

A call for precision in the study of behaviour and decision

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Standfirst

By definition, behavioural and decision scientists study behaviour and decision—but they rarely define these concepts, which results in divergent interpretations across studies. Researchers should give precise definitions of these concepts to enhance theoretical understanding and develop more effective and ethical interventions.

In natural sciences like physics, core concepts such as mass or energy are clearly defined and applied with precision by researchers. In contrast, two foundational concepts in the behavioural and decision sciences—behaviour and decision—are rarely articulated, despite scientists generally differing in how they understand them¹. This Comment is a call for behavioural and decision scientists to define human behaviour and decision more explicitly in their research. We propose key information that researchers should provide when reporting on these concepts to clarify their intended meanings, and we argue that doing so is essential for the advancement of the behavioural and decision sciences and the design of more effective and ethical interventions for improving behaviour and decisions.

Defining behaviour and decision

There are numerous definitions and interpretations of behaviour and decision available in the literature^{1,2}. Our objective is therefore not to propose the ‘best’ definition, as this would not accurately reflect the current state of research in the behavioural and decision sciences. Instead, we specify which information researchers should disclose when reporting on these concepts to ensure clarity and allow for comparisons across publications (Fig. 1).

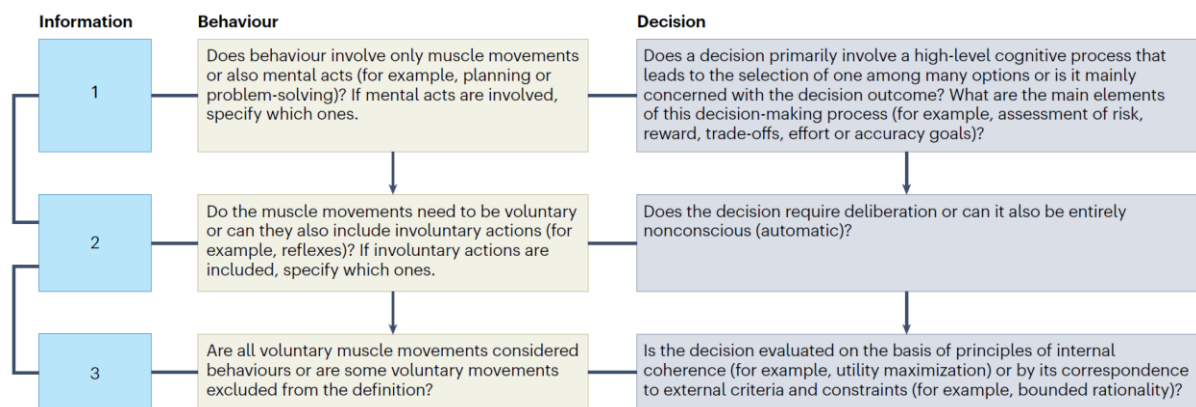


Fig. 1. Three key pieces of information researchers should provide when reporting on behaviour and decision. The information is organized chronologically: information at level ‘1’ (information 1) establishes the fundamental boundaries of the two concepts, and subsequent points introduce more nuanced distinctions. Examples are provided in Box 1.

For behaviour, the first important piece of information to disclose is whether it involves only muscle movement or also includes mental acts, such as planning, calculating, or problem-solving. We emphasize this distinction as a starting point because it sets the fundamental boundaries of what is being studied: if mental acts are classified as behaviour, then the scope of investigation extends beyond observable physical actions to include internal cognitive processes. Conversely, if behaviour is strictly limited to muscle movements, the focus is on more directly observable phenomena. This initial definitional step reflects a crucial point of debate in the literature³.

Building on the initial distinction and an ongoing discussion among researchers¹, the next important element to disclose is whether behaviour must involve voluntary muscle movements or can also include involuntary actions such as reflexes. Finally, for voluntary movements, another aspect to clarify is whether behaviour encompasses any such movements or excludes certain voluntary actions—such as answering survey questions about attitudes or performing simple survey tasks—that many behavioural scientists might not classify as behaviour⁴. Overall, this process of defining behaviour (Fig. 1) establishes its fundamental boundaries and extends into more nuanced distinctions. Specific examples are provided in Box 1.

Box 1. Examples of how to report on behaviour and decision**Behaviour (example 1)**

Behaviour involves only muscle movements and excludes mental acts (information 1). The muscle movements must be voluntary, rather than involuntary (information 2). Not all voluntary movements are behaviours: self-reporting internal psychological processes such as feelings or attitudes using survey items does not count as behaviour (information 3).

Behaviour (example 2)

In addition to muscle movements, behaviour involves mental acts. In particular, mentally working out solutions to various intellectual problems also counts as behaviour (information 1). Both voluntary muscle movements and reflexes count as behaviour (information 2). All voluntary muscle movements are behaviour, including responses to survey items measuring feelings or attitudes (information 3).

Decision (example 1)

A decision is the outcome of selecting one or more options among several alternatives—such as choosing which job or school to apply to—without considering the process behind it. It may involve pursuing or avoiding a particular course of action or maintaining the status quo (information 1). The decision need not involve deliberation and can also be entirely automatic (information 2). The quality of the decision is judged according to principles of correspondence to external criteria—such as limitations in cognitive capacity, time constraints, and the information available (information 3).

Decision (example 2)

In addition to the outcome, a decision involves the higher-level cognitive processes leading to the selection of one among multiple alternatives available simultaneously or over time. For example, these processes may include assessing risk or value and considering process goals, like minimizing effort and time to choose (information 1). These processes can be automatic but must involve a degree of (conscious) deliberation (information 2). The quality of the decision's outcome and/or process is evaluated according to its coherence with normative principles of rationality (for example, utility maximisation, or laws of probability) (information 3).

Based on information in Fig. 1.

For decision, a parallel line of reasoning applies, beginning with fundamental definitional boundaries and moving into more nuanced considerations (Fig. 1). The first essential point to clarify is whether this concept refers to the high-level cognitive process leading to the selection of an alternative among several (e.g., considering factors like job opportunities, cost of living, and social environment when deciding which city or country to relocate to), the decision outcome itself (e.g., the selected city or country), or both. Establishing this distinction sets the scope of investigation: including high-level cognition expands the focus beyond directly observable choices to internal cognitive operations, allowing to identify key decision components (e.g. heuristics evaluating risk and uncertainty of an option, expressing preferences according to the decision-makers' values, making or avoiding trade-offs), whereas defining decision solely as the final selection narrows attention to the outcome itself.

Once these boundaries are clear, the next point—which reflects an ongoing discussion in the literature⁵—is whether decisions require deliberate processes or can primarily operate outside of

conscious awareness. Finally, it is necessary to go beyond what decisions entail and their underlying processes to specify how they are evaluated—either through principles of internal “coherence” with rational frameworks or models, like utility maximisation, or through principles of “correspondence” to external cognitive and environmental goals and constraints⁶. This approach to defining decisions is outlined in Fig. 1, with specific examples detailed in Box 1.

Lastly, to enhance conceptual clarity, we encourage behavioural and decision scientists to specify and discuss the relationship between behaviour and decision in their research and avoid using them interchangeably, as the two concepts are closely linked and can be conflated. For example, if behaviour is defined to include mental acts such as planning or calculating, then it could also include decision-making, and the distinction between the two needs to be clearly discussed. In contrast, if the measured behaviour involves only muscle movements but not mental acts, then it could be distinct from (e.g., preceded by) a decision, and this relationship needs to be considered⁷. Additionally, if a decision is inferred ex-post from measures of attitude or likelihood around an intention to act (e.g., inferring environmental decisions from survey responses about one’s likelihood of saving energy), the line between decision and behaviour becomes blurred. In this case, researchers should clearly discuss the distinction between behavioural intentions or attitudes and decisions, rather than treating the two interchangeably. Box 2 presents two examples that specify the link between decision and behaviour. In the following sections, we address the importance of clearly defining the two concepts in scientific literature.

Box 2. Examples of how to specify the relationship between behaviour and decision

Example 1

Behaviour is distinct from decisions because it does not involve mental processes, whereas decisions primarily involve higher-level cognitive processes, such as assessment of risk and value when selecting among alternatives. When a decision involves a clear course of action (e.g., selecting which job or school to apply to), it can precede and explain the ensuing behaviour (e.g., completing and submitting the application).

Example 2

Both decisions and behaviour can involve mental processes, but of different types. The mental processes that count as behaviour include working out solutions to various intellectual challenges, such as solving mathematical problems. In contrast, decisions specifically involve high-level cognitive processes focused on evaluating options—such as weighing (or neglecting) their risk, value, and alignment with goals (e.g., minimizing effort or maximizing accuracy while deciding). Accordingly, decisions can lead to behaviours in two ways. First, when behaviour involves physical movement, a decision can guide the selection of the most appropriate movement among possible alternatives. Second, when behaviour involves solving intellectual problems, a decision can help determine which ideas and approaches to consider in working toward solutions.

Exactness of science and advancement of scientific knowledge

By definition, any study that belongs to the domain of the behavioural and decision sciences has an overarching goal to advance scientific knowledge of human behaviour and decision-making. Yet, this knowledge remains limited because researchers often do not define or differentiate between the two concepts³. Indeed, scientific progress hinges on theory development, and without clear conceptual definitions across papers, it is challenging to integrate insights about behaviour and decisions into theories⁸.

For example, imagine two studies: one considers behaviour to involve voluntary muscle movements that go beyond answering survey questions or completing simple tasks but excludes mental processes, while the other considers behaviour to include both voluntary muscle movements and mental acts such as planning, calculating, or problem-solving. If these studies produce conflicting findings but do not explicitly define behaviour, theory building would be hindered, as it would be challenging to recognize that the inconsistencies might stem from differing definitions of behaviour. Additionally, it would be unclear whether these studies contribute to the understanding of behaviour or decision-making, since the conceptualisation in the second study could also involve decisions.

Clearly defining the concepts of behaviour and decision would not only advance their theoretical understanding but also encourage the development of more universally accepted definitions. Indeed, if researchers consistently define these concepts in their publications, they would over time understand if their definition has weaknesses, such as overlapping with other concepts, not being easily translatable into measurable variables, or not being generalisable across different contexts. This could, in turn, prompt the emergence of the most rigorous definitions.

Understanding the mechanism

Besides improving exactness and advancing scientific knowledge, articulating the concepts of behaviour and decision would enable a more precise understanding of the extent to which decision-making is a psychological mechanism that drives behaviour. It is commonly posited that behaviour can be guided by both conscious (i.e., deliberate) and non-conscious psychological processes. In this context, if decision-making is understood as requiring some degree of conscious awareness, while behaviour is defined as voluntary muscle movements, then decisions could be investigated as core conscious drivers of behaviour. Conversely, if behaviour is also conceptualised as involving mental processes, it becomes essential to clarify how the mental processes related to decision-making are distinct from those behind behaviours and how the two are connected. Overall, different conceptualizations of behaviour and decision imply different relationships between the two concepts, and clearly defining them would compel researchers to more rigorously examine these connections, thereby advancing theoretical understanding.

Intervention design and effectiveness

Beyond improving the theoretical understanding of the connections between decisions and behaviour, clarifying the distinction between the two concepts could have important societal, organisational, and policy implications. Many recent applications of behavioural and decision sciences have focused on trying to change behaviour, particularly using nudges, more than improving decisions². The nudging techniques that have been developed have often inconsistent effects, and sometimes fail altogether⁹, suggesting that policy-makers or choice architects do not always understand how to get others to behave in the desired way or perhaps fail to consider that the behaviour has a decision-making component, and that alternative interventions that do not just modify behaviour, but are aimed at improving decision making (including their own) may be more suitable and effective. This issue could be remedied by more systematically defining what is meant by behaviour in such contexts, as this may help identify the most suitable type of intervention to achieve the desired outcomes and promote greater focus on improving decisions through bias mitigation interventions².

A distinction between interventions that enlist behaviour versus decisions has been made through the comparison between nudging, which aims to improve behaviour, and boosting, which aims to improve decision competence⁹. This strand of research suggests that different factors might drive the effectiveness of interventions depending on whether they target behaviour or decisions. For example, the success of interventions targeting decisions might depend on factors pertaining to the decision itself, such as its stage and individuals' actual and perceived susceptibility to cognitive errors (e.g., miscalculations or flawed reasoning) and biases (e.g., systematic distortions like

overconfidence and confirmation bias)². In contrast, interventions targeting behaviours may depend on factors such as the behaviour's automaticity or the extent to which it is habitual or routine¹⁰. Therefore, precisely identifying the behaviour or decision that researchers, policy-makers, and practitioners aim to improve is an important step toward tailoring interventions. This approach allows interventions to align with the specific cognitive processes involved and the context in which the behaviour or decision occurs, thereby enhancing effectiveness and minimising unintended consequences.

Ethics

Finally, clarifying the distinctions between behaviour and decisions can help researchers and practitioners not only design more effective interventions but also address ethical concerns about respecting individual autonomy. Autonomy is a cornerstone of ethical interventions, as it ensures that individuals retain the freedom to make informed choices while preserving their agency and capacity for reasoned scrutiny⁹. Recognizing whether an intervention targets behaviour or decisions is crucial because some interventions focused on improving decisions—especially debiasing training and boosting interventions that streamline decision information—align with this principle and generally avoid ethical concerns. In contrast, nudges and choice architecture that subtly influence behaviour or modify the structure of the decision (e.g., setting an option as an opt-out default) without fostering deliberation or competence have been critiqued for potentially steering individuals in ways that could challenge autonomy or be perceived as manipulative⁹. By distinguishing between behaviours and decisions, researchers and practitioners can design, test and apply interventions that explicitly respect autonomy, ensuring that interventions enhance, rather than undermine, individuals' ability to exercise independent and reasoned choice.

Conclusion

Clearly defining the concepts of behaviour and decision is essential for advancing the behavioural and decision sciences. Precise definitions not only enhance scientific accuracy but also improve theoretical understanding and support the development of more effective interventions. Furthermore, distinguishing between behaviours and decisions can help researchers and policy-makers address ethical considerations, ensuring that interventions respect individual autonomy. We encourage behavioural and decision scientists to rigorously define and distinguish between behaviour and decision in their research, setting a new standard for clarity and precision that will drive the field forward. Embracing this approach can expand scientific knowledge about the human mind and behaviour and lead to interventions that meaningfully improve people's decisions, behaviours, and lives.

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Competing interests

The authors declare no competing interests.

Contributions

D.K. and B.F. conceptualized the paper. D.K., B.F., and L.S. jointly wrote the first draft and provided comments and revisions.