BRIEF REPORT

PERSPECTIVE-TAKING: A RELATIONAL FRAME ANALYSIS

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The issue of perspective-taking has attracted the attention of mainstream developmental psychologists for a number of years, and recently these researchers have focused on Theory of Mind as a means of understanding specific deficits found in the autistic population (Baron-Cohen, 1995; Baron-Cohen & Hammer 1997; Baron-Cohen, Tager-Flusberg, & Cohen, 2000). An interest in these phenomena has also been shown by behavioral psychologists. Researchers interested in Relational Frame Theory (RFT), for example, a modern behavioral approach to language and cognition, have suggested the possible utility of approaching perspective-taking as generalized operant behavior (Barnes-Holmes, 2001).

According to RFT, 'deictic' relational frames that specify a relation in terms of the perspective of the speaker may play an important role in the development of perspective-taking skills (for a more complete account of these terms see Barnes-Holmes, Barnes-Holmes, & Cullinan, 2001). In the language of RFT, the three relational frames that appear to be most important for perspective-taking are I-YOU, HERE-THERE, and NOW-THEN. In a recent preliminary study, Barnes-Holmes (2001) developed a protocol for analyzing and training perspective-taking performances as generalized relational activity.

The methodology developed by Barnes-Holmes (2001) consisted of an extensive and detailed protocol for testing and training each of the three perspective-taking frames. In addition to distinguishing among patterns of responding in accordance with these three frames, Barnes-Holmes identified three types of relational responses required for perspective-taking of this kind. These responses can be defined as a simple relational response; a reversed relational response; and a double reversed relational response.

A simple relational response consists of simple relations in which none of the elements are reversed. For example, the experimenter might say "I (experimenter) have a red brick (an actual red brick is placed in front of the experimenter) and you (subject) have a green brick (a green brick is in front of the subject) -- Which brick do you have? (subject answers); Which brick do I have?" (subject answers). In this particular task, only limited relational activity is required for the subject to produce the correct answer because the actual bricks are placed in front of each individual in the same manner as specified in the instruction.

In a reversed relational response, some of the elements are reversed. For example, the experimenter might say "I have a red brick and you have a green brick. If I was you and you were me -- Which brick would you have? (subject answers) Which brick would I have?" (subject answers). In this particular task, the I-YOU relation is reversed with the statement "If I was you and you were me", and a correct response reflects this relational reversal (i.e., the experimenter has the green brick and the subject has the red brick). It is important to emphasise that in a reversed trial, the actual locations of the bricks remain fixed. That is, a correct response could not be determined simply by observing the locations of the bricks, as would have been the case with a simple trial.

In a double reversed relational response, two relations are reversed simultaneously. For example, the experimenter might say "I am sitting here on the blue chair and you are sitting there on the black chair. If I was you and you were me and if here was there and there was here-- Where would I be sitting? (subject answers). Where would you be sitting?" (subject answers). In this type of trial in which the frame of HERE-THERE is manipulated directly, the experimental setting no longer involved colored bricks, but referred to the

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actual seating arrangements of the experimenter and the subject. In the current example, therefore, the experimenter was actually sitting on a blue chair and the subject was sitting on a black chair. During any type of HERE-THERE reversed trial, the seating arrangements did not change, and thus once again a correct response could not be determined by simply observing the actual seating arrangements. In this particular task, both the I-YOU relation and the HERE-THERE relation are reversed simultaneously, and this is reflected in the correct response (i.e., the experimenter would be sitting on the blue chair and the subject would be sitting on the black chair). This would appear to require complex derived relational activity.

The protocol developed by Barnes-Holmes (2001) therefore, distinguished patterns of responding in terms of both relation type (i.e., I-YOU, HERE-THERE, and NOW-THEN) and relational complexity (i.e., simple, reversed, and double reversed relations). However, this research analyzed data only in terms of relation type but not relational complexity. The overall aim of the current study was to develop a robust protocol for assessing perspective-taking skills in adults that would incorporate the role of relational complexity.

METHOD

Subjects

Thirty-two subjects aged 18-30 years old were selected for participation in the experiment. All of the subjects were University students recruited through faculty board announcements from within the Department of Psychology at the National University of Ireland, Maynooth. Subjects were randomly assigned to each of four conditions (i.e., eight naïve subjects in each condition).

Setting and Apparatus

The experiment was conducted in a quiet room free from distraction. All subjects were exposed to the procedure in an experimental room located in the Department of Psychology. In Condition 1 only, a range of visual aids were employed to facilitate responding to all of the tasks contained within the protocol. These items included; two identically sized, differently colored chairs (one blue and one black); two play bricks (one red and one green); a pen; a cup; a picture of a television; a book; and two large colored stickers (one yellow and one brown).

General Procedure

Subjects were exposed to the experimental procedures individually and a naïve group of subjects was employed for each of the four conditions. Each subject received two exposures to a perspective-taking protocol. Each exposure to a protocol is referred to as a 'test'. However, it is important to note that when analyzing the results we were not concerned with whether subjects passed or failed, and as such no pass criterion had been set. The current study was primarily concerned with subjects' performances on various types of trials contained within the protocol. In this sense, therefore, the term test is simply used to denote an experimental trial that was not consequated by any form of corrective feedback. Each test consisted of one exposure to each of the tasks, that is, 265 tasks (Conditions 1-3) or 66 tasks (Condition 4). Conditions 1-3 each lasted approximately two hours (i.e., two test exposures of approximately one hour each). Condition 4 lasted approximately 30 minutes (i.e., two test exposures of approximately 15 minutes each). Subjects were never exposed to the protocol more than once per day, the second exposure (i.e., session) was normally conducted on the day after the first session (availability permitting). During each session, subjects were given a break of 5 minutes after each 20 minutes of testing (or earlier if requested). During this break, the experimental materials were removed but subjects did not leave the experimental room and could not communicate with anyone outside of the room.

All of the subjects in the present study were exposed to the protocol as a test only (i.e., no feedback was provided for subjects' responses). Each trial consisted of two questions (e.g., "Where am I sitting? Where are you sitting?"). The actual questions depended on the type of relation being tested. A correct response to a trial required that the subject answer both questions correctly.

Extended Protocol

The basic protocol used for testing the three perspective-taking frames was adapted from the study by Barnes-Holmes (2001). In the current study two versions of this protocol were employed. The "extended protocol" was identical to that used by Barnes-Holmes and contained 265 trials. This version of the protocol was employed in Conditions 1-3 -- only the format in which it was presented differentiated the conditions. The "short protocol" contained a subset (66) of the

trials used in the extended protocol. This version of the protocol was employed in Condition 4.

The extended protocol consisted of three types of relational tasks, involving responding to the three perspective-taking frames of I-YOU, HERE-THERE, and NOW-THEN, and three levels of complexity involving, simple relations, reversed relations, and double reversed relations. Although we analyzed the protocol in terms of relation type and relational complexity, it would be erroneous to imply that these two factors are separate. For example, a double reversal involves the explicit and simultaneous reversal of two frames (e.g., I-YOU and HERE-THERE). In this way, both the number of frames and the number of reversals involved in any one trial would inevitably contribute to the complexity of that trial. Attempting to analyze these factors separately is beyond the scope of the current work and our analyses of the results did not attempt to address this issue.

In the extended protocol, the three perspective-taking frames were tested across three levels; I-YOU (Level 1), HERE-THERE (Level 2), and NOW-THEN (Level 3) and these frames were combined in various ways to examine each of the three levels of complexity. Due to space restrictions, the precise methodological details of the extended or short protocol are not provided (full details may be obtained by writing to L.McHugh@swansea.ac.uk). However, examples of each of the tasks contained within either protocol are presented in Table 1. The reader is strongly advised to study this table before proceeding.

The three conditions varied only in the manner in which the tasks were presented. In Condition 1 the experimenter read aloud all instructions, subjects responded verbally, and the experimenter recorded each response. A series of visual aids (i.e., bricks, chairs, and pictures) were also used in conjunction with each task (these aids had been employed in the original study by Barnes-Holmes in order to reduce the memory requirements of the tasks when presented to young children). In Condition 2, the extended protocol was presented to each subject in written form, they recorded their own responses in written form, and all visual aids were removed. This comparison was designed to determine whether the visual aids facilitated the subjects' relational performances. In Condition 3, the experimenter read aloud all instructions, subjects responded verbally, and the experimenter recorded each response. No visual aids were employed. This condition was used to determine whether any differences observed between the first two conditions were due to the subjects' reading of the tasks or to the use of the visual aids.

Short Protocol

The short protocol was employed in Condition 4. This consisted of only 66 trials selected from the extended protocol, including trials containing all three frames and the three levels of complexity. Two key features differentiated the short protocol from the extended protocol. First, the former was shorter because it did not contain the many repetitions of trials that had been incorporated in the latter (the extended protocol was designed for training, whereas the current study was concerned only with testing). Second, in the short protocol the trials were randomly presented, whereas in the extended protocol I-YOU relations were introduced first, then HERE-THERE relations were combined with I-YOU, and finally NOW-THEN relations were combined with both I-YOU, and HERE-THERE relations. The aim of this modification was to eliminate fatigue and order effects. Condition 4 was identical to Condition 3 in that the experimenter read the instructions and no visual aids were employed.

RESULTS AND DISCUSSION

The results from the two tests of the extended protocol to which each subject was exposed were combined. Subjects' mean errors were then grouped and analyzed in terms of condition, relation type, and relational complexity. Analyses of variance (ANOVAS) were conducted on the data from each of the four conditions. The first three conditions were analyzed together (data from the extended protocol), whereas the results from Condition 4 (data from the short protocol) were analyzed separately.

The combined results for relation type from Conditions 1-3 are presented in Figure 1. A mixed 3 x 3 ANOVA with one factor being relation type as the within subject variable, and another factor being experimental condition as the between subject variable, indicated that condition was non significant [F (2, 21), .582, p= .5674]. The interaction between condition and relation-type was non-significant at the .05 level. Relation type, however, was significant [F (2,4), 7.170, p=.002].

Table 1

Examples of the Experimental Tasks Contained within the Extended and Short Protocols

Level 1: I-YOU

Simple I-YOU Relations

"I have a red brick and you have a green brick. Which brick do you have? Which brick do I have?"

Reversed I-YOU Relations

"I have a red brick and you have a green brick. If I was you and you were me. Which brick would I have? Which brick would you have?"

Level 2: HERE-THERE

Simple I-YOU Relations within Simple HERE-THERE Relations

"I am sitting here on the blue chair and you are sitting there on the black chair. Where are you sitting? Where am I sitting?"

Reversed I-YOU Relations within Simple HERE-THERE Relations

"I am sitting here on the blue chair and you are sitting there on the black chair. If I was you and you were me. Where would I be sitting? Where would you be sitting?"

Simple I-YOU Relations within Reversed HERE-THERE Relations

"I am sitting here on the blue chair and you are sitting there on the black chair. If here was there and there was here. Where would you be sitting? Where would I be sitting?"

Double I-YOU/HERE-THERE Reversed Relations

"I am sitting here on the blue chair and you are sitting there on the black chair. If I was you and you were me, and if here was there and there was here. Where would I be sitting? Where would you be sitting?"

Level 3: NOW-THEN

Simple I within Simple NOW-THEN Relations

"Yesterday I was watching television, today I am reading. What am I doing now? What was I doing then?"

Simple YOU within Simple NOW-THEN Relations

"Yesterday you were watching television, today you are reading. What are you doing now? What were you doing then?"

Simple I within Reversed NOW-THEN Relations

"Yesterday I was watching television, today I am reading. If now was then and then was now. What would I be doing then? What would I be doing now?"

Simple YOU within Reversed NOW-THEN Relations

"Yesterday you were watching television, today you are reading. If now was then and then was now. What would you be doing then? What would you be doing now?"

Simple I within Simple HERE-THERE Relations within Simple NOW-THEN Relations

"Yesterday I was sitting there on the blue chair, today I am sitting here on the black chair. Where was I sitting then? Where am I sitting now?" (During these trials, only the experimenter was seated on either of the chairs, and the subject remained standing a short distance from the experimental table).

Simple YOU within Simple HERE-THERE Relations within Simple NOW-THEN Relations

"Yesterday you were sitting there on the blue chair, today you are sitting here on the black chair. Where were you sitting then? Where are you sitting now?" (During these trials only the subject was seated on either of the chairs, and the experimenter remained standing a short distance from the experimental table).

Table 1 cont.

Level 3: NOW-THEN

Simple I within Reversed HERE-THERE Relations within Simple NOW-THEN Relations

"Yesterday I was sitting there on the blue chair, today I am sitting here on the black chair. If here was there and there was here. Where would I be sitting then? Where would I be sitting now?"

Simple YOU within Reversed HERE-THERE Relations within Simple NOW-THEN Relations

"Yesterday you were sitting there on the blue chair, today you are sitting here on the black chair. If here was there and there was here. Where would you be sitting then? Where would you be sitting now?"

Simple I within Simple HERE-THERE Relations within Reversed NOW-THEN Relations

"Yesterday I was sitting there on the blue chair, today I am sitting here on the black chair. If now was then and then was now. Where would I be sitting then? Where would I be sitting now?"

Simple YOU within Simple HERE-THERE Relations within Reversed NOW-THEN Relations

"Yesterday you were sitting there on the blue chair, today you are sitting here on the black chair. If now was then and then was now. Where would you be sitting then? Where would you be sitting now?"

Simple I within Double HERE-THERE/NOW-THEN Reversed Relations

"Yesterday I was sitting there on the blue chair, today I am sitting here on the black chair. If here was there and there was here and if now was then and then was now. Where would I be sitting now? Where would I be sitting then?"

Simple YOU within Double HERE-THERE/NOW-THEN Reversed Relations

"Yesterday you were sitting there on the blue chair, today you are sitting here on the black chair. If here was there and there was here and if now was then and then was now. Where would you be sitting now? Where would you be sitting then?"

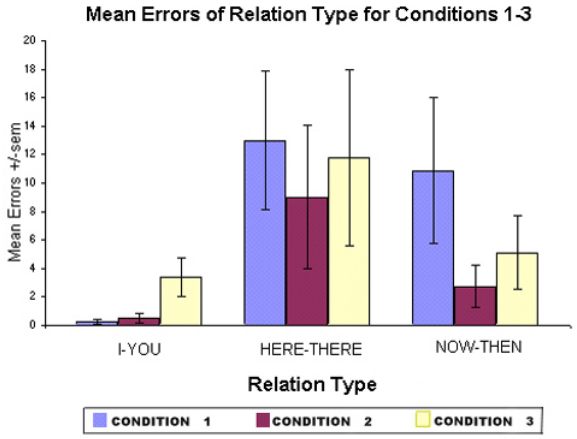

Figure 1

Post hoc tests (Fishers PLSD) revealed that there was a significant difference between subjects' responses to I-YOU compared to HERE-THERE ($p<.01$), but no other significant differences were obtained. The data on relation type from Conditions 1-3, overall, indicated that subjects made significantly more errors on the HERE-THERE relations than on the I-YOU relations, irrespective of the form in which the trials were presented.

The combined results for relational complexity from Conditions 1-3 are presented in Figure 2. A mixed 3 x 3 ANOVA with one factor being relational complexity as the within subject variable, and another factor being experimental condition as the between subject variable, indicated that condition was non significant [$F(2, 21), .440, p=.6498$], and the interaction between condition and relational complexity was non-significant at the .05 level. However, the within subject variable, relational complexity was significant [$F(2, 21), 13.119, p=.000$]. Post hoc tests (Fishers PDSL) revealed significant differences in subjects' mean error rates when responding to simple versus reversed relations ($p<.02$); simple versus double reversed relations ($p<.01$); and reversed versus double reversed relations ($p<.01$). With regard to relational complexity, the data from Conditions 1-3 indicated that subjects made significantly more errors on reversed relations than on simple relations; on double reversed

relations than on simple relations; and on double reversed relations than on reversed relations. The performances of the two exposures of Condition 4

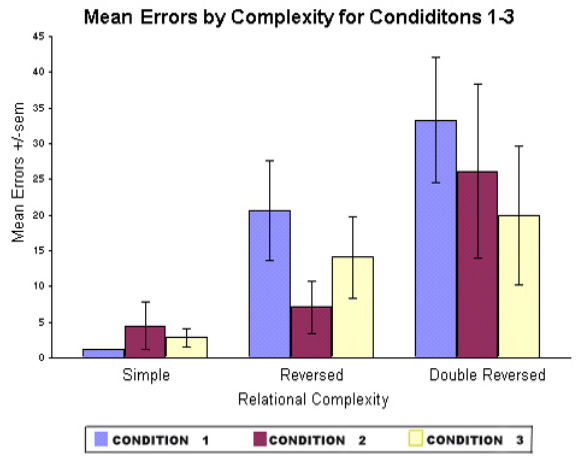

Figure 2

were not ostensibly different (see Figures 3 & 4) and thus, only Exposure 2 data were analyzed. The results for relation type are presented in Figure 3. A one way ANOVA revealed no significant differences between subjects' errors in relation type [F (2, 21), 2.283, p =.1279]. The latter finding was not observed with Conditions 1-3 and suggests that the differences observed in relation type in these former conditions may have resulted from fatigue. Subject fatigue may have occurred due to the fact that the trials were presented in order of relation type with all the I-YOU trials at the beginning of the extensive 265 trial protocol.

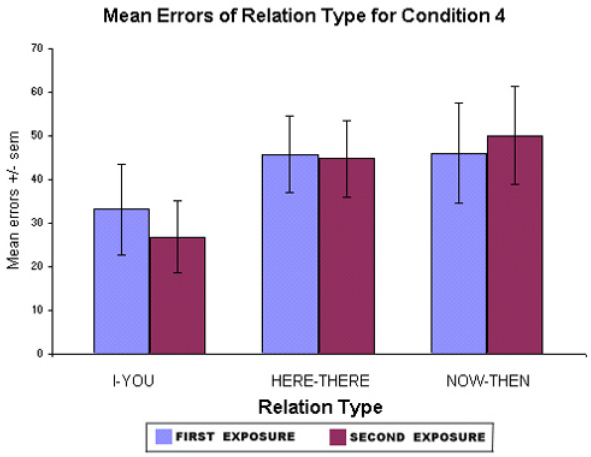

Figure 3

The results for relational complexity in Condition 4 are presented in Figure 4. (The number of errors on simple relations in the second exposure was zero. This is indicated on the figure by the absence of a bar.) A one way ANOVA revealed significant differences in subjects mean errors' when responding to trials of varying complexity [F (2,21), 9.326, p= .001]. Post hoc tests (Fishers PLSD) revealed significant differences in subjects' errors when responding to simple versus reversed relations (p<.01); and simple versus double reversed relations (p<.01). Unlike Conditions 1-3, there was no significant difference with regard to relational complexity between the performances obtained on reversed and double reversed relations. Subjects in Condition 4 made significantly more errors on reversed and double reversed relations than on simple relations (as they had done in Conditions 1-3). However, unlike Conditions 1-3 subjects exposed to the short

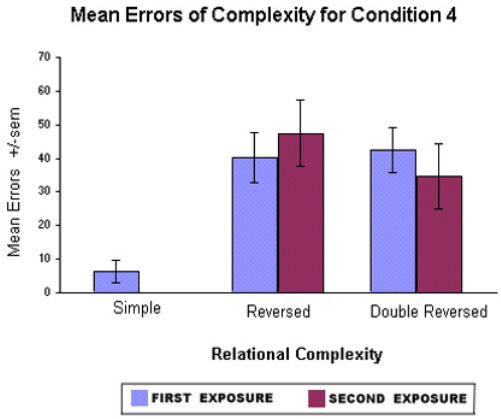

Figure 4

protocol did not produce significantly different error rates on reversed compared to double reversed trial types. Again, a possible reason for this difference is that during Conditions 1-3 the majority of the double reversal trial types were presented at the end of the 265 trial extended protocol, thus the increased error rates on these trial types may have been due to subject fatigue.

The findings from Conditions 1-4 can be summarized as follows. Overall, no significant differences were observed among Conditions 1-3, suggesting that neither the person reading the tasks nor the visual aids had an effect on subjects' performances. Significant differences were observed for both relation type and relational complexity in all conditions, but the results

obtained in Condition 4 suggest that the effects in the former conditions may have resulted from subject fatigue. Overall, the current findings suggest that, even in adults, perspective-taking is composed of functionally distinct relational components.

The current study extended previous work by Barnes-Holmes, and aimed to develop a relatively short protocol for testing relational perspective-taking, and its component skills in adults. The long-term goal of this work is to develop a systematic behavioral tool for analyzing perspective-taking skills. It is hoped that this work may help in designing effective interventions for remediating deficits in perspective-taking in populations such as those diagnosed with autism.

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STUDENT PAPER WINNER:
ABSTRACT

COMPOUND CLASS-SPECIFIC REINFORCERS AND EQUIVALENCE PERFORMANCES IN CHILDREN DIAGNOSED WITH DEVELOPMENTAL DISABILITIES

Christina Ashford

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The present study examined equivalence performances of children with developmental disabilities with compound reinforcers. Compound reinforcers consisted of computerized auditory and visual elements and a food element. In Experiment 1, participants received training either with no elements, one element, or both elements class specific. Results indicated that class-specific reinforcers may have facilitated acquisition. In Experiment 2, performances of participants trained with class-specific compound reinforcers indicated the formation of equivalence classes including all trained stimuli as well as visual and food reinforcer elements. In Experiment 3, participants received identity-matching training during which correct responses for one set of stimuli yielded conditioned class-specific reinforcers, and correct responses for another set of stimuli yielded primary class-specific reinforcers. Participants then received testing for equivalence relations between these new stimuli and previously trained baseline stimuli. Participants also received testing for equivalence relations between the auditory element of the class-specific reinforcers and all baseline stimuli. Two participants' performances indicated equivalence class formation including stimuli trained with either conditioned or primary class-specific reinforcers, and the performance of a third participant indicated class membership of stimuli trained with conditioned class-specific reinforcers only. All subjects demonstrated equivalence relations between the auditory reinforcer elements and baseline stimuli.

STUDENT PAPER WINNER:
ABSTRACT

HUMAN GROUP CHOICE: THE RELATION BETWEEN TRAVEL COST AND THE IDEAL FREE DISTRIBUTION

G. Anthony Benners

ARMSTRONG ATLANTIC STATE UNIVERSITY

Human group-choice research is an extension of the Ideal Free Distribution (IFD), a social foraging theory in behavioral ecology, to human behavior. The present study used a free operant procedure constructed as a between-groups experiment to test the relationship between the IFD and travel cost. The travel distance between resource sites was extended from 6 to 24 meters to investigate the effect on the group sensitivity measures. Although it was expected that group sensitivity would increase and overmatching would occur as the travel cost increased, sensitivity remained constant. However, when a large travel cost was employed, the orderliness of the group choices decreased. In addition, analysis of the individuals' switching behavior revealed a slight increase in switching as travel cost increased. Individual analysis also suggested that the group choice could be reduced to individual matching.

CONFERENCE PREENTATION ABSTRACTS

ELIMINATING OFF-TASK BEHAVIORS DURING TRANSITIONS BETWEEN ACTIVITIES

Rafael Bejarano and Dean C. Williams

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Developmentally disabled individuals touched icons presented on a computer screen in exchange for money delivered on two signaled schedules that alternated (i.e., on a two-component multiple schedule). In the rich component, 10 screen touches produced a quarter, and in the lean component, a larger number of screen touches (e.g., 100) produced a point that could be exchanged for one penny after the session. Four types of transitions between components were arranged: lean-to-rich, lean-to-lean, rich-to-rich, and rich-to-lean. Experimental conditions differed from one another in terms of whether or not a timeout was interpolated between the components. With no intercomponent timeouts, the longest postreinforcement pauses occurred during the rich-to-lean transitions. This effect disappeared, however, when intercomponent timeouts were arranged. These findings suggest that off-task behaviors may occur during transitions from a more preferable activity to a less preferable one, but that it may be possible to eliminate such behaviors by interpolating a short break between activities.

Poster presented at the 2nd convention of the Kansas Association for Behavior Analysis, Lawrence, KS, April, 2004.