions always begin with parent classes in italics.

Existing variants of the COM-B model diagram

The COM-B model has been represented diagrammatically with different levels of elaboration of the relationships between capability, opportunity,

motivation and behaviour. The simplest diagram of the COM-B model was published in the source paper^[2] and subsequent book^[15] and PHE-commissioned guides^{[16][17]} (Figure 1a). This diagram has arrows from capability to motivation and opportunity to motivation and double headed arrows between behaviours and each of capability, opportunity and motivation.

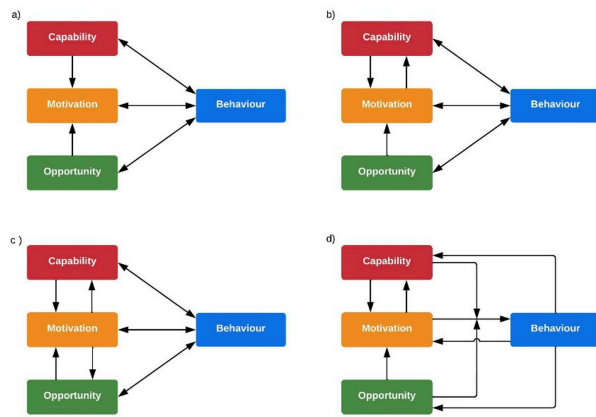


Figure 1. Variants of the COM-B model diagram

The arrow between capability and motivation represents the fact that capability can influence motivation. For example, knowing how to do something can increase motivation to do it, being good at doing something can increase motivation to do it, and understanding the consequences of doing something is an important factor influencing motivation to do it or not do it.

The arrow between opportunity and motivation represents the fact that opportunity can influence motivation. For example, having prompts in the environment can trigger motivation to engage in a behaviour; social norms can influence behaviour through motivation; and having ample resources to do something can increase motivation to do it.

A slightly more complex version of the diagram of the COM-B model^[18] (Figure 1b) represents the fact that motivation can also directly influence capability. For example, if doing something is very important to us we are more likely to be able to remember to do it when the time comes. High levels of motivation can sometimes impair performance. For example, in high pressure situations such as taking a penalty in a high stakes football match the motivation can undermine the skilled execution of the kick. Similarly, in complex high-pressure situations where lives are at stake, it can be hard to think clearly.

In a yet more complex version of the COM-B model diagram published in *Improving Health and Wellbeing: A Guide to Using Behavioural Science in Policy and Practice*^[19] (Figure 1c), there is an arrow showing motivation also influencing opportunity. This arises from the fact that opportunity is an attribute of an environment as it relates to enacting a particular

behaviour. That is, it is not just a description of the environment. This means that how far some attribute of the environment constitutes an opportunity can depend on how far it relates to a behaviour that a person is motivated to enact. For example, there is a well-known phenomenon in which alcohol-related cues in the environment are more salient for people with alcohol addiction than people who do not suffer from this condition^[20].

A further version of the diagram (Figure 1d) represents the influence of opportunity and capability on behaviour by arrows going to the arrow between motivation and behaviour rather than directly into behaviour^[1]. This reflects the idea that capability and opportunity interact with motivation to influence behaviour rather than having an additive influence on it. If there were an additive influence, in theory having a strong enough motivation would be enough to cause a behaviour even if the opportunity or capability were not present. However, this is not what the model states; it states that if *either* capability or opportunity are not present, no matter how strong the motivation, it will not happen. So this version of the model is a more accurate representation.

Further variants of the COM-B model diagram

Even more complex versions of the COM-B model diagram are possible. For example, one could draw an arrow showing a direct influence of capability on opportunity, representing the observation that what are opportunities for some people are not opportunities for others; for example, a visual prompt is not an opportunity for someone who cannot see.

Note that the COM-B model described above aims to represent the causal influences on a given behaviour of a given person at a given moment in time. In behavioural science we are often interested in applying the model to a person's patterns of behaviour over time, or the behaviour of a group or population, or most commonly the behaviour of a group or population over time. For example, we may wish to predict the rate at which the adult population of a country stops cigarette smoking over the course of a year. Given that capabilities, opportunities and motivations will vary across individuals and time, we need to use statistical aggregates of these influences in order to be able to make quantitative predictions at that level. For example, when predicting the population mean frequency of wearing a face covering in shops during a given month in a pandemic, we can

use the mean capability, opportunity and motivational influences both over time and over members of the population.

It is worth noting, finally that COM-B can also be extended to social structures such as organisations. In those cases, it is not the behaviour of people that are the focus but the behaviour of collectives (e.g., when a government passes a law or a company acquires another company). Then the ‘capability’, ‘opportunity’, ‘motivation’ and ‘behaviour’ terms take on a different meaning in relation to dispositions and processes of the organisation. This is an area for further development of the model.

Conclusions

In summary, the more complex versions of the COM-B model diagram are more comprehensive but for many purposes the simplest version (Figure 1a) is sufficient and has the benefit of being easier to understand. When using the COM-B model it is recommended to consider which of the causal links between components to include depending on the use to which the model is being put, in general opting for the simplest version that will meet the requirements at the time.

Declaration of potential competing interests

RW and SM are unpaid directors of the Unlocking Behaviour Change Community Interest Company. They are authors of several books on behaviour change whose royalties are used to fund behavioural science projects and resources.

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8. ^abehavioural opportunity – BCIO Vocab. <https://www.bciovocab.org/BCIO:006086>.
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10. ^aphysical behavioural opportunity – BCIO Vocab. <https://www.bciovocab.org/BCIO:006089>.
11. ^amotivation – BCIO Vocab. <https://www.bciovocab.org/BCIO:006133>.
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Declarations

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