

Chomsky vs. Skinner

In 1959, Noam Chomsky wrote a review of B.F. Skinner's *Verbal Behavior*, critiquing Skinner's behaviorist approach to understanding natural language. In this paper, I will argue that Chomsky's view on natural language is correct. I will start by explaining behaviorism, Skinner's contributions to the field, and then Skinner's approach to verbal behavior. I will explain two of Chomsky's objections and then on behalf of Skinner defend them. For each objection, I will decide whether Skinner's behaviorist view or Chomsky's view on natural language is valid. Ultimately, I will determine that Chomsky's perspective is more correct than Skinner's.

Behaviorism is the study of human and animal behavior. American Psychologists and Behaviorists John B. Watson and Ivan Pavlov are two key figures in the field. In the 1920s, they discovered classical conditioning, a learning procedure that builds an association between a biologically important stimulus, such as food, to a neutral stimulus, such as a bell or a flash. Skinner drew and expanded upon this model and created operant conditioning, a procedure in which learning occurs due to changes in behavior triggered by the environment.

Skinner's key contributions to the field were the operant conditioning chamber, also known as the Skinner Box, and radical behaviorism. The Skinner box contained a response-lever, food dispenser, a loud speaker, lights, and an electrified grid. The goal was to train animals to perform desired actions in response to a stimulus. He found that for a rat, food increases the strength of the lever-pressing behavior. Skinner also pioneered radical behaviorism, which is the study of behavior as a natural science that emphasizes the environment's role in shaping behavior. Radical behaviorism was an attempt to understand learning and intelligent behavior demonstrated by the Skinner box. It was also a reaction against internal states motivating intelligent behavior and action, which Skinner thought were unobservable and hence non-explanatory.

Inspired by operant conditioning and radical behaviorism, Skinner wrote *Verbal Behavior*, describing what we call today linguistics. Skinner defines verbal behavior as behavior reinforced through the mediation of other persons. For example, Skinner considers a thirsty speaker asking for a glass of water (page 1). The speaker engages in behavior to produce those certain speech sounds, and those sounds can be simply described in physical terms, such as the frequency of those speech sounds. The act of the glass of water reaching the speaker is more difficult to describe than the behavior of producing speech sounds. This is due to the complex behavior between the speaker and listener. Also, Skinner rejects the traditional formulation of verbal behavior in terms of meaning. The traditional formulation was that ideas, beliefs, and meanings could exist independently of humans. He believes that these entities are tied to humans' internal states and hence cannot exist nor be observed independently. He proposes a new formulation to meaning, in which the ultimate aim is to predict and control verbal behavior.

Now I'm going to explain Chomsky's objections to Skinner's approach to verbal behavior, then on behalf of Skinner challenge Chomsky's objections, and finally show why Skinner's rebuttals fail. Chomsky argues that the theoretical behaviorist terms, such as "stimulus", "response", and "reinforcement", are well defined with regards to controlled animal experiments, but lose objective sense in regards to natural language and real-life behavior. They are just a disguise, appealing to mental states that the behaviorist would otherwise deny. In Chomsky's review, he uses the examples of Mozart's music and the Dutch Masters paintings as stimulus controls, demonstrating the inappropriate use of "stimulus" for understanding natural language. Let us examine the case of a Dutch Masters painting as a stimulus control. When shown that stimulus, a speaker could say "Dutch." However, a speaker could also say, "Never saw it before", "Tilted", "Hanging too low", "Beautiful", "Hideous", or "Remember our camping trip last summer?" (page 31). Chomsky argues that naming any of these utterances as a "stimulus" response is

meaningless since we cannot objectively deduce what the stimulus is given the possible nonsynonymous responses. The stimulus is no longer in the physical world, but internal to the speaker. To predict the stimulus, we would need to understand the internal state of the speaker, since we don't know what the speakers sees in the environment until he or she speaks.

On behalf of Skinner, I believe Skinner would say that Chomsky is raising objections to the practical limitations of his argument, and not a foundational one. The Dutch Masters example is focused on the practical use of verbal behavior. This situation is too complex, and not as manageable as an animal experiment. Skinner's model of verbal behavior works under the ideal assumptions of accessibility and manipulability, conditions inherent in controlled animal experiments. Skinner would elaborate that once the ideal conditions are established, then we can add more complexity. But Chomsky just jumped to his conclusion without considering that Skinner's approach does not work under those highly complex and nonideal conditions. Chomsky did not object to Skinner's core argument -- the aim is to predict and control verbal behavior -- but to details that should be set aside in favor of focusing on the fundamentals.

I agree with Chomsky's objection of the vacuous application of behaviorist theorist terms when describing human verbal behavior. Similar to Chomsky, I think it is important to consider the practical case and its limitations. In the real world, verbal behavior doesn't happen under ideal conditions, but in complex ones. We need to understand verbal behavior in our reality, not in a manipulable, laboratory setting. Our language use is substantially more complex than observable behavior in the original behaviorists experiments, and hence the behaviorist theorist terminology is unlikely to extrapolate to the study of language. Furthermore, the behaviorist terminology are used in simple, controlled experiments, and are vacuous when applied to complex systems such as natural language. Due to mine and Chomsky's objections,

Skinner fails to defend that the results and terminology of low-level instinctive animal behavior extrapolate to the study of human behavior.

Chomsky's second objection is that Skinner ignores how the internal structure of the particular organism being studied contributes to its own verbal behavior. For example, Chomsky says that to predict the behavior of a machine, one must understand how it processes information, how it is structured, and how it responds to external stimulation (page 27). An organism is the result of its internal structure, genetic makeup, and past experiences. How can you neglect these internal characteristics when describing the outputs, such as natural language, of an organism? Chomsky also argues that not only do internal factors play a role in verbal behavior, they play a crucial one. Humans are uniquely able to recognize new sentences because we have internalized our respective language's grammar. For example, consider the zeroth, first, and second approximation algorithm to generating an English sentence. A zeroth-order approximation is a random string of words not accounting for relative frequencies of words in the English language. A first-order approximation takes into account relative frequencies of words. A second-order approximation takes into account relative frequencies of word pairings. As you progress from the zeroth-order to second-order approximation, a sentence looks more like English, but is still not English. These algorithms cannot learn grammar by reinforcement; there is some property of language internalized by humans.

Skinner would argue that since internal states cannot be observed and are subjective, they cannot contribute to verbal behavior. In the first chapter of *Verbal Behavior*, Skinner refutes that ideas and meaning can exist independently from a mind. For example, if you ask for evidence of an idea, you are likely to restate the idea in other words (page 6). He believes that this restatement is no closer to the idea than the original utterance, and hence the idea cannot be identified by a single expression. It cannot exist independently. Since ideas and other mental

states do not exist independently, they cannot be observed in scientific experiments. Additionally, Skinner believed the study of subjects' behaviors and reactions was the only objective way to learn about human beings, not through subjective means such as mental states. Hence the unobservable, subjective entities such as mental states cannot explain verbal behavior and only observable, objective phenomenon, such as external stimuli, can explain verbal behavior.

I agree with Chomsky's objection of solely relying on external factors to predict verbal behavior. To understand the output of a organism or machine in terms of its internal structure and external stimulus, I'll present the example of a computer program. To write assembly code, a programmer needs to understand the internal structure of the computer, such as the organization and functions of the CPU, RAM, and various registers. The programmer also needs to understand how to input external stimulus, such as data, to get the output of the program. The internal architecture of a system is just as important as the external stimulus in producing the output. In terms of empirical facts, language acquisition is a biologically scheduled process, supporting that internal factors are a crucial part of predicting verbal behavior. Also children do not require explicit instruction to acquire their first language, besides exposure to linguistic phenomenon. We can learn and produce novel sentences, which is something unique to the human species, and possibly an innate property. In response to Skinner's argument that mental states are unobservable, post-Skinner behaviorists accept observable mental states due to advancements in technology. Therefore, Skinner's rebuttal is invalid and Chomsky's objection is successful.

In conclusion, I explained and analyzed two of Chomsky's objections to Skinner's approach to verbal behavior. Chomsky's first objection was how Skinner applied terms and techniques from the study of animal behavior to human behavior. Although Skinner's rebuttal

was that Chomsky challenged the practical limitations to his approach, and not the foundational one, Skinner did not address how to generalize low-level instinctive animal behavior to the highly complex system of natural language. Chomsky's second objection was how Skinner ignored the internal factors of verbal behavior. Skinner believed internal factors were unobservable and subjective. However, I believe that Chomsky's argument is stronger because of empirical facts I presented about natural language. Chomsky argued that the internal structure of an organism contributes to verbal behavior, and that humans have an innate internal grammar. Hence, in my opinion, Chomsky's objections were valid and the correct approach to verbal behavior.