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The Interaction Between Stage and Value

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This issue is about a behavioral-developmental account of stage, value, and action that integrates the following three paradigms: (a) a behavioral paradigm, which includes notions of value (as established by reinforcement); (b) a developmental paradigm, as primarily measured by stage of development; and, in some cases, (c) a quantitative paradigm. A mathematical technique for predicting an organism's behavior that is based on the integration of these different paradigms would be extremely valuable and widely applicable to a range of organisms and behaviors, as discussed in the various contributions to the issue. This issue presents the first examples of a general and more integrative theory of behavior based on this approach.

In this introduction, the interplay of stage of performance and the valuation of reinforcers in predicting behavior or action are examined. This is done to provide some additional background on the issues involved. To reasonably predict behavior, one must consider (a) the stage of development, measured here in terms of the hierarchical complexity of tasks successfully completed, and (b) the value of outcomes of behavior, operationalized either as the overall value obtained, the value that is discounted due to delay, and perceived value under conditions of risk.

The Model of Hierarchical Complexity and How It Generates Stage of Development

Behavior can be analyzed by the difficulty of tasks that an individual successfully addresses. We divide the task properties that influence item difficulty into two overall parts: (a) the order of hierarchical complexity of the items in a task and (b) aspects of task content that are nonstructural, which include language, culture or country, or familiarity (to name a few).

Probably the most important predictor of difficulty is the order of hierarchical complexity (OHC). To classify a task in terms of its hierarchical complexity, the model deconstructs tasks into the actions that must be done at each order to build the behavior needed to successfully complete the task. A task is at a higher order if (a) it is defined in terms of two or more adjacent lower order task actions, (b) it organizes those adjacent lower order task actions, and (c) this organization is nonarbitrary. There are 17 known OHCs.

An individual's stage of development has the same name and number as the OHC of the task that it correctly completes. If an individual completes a task that is at OHC 11 (Formal), then their performance on that task is also considered to be at the Formal Stage 11.

The model of hierarchical complexity (MHC) is used to generate stimuli in the form of either problems or stories. The stimuli within a domain consist of an ordered series of tasks, usually from Preoperational Order 7 up to Metasystematic Order 13. For the studies presented here, and in other publications, tasks have been generated in several domains—for example, (a) reinforcement contingencies (behavioral economic); (b) mathematical and scientific; and (c) moral, interpersonal, political, and social domains. In these studies, the hierarchical complexity of the task has been shown to predict performance with *r*s varying from .7 to .98 depending on which instrument. The MHC has also been used to score performances or behavior that is either observed or obtained through written products or interviews, as in the Peddler study contained in this issue.

Value and Its Discounts

The description of how reinforcement contingencies and explanations of how the value of the reinforcers within those contingencies affect

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behavior form the field of behavioral economics and learning in psychology. For example, there have been several proposals for how value is determined by delay (Bickel, Miller, et al., 2007; Lawyer, Williams, Prihodova, Rollins, & Lester, 2010; McKerchar, Green, & Myerson, 2010). There should be a unified explanation that relates responding to the value of (a) immediate reinforcement, (b) delayed reinforcement or time between possible reinforcements, (c) change in delays (risk), and (d) change in change of delays (change in risk). An account should integrate over micro-, molecular, and molar levels. A microview looks at the contribution of each occurrence or nonoccurrence of a reinforcer or other event. A molecular view looks at a sample or local rates of reinforcement. A molar view looks at the overall rate of reinforcement.

Why Has the Integration of Stage and Value Been So Long in Coming?

The reasons are straightforward and hopeful. The stage of development and its dependence on the OHC of the tasks used to measure it are part of the developmental and evolutionary field or paradigm. A paradigm or field is made up of several metasystems. A metasystem organizes the actions of different systems. Systems organize single formal operational relationships. The paradigm that includes value is also studied and understood from the perspective of several metasystems. Looking at the interaction between these two paradigms is a cross-paradigmatic task; that is, it is one order of complexity higher than the paradigmatic order. These terms will be described in more detail next.

Metasystematic Stage 13

To make the transition from Systematic Stage 12 to Metasystematic Stage 13, there needs to be an understanding of the properties of systems. For example, the Efficient Market Hypothesis (EMH) states that at any given time, prices fully reflect all available information (Malkiel, 1973). Taking advantage of the EMH requires an understanding of a range of economic systems and the properties of those systems. When individuals understand that markets consist of systems of risks and returns and they are able to compare multiple systems, that skill places them at Metasystematic Stage 13.

Only approximately 1.5% of computer-literate people attain metasystematic stage performance, according to the data of Commons et al. (2014). The crucial aspect of the metasystematic stage is that the properties of systems are explored. The simplest way is to compare or coordinate two systems on the basis of the properties of those systems. With training, the number of people who understand metasystematic notions goes up to 20%, as shown by Fischer, Hand, and Russell (1984).

Paradigmatic Stage 14

At Paradigmatic Stage 14, one understands the impossibility of making metasystems work because there are too many considerations that make the metasystems either inconsistent or incomplete. One completely understands that there is no entirely safe and productive way to understand systems of action or reasoning. For example, the various metasystematic notions of value form paradigms such as economics that include multiple metasystems. These metasystems would include marketplace dynamics, discounting, and so forth. The dynamics of the metasystems of evolution, behavioral economics, and change in allocation are all seen as different “flavors” of the same process. This realization could be the beginning of integrating them into one paradigm. In addition, the collections of metasystems of development and evolution can be compared and then also seen as a paradigm.

Understanding systems and properties of systems is one thing at Metasystematic Stage 13, but at Paradigmatic Stage 14, one understands that no system can be both complete and consistent. One also understands that there is no possibility of solving problems because there are too many properties or aspects that one would like to include in the proposed solution. For example, as soon as a group of people come up with a regulation to fix a problem, other people figure out how to game it and get around it. Even with these considerations, no one knows the unintended consequences of such regulations. such as how to minimize costs. Another example is that at Paradigmatic Stage 14, one realizes that regulation needs to have goals that lead to progress, not stagnation. Current regulations such as those about building codes keep innovation from being made in design and construction, although they are meant to protect society. Approximately 0.1% of computer-literate people reach Stage 14. This is 1 out of a 1,000.

Cross-Paradigmatic Stage 15

When individuals' performances reach Cross-Paradigmatic Stage 15, they, for example, see the economic paradigm and political paradigm as being related and intertwined. They realize that both respond to "irrational" forces, and both have a form of marketplace with the economic market being faster and fairer. There is an understanding that political systems require a majority vote whereas an economic system simply requires a collection of people who buy and sell the same set of goods and services. The economic system may change in less than a second, but the political system changes at a very slow rate.

A second crossing of paradigms also takes place. The developmental stage and evolutionary stage, each of which forms their own paradigm, are crossed with the economics paradigm. The papers in this issue represent applications of cross-paradigmatic stage thought. This stage allows for understanding why the value of the consequences of behavior and their discounting parameters change with stages of development. These discounting parameters include not only time-to-consequence discounting but (also) risk discounting. Individual differences in these discounting parameters have a developmental and evolutionary basis. Approximately 0.002% of computer-literate people reach Cross-Paradigmatic Stage 15. This is 2 out of 100,000 people.

Note that the integrations presented here represent only partial crossings. There is surely recognition that the two paradigms are related. There are also some specific examples of one or a few relationships. However, a full "mapping" of all aspects of one paradigm onto another is not done. This is what we often find in a transition from one stage to the next; therefore, these papers may be considered transitional between paradigmatic and cross-paradigmatic. There is also sometimes a good reason not to perform the whole interrelating of the paradigms. For one thing, such a mapping may not be the purpose of any of these papers, and given the work involved and the lack of relevance of relating everything to everything, this will often be skipped.

Fully integrating the stage and value paradigms requires a pretty rare person to do it. However, once it is done, the results may be taught to others who perform at a lower stage. This is called "downward assimilation." Even if one can be somehow supported in downwardly assimilating a task solution, the stage at which one "processes" the value of such a difficult task may still be lower.

One needs to consider both stage and value to understand many issues. This issue of the journal is devoted to a few such cases.

Not only is the integration of stage and value difficult to do, it is resisted by people who look at just one or the other. This idea has been partly captured in terms of what is called "behavioral momentum" (Nevin, 2005; Nevin & Grace, 1999, 2000). Behavioral momentum is the tendency to keep doing what one has already been doing as long as it pays off a certain amount but not what an alternative action might pay. This suggests that not many people will even make the attempt to understand the necessity of considering both stage and value; much less will they do the work of actually attempting to synthesize the two paradigms. We would predict that students are the mostly likely candidates. Therefore, to convince most people of the necessity of considering stage and value at the same time so as to ultimately generate more complete descriptions of behavioral phenomena may take a long time.

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