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RESEARCH IN PROGRESS

DEVELOPING A PROCEDURE TO MODEL THE ESTABLISHMENT OF INSTRUCTIONAL CONTROL

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In a recent paper, we suggested that an agreed account of the referential properties of rules and instructions has yet to be developed (O'Hora & Barnes-Holmes, 2001). In order to address this fundamental issue, procedures are required that establish referential or 'specifying' properties in previously neutral stimuli. The present report summarizes the rationale for this research and outlines procedures that we are currently developing.

Skinner (1969) distinguished between rule governed behavior and contingency-shaped behavior. Skinner suggested that contingency-shaped behavior is acquired through direct exposure to environmental consequences, whereas rule governed behavior is controlled by "rules derived from the contingencies in the form of injunctions or descriptions which *specify* occasions, responses and consequences" (Skinner,1969 p 160; emphasis added). Although other researchers have suggested revisions of Skinner's approach to rules and rule following (Chase & Danforth, 1991; Hayes & Hayes, 1989; Schlinger, 1993; Zettle & Hayes, 1982), Skinner's definition of a rule as a contingency specifying stimulus remains the most influential within behavior analysis.

The empirical literature on instructional control stemmed largely from Skinner's (1969) definition of a rule. Recently, however, researchers have argued that the term 'rule' should be avoided because it has been used to refer both to antecedents of behavior and to outcomes of behavior (O'Hora & Barnes-Holmes, 2001; Ribes-Inesta, 2000). In the current report, therefore, we will use the term 'instruction' to refer to verbal antecedents of the type used in the empirical literature on rule governance and instructional control.

Over ten years ago, Hayes and Hayes (1989) argued that the conception of instructions as contingency specifying stimuli has one major weakness. Specifically, these authors contended that Skinner did not provide a functional-analytic definition of the term 'specify'. As a result, a wide variety of stimuli have been utilized in the empirical investigation of instructional control, including: "Press 3 and you will lose 17 points" (Schmitt, 1990), "You must choose one of the three bottom figures that is the most different with respect to the top one" (Martinez-Sanchez & Ribes-Inesta, 1996 p.308), "Go fast" (Hayes, Brownstein, Zettle, Rosenfarb, & Korn, 1986), and the presentation of a small dot that signaled a correct response (Danforth, Chase, Dolan, & Joyce, 1990, p. 100).

In each of the foregoing examples, and in many others, one might say that an instruction specifies a contingency. Nevertheless, when pressed to explain how a stimulus comes to specify a contingency, difficulties arise. For example, if a stimulus that specifies a contingency is simply considered a discriminative stimulus, the term 'specify' becomes redundant, and so too, one might argue, does the concept of an instruction. The abandonment of the terms 'instruction' and 'specify' may indeed be considered an attractive option on the grounds of parsimony (cf. Vargas, 1988), but if instructions are to be defined simply as discriminative stimuli, a further problem arises. Specifically, an instruction may control responding in the absence of an explicit history of reinforcement for following that instruction, and this fact is difficult to reconcile with the established definition of a discriminative stimulus (see Schlinger, 1993 for a detailed discussion). Rather than abandon the concepts of instruction and 'specifying', therefore, we suggest that a clear and precise definition of the term 'specify' is required.

Recent research in the area of derived stimulus relations has suggested one approach to a functional analysis of the term 'specify', and to instructional control more generally (Chase & Danforth, 1991; Hayes & Hayes, 1989; Hayes, Gifford, & Hayes, 1998). More specifically, Relational Frame Theory (RFT) suggests an approach to instructional control in terms of the derived relations involved. As an example, Hayes and Hayes (1989) conceptualized a simple instruction in terms of Before and After relations and relations of co-ordination or sameness. The instruction "When the bell rings, then go to the oven and get the cake" can be conceptualized in terms of the participation of the words in equivalence relations with actual events (e.g., the word "bell" with actual bells, the word "oven" with actual ovens), and the contextual control of relational cues for Before and After relations (i.e.,

"when", "then", "and" establish the sequence; bell BEFORE oven BEFORE cake, or by mutual entailment; cake AFTER oven AFTER bell). We recognize that this interpretation may not capture the intricate subtleties of instructional control in the natural environment and, in its current form, may be somewhat simplistic. Nevertheless, it constitutes the first step towards the analysis of instructional control as a form of derived relational responding. Moreover, RFT provides a clear functional-analytic definition of the term 'specify'.

The RFT approach to instructional control lends itself readily to experimental investigation. As mentioned earlier, a simple instruction from the perspective of RFT may involve responding in accordance with the derived relations of Same, Different, Before, and After. In the experimental work we are currently conducting, the first stage involves establishing the functions of Same, Different, Before and After for four abstract stimuli (e.g., !!! as Same, %%% as Different, etc.) using a complex computer-based pre-training procedure[1] (broadly similar to the relational pretraining reported by Steele and Hayes, 1991). Participants are then exposed to a test for instructional control over sequencing behavior. Figure 1 illustrates a representative test probe. Each test probe consisted of a visual presentation including nonsense syllables, colored squares and the contextual cues established in pre-training (i.e., !!!, %%%, etc., represented in the boxed area of Figure 1 by the uppercase words SAME and BEFORE). Specifically, this probe may be described as follows: C1 Before C2 Before C3 Before C4, where C1 is the same as B1, and B1 is the same as A1 (green); C2 is the same as B2, and B2 is the same as A2 (red); C3 is the same as B3, and B3 is the same as A3 (yellow); and C4 is the same as B4, and B4 is the same as A4 (blue). Participants are then required to enter a four-key response using four colored keys on the computer keyboard based on the network of Before and Same relations. The correct sequence response in this case is Green→Red→Yellow→Blue, (shown below the boxed area in Figure 1). A number of participants have been exposed to this and a variety of related tasks that also involved presenting Different and After contextual cues. Thus far, the predicted response patterns have emerged for 8 out of 14 participants across two experiments.

[1] The reader can download the Psyscope (Cohen, MacWhinney, Flatt, & Provost, 1993) application used in the current work at the Maynooth web-site: http://www.may.ie/academic/psychology/software.htm or see Roche, Stewart, and Barnes-Holmes (1999)

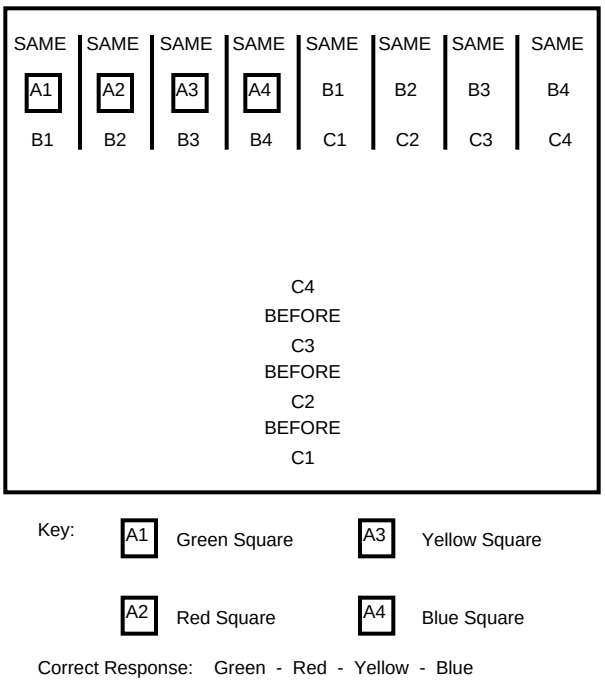

Figure 1

From an RFT perspective, the predicted performances constitute a basic model of instructional control in that response sequences are *specified* by derived Same or Different relations between A and C stimuli, and Before or After relations among C stimuli. In the context of the analysis of complex human behavior, the current research is critical. In order to provide a functional-analytic approach to the specification of contingencies by instructions, the term 'specify' must be defined functionally and demonstrated using previously neutral stimuli in a laboratory setting. The current research represents the first tentative steps towards that goal.

The procedures outlined herein were presented in more detail at the annual conference of the EABG (UK) group in London, April, 2001. The authors welcome suggestions, comments, and questions (denis.p.ohora@may.ie, dermot.barnes-holmes@may.ie, bryan.t.roche@may.ie).

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