

What is Social Behavior? Clarifying and Integrating the Concept for Cross-species Research

Marie I. Kaiser (Corresponding Author), kaiser.m@uni-bielefeld.de

Department of Philosophy, Bielefeld University

Universitätsstr. 25, 33615 Bielefeld, Germany

Joint Institute for Individualisation in a Changing Environment (JICE), University of Münster and Bielefeld University, Germany

Mitja D. Back, Department of Psychology, University of Münster, Germany

Simon M. Breil, Department of Psychology, University of Münster, Germany

Barbara A. Caspers, Department of Behavioral Ecology, Bielefeld University, Germany

Melanie Dammhahn, Department of Behavioural Biology, University of Münster, Germany

Uljana Feest, Institute for Philosophy, Leibniz University Hannover, Germany

Ahana A. Fernandez, Department of Behavioural Biology, University of Münster, Germany

Jürgen Gadau, Institute for Evolution and Biodiversity, University of Münster, Germany

Chaitanya Gokhale, Chair for Computational and Theoretical Biology, University of Würzburg, Germany

Joseph Hoffman, Department of Evolutionary Population Genetics, Bielefeld University, Germany

Sylvia Kaiser, Department of Behavioural Biology, University of Münster, Germany

Christian Kandler, Department of Psychology, Bielefeld University, Germany

Joscha Kärtner, Department of Psychology, University of Münster, Germany

Niclas Kuper, Department of Psychology, University of Münster, Germany

Joachim Kurtz, Institute for Evolution and Biodiversity, University of Münster, Germany

Denis Meuthen, Department of Evolutionary Biology, Bielefeld University, Germany

S. Helene Richter, Department of Behavioural Biology, University of Münster, Germany

Ricarda I. Schubotz, Department of Psychology, University of Münster, Germany

Claudia Voelcker-Rehage, Institute of Sport and Exercise Sciences, University of Münster, Germany

1. Introduction

Social behavior is a central object of inquiry across numerous scientific disciplines, including behavioral biology, evolutionary biology, comparative psychology, personality psychology, developmental psychology, social psychology, and the cognitive and social sciences more broadly. Researchers across these fields investigate how and why individuals behave in relation to other individuals, how social behaviors emerge, and how they shape cognition, attitudes, development, health, fitness, and evolutionary trajectories. Despite the centrality of social behavior to these disciplines, there remains surprisingly little consensus regarding what exactly constitutes social behavior, how it should be distinguished from related concepts such as social interactions, and how social behavior should be operationalized and linked to empirical measurements.

These ambiguities partly reflect a broader and longstanding lack of agreement concerning the basic concept of behavior itself. As several authors have noted, researchers across biology and psychology often rely on intuitive understandings of behavior rather than on explicit conceptual definitions (Levitis et al. 2009; Bergner 2011; Uher 2016). Moreover, it has been argued that existing definitions of behavior are frequently vague, contradictory, taxon-specific, or insufficiently operationalizable (Furr 2009; Levitis et al. 2009; Penke 2009; Bergner 2011; Uher 2016; Longino 2021). Questions concerning whether inactivity or sleep can count as behavior, whether behavior must involve observable movement, whether developmental processes or mental phenomena qualify as behavior, and whether behaviors permit or even require a functional characterization remain contested within the literature.

These conceptual difficulties become even more pronounced in the study of social behavior. Across disciplines, the term ‘social behavior’ is often used to refer to conceptually distinct phenomena, including observable activities of individuals, concrete interaction events, stable social traits, social motivations or cognitive processes, interaction patterns, affiliative tendencies, or properties of social systems. This creates confusion about what social behaviors are, and what they are not. For example, researchers typically treat cooperation and parental care as paradigmatic examples of social behaviors (or even of pro-social behavior) (Hamilton 1964). By contrast, one might argue that parental care is a social interaction between parents and offspring, that cooperation is the outcome of a social interaction, and that neither of them is a social behavior of a single individual. Similarly, researchers sometimes speak about empathy as if it were the social behavior of an individual. However, one might argue that empathy is an individual’s capacity to understand and respond appropriately to another individual’s emotional or cognitive state. Empathy should thus not be confused with the externally expressed social behaviors (e.g., helping, consoling, or affiliative contact) that can be caused by the internal processes that manifest empathy. Cases like these show that it is far from clear what a behavior is and what makes behaviors social.

Conceptual unclarity and confusion have important scientific consequences. First, ambiguities surrounding the meaning of ‘social behavior’ hinder clear communication both within and across disciplines. Researchers may employ identical terminology while implicitly referring to different ontological categories, levels of analysis, or explanatory frameworks. They may also use different concepts without recognizing that they refer to the same entities. Second, conceptual ambiguities complicate operationalization and measurement. What counts as an appropriate measure of social behavior depends partly on what one takes social behavior to be. For instance, if one understands social behaviors in terms of social interactions (e.g., Slobodchikoff 1988; Alcock 2013; Blumstein et al. 2010; Ward & Webster 2016;

Seebacher & Krause 2019; Delmé et al. 2024) one will prioritize measures that target interactions between individuals, such as dyadic, multiple or social network-based indicators (Croft et al. 2008; Gokhale & Traulsen 2010; Nowak & May 1992). If social behavior is primarily conceptualized in terms of its effects on other individuals (e.g., Kappeler et al. 2013; Székely et al. 2010), one will privilege measures that are relevant to the fitness or well-being of individuals. This shows that conceptual assumptions shape empirical-methodological choices, influence what kinds of behavioral data are collected, and affect the comparability of empirical findings across studies, species and disciplines.

These issues are particularly relevant for comparative and cross-species research. Biological and psychological approaches often differ substantially in how they conceptualize and investigate social behavior. Biology has historically emphasized the observation of social behavior and interactions, the ecological relevance of behavior, and evolutionary perspectives that seek to clarify its adaptive function and fitness consequences. Psychological approaches, by contrast, have less frequently involved direct behavioral observations, but rather focused on studying latent traits and measuring subjective experiences and self-concepts regarding their own behavior using self-report methodologies. Although both traditions have generated important insights, their partially divergent conceptual vocabularies and methodologies can hinder interdisciplinary integration and make it difficult to compare empirical findings concerning apparently similar social phenomena across species.

At the same time, there is increasing recognition that integrative and comparative approaches are essential for understanding social behavior, in particular for studying individual differences in social behavior (Blumstein et al. 2011; Uher 2008; Martin et al. 2023; Kuper et al. 2025). Cross-species perspectives provide opportunities to investigate the evolutionary origins, mechanisms, functions, plasticity, and diversity of social behaviors across organisms with different phylogenetic backgrounds, ecologies, and social systems. Such approaches can help to address questions concerning the generalizability versus species-specificity of individual differences in social behaviors and of the causes and consequences of these differences (Kuper et al. 2025). Comparative approaches may also help overcome theoretical and methodological limitations that emerge when research remains confined within disciplinary or species-specific boundaries. Several authors have therefore called for and proposed interdisciplinary conceptual and methodological frameworks that facilitate the integration of biological and psychological approaches to social behavior (e.g., Blumstein et al. 2011; Uher 2008; Martin et al. 2023; Kuper et al. 2025).

The present paper contributes to this initiative by developing an integrative conceptual framework that applies to social behavior across humans and non-human animals. Our analysis focuses on studies of personality and of individual differences in social behavior, but it might also be applicable in other biological and psychological fields. Drawing on perspectives from philosophy of science, biology, and psychology, this paper aims to clarify the concept of behavior and the concept of social behavior. We identify six necessary characteristics of behavior and distinguish them from two additional characteristics (Internal Coordination and Functionality) that are frequently associated with behavior but, we argue, are not necessary for identifying something as behavior (Section 2). We formulate four different dimensions that explain why a certain behavior is social (Section 3). We conclude by pointing out the empirical consequences of these conceptual clarifications (Section 4). By making conceptual assumptions explicit and integrating them, our proposed framework seeks to promote clearer communication across disciplines, improve the comparability of findings

across species and methodologies, and support more cumulative and integrative research on individual differences in social behavior across humans and other animals.

2. What Is a Behavior?

Before defining what makes a behavior social, it is necessary to clarify the more fundamental question of what a behavior is in the first place. Although behavior is one of the central concepts of both biology and psychology, there remains surprisingly little agreement regarding its precise meaning (e.g., Furr 2009; Levitis et al. 2009; Penke 2009; Bergner 2011; Uher 2016). Researchers often intuitively employ the concept without making explicit the assumptions underlying its use. Existing definitions frequently differ with respect to whether behavior requires movement, whether inactivity can count as behavior, whether internal processes such as cognitive, emotional, or motivational processes are themselves behaviors, and whether behavior should be characterized in functional terms (e.g., Millikan 1995; Furr 2009; Penke 2009; Levitis et al. 2009; Bergner 2011; Uher 2016; Pincus et al. 2020; Muszynski & Malaterre 2020; Longino 2021; Laskowski et al. 2022). These disagreements complicate theoretical reasoning and empirical investigation within and across disciplines.

The aim of this section is to develop a clear and integrative definition of behavior that applies to humans and non-human animals and that can serve as the foundation for the subsequent analysis of social behavior. We first identify four criteria that any adequate integrative definition of behavior must satisfy (Section 2.1). We then specify eight major characteristics of behavior which have been discussed in the biological, psychological, and philosophical literature (Section 2.2). Finally, we critically evaluate these characteristics and use them to formulate an integrative definition of behavior that can be used for research across biology and psychology (Section 2.3).

2.1 Criteria for an Adequate Integrative Definition of Behavior

A definition of behavior that is adequate and useful for integrating studies of individual differences in social behavior across species must satisfy several requirements. In addition to general conceptual virtues such as clarity, precision, non-circularity, and parsimony, four criteria are particularly important.

- (1) The definition should be *broadly applicable across species*. Because the aim of this paper is to develop a framework for comparative research across humans and non-human animals, the concept of behavior must be formulated in a way that is not restricted to a particular species or disciplinary tradition.
- (2) The definition should be *consistent with established scientific usage*. It should capture those characteristics of behavior that are widely accepted across biology and psychology. This is compatible with the definition rejecting some putative characteristics that are discussed by only some authors (on grounds of the other criteria).
- (3) The definition should enable researchers to clearly *demarcate behavior* from types of phenomena that are non-behavioral. We will elaborate this point below.
- (4) Relatedly and more generally, the definition should be *theoretically and empirically useful*. Conceptual definitions are not merely terminological devices; they structure explanation, guide operationalization, and influence the administration, scoring, analysis, and interpretation of measurement. A useful definition should therefore facilitate further theoretical analysis and support

empirical research (for the empirical relevance of our conceptual clarifications see Section 4).

The third criterion concerns what an adequate definition of behavior should exclude as non-behavioral. Most biologists and psychologists agree that developmental processes, bodily morphology, and physiological processes should be distinguished from behavior. Developmental change unfolds over extended periods and concerns transformations of the organism itself rather than activities performed by the organism. Morphological characteristics constitute relatively stable properties of the organism rather than behavioral expressions. Similarly, physiological processes such as hormonal regulation, neurotransmitter activity, or metabolic changes are generally regarded as mechanisms underlying behavior rather than behavior itself (see the characteristic Boundedness below).

More controversial is the status of mental phenomena, including experiences. The distinction between behavior and experience is fundamental in psychology (even though it is often blurred in methodological practice). Still, some psychologists adopt a broad notion of behavior and assume that emotions, thoughts, intentions, or other mental states are forms of behavior (e.g., Bergner 2011). For the purposes of cross-species research, however, a narrower conception seems more appropriate. Mental states are best understood as processes that coordinate, mediate, correlate with, or cause behavior rather than as constituents of behavior itself. Maintaining this distinction is important because mental processes are frequently invoked to explain behavior. Such explanatory roles presuppose a conceptual distinction between what does the explaining (explanans) and what is explained (explanandum). If mental states are identified with behavior, their explanatory function becomes difficult to articulate. Accordingly, the framework developed here treats emotional, cognitive, and motivational states as internal processes underlying behavior rather than as behaviors themselves.

Our analysis focuses on the behavior of individual organisms. This focus is important for our purposes because it allows us to distinguish individual behavior from relational phenomena such as social interactions and from properties attributed to groups or populations.

2.2 Major Characteristics of Behavior

In this section, we examine eight characteristics that have been proposed or discussed in the biological, psychological and philosophical literature as relevant to the concept of behavior. We first present these characteristics and elaborate them without presupposing that they are all necessary for identifying behavior. Section 2.3 then assesses them against the criteria for an adequate conception of behavior and identifies those that we take to be necessary.

Eight characteristics of behavior are assumed, mentioned, or explicitly discussed by researchers from behavioral ecology, personality psychology and philosophy of science: Particularity & Actuality, Boundedness, Activity, Externality & Perceivability, Situatedness, Responsiveness, Internal Coordination, and Functionality (Millikan 1995; Reis 2008; Furr 2009; Penke 2009; Levitis et al. 2009; Bergner 2011; Kappeler et al. 2013; Uher 2016; Pincus et al. 2020; Muszynski & Malaterre 2020; Laskowski et al. 2022). We also included in our analysis some older biological definitions of behavior discussed by Levitis et al. (2009) and Penke (2009) (Watson 1925; Tinbergen 1955; Davis 1966; Raven & Johnson 1989; Wallace et al. 1991; Beck et al. 1991; Starr & Taggart 1992; Grier & Burk 1992). Table 1 provides an overview of the implicit and explicit definitions of 'behavior' that our analysis is

based on; it also indicates which characteristics are mentioned in which definition and by which authors.

Table 1. Definitions of behavior and mentioned characteristics.

	Particularity & Actuality	Boundedness	Activity	Externality & Perceivability	Situatedness	Responsiveness	Internal Coordination	Functionality
Laskowski et al. 2022, p. 164 “We argue that in most situations it is only speculation to assume that two different behavioral responses... are expressions of the same underlying trait... or different traits... Define the behaviors by what is measured, ... and leave the interpretation of the behavioral response for the discussion.”						X		
Muszynski & Malaterre 2020, p. 2, 9 “specifying: (i) the entity in question ...; (ii) what the entity is doing...; (iii) the appropriate context, ... what the doing is about.”; “conception of behaviour as a spectrum, which turns to the explanations of the underlying mechanisms of the phenomenon in order to determine to what extent it is considered a behaviour. The important characteristics are the complexity, inputs and stability of the mechanism.”		X	X		X		X	
Pincus et al. 2020, p. 127 “An individual’s interpersonal dispositions, when understood in relation to their motives and goals, are assumed to give rise to variations in adaptive and maladaptive behavior that are contextualized yet consistent across relevant interpersonal situations”			X		X			X
Uher 2016, p. 490 “behaviour can be defined as the ‘external changes or activities of living organisms that are functionally mediated by other external phenomena in the present moment’”	X	X	X	X	X			X
Kappeler et al. 2013, p. 1 “Behaviour is one of the key interfaces between an animal and its environment... Behaviour therefore represents a major mechanism influencing an individual’s inclusive fitness, and thus ultimately evolutionary change.”					X			X
Bergner 2011, p. 148-9 “Any behavior... is a complex state of affairs that includes as component states of affairs a specific person’s acting to accomplish purposes W1...Wn, acting on discriminations K1...Kn, exercising competencies K-H1...K-Hn, engaging in physical processes or performances P1...Pn, achieving outcomes A1...An, expressing personal characteristics PC1...PCn, and engaging in actions having significances S1...Sn.”		X	X					X
Levitis et al. 2009, p. 108 “Behaviour is: the internally coordinated responses (actions or inactions) of whole living organisms (individuals or groups) to internal and/or external stimuli, excluding responses more easily understood as developmental changes.”		X				X	X	

Furr 2009, p. 372 “I suggest that behaviour may be defined as verbal utterances (excluding verbal reports in psychological assessment contexts) or movements that are potentially available to careful observers using normal sensory processes.”			X	X				
Penke 2009, p. 423 “From such an evolutionary, functional perspective, behaviour can be understood as a way how individuals adjust more or less instantaneously to their current environment”					X			X
Reis 2008, p. 313 “Personality is construed not as a generalized or acontextual tendency but as a set of “If... then” contingencies that spawn behavior: “If situation X, then behavior Y.”					X	X		
Millikan 1995, p. 137 “A behavior is ... 1. It is an external change or activity exhibited by an organism or external part of an organism. 2. It has a function in the biological sense. 3. This function is or would be normally fulfilled via mediation of the environment or via resulting alterations in the organism's relation to the environment.”		X	X	X	X			X
Grier & Burk 1992, p. 4 “All observable or otherwise measurable muscular and secretory responses (or lack thereof in some cases) and related phenomena such as changes in blood flow and surface pigments in response to changes in an animal's internal and external environment”				X	X	X	X	
Starr & Taggart 1992, Glossary “A response to external and internal stimuli, following integration of sensory, neural, endocrine, and effector components. Behavior has a genetic basis, hence is subject to natural selection, and it commonly can be modified through experience”						X	X	X
Beck et al. 1991, Glossary “Externally visible activity of an animal, in which a coordinated pattern of sensory, motor and associated neural activity responds to changing external or internal conditions”		X	X	X		X	X	
Wallace et al. 1991, Glossary “Observable activity of an organism; anything an organism does that involves action and/or response to stimulation”			X	X		X		
Raven & Johnson 1989, p. 1119 “Behavior can be defined as the way an organism responds to stimulation”						X		
Davis 1966, p. 2 “What an animal does”		X	X					
Tinbergen 1955, p. 2 “The total movements made by the intact animal”		X						
Watson 1925, p. 6 “Behavior is what an organism observably does or says”			X	X				

As Table 1 shows, the eight characteristics differ in prominence, and they occur in various combinations. Together they provide a useful basis for analyzing the concept of behavior and developing an integrated definition (section 2.3). In the remaining part of this section, we explicate each of these characteristics and relate them to ideas from the biological, psychological, and philosophical literature. Fig. 1 provides a concise definition of each characteristic and illustrates it by an example.

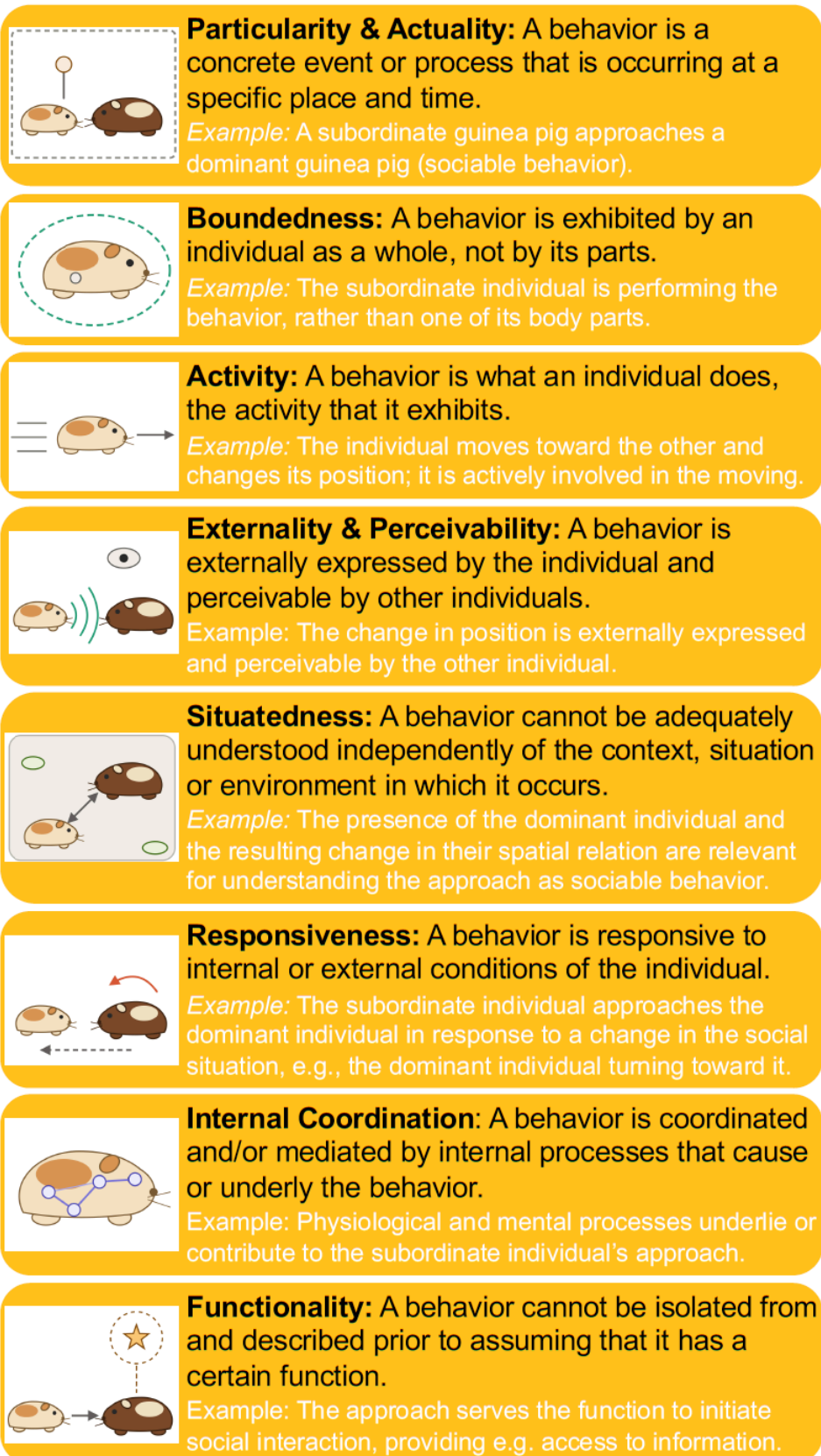


Figure 1. Major characteristics of behavior.

Particularity & Actuality: This criterion concerns the ontological status of behavior and introduces two basic assumptions about the kind of entities behaviors are. The first assumption is that behaviors are particulars (also called tokens), that is, concrete instances with a definite spatiotemporal extension, rather than abstract

types. For example, sociability – understood as the general tendency of an individual to engage in social interactions – is a trait or general feature of an individual, rather than a particular behavior. Sociability can manifest in a concrete sociable behavior, such as a subordinate guinea pig approaching a dominant guinea pig (see Fig. 1) or an individual joining a group or maintaining proximity to group members (Gartland et al. 2022). In personality psychology, these concrete behavioral manifestations correspond closely to what Fleeson (2001) and Steyer et al. (2015) describe as states, namely concrete behavioral expressions that vary across situations while reflecting to some extent underlying trait dispositions. Even though social behaviors are concrete particulars with definite spatiotemporal extension, they can be described on different levels of aggregation and abstraction (e.g., macro-, meso- and micro-level; Grünberg et al. 2018). Researchers might study highly aggregated social behaviors, such as sociable behavior in humans, or social behaviors of mid-level generality and abstraction, such as initiating affiliative interactions in mammals, or very specific social behaviors, such as instances in which guinea pigs in group X seek proximity to others (during time interval t_1 - t_5). Moreover, researchers often study behaviors by using behavioral indicators, which translate complex behavioral phenomena into quantifiable observations that can be systematically rated, recorded, compared, and statistically analyzed. For instance, the social behavior “seeking proximity to others” is studied by measuring the amount of time spent in close proximity (i.e., less than one body length distance) to others.

The second assumption is that behaviors are actualities. A behavior is an event or process that actually occurs rather than something that is merely potential, such as a disposition, capacity, or tendency. A similar idea was stated by Uher: “Behaviors are actualities, ongoing events with processual properties” (2016, p. 486). According to Uher, it is precisely this actual and processual character, together with the often brief but variable temporal extension of behaviors, that distinguishes them from developmental processes and from an individual's inner and outer bodily morphology. Whereas developmental change and morphological characteristics may describe enduring processes or properties of an organism, behaviors are concrete activities of an individual that occur in particular situations.

Boundedness: This criterion states that a behavior always belongs to an individual; that is, it is a behavior *of* an individual. There is no behavior that is not exhibited by an individual. Moreover, a behavior is exhibited by an individual as a whole rather than by one of its parts. For this reason, Uher refers to this characteristic as “wholeness” (2016, p. 482). An individual crying or an individual approaching another individual are behaviors; they are exhibited by an individual and ascribed to it. By contrast, the beating of your heart is not your behavior because it is something that a part of you, the heart, does; it is not something that you, as a whole individual, do. A slightly different formulation of this criterion emphasizes that behavior is bound to an individual's body (Uher 2016). In this sense, behaviors are often immaterial, involving only movements or changes of the individual's body, although they may sometimes involve material products, such as spit or odor molecules. The assumption that behaviors are bound to individuals and exhibited by individuals as a whole applies to behaviors in general but also, and especially, to a specific class of behaviors, namely agential behavior (i.e., behavior of “agents”, which can include biological agents) or actions of humans. Indeed, boundedness or wholeness is commonly regarded as a major characteristic of biological agency (e.g., Aaby 2024).

Activity: A behavior is frequently characterized as something that an individual does, or as the activity in which it engages (e.g., Davis 1966; Wallace et al. 1991). The term activity is understood here in a broad sense, without agentic

connotations. In this sense, behavior does not require action or agency. Agency is typically understood in terms of voluntary control by the agent or in terms of goal-directedness (Aaby 2024). According to this broader understanding, activities are a special kind of event or process that produces change and in which the individual plays an active role (Kaiser 2018). This active role consists of the individual constituting a necessary condition in the production of the change rather than merely being a passive object that undergoes it. In philosophical theories of action, a similar distinction is often drawn between what an individual does and what merely happens to it (e.g., Taylor 1966; Dretske 1988). For example, “being carried by an individual” is not an activity (and thus not a behavior) because the individual (who is carried) is not actively involved in the process and does not contribute to the change. However, the process of carrying and the role of the carried individual might be described differently, for instance in terms of “riding someone’s back”. This is activity (and thus a behavior) because the individual has an active role and is contributing to the process.

An alternative view equates behavior with movement (e.g., Tinbergen 1955; Furr 2009; see also Levitis et al. 2009). Although activity is closely related to movement, we think the two should not be identified. On the one hand, there can be behaviors that do not involve movement, such as birds incubating eggs, lions resting, octopuses camouflaging themselves, or silverbacks emitting fear scents. On the other hand, some phenomena that are commonly regarded as behaviors, such as the emission of acoustic, visual, olfactory, electric, or radiative signals, are not straightforwardly reducible to movement. Activity therefore provides a broader and more adequate characterization of behavior than movement alone.

Externality & Perceivability: This criterion encompasses two characteristics of behavior that are closely related. The first assumption, that behaviors are externally expressed by the individual, is rarely stated explicitly in definitions of behavior. Nevertheless, it is often implicitly assumed whenever internal processes are distinguished from behavior and treated instead as causes or underlying mechanisms of behavior (e.g., Uher 2016). Such internal processes include physiological phenomena, such as hormonal changes, as well as mental phenomena such as emotional, cognitive, or motivational processes. The first criterion of externality therefore provides an important conceptual boundary between behavior and the internal mechanisms that coordinate or produce it.

The assumption that behavior is externally expressed is frequently coupled with a second assumption that behavior is, at least in principle, perceivable by other individuals (e.g., Beck et al. 1991). The two assumptions are closely related because it is the external expression of behavior that makes the perception of behavior by other individuals possible. Perceivability should not be understood in anthropocentric terms or as being restricted to vision (i.e., as visibility to human observers), but rather more generally as accessibility to perception by conspecifics through all normal sensory modalities (Furr 2009; Back 2021). Perceivability also does not require that another individual actually perceives the behavior while it occurs. Rather, behaviors can become available to other individuals either directly when they occur or indirectly through the traces, signals, or other consequences they leave behind. The characteristic of behavior to be in principle accessible to other individuals makes it possible for behavior to have both social influences and social consequences (Furr 2009).

Situatedness: Behaviors do not occur in isolation but always within a particular context, situation, or environment. These circumstances can influence both which behaviors individuals exhibit and the conditions under which individual

differences in behavior become expressed. Person-situation approaches distinguish between effects of situational features on the occurrence of behavior and effects of situations on the expression of individual dispositions (Mischel & Shoda 1995; Tett & Guterman 2000). Situations can thus provide opportunities or constraints for particular forms of behavior – what has been described in terms of situational affordances (e.g., Columbus et al. 2019). This is relevant to defining behavior because the circumstances in which an event occurs can be necessary for identifying what the individual is doing. For example, approaching another individual may constitute sociable behavior when it occurs in response to that individual, whereas similar bodily movement in the absence of a relevant social context may not constitute the same behavior. Situatedness therefore helps distinguish behavior from mere bodily movement or other physical events: what an individual is doing cannot always be determined from the movement alone but requires consideration of the situation in which it occurs.

More generally, behavior can be understood as one of the “key interfaces between an animal and its environment” (Kappeler et al. 2013, 1). The environmental circumstances of a behavior may affect not only whether it occurs but also how it is manifested: for example, blinking may occur across many circumstances as part of normal eye maintenance, but its frequency can change under environmental conditions such as dry air. Such examples illustrate why behavior cannot be adequately characterized independently of the circumstances in which it occurs. Millikan (1995) and Uher (2016) make a stronger claim, arguing that behavior cannot be adequately understood independently of the context, situation, or environment in which it occurs. On this view, situatedness concerns not merely the causal influence of environmental conditions on behavior, but also the relevance of those conditions to how a behavioral phenomenon is characterized and understood.

Responsiveness: Closely related to the assumption that behavior is situated is the idea that behavior is responsive to internal and external conditions of the individual. The idea of responsiveness is very prominent in the biological literature (Raven & Johnson 1989; Wallace et al. 1991; Beck et al. 1991; Starr & Taggart 1992; Grier & Burk 1992; Levitis et al. 2009) and gives rise to the use of terms such as “behavioral response” (Laskowski et al. 2022, 164). Responsiveness means that internal and external conditions can influence or modulate whether, when, and how a behavior occurs; it does not imply that behaviors are simply triggered or caused by preceding stimuli. External conditions include environmental, contextual, and situational factors. Rather than endorsing a simple stimulus-response model, however, we take responsiveness to indicate that behavior is dynamically influenced by multiple internal and external conditions, whose effects depend on the individual and its environment or situation. Behaviors are therefore not simply passive consequences of preceding events. Instead, their occurrence and form depend on the interplay of multiple factors. This point is reinforced by the idea that responsiveness is internally coordinated (see below), such that the relationship between conditions and behavior is mediated by internal processes rather than operating in a simple linear sequence (Uher 2016; Muszynski & Malaterre 2020).

Situatedness and responsiveness are general characteristics of behavior. In the case of social behavior, they can be specified more narrowly in terms of the individual’s social environment and its responsiveness to other individuals (see Section 3).

Internal Coordination: A behavior is coordinated and/or mediated by internal processes that cause or underlie it. These processes may be physiological, such as hormonal or neural processes, or mental, such as cognitive, emotional, or

motivational processes. The assumption that behavior is internally coordinated entails that behavioral phenomena and physiological or mental phenomena are ontologically distinct. Internal processes contribute to the production and organization of behavior, but they are not themselves parts of the behavior. This distinction is particularly important because physiological and mental states are often invoked to explain behavior. Such explanations presuppose that the explanatory processes are conceptually distinct from the behaviors being explained. Some authors further emphasize that the internal coordination mechanisms underlying behavior are relatively complex, ontologically stable, and sensitive to multiple relevant inputs (Muszynski & Malaterre 2020).

Functionality: Some authors endorse the strong claim that behavior cannot be identified or described independently of assumptions about its function (Millikan 1995; Uher 2016). Because the function of a behavior is mediated by the environment, this criterion presupposes the criterion of Situatedness. Functional approaches are often associated with evolutionary perspectives that view behavior as a means by which organisms adjust to their environments and thereby enhance their fitness (Millikan 1995; Penke 2009). However, functions may also be understood as causal-role functions in the sense of Cummins (1975). According to this view, something has a function if it is part of a larger system and the function contributes to the system having a certain capacity. In this sense, behaviors of individuals can be functional because they are part of the individual and contribute to a major capacity of the individual. This capacity may be characterized in evolutionary terms as the capacity to survive and reproduce, but it can also be characterized differently (e.g., in terms of well-being or more immediate goals such as feeding). Independently of the specific view of function, biological descriptions of behavior are often permeated by functional concepts because such concepts provide an alternative to intentional vocabulary (Weber 2012), and because, unlike in the case of humans, we do not want to ascribe intentions to animals of all species.

Nevertheless, there is an important objection to incorporating functionality into the concept of behavior itself. Functional explanations seek to explain what a behavior contributes to a larger system or, in evolutionary accounts, why particular behaviors exist, persist, or vary. If function is built into the definition of behavior, the distinction between the phenomenon to be explained and its explanation becomes blurred. As Blumstein et al. (2010) argued, the functions of behavior provide an ultimate explanation of behavioral diversity. Moreover, particularly in evolutionary accounts, the relevant function need not be a function for the individual exhibiting the behavior. For example, involuntary cues may arise without having an evolved function for the sender while nonetheless being functionally relevant to, and selected for their effects on, receivers. Thus, even though functional concepts can be important for describing and explaining behavior, several authors argue that descriptions of behavior should be kept conceptually separate from descriptions of behavioral function. Some even advocate defining behaviors exclusively in terms of what is measured and reserving functional interpretations for subsequent analysis and discussion (Laskowski et al. 2022).

2.3 Toward an Integrative Definition of Behavior

We now assess these eight characteristics against the four criteria for an adequate conception of behavior introduced in Section 2.1. Our aim is not to determine which characteristics are generally important for studying behavior, but which are necessary for identifying something as behavior. On this basis, we retain six of the eight

characteristics as necessary criteria: Particularity & Actuality, Boundedness, Activity, Externality & Perceivability, Situatedness, and Responsiveness.

The criterion Particularity & Actuality is rarely stated explicitly in existing definitions. Nevertheless, it captures fundamental ontological features of behavior, and we therefore consider it to be indispensable. By characterizing behaviors as concrete, spatiotemporally bounded actualities rather than abstract types, dispositions, or capacities, this criterion clearly distinguishes behaviors from latent traits. This distinction is particularly important because a central aim of the present framework is to differentiate social traits from social behaviors and from behavioral indicators.

The criteria Boundedness, Activity, Situatedness, and Responsiveness are among the most widely recognized characteristics of behavior in the literature. Levitis et al. (2009) also identify broad agreement among biologists concerning Boundedness, Responsiveness, and the distinction between behavior and developmental change. We see that also Activity and Situatedness are frequently emphasized in both biological and psychological accounts. Together, these criteria characterize behavior as an activity of an individual organism that occurs within a particular context, is sensitive to internal and external conditions, and is coordinated by underlying physiological and psychological processes. Although Situatedness may be less fundamental than some of the other criteria, because a moderate version of it is arguably presupposed by Responsiveness, it nevertheless captures an important insight shared by many authors: behaviors cannot be adequately understood independently of the contexts in which they occur.

We further include Externality & Perceivability in our definition. Although this criterion is less frequently discussed explicitly, it contributes an important conceptual clarification. In particular, it makes clear that physiological and mental processes are not themselves behaviors but rather internal processes that cause, mediate, or coordinate behavior. While this conclusion is already implied by the criterion of Internal Coordination, externality makes the distinction more explicit and therefore helps avoid conceptual confluences that are common in both biological and psychological research. In addition, the criterion highlights that behaviors, by virtue of being externally expressed activities, are in principle accessible to perception by other organisms and thus can have social influences and consequences.

By contrast, we do not include Internal Coordination and Functionality in our definition of behavior. First, although behaviors are indeed internally coordinated and the underlying mental and physiological processes are important objects of scientific inquiry, this criterion adds little to distinguishing behaviors from non-behaviors beyond what is already captured by Externality & Perceivability. Internal coordination concerns the mechanisms that generate or regulate behavior rather than a defining characteristic of behavior itself. Second, although behaviors often have functions and are frequently studied from functional, ecological, or evolutionary perspectives, we do not regard functionality as a necessary condition for identifying or describing behavior. Functional characterizations can provide important information about what a behavior consists of and how it should be understood, but they address an additional question concerning what a behavior does, contributes to, or has been selected for. This question should therefore be kept conceptually distinct from the question of what counts as behavior. This distinction is particularly important because a behavior or behavioral cue may have effects that are functional for other individuals without having an evolved function for the individual exhibiting it. For example, an involuntary cue may benefit a receiver by eliciting an adaptive response even though the cue itself has no function for its sender. Thus, functional analyses remain

indispensable for understanding and characterizing behavior, but functionality should not determine what counts as behavior in the first place.

Accordingly, we define behavior as follows:

“A behavior is a temporally and spatially concrete, externally expressed activity of an individual that is perceivable by other individuals, occurs within a particular situation or environment, and is responsive to internal or external conditions of the individual.”

This definition is intended to be applicable across humans and non-human animals while remaining consistent with major insights from both biological and psychological research traditions. By emphasizing the perceivable character of behavior and its situatedness, it also provides a conceptual bridge to the next section, which addresses the further question of what additional characteristics make a behavior social.

3. What Makes a Behavior Social?

Having clarified what a behavior is, we can now turn to the question of what distinguishes social behaviors from behaviors more generally and from non-social behaviors. At first glance, the answer may appear straightforward: social behaviors are behaviors that involve other individuals. However, closer examination reveals that this intuition can be specified in several different ways. Across biology, psychology, and philosophy, researchers have implicitly assumed or explicitly proposed different criteria for identifying social behavior, emphasizing interaction with others, responsiveness to others, orientation toward others, or effects on others (e.g., Argyle 1969; Wiggins 1979; Slobodchikoff 1988; Horowitz et al. 2006; West et al. 2007; Szekely et al. 2010; Blumstein et al. 2010; Kappeler et al. 2013; Mast et al. 2015; Ward & Webster 2016; Seebacher & Krause 2019; Pincus et al. 2020; Longino 2021; Delmé et al. 2024). Although these approaches often overlap in practice, they rest on different theoretical assumptions and highlight different aspects of the sociality of behavior.

The aim of this section is to analyze and systematize these different approaches to characterizing social behavior and to use them to formulate four major characteristics of social behavior. In contrast to the previous section, we do not argue that any of these four characteristics is a necessary criterion for social behavior (nor that, taken together, they are sufficient). As we will show in the following, no single criterion adequately captures all phenomena that researchers commonly regard as social behavior. The four characteristics should thus be understood as representing different dimensions through which a behavior can be meaningfully related to other individuals and thus can be social. This analysis ultimately leads to a more flexible and inclusive conceptualization of social behavior.

3.1 Major Criteria of Social Behavior

A review of implicit and explicit definitions of social behavior reveals four dimensions of the sociality of behavior that are frequently mentioned across biology, psychology, and philosophy: social interactionality, social situatedness and responsiveness, social directedness, and social consequences. Each dimension identifies a distinct way in which the behavior of one individual may be related to other individuals.

Table 2 provides an overview of the implicit and explicit definitions of ‘social behavior’ (or of related terms, such as ‘interpersonal behavior’) that our analysis is based on; it also indicates which dimensions are mentioned in which definition and by which authors.

Table 2. Definitions of social behavior and mentioned dimensions.

	Interactionity	Social Situatedness & Responsiveness	Social Directedness	Social Consequences
Delmé et al. 2024, p. 37 “Social behaviour, which broadly refers to interactions between individuals of the same species”	X			
Longino 2021, p. 2852 “social behaviors that require another participant, such as marriage and divorce, nurturance, aggression, sexual behavior”		X		
Pincus et al. 2020, p. 127 “A potential misinterpretation of the term “interpersonal” is to assume it refers to a limited class of phenomena that can be observed only in the immediate interaction between two proximal people. In contrast, Contemporary Integrative Interpersonal Theory assumes interpersonal functioning occurs not only between people, but also inside the mind via the social-cognitive capacity for mental representation of self and others... Interpersonal situations (i.e., those involving self and others) occur in perceptions of contemporaneous relationships and social interactions, memories of past relationships and social interactions, dreams and fantasies of relationships and social interactions, and expectations of future relationships and social interactions.”	(X)	X		
Seebacher and Krause 2019, p. 820 “We use the term social behaviour primarily for interactions between individuals of the same species.”	X			
Ward & Webster 2016, p. 1 “what constitutes social behaviour, considering that the term encompasses a diverse range of behavior but that its defining characteristic is simply that it involves an interaction between animals”	X			
Mast et al. 2015, p. 154 “Interpersonal behavior (or social interaction behavior) is defined as any verbal or nonverbal behavior directed toward or elicited by one or many real or imagined social interaction partners.”	X	X	X	
Kappeler et al. 2013, p. 2 “social behaviour, i.e. those that involve effects on or by conspecifics, in most cases mediated by communication or direct interaction.”	X	X		X
Blumstein et al. 2010, p. 1 “Social behavior is comprised of interactions among conspecifics and results in relationships of variable form, duration, and function.”	X			X
Szekely et al. 2010, p. 1 “Social behavior, heuristically defined as activities among members of the same species that have fitness consequences for both the focal individual and other individuals in the group, is thus ubiquitous.”	X	X		
West et al. 2007, p. 415 “From an evolutionary perspective, social behaviours are those which have fitness consequences for both the individual that performs the behaviour, and another individual.”				X
Horowitz et al. 2006, p. 69 “Generally speaking, interpersonal behaviors are motivated. When person A initiates an interaction with person B, we assume that A's behavior is purposeful (goal-directed). The person is not necessarily conscious of the goal (or motive), and for any given person, interpersonal goals may range in importance from trivial to vital.”	X		X	
Slobodchikoff 1988, p. 3	X		X	

“Social behavior includes any behavioural interactions among members of social groups. Social behaviour, ...includes any selfish, spiteful, cooperative or altruistic behaviour directed at group members and need not be limited to social species.”				
Wiggins 1979, p. 398 “interpersonal events may be denned as dyadic interactions that have relatively clear-cut social (status) and emotional (love) consequences for both participants (self and other)”				X
Argyle 1969, p. 11, 16, 430 “it analyses social behavior in terms of the basic elements of interaction- bodily contact, proximity, orientation, gestures, facial expression, eye-movements, the verbal and non-verbal aspects of speech”; “Sociology and anthropology have been concerned mainly with such uniformities of social behaviour, and these consist basically of interaction patterns. A social structure consists of regularities of social behaviour between people occupying different positions... Psychologists, of various kinds, are concerned with human behaviour; social interaction is one of the most important kinds of human behavior”; “Social behaviour is produced as a stream of closely integrated responses subject to continuous correction as a result of feedback”	X	X		

In the remaining part of this section, we explicate the four dimensions that make behavior social. Fig. 2 provides a concise definition of each dimension.

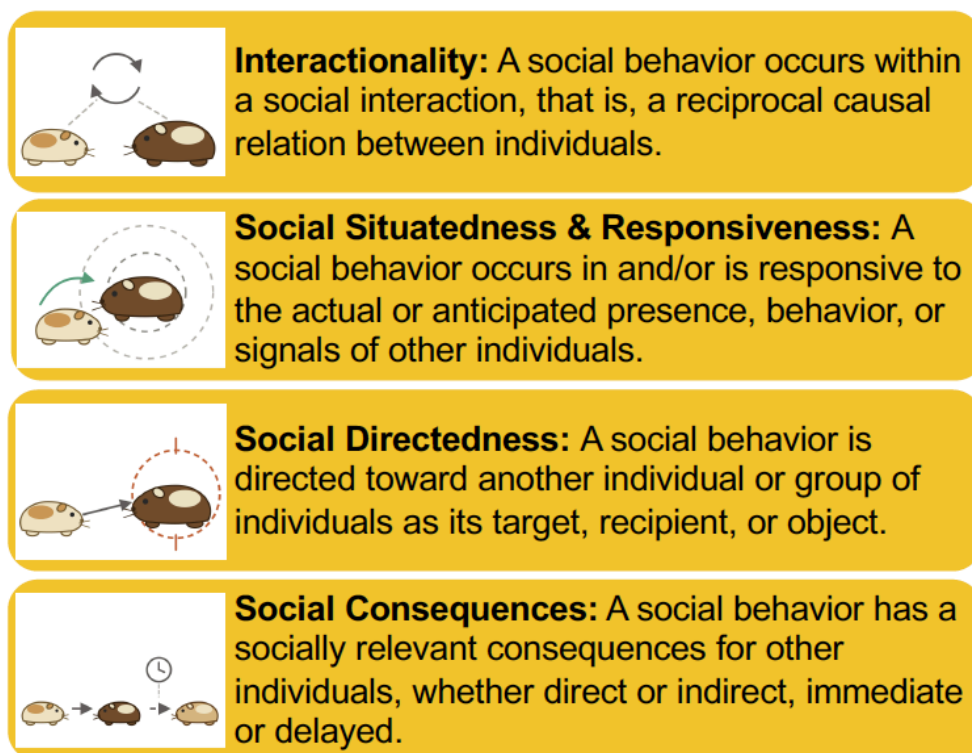


Fig. 2: Four dimensions of the sociality of behavior.

Social Interactionality: The most common definition in biology characterizes social behavior primarily through social interaction. This view emphasizes that most social behavior takes place in interactions with other individuals (Wiggins 1979; Slobodchikoff 1988; Horowitz et al. 2006; Alcock 2013; Blumstein et al. 2010; Kappeler et al. 2013; Ward & Webster 2016; Delmé et al. 2024). Some researchers, however, also stress that social or interpersonal behavior can take place outside of

real social interactions, for instance in dreams or when social interaction partners are imagined in memories or expectations (Mast et al. 2015; Pincus et al. 2020). Some authors even seem to assume that social behaviors are the same as or consist of social interactions – they say that “social behavior is comprised of interactions” (Blumstein et al. 2010, 1), that they “use the term social behaviour primarily for interactions” (Seebacher & Krause 2019, 820), or that “social interaction is one of the most important kinds of human behavior” (Argyle 1969, 16).

Interactionality captures an important and intuitively appealing class of social phenomena. Grooming another individual, being aggressive to others, playing with another individual, cooperating with others, and caring for offspring are all social behaviors that involve direct, reciprocal exchanges between individuals. Conceptually, however, social behaviors and social interactions belong to different ontological categories. Social behaviors are activities of individuals, whereas social interactions are relations of mutual causal influence between individuals (i.e., in dyadic interactions at least, each individual influences the other once). Many paradigmatic social phenomena, such as grooming, aggression, or cooperation, involve both individual behaviors and interactions between individuals.

The distinction between social behaviors and interactions does not entail a choice between individual-centered and relational approaches to social phenomena. Rather, it distinguishes two levels of analysis that are closely connected. We focus on social behavior as an activity of an individual, while recognizing that such behaviors can constitute, and be shaped by, interactions at the dyadic or group level. A relational approach can therefore take individual behaviors as the constituents of higher-level relational phenomena without reducing those phenomena to the properties of individuals considered in isolation. Conversely, distinguishing the individual behaviors that enter into an interaction can help clarify how relational phenomena are constituted and how causal influence is transmitted between individuals. In this sense, specifying social behavior at the individual level does not restrict relational explanations; rather, it provides a more precise basis for investigating how interactions and other higher-level social phenomena arise from and feed back on the behaviors of interacting individuals (cf. Longino 2013, 2021).

At the same time, the distinction shows why interaction cannot serve as a necessary condition for social behavior. Some behaviors appear social despite lacking direct reciprocal interaction, including interactions with chatbots, imaginary companions, or socially organized self-talk. In such cases, the behavior may be socially directed or organized by social representations, yet no mutual causal coupling with another conspecific exists. Likewise, individuals may modify their behavior in the presence of others without engaging in direct interactions. Interactionality therefore identifies one important dimension of sociality, but social behavior cannot be reduced to direct interaction alone.

Social Situatedness & Responsiveness: A second tradition emphasizes the role of other individuals as the social context and determinants of behavior. According to this criterion, a behavior is social when it occurs in the actual or anticipated presence of other individuals (social situatedness) and is responsive to their actual or anticipated behavior, signals, or presence (social responsiveness). The social situatedness component concerns the context in which the behavior occurs. Other individuals form part of the relevant situation, such that a behavior may be social because it is exhibited under social conditions created by their actual, anticipated, or implied presence. By contrast, the social responsiveness component concerns the factors to which the behavior responds. A behavior qualifies as social when other individuals function as relevant determinants of its occurrence, form, or

intensity. Such responsiveness need not involve direct interaction. Avoiding a dominant individual, adjusting one's position relative to nearby group members, modifying behavior because others are observing, or synchronizing activities with group members may all count as social behavior under this criterion.

This criterion also resonates with several influential traditions. It resembles Allport's (1954) classic characterization of social psychology as an attempt to understand and explain how the thoughts, feelings, and behavior of individuals are influenced by the actual, imagined, or implied presence of others (see also Mast et al. 2015; Pincus et al. 2020). It also resonates with classical ethological approaches, which often explain behavior by reference to the stimuli that elicit or modulate it. In the social domain, such stimuli include the presence, signals, and activities of conspecifics, to which individuals respond (e.g., Tinbergen 1963). Nevertheless, responsiveness may not be necessary for every social behavior. Dominance displays, alarm calls, scent marking, or courtship signals may be directed toward other individuals without being immediate responses to their behavior or presence. Such examples suggest that social responsiveness captures an important dimension of sociality but does not exhaust the concept.

Social Directedness: A third approach characterizes social behavior through its orientation toward other individuals. According to this criterion, a behavior is social when it is directed at another individual (or group of individuals) who functions as its target, recipient, or object. Here, 'directed' does not necessarily imply conscious intention or deliberate targeting: a behavior can be directed toward another individual by virtue of its organization or functional orientation without the individual consciously intending to affect that individual. Many paradigmatic examples of social behavior appear to satisfy this condition. Approaching, grooming, threatening, helping, courting, teaching, or communicating typically involve a specific orientation toward another individual. This criterion captures the intuition that social behavior is not merely behavior performed in the presence of others but behavior that treats another individual as behaviorally relevant in a more direct sense.

Social directedness is related to, but distinct from, social responsiveness. Social responsiveness concerns the role of other individuals as determinants of a behavior: a behavior is responsive when the presence, behavior, signals, or anticipated presence or behavior of another individual influences its occurrence, form, or intensity. Social directedness, by contrast, concerns the orientation of the behavior itself: another individual functions as the target, recipient, or object toward which the behavior is directed. The two criteria can therefore come apart. An individual may be responsive to another's presence or behavior without directing its own behavior toward that individual, for example, by changing its position or activity in response to a nearby dominant individual. Conversely, a behavior may be directed toward another individual without being an immediate response to that individual's behavior or presence, as in dominance displays, alarm calls, scent marking, or courtship signals. Directedness thus concerns whom or what the behavior is oriented toward, whereas responsiveness concerns what factors involving others contribute to the occurrence, form, or intensity of the social behavior.

At the same time, social directedness raises important conceptual questions. Determining whether a behavior is directed toward another individual often requires more than describing bodily movements. Philosophers of behavior have repeatedly argued that behavior types cannot always be individuated through purely extensional movement descriptions (Millikan 1995; Weber 2012). The same bodily movement may count as greeting, threatening, teasing, or accidental contact depending on its context and social significance. Consequently, identifying social directedness

frequently relies on interpretive assumptions concerning the social function, meaning, or orientation of behavior. This also creates an important measurement problem: judgments of social directedness may vary depending on whether they are made by experienced observers, multiple independent observers, or naive observers, making the criterion potentially difficult to operationalize and assess objectively.

Moreover, directedness appears too restrictive to serve as a general definition of social behavior. Social facilitation, conformity, audience effects, behavioral synchronization, or avoidance of dominant individuals may all be social without possessing a clear target or recipient of the behavior. Likewise, individuals can produce involuntary or unconscious behavioral cues that are socially informative to others without being specifically directed at them. Such behaviors may affect social partners or be used by them as information even though the behavior itself is not oriented toward those partners. Social directedness therefore appears better understood as one dimension of the sociality of behavior rather than as a necessary condition.

Social Consequences: A fourth criterion focuses on the consequences of behavior for other individuals. According to this view, a behavior is social when it produces socially relevant effects on other individuals, or when its occurrence or outcome is shaped by such effects. This perspective appears in several definitions of social behavior. Wiggins (1979, 398), for example, characterizes interpersonal events in terms of dyadic interactions with social and emotional consequences for both participants. From an evolutionary perspective, West et al. (2007, 415) define social behaviors as those having fitness consequences for both the individual performing the behavior and another individual. Blumstein et al. (2010, 1) characterize social behavior as interactions among conspecifics that result in relationships of variable form, duration, and function, while Kappeler et al. (2013, 2) define social behavior in terms of effects on or by conspecifics, in most cases mediated by communication or direct interaction. These formulations differ in what they take to be socially relevant consequences, such as social and emotional states, fitness, relationships, or effects on other individuals, but they share the idea that consequences for others are central to the social character of behavior.

Unlike interactionality, this criterion does not require reciprocal exchange, and unlike social responsiveness, it focuses not on the factors that contribute to the occurrence, form, or intensity of a behavior but on what the behavior brings about for others. Social consequences are therefore downstream effects of behavior, which may be direct or indirect, immediate or delayed, and intended or unintended. A behavior may be social because it changes the opportunities, fitness, information, emotional states, or subsequent behavior of other individuals, even when it does not occur in response to them or involve direct interaction. Alarm calling, scent marking, territorial displays, or public information use can all affect other individuals without requiring immediate reciprocal engagement. For example, an alarm call may alter the subsequent behavior of several group members without being directed at any particular individual, while scent marking may influence the later behavior of individuals that encounter the mark in the marker's absence. Social consequences can thus extend beyond the individuals immediately involved in a behavior and beyond the situation in which the behavior occurs.

The advantage of this criterion is its broad scope: it captures indirect and downstream forms of social influence that may be missed by focusing on the interactionality, directedness, or responsiveness of social behavior. However, not every effect on another individual is thereby social. A consequence should count as socially relevant when the behavior changes another individual's socially relevant

states, opportunities, relations, or behavior, for example, by altering access to resources or partners, social status, affiliation, information about other individuals, or subsequent social behavior. This distinguishes social consequences from incidental effects on conspecifics, such as changes in temperature, light, or other environmental conditions that happen to affect another individual. Social consequences therefore capture a distinct dimension of sociality: they concern what an individual's behavior brings about for other individuals in their capacity as social partners or participants in social relations.

3.2 Toward an Integrative Conception of Social Behavior

The preceding discussion suggests that the four dimensions capture different but overlapping aspects of what makes behavior social. Importantly, they do not all operate at the same conceptual level, nor do they appear equally suitable as jointly necessary conditions. One possible strategy would be to define social behavior as behavior that satisfies all four criteria simultaneously. Such a definition would characterize social behavior as behavior that (1) occurs within interactions with other individuals, (2) is situated in and responsive to their actual or anticipated presence, (3) is directed toward them, and (4) has socially relevant consequences for them. However, such an approach faces substantial difficulties. The four dimensions emerge from different theoretical traditions, including ethology, social psychology, philosophy of action, interaction theory, and behavioral ecology. Consequently, it is difficult to justify requiring all of them simultaneously. More importantly, many widely accepted social behaviors satisfy only some of the dimensions. Territorial scent marking can have social consequences without requiring direct interaction or responsiveness to the immediate presence of conspecifics. Audience effects involve social situatedness and responsiveness without necessarily being directed toward particular individuals. Dominance avoidance can be socially responsive without involving direct interaction or directedness toward the dominant individual. Alarm calls may have social consequences for many conspecifics without being directed at any specific recipient. Such examples suggest that neither any single criterion nor a conjunction of all four adequately captures the full diversity of phenomena that researchers study under the label of social behavior.

We therefore propose a more general characterization. At the most fundamental level, what makes a behavior social is that it is meaningfully related to other individuals in virtue of how it occurs, what it responds to, what it is oriented toward, or what it brings about for them. The four dimensions discussed above can thus be understood as different ways in which a behavior can be socially related to other individuals, rather than as jointly necessary defining characteristics. This relation can take several forms. First, a behavior may occur within a social interaction, understood as a reciprocal causal relation between individuals of the same species. Second, it may be socially situated and responsive insofar as it occurs in and is shaped by the actual, anticipated, or implied presence, behavior, or signals of other individuals. Third, it may exhibit social directedness by being oriented toward another individual or group of individuals as its target, recipient, or object. Fourth, it may have social consequences by changing the socially relevant states, opportunities, relations, or behavior of other individuals.

Accordingly, we propose the following integrative definition:

“A social behavior is a behavior of an individual that is meaningfully related to other individuals through interaction, social situatedness and/or responsiveness, social directedness, or socially relevant consequences.”

This definition preserves the common intuition that social behavior concerns relations among individuals while remaining sufficiently broad to accommodate the diversity of social phenomena studied across disciplines. Rather than treating interactionality, social situatedness and responsiveness, social directedness, and social consequences as jointly necessary conditions, it conceptualizes them as complementary dimensions through which the sociality of behavior can be expressed. The definition is therefore inclusive without treating every behavior that merely occurs in the presence of, affects, or is affected by another individual as social: the relevant relation must instantiate at least one of the specified dimensions of sociality.

4. Conclusion

The conceptual framework of what counts as behavior and what makes it social developed in this paper has direct empirical implications for the study of individual differences in social behavior. It provides a basis for identifying, measuring, and comparing social behaviors within and across species.

These conceptual clarifications matter empirically in at least three ways. First, they help determine what exactly is being identified and measured as a behavioral phenomenon. If social behavior is an activity of an individual, measures should capture instances or patterns of such activity rather than treating a latent trait or a social interaction as the behavior itself. Distinguishing the four dimensions of sociality can further guide the selection of behavioral indicators and make explicit which aspects of social behavior a measure captures. Second, they help assess the scope and comparability of empirical findings. Similar measures may capture different behavioral phenomena, while different measures may capture behaviors that instantiate the same social dimension. Making these conceptual relations explicit allows us to distinguish what a finding establishes about a particular behavior from what it establishes about related phenomena, and thus clarifies the scope of the conclusions that can be drawn from a given operationalization. Third, they support more systematic cross-species comparison. The same social phenomenon need not have the same observable form across species, and similar behavioral forms need not instantiate the same social phenomenon. Separating the concept of social behavior from its species-specific expression and measurement therefore provides a basis for evaluating when findings are genuinely comparable and where species-specific differences need to be taken into account.

Conceptual clarification is therefore not merely a terminological exercise. It shapes what is classified as social behavior, guides how it should be operationalized, and specifies what and how has to be measured, and how findings can be interpreted, evaluated, compared, and generalized, thereby contributing to more empirically meaningful and cumulative knowledge about individual differences in the social behavior of humans and non-human animals.

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