

Opinion: The Two Subject Matters of Behavior Analysis and Early Intervention

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I argue that our field has two subject matters that are distinct in several ways. Each is derived from, and contributes to, the foundation science and epistemology associated with behavior selection. The research and application areas are not the typically touted applied, “experimental,” or theoretical areas of behavior analysis. First of all most of the empirical research in both subject matters employs the experimental method and most draw on theoretical inquiry. The differences that I want to describe occurred to me as I sought to identify which of two Spanish phrases best represented our science-- *Analisis de el Comportamiento* or *Analisis de La Conducta*. I found the distinction between the meaning of the two compelling because they clarified issues that I and my colleagues had faced in the more than 20 years of building schools that educated the “whole child” based entirely on scientific procedures (Greer, 2002). To me, *Analisis de el comportamiento* appeared to concern behavior broadly construed as in the the behavior of matter or species and it’s origins, whereas *analisis de la conducta* was about “behaving well.” “*Analisis de la conducta*” identifies the variables associated with: behaving fluently, the molecular and molar contingencies associated with existing operants, or conducting one’s self consistent with the best interests of the individual and culture. “*Analisis de el comportamiento*” appeared to concern how behavior *functions* originate, operants or higher order operants, and how they can be induced when they are missing. Of course, both subject matters in our science are really about the effects or functions of behavior, rather than behavior per se. Other behavior scientists are concerned about the topography of behavior ranging from muscle movement to blood flow in parts of the brain.

I am sure that my simplistic definition of the two Spanish terms would not hold up to the scrutiny of someone who is really expert in Spanish. But my musings of the two terms led me to reflect that the two definitions I had extrapolated really had to do with an evolution in the way I was beginning to view our science. It seems to me that when operants are already in the individual’s repertoire the fundamental concern is to identify the contingencies that evoke the behaviors—the existing controlling variables for behavior whether we call the behavior “appropriate or bad.” They are the proverbial “performance behaviors.” On the other hand it seemed to me that when the objective of scientific inquiry or application is to create or induce new operants or higher order operants different tactics and strategies are needed. Thus, when we seek to teach children to use language functionally, solve problems, enlarge their community of reinforcers, or acquire academic literacy, to name a few examples, we are engaged in *teaching* new operants or higher order operants (Catania, 1998; Greer, 2002; Hayes, Barnes-Holmes, & Roche, 2000; Skinner, 1968). When we seek to identify and form new repertoires the verb *teach* seems eminently suitable, while the verb *train* is suitable for arranging controls for existing repertoires.

Examples of research concerned with identifying the controlling variables for behaviors that exist in the individual's repertoire includes but is not limited to: the effects of schedules of reinforcement on key pecking (after the pigeon has learned to peck on the key), or the source of tantrums that have already been unwittingly shaped by children's caretakers. Such efforts also include "assessments of reinforcers," identification of collateral behaviors (i.e., adjunctive responses), isolation of existing generalized stimulus control, the effects of drugs on performance, or the identification of conditioned eliciting stimuli associated with emotional responding. There is a long history in our science for this pursuit (Catania, 1998). Still other examples of the analysis of the controlling variables for performance in applied settings concern the identification of tactics for classroom management (i.e., following classroom rules, transitioning, staying out of the principal's office), job performance and safety (i.e. ways to avoid back, injury, buckling seat belts), and medical compliance. I would also argue that most if not all of the research devoted to the study of behavior change that was traced to observation, as in Bandura's early work (see Bandura, 1986 for a radically different interpretation) is actually the effects of observing the contingencies received by others and the emission of those behaviors by the observer without direct contact with the contingencies. In almost all of the studies on behavior change by observation, it is likely that the operants were already in the individual's repertoire. Few, if any of these observational studies determined whether or not the repertoires observed were in the observers' repertoires prior to the observation. Without evidence that the repertoire was not present prior to the observation effects, I argue that they cannot be said to incidences of *observational learning*. (See Greer, Keohane, Meincke, Gautreux, Pereira, Chavez-Brown, & Yuan, 2004 for experiments that investigated the inducement observational learning in individuals who did not have the repertoire.) There is a big difference between finding the shortest line by observation and learning a foreign language by observation.

The study of schedules of reinforcement, the development of fluency, and the management of behavior in work settings or the classroom involves analyses of repertoires that exist and the variables that determine their rate of performance, and variables that control their presence or absence. When the behavior is reinforced according to particular schedules, certain effects occur and when ignored, or the identified variable is removed or manipulated in a different manner, the behavior decreases or is placed into extinction. We are engaged in studying performance behavior when, for example, in research with pigeons, primates, and humans "reversal" designs result in reliable and significant changes. The operants are in the organisms' repertoires.

But what if a repertoire is not available? The formation of new repertoires requires that the scientist induce new operants or higher order operants that are not present in the individual's repertoire. *Early and intensive behavioral interventions* are concerned, or should be concerned, for the most part in building new operants or repertoires. In his incredibly inventive approach to almost everything, Skinner (1968) also introduced this area of our science when he developed programmed instruction. Programmed instruction required a set of procedure *to form new repertoires*. In early intervention, or indeed in much of education, we need to provide children with important

new repertoires that they are missing. What if the child cannot speak (Ross & Greer, 2004; M. Sundberg, Michael, Partington, & C. Sundberg, 1996)? What if the child can not match, mand, tact, emit naming responses, emit a word learned as a tact or as a mand when taught only one establishing operation control (Lamarre & Holland, 1985; Nuzzolo-Gomez & Greer, 2004)? What about developing a relation between the two initially independent responses of vocally spelling a word or writing the word (Greer, Yuan, & Gautreaux, 2004)? What if the individual is not a true listener but responds to visual cues only (Greer, Chavez-Brown, Nirgudkar, Stolfi, & Rivera-Valdez, 2003)? How do individuals learn to emit a production response when they are taught only a topographical response as in going from multiple choice to essay responses (Gautreaux, Keohane, & Greer, 2003)? How do individuals come to learn to act as a speaker after learning something as a listener (Horne & Lowe, 1996; Greer, stolfi, Chavez-Brown & Rivera-Valdez, 2004)? These, and other subjects constitute the area of our science concerned with the formation of of new operants and *higher order operants* (Catania, 1998).

Teaching children to speak or emit other topographies of verbal behavior, form letters, follow spoken directions, take dictation, perform mathematical operations, manage the contingencies in their environment as “self” managers, come under visual or verbal instructional control, engage in social discourse are just a few of the new operants that constitute early intervention. The operants are not in the child’s repertoires and the process involves developing the necessary conditions for developing the operants. In addition, teaching children to acquire a naming repertoire when they do not have naming (Greer, Solfi, Chavez-Brown, & Rivera-Valdez, 2004), teaching transformation of establishing operations across mand and tact functions for the same response form (Nuzzolo-Gomez & Greer, 2004), or teaching metaphorical extensions to students who do not have the extended tacts involved in metaphorical extension (Meinke, Keohane, Gifaldi, & Greer, 2003) are examples of the teaching of higher order operants. When children cannot acquire new operants by observation, a repertoire that I would term *true observational learning*, and one teaches this repertoire this too is an example of teaching higher order operants (Greer, Pereira, & Yuan, 2004). The teaching of higher order operants is critical to childrens’ prognosis because there is evidence that without the accrual of these higher order operants children may not be able to progress in the accrual of more sophisticated repertoires (Greer & Keohane, 2004).

I, and many of my colleagues in the field, have been alarmed that so much of the applied research published in what was our former flagship in applied behavior analysis has increasingly been devoted to analyses of the controlling variables for performance. This emphasis seemed to some of us to be an exercise in chasing bad behavior. However, from my newly evolved perspective I see that they are simply secondary to the interests of my colleagues and I who are concerned with what is needed in early interventions or in education in general. That work is simply not the subject area of primary interest to those of us concerned with forming new repertoires. We are concerned with bridging the educational gap between the well-to-do and the not so well-to-do, or compensating for native disabilities by super teaching interventions. The deficit vocabularies of children from impoverished families, or the lack of these repertoires in children with native disabilities, call for the building of missing verbal operants and the multiplication of the

component topographies for these verbal operants. There is growing evidence that these children also missed certain incidental instructional opportunities that lead to the formation of higher order operants and these missed opportunities also contribute to the poor schooling outcomes that occur when impoverished children enter school (Hart & Risely, 1996). Individuals engaged in early interventions require tactics and strategies from research devoted to identifying and implementing the means to evoke new operants and higher order operants. Journals like this one provide resources for publication and dissemination of research that is relevant to the teaching of repertoires, an outlet that has been missing in what was formerly a publication for both areas of research.

Research in the formation of new repertoires calls for different research procedures as in, for example, the use of designs that allow for testing for functional relations that are not reversible. Study of the formation of new repertoires call for designs such as multiple baselines or time lagged multiple probe designs that incorporate pre and post measures. They also call for concomitant analyses of the acquisition of the independent variable with relevant trend displays. While replicated AB designs are useful they are not true experiments. The time lagged design allows for controls for maturation and instructional history necessary to provide true experimental analyses of the acquisition of repertoires.

Examples of research that identifies necessary, sufficient, or necessary and sufficient variables that lead to the formation of new operants include the identification of the learn unit (Emurian, Hu, Wang, & Durham, 2000; Greer & McDonough, 1999), conditions that lead to parroting as a basis for forming true echoes (Sundberg, Loeb, Hale, & Eighenheer, 2001/2002; M. Sundberg, Michael Partington, & C. Sundberg, 1996; Yoon, 1998), induction of verbal operants (Ross & Greer, 2003; Tsiouri & Greer, 2003; Williams & Greer, 1993, Yoon, 1998) the induction of naming (Horne & Lowe, 1996; Lowe, Horne, Harris, & Randle, 2002; Greer, Stolfi, Chavez-Brown, & Rivera-Valdez, 2004), differences in contingency shaped and verbally governed responding (Catania, Mathews, & Shimoff, 1990), the types of repertoires found in the research literature of Relational Frame Theory (Hayes, Barnes-Holmes, & Roche, 2000), and verbal behavior analysis (Greer & Keohane, 2004).

The bad news is that our former flagship ignored research in the formation of new operants and higher order operants for a long time. One example of the result of that neglect is that some individuals engaged in early interventions relied largely on findings from studies of performance behavior as in cases where professionals mistakenly provide children with "maintenance trials." Once an operant is mastered it needs to lead to successively more complex uses and the acquisition of higher order operants--not maintenance trials. There are no maintenance trials in programmed instruction. The good news is that we have exciting new findings in the formation of repertoires and this means that early intervention can make important new advances. But, we need to be clear about which findings in our science are needed for the best interests of children and use the relevant findings. In addition, those findings need to be disseminated to the field and their must be publication outlets for those findings.

Of course, I may be wrong and my musings may be off the mark. However and some of the issues I have raised have been subjected to empirical tests and applications to educating children and the results have been very helpful. We need more of these types of tests so that early intervention research and applications can be about the business of forming new repertoires.

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