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Ethics-Sensitive Management of the University Human Subject Pool

David M. McCord
Western Carolina University

In a comprehensive survey of the 366 psychology departments that have both graduate programs and human subject pools, Sieber and Saks (July 1989) found that many were not in full compliance with American Psychological Association (APA) ethical guidelines. Specifically, subject pools that offer no clear educational benefit and have only unattractive alternatives to participation are actually nonvoluntary. The original intent of the subject pool concept was to provide grist for the research mill; many in academia can remember mandatory participation as experimental subjects with little if any educational debriefing. The increasing sensitivity to ethical considerations in subject pool policies and procedures is timely and appropriate. Sieber and Saks covered essential issues in the ethical management of human subject pools; useful information is also available in *Ethical Principles in the Conduct of Research With Human Participants* (American Psychological Association, 1982).

At Western Carolina University, the Department of Psychology faculty has assigned approximately equal importance to (a) the need for experimental subjects and (b) the educational value of research participation. Increasing sensitivity to ethical considerations results in constant readustment of the system. Traditionally, the faculty has determined how many credits (hours) would be required of Psychology 101 students by assessing supply and demand factors at the beginning of each semester; the requirement might vary from one to three hours depending on how many students were enrolled in introductory classes and how many subjects were needed in ongoing research projects. The sociobiologist, characteristically a troublemaker, has argued strongly that the variable nature of the requirement belies any pedagogical intent. He has maintained, in addition, that the typical three-hour requirement is excessive. A second major difficulty is that, according to current ethical thinking (Sieber & Saks, 1989), students must be given alternatives that are essentially equivalent in terms of time, effort, odiousness, course credit available, and so forth. The typical alternative of writing a summary of a journal article does not fare well under close ethical scrutiny.

Revisions currently under consideration include the following ideas: (a) expanding the subject pool by including other freshman- and sophomore-level courses (Thinking, Reasoning, and Expressing; Educational Psychology; General Psychology); (b) maintaining a fixed requirement of two credits (or hours), regardless of supply–demand factors; and (c) providing a variety of alternative means of satisfying the requirement. Alternatives under consideration are (a) allowing students to sign up as observers rather than as participants in selected studies, as deemed appropriate by the experimenter; (b) scheduling a series of evening research presentations by graduate students and faculty, with attendance counting as one credit; (c) allowing the customary journal article summary, with a specific collection of recent, high-quality articles selected by faculty at the beginning of each semester; and (d) allowing students to assist in an ongoing research project for one or two hours (e.g., doing data entry). Sieber and Saks (1989) provided a very helpful listing of other ethical considerations, such as signed consent procedures, grievance procedures, and documentation.

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Commentary on Bandura's "Human Agency"

William T. Powers
Northbrook, IL

Albert Bandura (September 1989) has attempted to bring some of the principles of control theory into his discussions of human agency. The attempt suffers, however, because of its author's unfamiliarity with control theory either as a technical subject or as a model of behavior. Bandura is reinventing a wheel that many others have helped to shape. There is a long history of work relating feedback phenomena to behavior (for a thorough review relevant to the social sciences, see Richardson, in press). My own model, first described in 1960, can represent most of the phenomena that Bandura mentioned (Powers, 1973, 1978, 1989; Robertson & Powers, 1990). It has been used by some personality theorists (Carver & Scheier, 1981; Hyland, 1988). After a very brief summary of the subject, I will try to show how control theory handles ideas of the sort Bandura presented.

The Nature of Control Theory

Engineers of the late 1930s invented electromechanical control systems as a way of imitating purposive human behavior. In doing so they also developed a formal way of analyzing such purposive systems, called *control theory.* Purposive behavior as control behavior entails neither prediction nor an impossible influence of future outcomes on present actions. Instead, it works through (to use human terms) continually comparing a perceptual version of the current external situation with an inner specification for that perception. Action is driven by the difference, or error. Properly designed, such a system acts on its environment to bring the relevant aspects of it quickly to the state that is specified—as, of course, that state is represented by perception of it, not necessarily as it actually is. This state is automatically defended by the same control organization against disturbances, without any need for it to predict disturbances or in any way sense their causes. Understanding of how this can happen is an excellent criterion for judging one's grasp of control theory.

In a hierarchical control model, control systems are nested into many levels. Higher level systems act not through muscles but by adjusting the specifications or reference signals that serve as goal settings for lower level systems. In normal operation, all control loops are closed through lower level systems and eventually through the external world. The effects on the external world are detected by the lowest level systems, then represented again at each succeeding level until the one in question is again reached, closing the loop. A higher level control process appears to an observer as an abstract condition of the immediate environment (and the organism), brought about and stabilized by coordinated variations in controlled variables of more detailed types. An example is a chess player controlling a strategic position on the board through control of arm movement and hand position. Thus, control processes at all levels are available for experimental investigation, once the relevant kind of controlled variable is identified. There are objective procedures for doing this.

If the output of a control or subsystem in such a hierarchy is temporarily switched, so that it enters the perceptual input of the same system rather than serving as a reference signal for a lower system, the result is the same as if the lower system had acted instantly and perfectly to make its own perception match the reference signal. This is called the *imagination mode.* With many systems of a given level operating in this mode, higher systems can test control actions without actually carrying them out. The intended effects, normally achieved through action, are apparently (from the viewpoint of higher systems) accomplished without effort. This allows higher level systems to be developed and tested prior to putting them into action. Although this connection is a theoretical property of a model, connections exist at many levels in the brain that appear to follow the necessary paths, short-circuiting efferent signals into the afferent channels.

Armed with these three aspects of a control-theoretic model of how the brain can produce and imagine multiordinal purposive behavior, one can ask how control theory can be used in the context that Bandura (1989) discussed.

Using the Model to Refine Social Cognitive Theory

The first part of Bandura's (1989) article was concerned with belief, motivation, cognized goals, concepts of self-efficacy, optimism, and so on—natural language terms that are difficult to pin down to specific meanings. In a commonsense sort of way one understands such words; a control-system model, however, by supplying a more specific picture of how behavior works, can resolve ambiguities of natural language and suggest ways to refine experimental investigations.

In control theory, goals are specifications for desired perceptions, perceptions are reports of the current state of affairs, and imagination consists of perceptions generated inside the person. Bandura (1989) spoke of belief in ways that sometimes seem to mean a kind of goal (as in a belief that one is justified in setting high goals), at other times seem to describe perceptions (beliefs about one's actual effectiveness in achieving a given goal), and at still others suggest imagination (rehearsing or imagining achieving a goal without actually behaving). The part played by belief in behavior would be quite different in each of these meanings.

A belief interpreted as an optimistic goal for effectiveness would lead to an increase of effort and, if the effort were successful, an increase of the perceived and actual effectiveness of action. A belief that works by increasing the optimism of perceptions—by representing the same actual consequences of behavior more favorably—reduces the apparent shortfall that is driving behavior, and so decreases behavior. And belief as imagination—substituting imagined success for a perception that reports something less than success—can put an end to effective action. Seen from the standpoint of control theory, belief has a number of quite different implications.

Motivation is another ambiguous term. The word means literally whatever is capable of moving one to act. Bandura (1989) has suggested that one can measure motivation in terms of the amount of effort that a person will produce to achieve a goal. The control model shows at least four ways in which effort can be increased: by raising the setting of the reference signal (raising the aim), by adopting a pessimistic perception of achievement (increasing error through underestimating achievement), by increasing the system's action sensitivity to a given amount of error (increasing the "importance" of the goal or one's "commitment" to it), and by applying a disturbance that tends to make the perception deviate further from the reference setting (introducing external obstacles or opposition). Control theory shows that these different scenarios can have the same apparent motivating result, but for quite different underlying reasons. It shows us that motivation is not a unitary concept, but a catchall.

The language of control theory, although sometimes stilted, does not merge such very different phenomena into one ambiguous term. By offering an explanation of how behavior works, control theory often shows us new ways of interpreting commonsense ideas, not necessarily by showing that they are wrong but often by enriching our understanding of the phenomena they describe.

Bandura's Use of Control Theory

Very little of what Bandura said about the properties of control systems is right. A control system regulates *input,* not *output.* Action is not regulated; it varies with every disturbance. The joint effect of action and disturbance, a consequence or outcome, is the controlled variable that is sensed, that is compared with the internal standard, and that is regulated. A control system is never inert; it is always in equilibrium with external forces and is always acting. It does not need an external agency to stir it into action. It doesn't work the way Bandura (1989) said it works, and it doesn't behave the way he said it behaves.

One of Bandura's (1989) major propositions was that negative feedback control can account only for ongoing regulation or automatized behavior. He proposed that something different—proactive control—is needed to account for human changes of goals. As I explained earlier, however, a hierarchical control-system model has no difficulty handling the phenomenon of a change in goals: Altering or

instituting goals for systems at one level is the means by which systems of higher level achieve their own goals. Once one understands a goal as an internal specification for a perception rather than an objective external state of affairs or a command to act, the problem of multiordinal goal seeking becomes tractable. As mentioned, a model of this sort has been around for quite a long time. If Bandura chooses not to use it, that is his prerogative; but in that case he should know what it says and should show how his version is an improvement on it.

Control Theory in the Social Sciences

Control theory is best used and tested through the method of modeling or simulation. To devise working models, however, and especially to test them, one needs experimental data that are more reliable than the customary results of research in the social sciences. By helping to refine commonsense terms, control theory can help devise experiments that yield far less equivocal data—especially data that leave far fewer subjects either not showing the proposed effect, or showing the opposite effect! It can generate ideas for tracking down causes of variability and eliminating them, so that instead of simply abandoning an approach that fails to get anywhere (the fate of most lines of research in the social sciences), investigators can systematically refine experiments until they predict correctly for nearly every subject, nearly every time.

Consider, for example, the use (as in Carver & Scheier, 1981) of a mirror to induce self-awareness. This is a chancy method because there is normally no way to tell whether the person uses the mirror as assumed. Subjects who ignore it dilute whatever effect there may be, putting unnecessary variability into the results. Control theory suggests that to see whether the visual perception of external appearance is in fact of concern to each subject, the experimenter should introduce a disturbance and see if it is corrected. The mirror, for example, could be set at the wrong angle for self-viewing. If the subject adjusts it appropriately, one can be much surer that this subject is concerned with what can be seen in the mirror (although what that means to the subject is still undetermined without further testing to reveal more detailed controlled variables). Testing for controlled variables by the use of systematic disturbances is one of the primary techniques of behavioral control theory. This method, even so briefly described, may suggest many applications to social scientists.

Conclusion

Hundreds of life scientists in all disciplines have adopted control theory as a basic paradigm. More are working to understand and apply it. Control theory promises to bring a new precision into our understanding of human behavior, replacing the fuzziness of statistical findings with system models that behave and can be tested. It does not have to be applied reductionistically, nor is its scope limited to neuromuscular coordinations. It shows us a new way in which behavior could be organized, one that involves neither responses to stimuli nor actions calculated by programs in the brain. These new organizing principles can be as useful to the personality psychologist as to the physiologist. It behooves everyone who wants to use this new tool, however, to learn what it is about: As any wide receiver would advise, don't run with the ball before it is securely in your hands.

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Some Philosophical Implications of Bandura's Social Cognitive Theory of Human Agency

William A. Rottschaefer
Department of Philosophy, Lewis and Clark College

It is no news that a cognitive revolution has occurred in psychology. Nor, perhaps, that two revolutions have occurred. The first revolution cognitivized the mechanisms of input—for instance, perception, memory, thought, imagery, and problem solving (Gardner, 1985). A second cognitive revolution in psychology is occurring in the work of the social learning theorists. It is cognitivizing the mechanisms of output—for instance, learning, motivation, and personality. In their magisterial account of theories of learning, Bower and Hilgard (1981) suggested that "social learning theory may provide a basis of consensus for much of the learning research in the next decade" (p. 472). Referring in particular to the work of Albert Bandura, they argued that social learning theory "provides the best integrative summary of what modern learning theory has to contribute to the solution of practical problems" (p. 472). They also maintained that it offers a "framework within which to place information processing theories of language comprehension, memory, imagery and problem solving" (p. 472). The recent article by Albert Bandura (September 1989) on human agency from the perspective of his cognitive social theory confirms the assessment of Bower and Hilgard and is indicative of the empirical and theoretical success of the second cognitive revolution in psychology.

Philosophical psychology has in recent years undergone a revolution of its own. That revolution is part of a larger sea change in philosophy that has come to be called *naturalism.* Naturalistic philosophers contend that solutions to philosophical problems require the use of the best empirical and theoretical results available. Bandura's work should, among other contributions, be helpful for philosophers attempting to work out naturalistic theories of human learning, action, freedom, moral agency, and a unified conception of the self as agent. In this comment, I focus on one issue of perduring philosophical importance—that of reductionism.

Bandura (1989) characterized human agency as emergent and interactive. He compared his account with the views of human agency as autonomous and mechanistic. The former, he contended, lead to dualistic positions in which human agency is unaffected by the world about it, and the latter to various reductionistic accounts. Reductionists may acknowledge only some elements of a psychological level of explanation as, for instance, behaviorists or neobehaviorists do, or may eliminate the psychological level of explanation entirely. These latter are often called *eliminative materialists.* Bandura contended that his account of human agency discredits both dualistic and eliminative ma-