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Extending the Hierarchy of the Assessment of Basic Learning Abilities: The Role of Conditional Position Discrimination

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Abstract

The Assessment of Basic Learning Abilities (ABLA) is designed to measure the ability of individuals with developmental disabilities to learn three simple and three conditional discrimination tasks. The current study was designed to determine whether a conditional position discrimination would fit into the current ABLA hierarchy, and where it may fit. It was found that a conditional position discrimination fell above level 6, with half of the participants at level 6 being able to perform the task. The study also demonstrated that a direct response-reinforcer procedure was not effective in improving performance on the task.

Kerr, Meyerson, and Flora (1977) demonstrated that there is a hierarchical pattern in the order of six discrimination skills (simple motor, position, visual, visual match-to-sample, auditory, and auditory-visual combined) in a test they developed which since has been referred to as the Assessment of Basic Learning Abilities (ABLA; see Table 1). Other patterns observed as a result of their study include poorer performance associated with lower levels of functioning, and an increase in auditory discrimination skill with an increase in age.

The research most relevant to the current study is the early finding that the six ABLA levels are hierarchical. Kerr et al. (1977) found that of the 117 individuals who participated in their study, 111 showed similar results, such that if an individual passed a certain level, lower levels were also observed to be passed and if they failed a certain level, higher levels were not observed to be passed. These results have been observed in both children with developmental disabilities, and more recently in children with autism-spectrum disorder (Ward & Yu, 2000). Another important finding of the Kerr et al. (1977) study was that failed levels are failed rather quickly and are very difficult to teach, if they are learned at all, which provides further evidence of the hierarchical nature of the ABLA skills. In addition, further studies have demonstrated that failed levels are difficult to teach using standard prompting and reinforcement procedures (Meyerson, 1977; Witt & Wacker, 1981; Yu & Martin, 1986). For example, Meyerson (1977) found that participants needed anywhere from 100 to 900 trials of practice on a failed ABLA level before any higher level of discrimination could be attained.

This is not to say that such discriminations cannot be taught. For example, there have been attempts to teach individuals tasks that match their failed ABLA level using techniques other than standard prompting and reinforcement proce-

Table 1. List of ABLA Level Instructions and Correct Responses

Level	*Instruction*	*Correct response*
1	Tester puts foam into bucket and asks participant to do the same	Putting the foam into the bucket
2	Red box and yellow can are in fixed positions. Tester asks "where does it go?"	Put the foam in the container on the left
3	Red box and yellow can are presented in randomly rotating positions. Tester asks "where does it go?"	Put the foam in the yellow can
4	Red box and yellow can are presented in randomly rotating positions. Participant is either given the red cube or yellow cylinder (random order). Tester asks "where does it go?"	Yellow cylinger – in yellow can Red cube – in red box
5	Red box and yellow can are in fixed positions. Tester gives participant foam and says either "yellow can" in a low drawn out voice, or "red box" in a high, fast tone (random order)	"yellow can" – put foam in yellow can "red box" – put foam in red box
6	Same directions as Level 5 with the exception that the red box and yellow can now rotate positions randomly	Same as Level 5

dures. Conyers and colleagues (2000) used a multiple-component training procedure which included a direct response-reinforcer procedure to teach individuals who failed ABLA level 6 an auditory-visual combined discrimination task. Researchers have suggested that when the topography of a taught behaviour directly results in obtaining a reinforcer it may be learned more rapidly than when reinforcement for the same behaviour is delivered by another person. For example, if the behaviour being taught is opening one's mouth if the edible reinforcer is placed directly in the individuals mouth after it is open, rather than given to them by hand, the behaviour may be acquired more quickly (Koegel & Williams, 1980).

Although the current ABLA consists of six levels attempts have been made to modify the current hierarchy. For example, in reviewing six studies Martin and Yu (2000) found that of the 197 individuals who passed level 5, all but eight also passed level 6. This has led many researchers to omit level 5. In an attempt to find an appropriate replacement for level 5, Sakko and colleagues (2004) suggested a visual-visual non-identity match task.

The purpose of the current study was to determine if a conditional position discrimination (CPD) would fit into the current ABLA hierarchy, and if so where it would fit. A CPD is one in which a particular stimulus or the presence or absence of a stimulus is associated with a location. A practical example of a CPD may be turning left or right when shown a picture of an arrow. Saunders, O'Donnell, Williams, and Spradlin (2006) reported that two men had learned a CPD task in a previous study. Both individuals lacked naming skills suggesting they would likely fall below ABLA level 6 and potentially ABLA level 4. Given that level 4 is the first to assess conditional discrimination the current study sought to determine if conditional discriminations may occur below level 4. In the current hierarchy position is presented as falling below visual, but this is based on the assumption that when one responds with a position "bias" that their behaviour is actually under control of the position of some object as opposed to a possible lesser response cost or other variable. This study is an important addition to the ABLA literature because it examined where in the hierarchy an actual CPD would fall. Additionally, this study also evaluated the effectiveness of a direct response-reinforcer procedure (isolated from the multiple-component package used by Conyers et al., 2000) for teaching this task to individuals who were unable to acquire it using the standard ABLA teaching procedure.

Method

Setting and Participants

Prior to conducting this study approval was granted from the Institutional Review Board. Consent was obtained from the parents of all participants. Ten individuals with various forms of developmental disabilities participated in this study. Six of the participants tested at ABLA level 6, two at ABLA level 4, and two at ABLA level 3. Table 2 provides the participants' age, diagnosis, communication ability, corresponding ABLA level and performance on the CPD assessment. Sessions were conducted in a room at a school for children with developmental disabilities. The room measured approximately 6m x 6m., contained a table and two chairs, and was equipped with video recording capabilities. To protect the privacy of individuals, pseudonyms are used throughout the text.

Procedure

ABLA Testing. Materials included a yellow can, approximately 15 cm in diameter and 17 cm in height; a red box with black stripes, approxi-

Table 2. Participants and Their Age, Diagnosis, Communication Ability, Corresponding ABLA Level and Performance on the CPD Assessment

Participant	*Age*	*Diagnosis*	*Communication ability*	*Highest ABLA level passed*	*CPD assessment*
Michelle	9	Autism spectrum disorder	Spoken language (full sentences)	6	Pass
Evan	8	Autism spectrum disorder	Spoken language (full sentences)	6	Pass
Andrew	13	Autism spectrum disorder	Spoken language (full sentences)	6	Pass
Mike	16	Autism spectrum disorder	Spoken language (2–3 word utterances)	6	Fail
Jane	9	Autism spectrum disorder	Spoken language (2–3 word utterances)	6	Fail
Jacob	7	Traumatic brain injury	Spoken language (2–3 word utterances)	6	Fail
Marie	16	Autism spectrum disorder	Dynavox	4	Fail
Kelly	9	Moderate mental retardation	Gesture	4	Fail
Bryan	17	Autism spectrum disorder	Gesture	3	Fail
Chris	16	Failure to thrive	Gesture	3	Fail

mately 14 cm X 14 cm X 10 cm; a yellow cylinder, approximately 4 cm in diameter 7 cm in height; a red cube with black stripes and approximate dimensions of 5 cm × 5 cm × 5 cm; and a piece of irregularly shaped grey foam, approximately 5 cm in diameter. Each level began with a demonstration of the correct response by the experimenter, a guided trial, and the opportunity to perform a correct response. Scoring for each level began when the participant performed a correct response independently. Correct responses were reinforced using preferred edible and tangible items determined by preference assessment (Fisher, Piazza, Bowman, & Hagopian, 1992). Incorrect responses were followed by a demonstration of the correct response, a guided trial, and the opportunity to perform the correct response independently. Once the participant performed eight consecutive correct responses for a level testing began for the following level. Testing of a level was terminated when the participant performed eight cumulative incorrect responses on a given level. It was then determined that the highest level passed was their ABLA score.

Conditional Position Discrimination Assessment (CPD). The materials used in this procedure consisted of a yellow paper dot 8 cm in diameter, two identical yellow cans and a yellow cylinder. The yellow cans were presented approximately six inches from each other and centered on the table in front of the participant and remained in fixed positions between trials. During half of the trials the yellow dot was placed on the table such that it was in front of the two cans. The yellow dot was placed equidistant from each can to avoid bias. The participant was presented with the yellow cylinder and asked "where does it go?" In the presence of the yellow dot the correct response was to place the cylinder in the yellow can on the participant's right. When the yellow dot was not present the correct response was to place the yellow cylinder in the yellow can on the participant's left. Testing procedures were the same as those for ABLA testing.

Conditional Position Discrimination Teaching. Those participants unable to perform the task during initial testing participated in the teaching part of this study. Those individuals at level 6 six participated in two teaching conditions; standard ABLA teaching procedure (A), and a direct-response reinforcer procedure (B). As a control one participant at ABLA level 4 participated in both the A and B phases to determine if the direct-response reinforcer procedure had differential effects on individuals at lower ABLA levels. All other participants took part only in A phase.

Phase A (Standard). The materials and procedure for this phase were the same as during the CPD testing with the exception of the pass/fail criterion. Trials were conducted in blocks of ten. During half of the trials the yellow dot was present and during the other half the yellow dot was not present. The presence of the yellow dot was quasi-randomly determined over trials. The consequence for correct and incorrect responding was the same as during the CPD testing and mastery criterion was set at 80% or above in each of three consecutive trial blocks.

Phase B (Direct Response-Reinforcer). The materials used for the direct response-reinforcer (DRR) procedure were the same as in phase A, with the exception being that the yellow cylinder was not used in this phase. During this procedure a second experimenter placed the reinforcer (determined by preference assessment) under the yellow can that was the correct choice while the view of the participant was blocked. The correct response when the yellow dot was present was to lift the yellow can on the right, and the correct response when the yellow dot was not present was to lift the yellow can on the left. If the participant engaged in an incorrect response (i.e., lifting the incorrect can) nothing was revealed, and the participant was prompted to lift the other can. Participants would not receive the reinforcer for incorrect trials. When the participant engaged in a correct response the reinforcer would be found underneath the can that they lifted. Trials were conducted in blocks of ten and mastery criterion was set at 80% or above in each of three consecutive trial blocks.

Participants at ABLA levels 3 and 4 only participated in the standard phase of the CPD teaching portion of the study. The exception was one participant at ABLA level 4 (Marie), who participated in both the standard and DRR phases in an AB design. This was conducted as probe to determine if the DRR procedure had differential effects based on discrimination ability. Those participants at ABLA level 6 participated in both the standard and DRR phases of the

CPD teaching portion using an ABAB design within a multiple baseline across subjects.

Inter-Observer Agreement

Inter-observer agreement (IOA) for all testing and teaching procedures was scored by having another experimenter independently watch video recorded sessions and scoring all responses as correct or incorrect, and calculated by dividing the number of agreements by the number of agreements plus disagreements and multiplying by 100%. An agreement was scored if both experimenters scored the response as either correct or incorrect. A disagreement was scored if one experimenter scored a response as correct and the other scored it as incorrect, and vice versa. Table 4 provides the percentage of IOA collected for each condition, the range, and the mean.

Procedural Integrity

Procedural integrity (PI) was addressed by having another experimenter independently watch video recorded sessions evaluated the experimenter's behaviours that were determined to be critical using a checklist (Table 3). A checkmark was placed beside those steps which the experimenter completed. Procedural integrity was then calculated by dividing the number of steps performed correctly by the total number of steps and multiplying by 100%. Table 4 also provides the percentage of sessions in which PI data was collected for each condition, the range, and the mean.

Results

Initial Assessment

Table 2 shows the ABLA test level and performance on the initial CPD assessment for all participants. None of the participants who tested at levels 3 and 4 passed the initial CPD test. Of the participants who tested at ABLA level 6, three passed the CPD during initial testing and three did not. Of the three participants at ABLA level 6 who passed the CPD task during assessment, all did so in less than 12 trials.

Table 3. Critical Steps Used for Procedural Integrity Data Collection

Steps used in PI data collection

Task

1. Correct materials used according to level
2. Conduct a mini-preference assessment
3. Place the materials in front of the participant
4. Begin level with a demonstration, then a guided trial, and opportunity for an independent response
5. Continue until an independent correct response is made
6. Begin collecting data
7. Give correct instruction according to level
8. If correct response provide social praise and edible/tangible reinforce
9. If incorrect use correction procedure (demonstration, guided trial, opportunity to perform a correct response) until an independent correct response is made
10. Remove materials from table
11. Record data
12. Represent materials and follow steps 7–11 until 8 cumulative incorrect responses, or 8 consecutive correct responses are made

Table 4. Percent of Sessions with Inter-Observer Agreement Data and Procedural Integrity Data, Range, and Mean for Each Phase of the CPD Teaching

	Standard (1)	*DRR (1)*	*Standard (2)*	*DRR (2)*
IOA taken	33%	33%	52%	37%
Mean	99% (90–100%)	100%	100%	100%
PI taken	33%	33%	85%	42%
Mean	98% (80–100%)	98% (83–100%)	100%	100%

Table 5. Mean and Range of Scores for Performance During Each Phase of the CPD Teaching for Each Participant

Participant	*Standard (1)*	*DRR (1)*	*Standard (2)*	*DRR (2)*
Marie	55% (30–90%)	47% (10–70%)		
Jacob	46% (0–90%)	45% (20–70%)	54% (40–70%)	55% (30–80%)
Mike	40% (20–60%)	48% (30–70%)	40% (30–50%)	45% (10–60%)
Jane	52% (30–90%)	44% (20–60%)	60% (50–90%)	50%

Conditional Position Discrimination Teaching

Seven of the participants took part in this component of the study. Only those participants who did not pass the CPD assessment were included in this part of the study. Of the participants who tested at ABLA levels 3 and 4, none were able to reach mastery criteria for the CPD using the standard teaching procedure even after as many as 500 trials (Figures 1-3). One participant at ABLA level 4 (Marie) participated in both the standard teaching procedure and the direct-response reinforcer procedure. This participant did not meet mastery criteria during either phase (Figure 4). Marie's performance decreased slightly during the direct response-reinforcer (DRR) condition. Of the ABLA level 6 participants none were able to meet mastery criteria for the CPD task during either phase even after as many as 840 trials (Figure 5). Table 5 provides the range of scores as well as the mean score for each participant that participated in both phases. There was only a slight difference in performance between conditions. Jacob and Mike performed slightly better during the DRR conditions, while Jane performed slightly better during the standard conditions.

Discussion

The results of this study indicate that those individuals who are unable to perform a CPD during initial testing were still not able to learn the task after as many as 840 trials using both the standard teaching procedure and the direct response-reinforcer procedure. This is consistent with the ABLA literature that suggests failed levels are often difficult to teach, even after several hundred teaching trials (Meyerson, 1977; Witt & Wacker, 1981; Yu & Martin, 1986). Those individuals who were able to perform this task during assessment were able to do so within 12 or fewer trials. This result is also consistent with the ABLA research which indicates that levels are passed or failed quickly. Kerr et al. (1977) found that 97% of participants passed or failed a level in 30 trials or less. The findings of this study follow the same pattern. Although its level of difficulty in comparison to the other discriminations has not been determined, it is interesting that it shares the same feature with all ABLA discriminations in that it is either acquired quickly or not at all.

It is suggested from the findings of this study that individuals testing below ABLA level 6

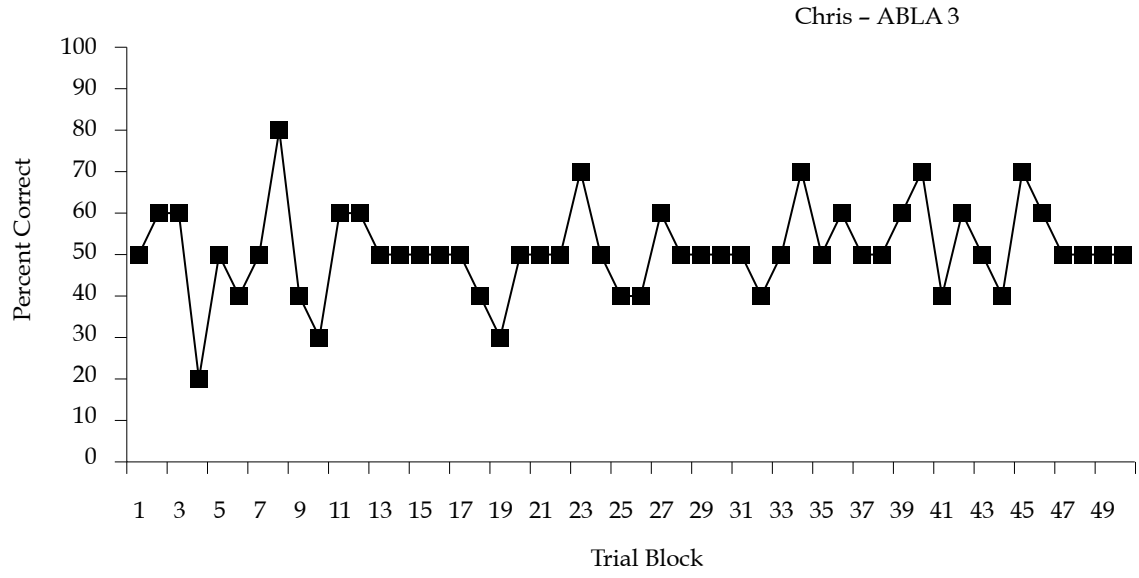

Figure 1. Percent correct responding per trial block during the CPD teaching condition for Chris

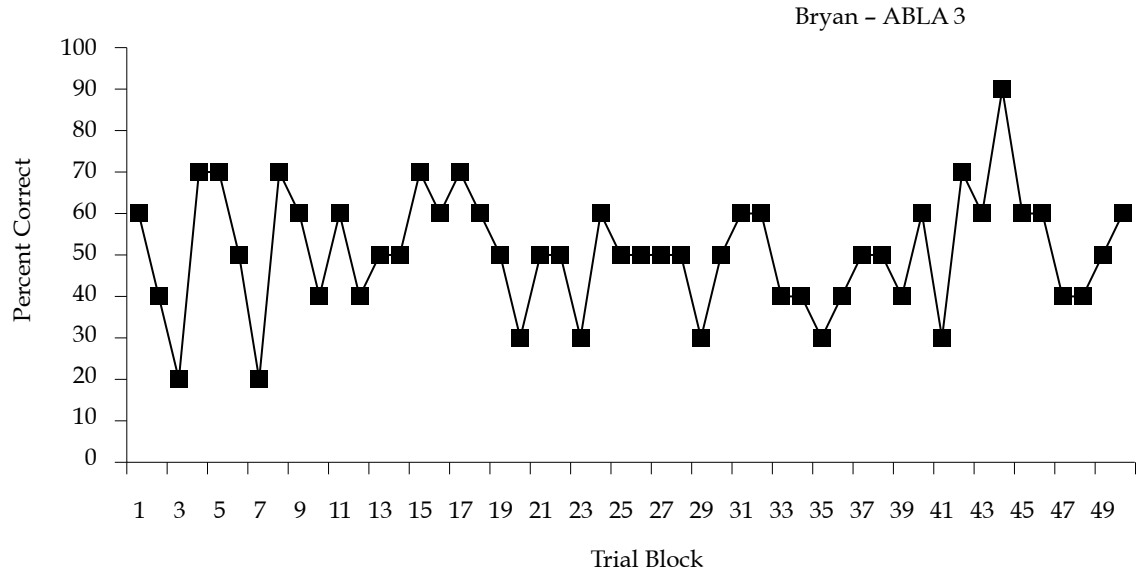

Figure 2. Percent correct responding per trial block during the CPD teaching condition for Bryan

may have difficulty learning a CPD. Thus, the ability to perform a CPD may fall above ABLA level 6. The fact that some individuals at ABLA level 6 were able to perform this task and some were not indicates that there may be a level above 6 that distinguishes this ability. However, it is unclear whether this task would be level 7 or whether there are other tasks that may correlate with conditional position discrimination ability. Furthermore, a statistical analysis such as that used by previous ABLA researchers was not used due to the small number of participants. Future studies including more participants may allow for such an analysis that would provide evidence that a CPD is indeed more difficult than level 6.

Additionally, it is unclear why some individuals are able to perform this task whereas others are not. It was anecdotally observed that those individuals who were able to perform this task had a much more advanced vocal repertoire. For example, these individuals were able to speak in full sentences and engage in conversations with the experimenter. Those individuals who were unable to perform this task had a vocal repertoire that was limited to two to three word utterances. Previous research has found that discrimination ability is related to

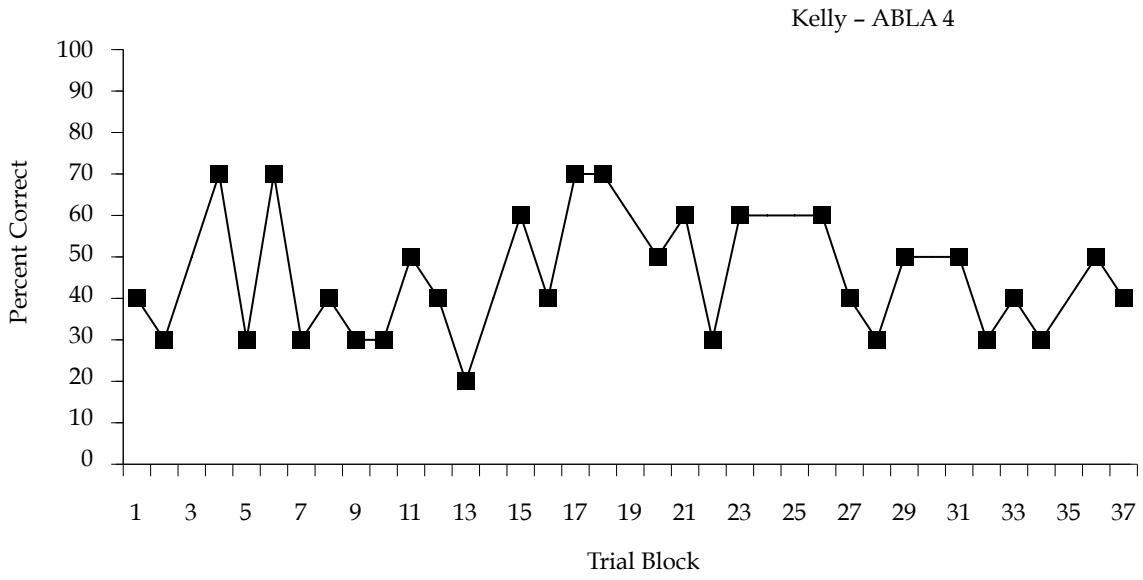

Figure 3. Percent correct responding per trial block during the CPD teaching condition for Kelly

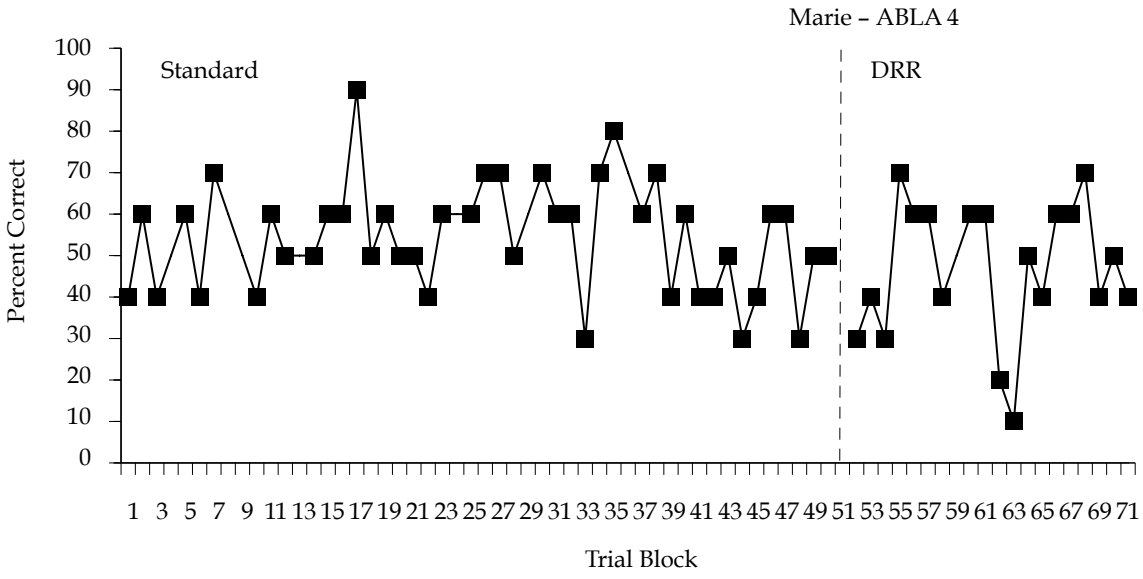

Figure 4. Percent correct responding per trial block during the CPD teaching condition, phases A and B for Marie

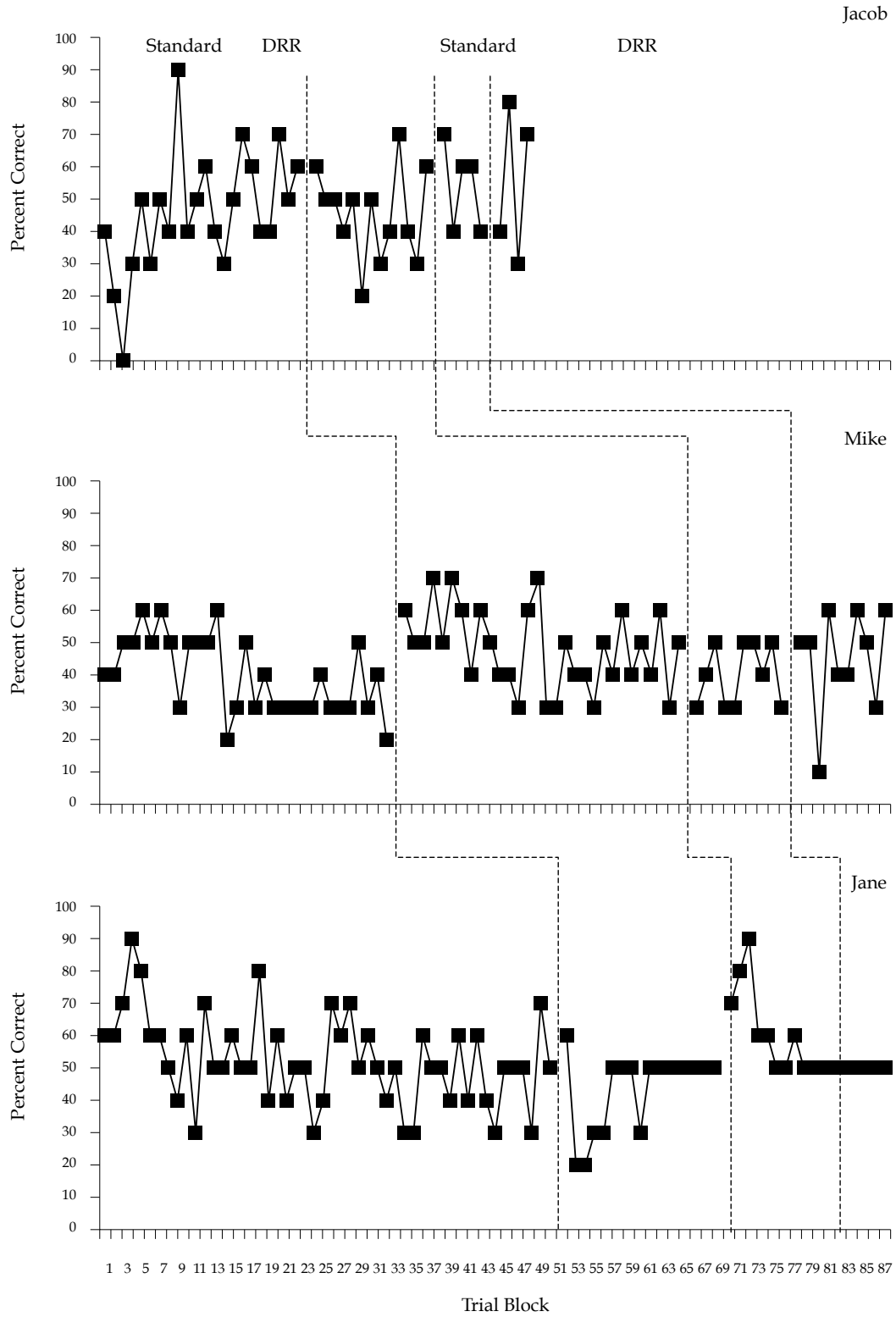

Figure 5. Percent correct responding per trial block during all phases of the CPD teaching for Jacob (top panel), Mike (middle panel), and Jane (lower panel)

language ability. For example, Marion and colleagues (2003) found that discrimination skill as assessed by the ABLA was a more accurate predictor of performance on assessments of verbal operants than level of functioning based on diagnosis. Additional research has indicated that the ABLA is correlated with language ability such that those individuals below level 4 had no formal verbal ability, those at level 4 could communicate using single words or signs, and two or more words typically occurred in those individuals above level 6 (Ward & Yu, 2000).The results of this study also indicate that the direct response-reinforcer teaching procedure was not effective in teaching a CPD. Although others have found it to be useful in teaching other skills that require lower forms of discrimination such as imitation and following vocal instructions (Williams, Koegel, & Egel, 1981), the procedure was not effective for teaching a CPD. The procedure was also found to be useful in teaching skills at ABLA level 6 to individuals who had failed that level (Conyers et al., 2000). However, the procedure was part of a multiple-component training package. Thus, it is unclear if the direct response-reinforcer procedure alone would have produced the same results.

Although the results of this study indicate that individuals who are unable to perform a CPD during initial assessment may have difficulty learning this task, this should not be taken to mean that they are unable to ever acquire this skill. The current study is limited in that it only assessed the utility of two procedures in teaching this skill. It is possible that other instructional procedures such as breaking it down into its component parts or transferring stimulus control may be effective.

Despite the limitations of this study the results have led to the development of additional questions to be addressed in future research. For example, the anecdotal observation of a correlation between expressive language and the ability to perform a CPD is of interest. Additionally, future research is warranted to determine whether there are other discrimination tasks that correlate with CPD, as well as the predictive ability of CPD for everyday learning tasks.

Overall, the results of this study provide a basis for further avenues for research on the ABLA. Given the limitations and the small number of participants involved in this study, the extent to which the findings can be generalized is limited. However, the results demonstrate a need for further research in this area and provide the basis for such research to be conducted.

Key Messages from This Article

People with disabilities: You have the right to the most effective assessment and treatment procedures, and deserve the opportunity to partake in the decisions that affect your life.

Professionals: In providing the most effective and appropriate treatment it is important to have accurate assessment tools.

Policy Makers: It is important that the assessment and treatment procedures supported in legislation have been scientifically proven to be the most effective.

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