ON THE UNITS OF ANALYSIS IN VERBAL BEHAVIOR

Carsta Simon

University of Agder

This paper outlines conceptual challenges in studying verbal behavior and sets the stage for future research on verbal interactions from a fresh perspective. Different approaches to identifying verbal operants independent of those suggested by Skinner (1957) are discussed. How should we break down the continuous flow of verbal behavior into units that we can measure? What is it in a conversation that is selected by its environment and how does this unit hold together? How can we achieve measurements of relevant aspects of verbal behavior? These and other questions are explored to prepare for empirical research on the question of units of selection in verbal interaction.

Keywords: units of verbal behavior; units of selection; evolution; cooperation; conversation

Following Chomsky's (1959) critique of Skinner's (1957) *Verbal Behavior*, researchers have mainly approached verbal interactions from a cognitive perspective with minimal reference to operant learning. During the last decades, there has been a substantial increase in research activity using Skinner's terminology (Petursdottir & Devine, 2017). However, most of this activity focuses on applied research developing and testing language interventions (Drash & Tudor, 2004; T. Smith, 2001; Sundberg & Michael, 2001). Limiting research on verbal behavior to attempts to identify and understand Skinner's tacts, mands, echoics, and other verbal operants in verbal exchange will necessarily leave many questions unanswered. Skinner's approach cannot answer why or how we cooperate, persuade, or become friends through interactions in conversations. What verbal operants beyond those suggested by Skinner might exist? How can we identify them? This paper highlights challenges in answering these questions. Likely, these challenges are among the reasons that most research on verbal behavior remains within Skinner's framework. Recent publications (e.g. Baum, 2017; Hineline, 2018; Pohl, et al., 2020; Simon, 2018a, 2020; Simon & Baum, 2017) support the hypothesis that the attempt to go beyond Skinner's verbal operants when researching verbal interaction from a behavioral point of view is an emerging topic that has received some but not extensive coverage. The goal of this paper is to provide a better understanding of these conceptual challenges in defining and measuring verbal phenomena, which will hopefully allow future research to tackle them and to advance the field into new and exciting areas of work.

Organisms behave from birth (feasibly conception) to death. A prerequisite for quantitative research on behavior is dividing this continuous flow of behavior into units of analysis. If we want to understand the interaction between (verbal) behavior and environmental events, we need to determine when behavior is occurring, increasing, or decreasing; and for that, we must measure it. When introducing tacts, mands, echoics, and the like as verbal operants, Skinner (1957) suggested some units of analysis. In the following, we discuss reasons that may help explain why there is so little research on verbal phenomena that goes beyond an analysis of Skinner's operants in behavior analysis.

The Challenge of Harnessing Extended Verbal Patterns for Scientific Examination

One of the goals of empirical psychology is the measurement of phenomena. Measurement refers to the process of systematically assigning numbers or labels to objects, events, or behaviors according to specific rules. A good measurement might be defined as a consistent mapping of a numerical relative on an empirical relative. In other words, in a realist stance, measurement involves creating a numerical representation (the numerical relative) that accurately reflects some

Author Note: Address correspondence to: Carsta Simon (email: carsta.simon@uia.no), Department of Psychosocial Health, University of Agder, Grimstad, Norway. https://orcid.org/0000-0001-8150-3248

Parts of the article have previously appeared in the author's PhD thesis (Simon, 2018b).

https://doi.org/10.17605/OSF.IO/N2YBA

aspect of reality (the empirical relative)[1]. A premise for speaking of a map true to scale—or of homologous patterns in a model and in the modeled phenomena—is reliable correspondence between the terms in which the findings are expressed, and in the phenomena studied. This means that the terms used in scientific descriptions must correspond closely to the actual phenomena they describe. In short, a prerequisite for trustworthy measurement of phenomena is an unambiguous terminology for the description of these phenomena. The clearer the relation between terms and the contexts that occasion them, the more consistently will our numerical relations correspond to the relations between phenomena we measure.

There are two ways to create this correspondence between terms and phenomena. Either we look at the phenomenon and invent a (technical) term, or we assign phenomena to terms already in use. The technical terms "microscope" and "osmosis" were coined to describe a new object and a new event while avoiding confusion with previously established connotations. For the same reason, Skinner (1957) introduced terms such as tact and mand instead of referring to these verbal operants as labels and requests. To create correspondence between terms and phenomena, psychology, though, takes a different route. In most cases, psychologists do not invent new terms for observed phenomena but *operationalize* familiar terms (Harzem, 1986).

Operationalization involves creating an explicit and clear definition of a variable or concept to measure it systematically. For example, "stress" can be operationalized by measuring physiological responses like heart rate or cortisol levels. In operational definitions of everyday terms, phenomena arising from certain procedures are assigned to preexisting terms. "Extraversion" is operationalized, for example, by physiological measures (e.g. Depue & Collins, 1999; Forsman, et al., 2012; Johnson et al., 1999; Shiner & Caspi, 2003) and by personality questionnaires (e.g. Conn & Rieke, 1994; Costa & MacCrae, 1992; Eysenck & Eysenck, 1994; Hogan, 1995).

By adopting the gold standard of operationalization of complex phenomena, one attains the impression that psychology successfully brings complex extended behavioral patterns under experimental control. After all, extroverted behavior is complex. Where control of complex behavior was not achieved, this is often not conceived as a problem—since the real interest lies in cognitive processes and not in particular behavior (see also Harzem, 1986). As there is no reason to assume that less complex behavior and more complex behavior result from qualitatively different cognitive processes, concluding the workings of cognition from button presses does not create a problem.

Operationalization involves creating an explicit and clear definition of a variable or concept to measure it systematically. In the context of behavioral science, operationalization is crucial for turning abstract concepts into measurable observations. By ensuring the operationalization of terms is clear and precise, we achieve a "homological mapping of a numerical relative on an empirical relative"—meaning that our numerical measurements (like scores on a stress scale) accurately reflect the empirical reality (the actual stress experienced by individuals). This process allows researchers to establish reliable and valid measures of complex behaviors and phenomena.

At the same time, the question arises of how to verify that the overall goal of measurement was achieved. Aiming at identifying the empirical relative that maps accurately onto the numerical relative, behaviorists are aware of how little we can be sure if our terminology (the presupposition of the numerical relative) actually maps onto cognitive processes (as the empirical relative). Thus, to be able to attain higher certainty to what extent measurement of phenomena has actually been achieved; behaviorists focus on behavior itself. Defining behavior-environment relations as the focus of study avoids the problem that it is only inadequately testable whether or not cognitive processes actually are the empirical relative we measure. Another problem, however, remains in the effort to measure complex behavior.

[1] From a pragmatic viewpoint, measurement is the activity of classifying, ordering, or quantifying elements based on a relevant attribute to achieve a larger goal.

Operationalization of complex human behavior by isolated acts is only practical as long as the operationalization is not treated as an exhaustive technical term. Exhaustive definitions define concepts by observables, without remainder, and can only be applied in one context. Partial definitions, in contrast, imply additional meaning, beyond the current situation (Moore, 2011). Assigning procedures to context-dependent everyday terms creates partial definitions that do not make the terms less ambiguous. To phrase it in Wittgenstein's terminology (1953; 2010), defining the meanings of a word as the contexts in which it is used, a technical term is used in the context for which it was invented. Everyday terms, in contrast, are used in many contexts, and not all of those usages may relate to the phenomenon observed by a certain procedure. Operationalization may achieve that the phenomenon maps unambiguously onto the word, but the word does still "map" ambiguously on the phenomenon.

Harzem (1986) gives an example of this problem of "back translation" from a concrete procedure to a fuzzy term: If a researcher operationally defines stress by immobilizing a rat for 48 hours and then makes assertions about marital stress, the two phenomena do not share much but the label stress. This common label invites smuggling conclusions about one research question (reactions of a constrained rat) into the other (how to prevent marital stress).

Is this problem solvable by either restricting us to the use of technical terms or restricting the phenomena we operationally define? The answer might be yes and no. Restricting phenomena or the use of technical terms counteracts the "smuggling problem", but it restricts us to investigating less complex and, to many, less relevant behavior.

This article attempts to discuss which events might induce verbal behavior and the connected question of what constitutes an appropriate verbal behavioral unit of analysis. To understand, for example, conversation, we need to develop a methodology that allows for a more generalizable, or externally more valid, analysis of verbal behavior than earlier approaches focusing on the identification of Skinner's (1957) discrete operants.

For example, the observation that Jakob says that Piet is convincing Felix may serve as a starting point for testing if "convincing" can be selected as a verbal unit by altering its contingency with environmental events (such as "reinforcers"). The extent to which our labels correspond to units of selection depends on the extent to which our verbal units (e.g., the term "convincing") and the related behavioral unit (e.g., a speaker's behavior) map onto each other. Going beyond Skinner requires addressing new methodological problems.

One criterion to identify units of selection is investigating how a part's removal affects the whole. For instance, the species of Drosophila in my kitchen is presumably equally (little) affected if I remove the individual sitting on an apple or the one sitting on a pear. If, however, my heart is removed, my organism is qualitatively and quantitatively differently affected than if my appendix is removed. In an effort to identify units of selection, "functioning together", such as the functioning of my heart, my liver, and other body parts, is one coherence criterion. Cooperation is a behavioral example of such "functioning together" in the sense that the effect on the environment can change when the parts change. "Functioning together" may often go along with another coherence criterion: common variation going along with a change in environmental factors (Baum, 2002; Herrnstein, 1977). If I have not eaten for a while, I do not only take out a pan, but I also fill it with water and pasta and place it on the stove. R. F. Smith (1974) describes "behavioral packages", which change in pigeons when being food deprived.

Defining coherence by common function suggests that verbal interactions amount to cooperation. Of course, cooperation in a verbal interaction can be more or less successful and more or less explicitly the goal of a conversation. At times, Piet's and Jakob's verbal activities in a conversation are parts of two opposite extended patterns; say Piet's utterances are part of "getting Jakob to go to the movies with him" and Jakob's utterances are part of "getting some time for himself". At the same time, Piet and Jakob cooperate (talk), which is part of a more extended pattern (such as maintaining a sibling relationship), which is in a contingency with a shared environmental event (say, safety by social and financial support). If Jakob left the room when Piet asks him to join him at the movies, each of them would still engage in parts of their more extended behavioral patterns but such a

non-cooperative act would make social and financial support in the future less likely.

The part-whole relationship and dropping the requirements that only one organism may engage in an operant open up for the investigation of verbal behavior of dyads or even more people. Possibly, verbal behavior is inherently cooperative and can be illuminated even better if changes in joint verbal interaction are investigated as dependent variables. The function of aggregates of parts (e.g., a whole utterance or a whole organism) may differ from the function of single parts (e.g., an utterance's first word or an organism's liver), meaning that selection would act on aggregates and on parts of aggregates. Aggregates can function as a sum of parts or other, new effects can emerge from the cooperation of parts. If Piet says "it is better to", "I think" or "well, just consider" this may induce Jakob to say, "Piet is convincing Felix". Jakob names the individual, of which Piet provided parts. However, does it follow that selection acts on this individual, on convincing? Possibly, but not necessarily. It seems conceivable that there is at least partial correspondence between units of operant selection and units occasioning our verbal behavior but there is no reason to assume perfect mapping. Likely, labeling, or tacting in Skinner's (1957) terminology, has evolved because it increases an organism's behavior-environment fit. Our verbal behavior is tailored to the environment as we "tact" because "tacting" can enter into a contingency with environmental events such as "reinforcers" and "punishers".

Skinner investigated mainly rats' lever presses and pigeons' key pecks in his experiments. However, as Zeiler (1986) points out, Skinner's operant concept can involve any number of stimuli and responses:

> "[Skinner's operant concept] imposes no restrictions on the size or extent of either stimulus or response, nor does it require that complex behavior be composed of smaller units. Any behavior, no matter how extended in time or space, could itself be a unit [….] Units of measurement of behavior also are a problem in that different generic units must be measured in different ways […] Have we confused technology for studying behavior in the laboratory and orderly observable effects of variables with a unit?" (pp. 6-12)

If so, this suggests that the most meaningful human behavior may simply not occur in continuous sequences but is interrupted and restarts. It may be episodic (Baum, 2007), much like a locomotive's traveling of 100,000 miles per year, which consists of intermittent episodes of traveling and parking (Rachlin & Frankel, 2009). Possibly, the unitary properties that exist in our verbal labels are not occasioned by smooth behavior shown continuously over time. Our saying that Piet is "working", "being a good friend", and "convincing Felix" may not be induced by continuous sequences in the first place but by episodes a speaker has observed over time.

If our verbal labels are not induced by continuous sequences, does it follow that verbal labels are not induced by orderly (but non-sequential) patterns? From an adaptive point of view, it seems likely that there is an orderly relationship between Jakob's behavior and Piet's saying that Jakob is working or is "convincing Felix". Piet's verbal behavior, however, may be induced by units of Jakob's behavior, which are composed of temporally non-contiguous components. Nothing prevents such episodes from being orderly.

It may be worth investigating if lawful relations between complex verbal activities and environmental events are most effectively assessed by dropping the proposition that behavioral units of selection are continuous in their structure. In a functional approach, the unit of behavior can be defined by what emerges when there is a (changing) contingency between activities and environmental events. Presuming that the components of verbal units of selection are orderly but not necessarily sequential, we understand why Piet can legitimately say that Felix trains skiing—although, when filming Felix, Piet would not only see Felix standing on skis but would also see him waxing the skis, taking the bus to the skiing track, asking for directions, taking a drink of water, working, sleeping, and so on.

Research Programs that Might Inspire Empirical Answers

Although the primary goal of this paper is to be informative, it will hopefully eventually inspire the (re)design of experiments. Possibly, inspiration for how to solve the issues discussed

above may be found in other approaches for which Skinner's work has set the stage. Examples of approaches that further develop some of the issues raised in this paper are the concepts of Interlocking Behavioral Contingencies (IBCs, Glenn, 2004), of metacontingencies (Glenn, 2004), and Relational Frame Theory (RFT, Hayes, 1991). These approaches focus on contextual control by emphasizing the importance of environmental contingencies and context in shaping verbal behavior. They also highlight the need to understand and analyze complex, extended patterns of verbal behavior rather than isolated acts. Also, IBCs, metacontingencies, and RFT stress the importance of identifying appropriate units of analysis for studying behavior. They, too, situate verbal behavior in a context of cooperation and interaction by investigating how verbal interactions involve cooperation and the interplay of multiple individuals' activities, essential for effective communication and achieving collective outcomes. Moreover, all three approaches are concerned with operationalization and measurement. They advocate for precise operational definitions and methodologies to systematically measure and study verbal phenomena.

Maybe, the study of the cooperative nature of verbal behavior in conversations would benefit from an IBC-, or a metacontingency, analysis. IBCs can be defined as interconnected actions of multiple individuals where each person's behavior induces another's behavior, creating a chain of interactions that depend on each other. Different from contingencies suggested by Skinner (1957), IBCs often result in an aggregate product that is greater than the sum of its parts. In conversations, a part of an IBC could be the verbal activities of one person (e.g., asking a question) inducing another person's response (e.g., providing an answer). This cooperative interaction contributes to the conversation flow and that the interaction achieves its purpose. The research implications might be that studying IBCs can help identify the specific verbal activities that facilitate verbal cooperation and effective communication.

Examples of studies that could be conducted in the IBC framework are studies on dyadic interactions that investigate how pairs of individuals coordinate their verbal behavior during problem-solving tasks. One could, for example, measure the impact of different types of verbal inducers on cooperative problem-solving efficiency. Also, group dynamics can be studied from this perspective. One could examine how small groups coordinate verbal behavior in team-based projects. One could also identify key verbal activities that facilitate successful collaboration and those that hinder it. Possibly, inspiration might be gathered in naturalistic observations where one observes real-life settings such as classrooms, workplaces, or social gatherings to potentially identify natural occurrences of IBCs. From these observations, one might derive hypotheses on what variable to test in experimental manipulations where specific verbal actions are correlated with putative inducers to see their impact on group cooperation.

Although the IBC perspective invites designing experimental setups to manipulate and observe changes in verbal behavior within dyads or groups to better understand the dynamics of cooperative verbal interactions, the problem remains that one needs to partition the continuous stream of (verbal) behavior into units that might or might not best be studied as parts of a chain. Moreover, the idea of a stimulus-response chain that is central in IBC analysis, draws attention away from the possibility to investigate contingencies by measuring correlations of continuous events. Also, an IBC analysis of a conversation would likely indirectly entail a study of turn taking, where each conversational partner's turn is regarded a unit (i.e., an effective cause) in a chain.

Metacontingencies are defined as contingencies that govern the interactions of a group of individuals, leading to a collective outcome that benefits the group or the larger environment. In the context of verbal behavior, metacontingencies might be seen in group discussions, organizational communication, and social movements where the coordinated verbal actions of individuals lead to group-level outcomes (e.g., decision-making, problem-solving). The metacontingency perspective might provide insights into how group verbal behavior is induced by and induces environmental events. It may help to understand how collective verbal behavior emerges and is maintained, and how it can be influenced to achieve desired group outcomes. The metacontingency concept may also be applied to studying two conversational partners' actions by

identifying what aggregate product their conversation, or parts of it, correlate with.

Another approach to enhancing our understanding of verbal behavior is to test empirically if phenomena that have been thoroughly investigated within non-verbal behavior (such as blocking, effects of fixed and variable schedules, the Premack principle etc.), also occur in verbal behavior. For example, Conger and Killeen (1974) and Simon and Baum (2017) have taken this approach when they investigated whether the Matching Law (Baum, 1974; Herrnstein, 1961) applies to interactions in conversations.

The concrete takeaways I aimed for in this paper were to emphasize the need for expanded units of analysis. I highlighted the necessity of identifying and defining verbal units beyond Skinner's operants to better understand complex verbal interactions. I underlined the importance of contextual control by highlighting how verbal behavior is influenced by environmental contingencies defined by the context in which it occurs, suggesting a need for more nuanced analysis. I reviewed operationalization challenges by discussing the difficulties of creating precise operational definitions for verbal behavior and the importance of clear, unambiguous terminology in scientific measurement. Moreover, I drew attention to the cooperative nature of verbal behavior by elaborating on that verbal behavior often involves cooperation and interlocking behavioral contingencies, requiring analysis of interactions between multiple individuals. I called for new methodological approaches to study verbal behavior, including considering non-sequential and episodic patterns of behavior. Moreover, I proposed that future research could focus on developing experimental methodologies to analyze more complex verbal patterns and interactions, aiming for greater external validity and generalizability.

By addressing these points, the paper aims to broaden the scope of research on verbal behavior, moving beyond traditional frameworks to better capture the intricacies of human communication. If complex human activities, nonverbal or verbal, do not exist in consistent unitary form allowing experimental scrutiny, this may be the reason why we have not yet demonstrated experimental control of such complex patterns. Not requiring verbal units of selection to consist of sequential components poses new methodological challenges such as measuring the beginning and end of an activity and the requirement of criteria defining that the activity, not only a part of it, has actually occurred. Skinner (1957) has paved the way for an investigation of verbal behavior from a natural science perspective. Here, I invite behavioral researchers to aim at a better understanding of the whole picture of verbal interactions.

REFERENCES

Baum W.M. (1974) On two types of deviation from the matching law: bias and undermatching. *Journal of the Experimental Analysis of Behavior*. *22*(1), 231-242. https://doi.org/10.1901/jeab.1974.22-231

Baum, W. M. (2007). Commentary on Foxall, "Intentional Behaviorism". *Behavior and Philosophy*, *35*, 57-60.

Baum, W. M. (2017). *Understanding behaviorism: Behavior, culture, and evolution.* Wiley. https://doi.org/10.1002/9781119143673

Chomsky, N. (1959). A reviews of B. F. Skinner's verbal behavior. *Language, 35*(1), 26–58. https://doi.org/ 10.2307/411334.

Conger, R., & Killeen, P. (1974). Use of concurrent operants in small group research: A demonstration. *Pacific Sociological Review, 17*(4), 399-416. https://doi.org/10.2307/1388548

Conn, S. R., & Rieke, M. L. (1994). *16PF fifth edition technical manual*, Institute for Personality and Ability Testing, Incorporated.

Costa, P. T., & MacCrae, R. R. (1992). *Revised NEO personality inventory (NEO PI-R) and NEO five-factor inventory (NEO-FFI): Professional manual*, Psychological Assessment Resources, Incorporated.

Depue, R. A., & Collins, P. F. (1999). Neurobiology of the structure of personality: Dopamine, facilitation of incentive motivation, and extraversion. *Behavioral and Brain Sciences, 22*(3), 491-517. https://doi.org/10.1017/s0140525x99002046

Drash, P. W., & Tudor, R. M. (2004). An analysis of autism as a contingency-shaped disorder of verbal behavior. The Analysis of Verbal Behavior, 20, 5-23. https://doi.org/10.1007%2FBF03392988

Eysenck, H. J., & Eysenck, S. B. G. (1994). Manual for the Eysenck Personality Questionnaire:(EPQ-R Adult): Educational Industrial Testing Service.

Forsman, L. J., de Manzano, Ö., Karabanov, A., Madison, G., & Ullén, F. (2012). Differences in regional brain volume related to the extraversion–introversion dimension—a voxel based morphometry study. *Neuroscience Research, 72*(1), 59-67. https://doi.org/10.1016/j.neures.2011.10.001

Glenn, S. S. (2004). Individual behavior, culture, and social change. *The Behavior Analyst, 27*(2), 133-151. https://doi.org/10.1007%2FBF03393175

Harzem, P. (1986). The language trap and the study of pattern in human action. In T. Thompson & M. D. Zeiler (Eds.), *Analysis and integration of behavioral units* (pp. 45-53). Psychology Press.

Hayes, S. C. (1991). A relational control theory of stimulus equivalence. In L. J. Hayes; P. N. Chase (eds.). *Dialogues on verbal behavior*. (pp. 19–40). Context Press.

Herrnstein, R. J. (1961). Relative and absolute strength of response as a function of frequency of reinforcement. *Journal of the Experimental Analysis of Behavior, 4*(3), 267-272. https://doi.org/10.1901%2Fjeab.1961.4-267

Hineline, P. N. (2018). Narrative: Why it's important, and how it works. *Perspectives on Behavior Science, 41*(2), 471-501. https://doi.org/10.1007%2Fs40614-018-0137-x

Hogan, R. (1995). *Hogan personality inventory*. Hogan Assessments Systems.

Johnson, D. L., Wiebe, J. S., Gold, S. M., Andreasen, N. C., Hichwa, R. D., Watkins, G. L., & Boles Ponto, L. L. (1999). Cerebral blood flow and personality: a positron emission tomography study. *American Journal of Psychiatry, 156*(2), 252-257. https://doi.org/10.1176/ajp.156.2.252

Moore, J. (2011). Behaviorism. *The Psychological Record, 61*(3), 449. https://doi.org/10.1007/ BF03395771

Petursdottir, A. I., & Devine, B. (2017). The impact of Verbal Behavior on the scholarly literature from 2005 to 2016. *The Analysis of Verbal Behavior, 33*(2), 212-228. https://doi.org/10.1007%2Fs 40616-017-0089-3

Pohl, P., Greer, R. D., Du, L., & Lee Moschella, J. (2020). Verbal development, behavioral metamorphosis, and the evolution of language. *Perspectives on Behavior Science, 43*(1), 215-232. https://doi.org/10.1007%2Fs40614-018-00180-0

Rachlin, H., & Frankel, M. (2009). Taking pragmatism seriously: A review of William Baum's understanding behaviorism: Behavior, culture, and evolution (second edition). *Journal of Experimental Analysis of Behavior, 92*(1), 131-137. https://doi.org/10.1901/jeab.2009.92-131

Shiner, R., & Caspi, A. (2003). Personality differences in childhood and adolescence: Measurement, development, and consequences. *Journal of Child Psychology and Psychiatry, 44*(1), 2-32. https://doi.org/10.1111/1469-7610.00101

Simon, C. (2018a). The functions of active listening responses. *Behavioural Processes, 157*, 47-53. https://doi.org/10.1016/j.beproc.2018.08.013

Simon, C. (2018b). *Selection of verbal behavior during ontogeny: The challenge of harnessing behavior patterns for scientific investigation.* (PhD dissertation). Oslo Metropolitan University, Oslo.

Simon, C. (2020). The ontogenetic evolution of verbal behavior. *European Journal of Behavior Analysis, 21*(2), 1-18. https://doi.org/10.1080/15021149.2019.1710034

Simon, C., & Baum, W. M. (2012). Expelling the meme-ghost from the machine: An evolutionary explanation for the spread of cultural practices. *Behavior and Philosophy, 39/40*, 127-144.

Simon, C., & Baum, W. M. (2017). Allocation of speech in conversation. *Journal of the Experimental Analysis of Behavior, 107*(2), 258-278. https://doi.org/10.1002/jeab.249

Simon, C., & Hessen, D. O. (2019). Selection as a domain-general evolutionary process. *Behavioural Processes, 161*, 3-16. https://doi.org/10.1016/j.beproc.2017.12.020

Skinner, B. F. (1957). *Verbal behavior*. Copley Publishing Group.

Skinner, B. F. (1981). Selection by consequences. Science, 213(4507), 501-504. https://doi.org10.1126/science.7244649

Smith, R. F. (1974). Topography of the food-reinforced key peck and the source of 30-millisecond interresponse times. *Journal of the Experimental Analysis of Behavior, 21*(3), 541-551. https://doi.org/10.1901%2Fjeab.1974.21-541

Smith, T. (2001). Discrete trial training in the treatment of autism. *Focus on Autism and other Developmental Disabilities, 16*(2), 86-92. https://doi.org/10.1177/108835760101600204

Sundberg, M. L., & Michael, J. (2001). The benefits of Skinner's analysis of verbal behavior for children with autism. *Behavior Modification, 25*(5), 698-724. https://doi.org/10.1177/0145445501255003

Wittgenstein, L. (1953/2010). *Philosophical investigations*. John Wiley & Sons.

Zeiler, M. D. (1986). Behavioral units: A historical introduction. In T. Thompson & M. D. Zeiler (Eds.), *Analysis and integration of behavioral units* (pp. 1-12). Erlbaum.