Relationships Between ABLA Test Performance, Auditory Matching, and Communication Ability

By

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Abstract

The present study examined whether an extension of the Assessment of Basic Learning Abilities (ABLA) test, to include auditory matching tasks, enhanced its relationship to communicative ability. The participants were 40 developmentally-disabled persons. Participants were assessed on the ABLA test, and four auditory matching tasks. In addition, a care worker of each participant completed the Communication Ability Screening Survey (CASS) and a portion of the Vineland Adaptive Behavioral Scales (VABS) that assessed communicative ability. To examine whether adding auditory matching tasks to the ABLA test would increase its correlation with communication ability, a forward multiple regression analysis was used. For individuals classified at or above ABLA Level 4, the addition of auditory matching tasks to ABLA Levels 4 and 6 differentiated individual communicative ability to a greater extent than the ABLA test alone.

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Relationships Between ABLA Test Performance, Auditory Matching, and Communication Ability

Staff who work at facilities for the developmentally-disabled often find it difficult to determine which tasks are best suited to an individual's abilities. For this reason, Kerr, Meyerson, & Flora (1977) developed the Assessment of Basic Learning Abilities (ABLA) test. The ABLA test assesses a client's ability to learn a simple imitation task, and five two-choice motor, visual, and auditory discriminations of increasing difficulty. An individual's performance on the ABLA test has been shown to be predictive of the ease or difficulty with which a client can readily learn to perform educational, prevocational, and vocational tasks (Stubbings & Martin, 1995; Kerr et al., 1977). For example, a client classified at Level 3, a two-choice visual discrimination on the ABLA test could be taught, within 20 or 30 training trials, using standard reinforcement and prompting procedures, to master training tasks based on two-choice visual discriminations. In addition to using the ABLA test to assess an individual's skill level, recent findings suggest that the ABLA test is correlated with various measures of communication. Several studies (Casey & Kerr, 1977; Meyerson, 1977; Barker-Collo, Jamieson, & Boo, 1995; Ward, 1995) have suggested that ABLA level is correlated with measures of receptive and expressive communication, which include an individual's use and understanding of

gestures, sign language, symbols, and basic language skills. The current study assessed whether or not an extension of the ABLA test, to include auditory matching tasks, enhanced its relationship to various measures of communication.

The ABLA Test

The ABLA test is comprised of six tasks: a simple imitation task, a position discrimination, a visual discrimination, a visual match-to-sample discrimination, an auditory discrimination, and an auditory-visual combined discrimination.

Kerr et al. (1977) chose these particular discriminations because one or more of them appeared to be required for a client to readily learn a large number of self care, academic, pre-vocational, and vocational tasks in programs at facilities for the developmentally-disabled. To examine this contention, a study by DeWiele and Martin (1996) assessed the basic discriminations required to perform a total of 194 tasks randomly selected from over 500 tasks taught to developmentally-disabled persons at a large residential training facility. The tasks were selected from a variety of departments including vocational training, recreation, communication, physiotherapy, and by the staff in the home residence of each of the clients. Experts on the ABLA test then rated the tasks to assess whether or not they could be performed by clients on the basis of ABLA discrimination levels. The experts agreed that 69% of the

tasks were based on the tasks assessed by the ABLA test.

The required materials for the ABLA test include a yellow can, a red box, a yellow cylinder, a red block, and a piece of beige foam. The selection of materials by Kerr et al. (1977) was somewhat arbitrary; other shapes, colors, and sizes could have been used. However, there were several considerations that influenced Kerr et al. to use the test materials listed previously. First, red and yellow are primary colors, and are usually among the first taught to children. Second, the materials required for the ABLA test are relatively inexpensive, easy to make, and readily available to most staff at training facilities. Third, the box and cylinder are extremely common shapes. They could be used to teach two-choice discriminations that would likely have practical value in everyday life. Also, the selection of functional tasks is an accepted ethical guideline of both research and training programs for developmentally-disabled persons (Van Houten et al., 1988).

Although it would be possible to assess the ABLA discriminations without using containers, Kerr et al. (1977) stressed the importance of containers in designing a testing situation in order to make it easier for the tester to decide if a correct response has been made. First, requiring a client to place an object in a container made it easier for the experimenter to react to the response without allowing the client to switch choices. Second, any activity

other than placing the object in a container (e.g., throwing objects, pointing to a container, etc.) was not recorded and the trial was reprompted. This minimized the subjective judgements on the part of the experimenter (e.g., if pointing counted as a response, it might have been difficult to distinguish between a client pointing exactly to the left versus pointing between left and center).

A complete description of the ABLA levels, and the types of discriminations required to perform them is presented in Table 1. Each ABLA level surpasses the previous level in terms of the types of discriminations required. For example, Level 2 (position discrimination) and Level 3 (visual discrimination) of the ABLA test both consist of a simultaneous discrimination, however the levels differ in terms of the number of relevant visual cues present to make the discrimination (see Table 1).

Guidelines for administering the ABLA test. The ABLA test can usually be administered in approximately 30 minutes for each individual. During the assessment sessions, a client is seated at a table directly across from the tester. Alternate seating arrangements may be made for clients who are confined to a wheelchair. On each test trial, a correct response is immediately followed by praise (e.g., "Good boy!") and food (e.g., raisins, peanuts, and juice).

Before the testing of each level begins, the client is provided with a demonstration, a guided trial, and an opportunity for an independent response. For the demonstration trial the tester presents the stimulus, and

Table 1

A Description of the ABLA Levels and the Types of Discriminations

ABLA Levels and Original Names	Types of Discriminations
Level 1, Imitation: A tester puts an object into a container and asks a client to do likewise.	A simple imitation
Level 2, Position Discrimination: When a red box and a yellow can are presented in a fixed position, a client is required to place a piece of foam in the container on the left when the tester says, "Put it in."	A simultaneous visual discrimination with position, color, shape, and size as relevant cues
Level 3, Visual Discrimination: When a red box and a yellow can are randomly presented in left-right positions, a client is required to place a piece of green foam in the yellow can when the tester says, "Put it in."	A simultaneous visual discrimination with color, shape, and size as relevant cues
Level 4, Match-to-Sample: A client demonstrates Level 4 if, when allowed to view a yellow can and a red box in randomly alternating left-right positions, and is presented randomly with a yellow cylinder and a red cube, he/she consistently places the yellow cylinder in the yellow can and the red cube in the red box.	A conditional visual-visual identity discrimination with color, shape, and size as relevant cues

Level 5, Auditory Discrimination: When presented with a yellow can and a red box (in fixed positions), a client is required to put a piece of green foam in the appropriate container when the tester randomly says, "red box" (in a high-pitched rapid fashion) or "yellow can" (in a low-pitched drawn-out fashion).	A conditional auditory-visual nonidentity discrimination involving speech sounds, with pitch, pronunciation and duration as relevant auditory cues, and with position, color, shape, and size as relevant visual cues
Level 6, Auditory-Visual Combined Discrimination: The same as Level 5, except that the right-left position of the containers is randomly alternated.	A conditional auditory-visual nonidentity discrimination involving speech sounds, with the same auditory cues as Level 5, and with only color, shape, and size as relevant visual cues

demonstrates the required response while stating the appropriate verbal cue. For example, in Level 1 the verbal cue would be "When I say 'Where does it go?' it goes in here". In the guided trial, the tester presents the stimulus and guides the individual to make the correct response. Following the guided trial, the client is required to make an independent correct response when the stimulus is presented.

The testing of each trial begins after the client is able to perform one trial independently, thus demonstrating the correct response unassisted. If an individual is unable to make a correct independent response on eight consecutive trials, the individual cannot be tested. If an individual is unable to make a correct response at an ABLA level, the ABLA classification is at the preceding level.

When an incorrect response is made on any trial, it is immediately followed by an error correction procedure which involves a demonstration, a guided trial, and an opportunity for independent response. The error correction procedure is repeated until the client has completed a correct response, or met the failing criterion. Trials on a particular task continue until a passing or failing criterion is met, whichever occurs first.

The passing criterion for any level is eight consecutive correct responses (not including a correct response which occurs during the error correction

procedure). The failing criterion is met when a participant fails to respond correctly on eight cumulative independent responses (including those which occur during error correction). It is important to note that, statistically, only once in 256 trials will eight consecutive correct responses occur by chance in a two-choice discrimination task in which responses on successive trials are independent (Kerr et al., 1977). Therefore, when the failing criterion has been met on a particular level, this should be interpreted as a demonstration of a difficulty to learn on the part of the client.

Research on the ABLA Test

Research suggests that the ABLA test is a useful behavioral tool for assessing the training needs of developmentally-disabled persons (DeWiele & Martin, 1996; Yu, Martin, & Williams, 1989). To date, there have been several findings related to the ABLA. These findings include the hierarchial organization of the ABLA, the difficulty in teaching failed levels, and the predictive validity of the ABLA.

Hierarchial organization. Research indicates that the ABLA test levels are hierarchically ordered, such that each level surpasses the previous in level of difficulty. That is, individuals who have passed a particular level will also be successful in passing lower levels. Accordingly, an individual who has failed a particular level will not have

the discrimination skills to pass higher levels (Kerr et al., 1977; Martin, Yu, Quinn, & Patterson, 1983). For example, Kerr et al. (1977) tested 170 clients, and only 6 clients deviated from the hierarchial ordering pattern. Similarly, of a total of 135 clients assessed by Martin et al. (1983), all but two clients confirmed the hierarchial order of the ABLA test.

Difficulty in teaching failed ABLA levels. Research has revealed that a failure to pass any given level in the ABLA test (e.g., Level 3, visual discrimination) will result in tasks at that level being extremely resistant to training using standard prompting and reinforcement procedures. For example, Meyerson (1977) attempted to train the first failed level, and found that participants needed 100-900 training trials before a higher level of discrimination was attained. Similarly, Wacker, Steil, and, Greenbaum (1983) tried to teach a series of failed visual and auditory tasks to eight individuals; the discrimination level of all clients remained unchanged, even after as many as 100 trials. Novel tasks taught to clients that involve ABLA levels that they have passed, on the other hand, are typically mastered within 25 trials (Stubbings & Martin, 1995; Wacker et al., 1983).

Predictive validity of the ABLA. The ABLA test has been shown to be highly predictive of the ease or difficulty with which developmentally-disabled persons are able to perform

educational, prevocational, and vocational tasks (Stubbings & Martin, 1995; Tharinger, Schallert, & Kerr, 1977; Witt & Wacker, 1981; Yu & Martin, 1986). For example, Tharinger et al. tested 11 children, 4 to 11 years of age, on the ABLA test and on a series of educational training tasks. The results indicated that in the majority of cases (83 percent), children passed only those training tasks that required a discrimination level that was passed on the initial ABLA assessment, which was administered approximately two to three months earlier.

The predictive validity of the ABLA has also been confirmed for prevocational and vocational tasks. Wacker, Kerr, and Carroll (1983) examined the accuracy of predictions for two-choice and four-choice vocational analogue tasks, based on the discrimination level passed in the ABLA assessment. Performance on the ABLA test predicted performance on the analogue tasks for 11 of the 12 clients.

A question arises as to the predictive ability of the ABLA test as compared to more standard measures of developmental disability, such as IQ scores. The degree of retardation as measured by IQ is associated with ABLA test performance, with 73 percent of moderately retarded persons, 35 percent of severely retarded persons, and none of profoundly retarded persons able to learn ABLA Levels 5 and 6 (the auditory discriminations) (Kerr et al., 1977). However, IQ tests provide a much more global measure of

performance than the ABLA, and IQ does not have the predictive validity of the ABLA for the types of motor, visual, and auditory tasks examined to date (Kerr et al., 1977; Stubbings & Martin, 1995; DeWiele & Martin, 1996; Yu et al., 1989).

In summary, the ABLA test appears to have considerable potential as an assessment and training tool for staff working with developmentally-disabled persons. Some research also suggests that performance on the ABLA test is correlated with a client's level of communication. A question arises: will an extension of the ABLA test, to include auditory matching tasks further increase its relationship to communicative ability? This was the focus of the current study.

Auditory Matching Discriminations

As mentioned previously, Levels 5 and 6 of the ABLA test assess a client's ability to perform auditory-visual nonidentity discriminations, involving speech sounds (See Table 1). In order to make a correct response on Levels 5 and 6, a client must match, through differential consequences, an auditory cue (e.g., "red box" spoken in a high, rapid tone) with the appropriate visual object (e.g., a red box). In recent years, several researchers have developed tasks that require auditory discriminations that are clearly different from those included in the ABLA test.

Two-choice task to produce a matching sound. Walker, Lin, and Martin (1994) developed a procedure for assessing an individual's performance on an auditory-visual nonidentity discrimination, involving simple sounds, in which the correct response produced a sound that matched the auditory cue. In this test, a bell and a tambourine were placed on the table directly in front of a participant. A second bell and tambourine were placed underneath the table and out of sight of the participant. Across trials, the tester rang either the bell or the tambourine which were located underneath the table. In order to make a correct response, a participant had to listen for a sound, and then visually discriminate and manipulate an object that would produce that sound.

Two-choice task to produce a nonmatching sound. Ward (1995) described a second auditory-visual nonidentity discrimination, involving vocal rather than simple sounds, in which the correct response produced a sound that did not match the auditory cue. In this test, a yellow cylinder with a squeaker inside and a red cube filled with rice were placed in front of a participant. When the experimenter said, "Where's the squeak, squeak...?", the correct response involved a participant picking up and shaking the cylinder to produce a squeak noise. However, when the experimenter said, "Where's the ch, ch, ch, ch...?", the correct response involved picking up the cube and shaking it to produce the

sound of rice moving back and forth.

Auditory-auditory identity matching task. Lin, Martin, and Collo (1995) examined a third type of auditory matching task, another one involving speech sounds, called auditory-auditory identity matching. For example, in a study conducted by Lin et al. (1995), a tester said, "pen, pen, pen" in a high rapid tone or "b-l-o-c-k, b-l-o-c-k, b-l-o-c-k" in a slow deep tone. Two research assistants would produce one of the two auditory cues ("pen, pen, pen" in a high rapid tone, or "b-l-o-c-k, b-l-o-c-k, b-l-o-c-k" in a slow deep tone). This was done in a randomized fashion such that, on each trial, one assistant would produce the auditory cue matching that of the tester. The participant was required to place a stimulus object in the palm of the assistant who had produced the matching auditory cue.

Auditory-auditory non-identity matching task. Harapiak, Martin, & Yu (1997) developed an auditory matching task involving non-identical speech sounds. On each trial, a tester would say, "ball, ball, ball" in a high rapid tone, or "i-c-e, i-c-e, i-c-e" in a slow deep tone. In a randomized fashion, the assistants would produce one of two auditory cues (e.g., "skate, skate, skate" in a high rapid tone, or "r-i-n-k, r-i-n-k, r-i-n-k" in a slow deep tone). The participant was required to match, based on pitch, an auditory cue produced by the tester with an auditory cue produced by an assistant.

Research on Auditory Matching Discriminations And Their Relation to the ABLA Test

Hierarchical ordering of the auditory matching tasks.

Research indicates that the four auditory matching tasks are hierarchically ordered in relation to each other, and in relation to the ABLA test (Walker et al., 1994; Ward, 1995; Lin et al., 1995; Harapiak et al., 1997). This hierarchy of ABLA levels and tests of auditory matching is presented in Table 2.

To examine the relations between the ABLA levels and auditory matching tasks, Harapiak et al. (1997) used the Method of Order Analysis (Krus, Bart, & Airasian, 1975). Combining the results of a series of studies, Harapiak et al. indicated that all relations between ABLA levels and auditory matching tasks supported the proposed hierarchy. Four of five relations were significant at the .01 level. First, the results of 14 participants out of a total of 14 participants (Walker et al, 1994; Lin et al., 1995; Harapiak et al., 1997) indicated that the two-choice task to produce a matching sound was more difficult than ABLA Level 4. The results of nine participants out of a total of nine participants suggested that the same task, a two-choice task that produced a matching sound, was less difficult than ABLA 5.

Third, the results of 3 participants, out of a total of 4 participants indicated that the two-choice task to produce

Table 2

Existing Hierarchy of ABLA Levels and Auditory Matching Tasks

ABLA Level 1 - Imitation

ABLA Level 2 - Position Discrimination

ABLA Level 3 - Visual Discrimination

ABLA Level 4 - Match-to-Sample Discrimination

Two-Choice Task to Produce a Matching Sound (with simple sounds)

ABLA Level 5 - Auditory Discrimination

ABLA Level 6 - Auditory-visual Combined Discrimination

Two-Choice Task to Produce a Nonmatching Sound (with vocal sounds)

Auditory-Auditory Identity Matching (with vocal sounds)

Auditory-Auditory Nonidentity Matching (with vocal sounds)

a nonmatching sound was more difficult than ABLA Level 6 (Ward,1995; Harapiak et al., 1997). Although this result supported the proposed hierarchy, it did not reach significance. Fourth, the results of nine participants out of a total of nine participants (Harapiak et al.) indicated that auditory-visual nonidentity matching was less difficult than auditory-auditory identity matching. Finally, the results of six participants out of a total of six participants (Harapiak et al.) confirmed the hypothesis that auditory-auditory nonidentity matching was more difficult than auditory-auditory identity matching.

Theoretical explanations of the auditory matching tasks. Similar to each of the levels on the ABLA test, it is suggested that the hierarchical ordering of the auditory matching tasks, in relation to each other and to the ABLA test, may be due to the types of discriminations required. A listing of the types of discriminations required to perform each of the auditory matching tasks is presented in Table 3. A comparison of Tables 1 and 3 provides some plausible explanations of the hierarchical order that has emerged. For example, why is the bell-tambourine task more difficult than ABLA Level 4 (match-to-sample discrimination)? First, Level 4 is a visual-visual identity discrimination while the bell-tambourine task is an auditory-visual nonidentity discrimination. Presumably, within-modality discriminations are easier than across-modality discriminations, and

Table 3

Types of Discriminations Required for the Auditory Matching Tasks

Auditory Matching Tasks	Types of Discriminations
Two-Choice Task to Produce A Matching Sound	A conditional auditory-visual nonidentity discrimination involving simple environmental sounds, with tone and duration as relevant auditory cues, and with position, color, shape and size as relevant visual cues, and the correct response produces a matching sound
Two-Choice Task to Produce a Nonmatching Sound	A conditional auditory-visual nonidentity discrimination involving speech sounds, with duration and pronunciation as relevant auditory cues, and with color, shape, position, and size as relevant visual cues, and the correct response produces nonmatching sound
Auditory-Auditory Identity Matching	A conditional auditory-auditory identity discrimination with pitch, pronunciation, and duration as relevant auditory cues
Auditory-Auditory Nonidentity Matching	A conditional auditory-auditory nonidentity discrimination with pitch, pronunciation, and duration as relevant auditory cues

identity discriminations are easier than nonidentity discriminations. Considering that the bell-tambourine task and ABLA Level 5 are both auditory-visual nonidentity discriminations, why is the bell-tambourine task easier than Level 5? One possibility is that the bell-tambourine task requires a discrimination involving simple sounds while Level 5 involves speech sounds, which may be more complex and therefore more difficult to discriminate. Also, ABLA Level 5 may be more difficult than auditory nonidentity matching (with environmental sounds) because of a difference in consequences; in ABLA Level 5, a correct response is reinforced by praise and an edible, whereas, for the auditory matching task, a correct response is reinforced by praise, an edible, and a matching environmental sound (e.g., ringing of a bell or tambourine).

A comparison of Tables 1 and 3 suggests that possible explanations may also be offered for the hierarchical ordering of the auditory-visual and auditory-auditory matching tasks beyond Level 6. As indicated, the auditory-visual matching tasks involve matching an auditory stimulus and a visual stimulus based on relevant auditory and visual cues. Further, the auditory-auditory matching tasks involve matching two auditory stimuli based on relevant auditory cues. The ability to distinguish auditory cues, in the presence of and the absence of a visual stimulus, are necessities in learning to communicate. The addition of

auditory matching tasks to the ABLA test may allow further differentiation between individuals with regards to communication skills.

Research on Communication Measures and Their Relation to the ABLA Test

Several studies have indicated that the ability to perform auditory discriminations on the ABLA test is a prerequisite to learning more complex language discriminations. For example, Casey and Kerr (1977) assessed 42 normally developing children (aged 13 to 35 months) to examine the relationship between performance on the ABLA auditory discrimination tasks (Levels 5 and 6), and basic language ability. Those individuals who were able to pass the ABLA auditory discrimination tasks scored significantly higher on three measures of language skills (mean length of utterance, upper bound, and a vocabulary sample) than children who were unable to pass the ABLA auditory discrimination tasks. The results indicated a clear association between the presence of auditory discrimination skills, a mean length of utterance greater than 2.3 morphemes, and a vocabulary greater than 75 words. The same study also established a hierarchical ordering among the six basic discrimination tasks with normal developing children, with ABLA Level 4 (match-to-sample discrimination) developing around 17-18 months of age, and ABLA Levels 5 and 6 (auditory discriminations) developing around 27-32 months

(the age at which normal children typically experience a rapid growth in the production of speech). In another study, Meyerson (1977) assessed 52 developmentally-disabled children on the ABLA auditory discrimination tasks and the Distar Reading Readiness Test. Those individuals who failed the auditory discrimination tasks also failed the Distar, while those individuals who passed ABLA Level 6 also passed the Distar.

Third, Ward (1995) assessed 32 developmentally-disabled children on the ABLA test, and five forms of expressive communication. The forms of expressive communication, ranging from very simple to more complex, were as follows: (a) mute, (b) echolalic, (c) single signs, (d) "one-word", and (e) "two or more words". The findings indicated that expressive communication abilities were highly correlated with ABLA performance. Those individuals who were unable to pass the auditory levels of the ABLA test were identified as being at a one-word level or lower; while, conversely, those individuals who passed the auditory discrimination tasks were able to combine two or more words in phrases or sentences to express their needs.

Barker-Collo et al. (1995) assessed 40 individuals on the ABLA test, the Vineland Adaptive Behavioral Scales (VABS) (Sparrow, Balla, & Ciccetti, 1984), and the Communication Status Survey (CSS) (Barker-Collo et al., 1995). ABLA level was significantly correlated with VABS

scores of receptive and expressive communication, and aspects of communication measured by items on the CSS. Results on the VABS expressive communication scale and the CSS were examined in order to identify the extent to which each individual used formal communication. Formal communication was defined as having a vocabulary that exceeded 20 words, signs, or symbols. Individuals with formal communication ability (measured by the CSS and the VABS) scored significantly higher on CSS items that assessed the ability to communicate choice, to request assistance, to use greetings and closings, and to provide information about objects or actions in the immediate and external environment, than individuals with no formal communication. The findings also indicated that formal communication ability was significantly related to ABLA level such that those individuals with no formal communication were classified at Level 2 or lower on the ABLA test; while, conversely, those individuals with proficient formal communication were classified at or above Level 4 on the ABLA test. Barker-Collo (1995) revised the CSS and the test was renamed the Communication Ability Screening Survey (CASS). Barker-Collo (1995) assessed forty-two participants on the VABS and the CASS, and replicated the findings of Barker-Collo et al. (1995) in terms of significant correlations between CASS items and VABS measures of receptive and expressive communication.

Statement of the Problem

To date, several studies (Walker et al., 1994; Ward, 1995; Lin et al., 1995; Harapiak et al., 1997) indicated that the four auditory matching tasks were hierarchically ordered in relation to each other and in relation to the ABLA test (see Table 2). One auditory matching task was positioned between ABLA Levels 4 and 5, and the remaining three auditory matching tasks were considered more difficult than ABLA Level 6. One purpose of the present study was to assess additional participants in order to provide further support for the hierarchical ordering of the auditory matching tasks.

Recent studies (Casey & Kerr, 1977; Meyerson, 1977; Ward, 1995; Barker-Collo et al., 1995; Barker-Collo, 1995) have also indicated that the ABLA level is correlated with a client's performance on various measures of receptive and expressive communication. However, to date no one has examined whether an extension of the ABLA test, to include auditory matching tasks, will enhance its relationship to communicative ability.

The second purpose of the present study was to assess whether the addition of four auditory matching tasks to Levels 4, 5 and 6 of the ABLA test differentiated individual communicative ability to a greater extent than the ABLA test alone. It was hypothesized that, for individuals classified at or above ABLA Level 4, the extension of the ABLA test to

include auditory matching tasks would increase its correlation with communicative ability.

Method

Setting and Participants

The testing and training sessions occurred in an assessment room located in the St. Amant Centre, a residential and community training facility for developmentally-disabled persons. The room was 2.4m by 1.8m, and contained a table, sitting ledge, and two chairs. During the sessions, the tester sat directly across the table from the participant. Additional observers were seated on the sitting ledge next to the participant.

A total of 40 participants were included in the present study. Potential participants were selected, in part, from a listing of 23 developmentally-disabled persons from a previous study that examined performance on the ABLA test and auditory matching tasks (Harapiak et al., 1997). This listing contained participants' names and classification levels on the ABLA test and auditory matching tasks. Eighteen of the 23 participants resided at the St. Amant Centre, a residential and community training facility for developmentally-disabled persons. The remaining five participants resided in group homes affiliated with the St. Amant Centre. All participants were classified at or above ABLA Level 4.

For the present study, all 23 participants were

reassessed on the ABLA test to determine if their classifications remained at or above ABLA Level 4. Those participants who met the criterion of being classified at or above ABLA Level 4 were included in the present study. All 23 participants were also reassessed on the auditory matching tasks. Additional individuals who also met the criterion were selected to participate in the study, for a total N of 40. These individuals were chosen from various group homes affiliated with the St. Amant Centre. By including more individuals at each classification level, the present study attempted to support and extend the findings of Harapiak et al. (1997) (see Table 4 for the reassessment of ABLA and auditory matching classifications of the Participants). All participants who passed ABLA Level 5 also passed Level 6, therefore ABLA Level 5 will not be discussed further.

Written consent for each client was obtained according to the following steps. First, written consent was obtained directly from participants over 18 years of age, and capable of giving consent. The researcher approached each participant over 18 years of age to explain the study, answer any questions, and ask the participant whether he/she would like to take part in the study. For individuals who agreed to participate, a signature was obtained from them with a staff member present. The staff member initialed the consent form (for a copy of the participant consent form,

Table 4

Scores of Participants on the ABLA Test and Auditory Matching

Participant	Highest ABLA Level Passed	bell-tambourine task	rice-rattle task	"pen-pen" task	"ball-field" task
1	4	Failed	Failed	Failed	Failed
2	4	Failed	Failed	Failed	Failed
3	4	Failed	Failed	Failed	Failed
4	4	Failed	Failed	Failed	Failed
5	4	Passed	Failed	Failed	Failed
6	4	Passed	Passed	Failed	Failed
7	6	Passed	Failed	Failed	Failed
8	6	Passed	Failed	Failed	Failed
9	6	Passed	Passed	Failed	Failed
10	6	Passed	Passed	Failed	Failed
11	6	Passed	Passed	Failed	Failed
12	6	Passed	Passed	Failed	Failed
13	6	Passed	Passed	Failed	Failed
14	6	Passed	Passed	Failed	Failed
15	6	Passed	Passed	Failed	Failed
16	6	Passed	Passed	Failed	Failed
17	6	Passed	Passed	Failed	Failed
18	6	Passed	Passed	Failed	Failed
19	6	Passed	Passed	Failed	Failed
20	6	Passed	Passed	Failed	Failed
21	6	Passed	Passed	Failed	Failed
22	6	Passed	Passed	Failed	Failed
23	6	Passed	Passed	Passed	Failed
24	6	Passed	Passed	Passed	Failed
25	6	Passed	Passed	Passed	Failed
26	6	Passed	Passed	Passed	Failed
27	6	Passed	Passed	Passed	Failed
28	6	Passed	Passed	Passed	Failed
29	6	Passed	Passed	Passed	Failed
30	6	Passed	Passed	Passed	Failed
31	6	Passed	Passed	Passed	Failed
32	6	Passed	Passed	Passed	Failed
33	6	Passed	Passed	Passed	Failed
34	6	Passed	Passed	Passed	Failed
35	6	Passed	Passed	Passed	Passed
36	6	Passed	Passed	Passed	Passed
37	6	Passed	Passed	Passed	Passed
38	6	Passed	Passed	Passed	Passed
39	6	Passed	Passed	Passed	Passed
40	6	Passed	Passed	Passed	Passed

Note. The abbreviations in the table refer to the ABLA Levels 4 and 6, two-choice task to produce a matching sound (bell-tambourine task), two-choice task to produce a nonmatching sound (rice-rattle task), auditory-auditory identity matching task ("pen-pen" task), and auditory-auditory nonidentity matching task ("ball-field" task).

see Appendix A). Immediately following, parents of all potential participants, including individuals over 18 years of age, were contacted by mail and asked to complete a consent form (for a copy of the project description and the legal guardian consent form, see Appendix B). If the parent was the legal guardian for the client, the consent process ended there and the client was included in the study provided that both the client and the parent agreed to participate. If the parent was not the legal guardian, a third step was implemented in which the legal guardian (the Public Trustee) was contacted by mail for consent (see Appendix B). All participants had the right to discontinue or terminate sessions at any point during the study. For each participant, clinical records were accessed to obtain information concerning clinical diagnosis, age, and functioning level (see Table 5 for ages, and functioning levels of Participants). In order to assess a participant's communicative ability, a primary care worker of each participant was asked to fill out the Communication Ability Screening Survey (CASS), and parts of the Vineland Adaptive Behavioral Scales (VABS) that assessed communication skills.

Materials

The ABLA tasks. The materials for the ABLA test consisted of a red box measuring 15 cm X 15 cm, a yellow can measuring 13 cm in diameter and 16.5 cm in height, a small

Table 5

Age and Functioning Level for Participants Corresponding to Table 4

Participant	Age	Functioning Level
1	25	moderate
2	40	moderate
3	22	severe
4	22	severe
5	27	severe
6	31	profound
7	30	severe
8	20	severe
9	41	moderate
10	34	moderate
11	29	moderate
12	24	severe
13	29	moderate
14	39	moderate
15	30	moderate
16	36	mild-moderate
17	29	moderate
18	32	severe
19	26	severe
20	28	moderate
21	32	severe
22	31	severe
23	42	severe
24	36	mild
25	42	mild
26	30	moderate
27	35	severe
28	24	severe
29	33	severe
30	27	mild
31	33	severe
32	22	severe
33	33	moderate
34	27	severe
35	31	mild
36	33	moderate
37	35	moderate
38	26	mild
39	31	mild
40	23	mild

red block, a small yellow cylinder, and a small piece of irregularly-shaped beige foam.

The auditory matching tasks. A listing of materials used for each of the four auditory matching tasks is presented in Table 6. No materials were needed for the auditory-auditory nonidentity matching task (Harapiak et al., 1997).

Communication Ability Screening Survey (CASS). Barker-Collo (1995) developed the Communication Ability Screening Survey (CASS; formerly the CSS)(Barker-Collo et al., 1995), which enables a care worker to rate a series of items that indirectly assess a client's communication ability. The CASS is presented in Appendix C. The CASS consists of 3 subscales: (a) expressing needs and wants, (b) participation in social interactions, and (c) modes of communication. Items for (a) and (b) were rated by a care worker in terms of the frequency with which an activity occurred, on a scale ranging from 0 (never) to 3 (always). Items for (c) were rated by a care worker in terms of the percentage of total interactions (with each mode of communication), on a scale ranging from 0% (never) to 100% (always).

The results of Barker-Collo et al. (1995) suggested that the CASS was a reliable and valid tool for assessing the communication abilities of developmentally-disabled persons. The internal reliability coefficients of scales expressing a client's needs and wants, participation in

Table 6

Summary of the Auditory Matching Tasks

Task	Materials	Auditory Cues	Correct Responses
TPMS	2 table bells	"make the same sound"	hit the bell
	2 tambourines	"make the same sound"	hit the tambourine
TPNS	rattle	"rattle, rattle..."	shook rattle
	can with rice	"ch, ch, ch..."	shook can with rice
AAIM	blue pen	"pen," spoken in a high rapid tone	placed pen in palm of correct assistant
	red block with black stripes	"block," spoken in a slow, deep tone	placed block in palm of correct assistant
AANM	no materials	"ball/field," spoken in high, rapid tone	pointed to correct assistant
	no materials	"ice/rink," spoken in a slow, low tone	pointed to correct assistant

Note. The abbreviations in the table refer to the two-choice task to produce a matching sound (TPMS), two-choice task to produce a nonmatching sound (TPNS), auditory-auditory identity matching task (AAIM), and auditory-auditory nonidentity matching task (AANM).

social interactions, and modes of communication were .82, .86, and .50 respectively. The low internal reliability coefficient of .50 for modes of communication was expected due to the fact that individuals usually rely on one or two modes of communication. In addition, the findings of Barker-Collo indicated that interrater reliability, for a random sampling of 21 participants,
was r = .90, and test-retest reliability, assessed for all participants, was r = .91.

Vineland Adaptive Behavioral Scales (VABS). A portion of the Interview Edition, Expanded Form of the VABS was administered in a semi-structured format to the care worker of each client. The Vineland Adaptive Behavioral Scales (VABS) (Sparrow et al., 1984), has been used to assess the personal and social sufficiency of individuals from birth to adulthood, as well as low-functioning adults. For the present study, individuals were assessed on two communication subscales of the VABS: (a) receptive communication, and (b) expressive communication. For a copy of the VABS subscales, see Appendix D. Receptive communication assesses what an individual understands, and expressive communication assesses what an individual says. Expressive and receptive communication were represented by 23 items and 76 items respectively. These items were rated by a care worker on a scale ranging from 0 (no, never) to 2 (yes, usually). When the item was not applicable to the

individual, it was recorded as N (no opportunity) or DK (don't know the answer).

The communication domain of the Expanded Form of the VABS was reported to have good internal consistency reliability, which ranged from .84 to .97 across 15 age groups (Sparrow et al., 1984). Although the test-retest and interrater reliability coefficients were not formally computed for the communication domain of the Expanded Form, both of these coefficients were expected to be higher than the coefficients (test re-test, and interrater reliability) that were computed for the communication domain of the Survey Form of the VABS. This expected increase was due to the increased length of the Expanded Form. The test re-test reliability and interrater reliability coefficients for the Survey Form of the VABS were $\underline{r} = .86$ and $\underline{r} = .77$, respectively.

Procedure

ABLA assessments. Each participant was assessed on ABLA levels according to guidelines described by Kerr et al. (1977) and as summarized in the introduction. In accordance with ABLA format, a demonstration, a guided trial, and an opportunity for an independent response was provided prior to testing. Testing continued on each ABLA level and auditory matching task until either eight consecutive correct responses (passing criterion) or eight cumulative errors (failing criterion) occurred. Throughout all testing

sessions, each correct response was reinforced by verbal praise. Participants were also given edibles contingent on each correct response provided that they could be delivered on a CRF schedule (i.e., that there were no dietary restrictions).

For four participants, the required responses on ABLA levels and auditory matching tasks were modified due to limited use of the upper body. In these cases, a response was scored as correct if a clear indication of choice was made by pointing to the appropriate container, rather than placing the object in it.

During testing sessions, if a participant, when prompted, failed to respond, or behaved in a way that was undesirable, the trial was terminated. The tester removed all materials from the table, turned away from the participant for 10 seconds, and then began a new trial. If this occurred repeatedly (e.g., more than five times) during a testing session, the session was terminated and rescheduled.

Individuals with previous ABLA and auditory matching classifications (Harapiak et al., 1997) were assessed only on the highest ABLA level passed, and all higher failed levels. For example, a client previously classified at ABLA Level 6 (according to Harapiak et al.) was assessed only on ABLA Level 6, and the three auditory matching tasks that were considered more difficult than Level 6. Individuals not

previously assessed by Harapiak et al. were assessed on all levels of the ABLA test (for a copy of the ABLA and auditory matching data sheets, see Appendix E).

Auditory matching assessments. The key components of the four auditory matching tasks are summarized in Table 6. The tasks were administered in the standard ABLA format (Kerr et al., 1977). In accordance with the ABLA test, testing continued on each auditory matching task until either eight consecutive correct responses (passing criterion) or eight cumulative errors (failing criterion) occurred.

Two-choice task to produce a matching sound (bell-tambourine task). During testing, the tester sat directly across from the participant. One bell and one tambourine were placed 30 cm apart, directly in front of the participant. The tester began the demonstration by hitting the bell, hidden under the table, consistently for 10 seconds, while at the same time saying, "Make the same sound." A guided trial was then implemented whereby the tester continued to hit the hidden bell, and said, "Make the same sound", while guiding the participant's hand to match the sound requested. The participant was then prompted to ring the bell or hit the tambourine in response to the appropriate cue (the simple sound produced by the tester). For individuals with limited body use, who were unable to tap the tambourine or bell, they were instructed to point to

the desired object. Test trials and scoring began when the participant was able to perform a correct response with the bell and tambourine on the practice trials. A response was considered correct if the participant, when asked to make an independent response, produced the matching sound to that of the tester.

Two-choice task to produce a nonmatching sound (rice-rattle task). During testing sessions, the tester sat directly across from the participant. One rattle and one can of rice were placed 30 cm apart, directly in front of the participant. The tester provided a demonstration trial by saying, "rattle, rattle, rattle..." and then shaking the rattle placed on the table. A guided trial was then implemented whereby the tester said, "rattle, rattle, rattle..." and then guided the participant's hand to shake the rattle. The participant was then prompted to make an independent response. The same procedure was repeated with the can of rice, and the auditory cue "ch, ch, ch..." Individuals with limited upper body use who were unable to perform the desired response (shaking the rattle or rice) were allowed to point to the object of choice. One participant, who was unable to match the auditory cue to the physical object, was instead presented with the words "rice" and "rattle" (substituted for physical objects) and was asked to point to the correct word. Test trials and scoring began when the participant was able to perform an

independent correct response, with the rattle and can of rice, on the practice trials.

Auditory-auditory identity matching with vocal sounds ("pen"-"pen" task). During testing, the tester was positioned beside the participant, and two research assistants were seated across from the participant. Both assistants placed their hands, palms up, on the table, and within reach of the participant. The tester began the demonstration trial by picking up one of two stimulus objects (a pen or a small block), and produced the corresponding auditory cue (e.g., "pen, pen" in a high rapid tone). Following the auditory cue produced by the tester, the two research assistants produced auditory cues, with one assistant following the other in a randomized fashion. On each trial, one assistant produced a matching auditory cue to that of the tester ("pen, pen" in a high rapid tone), and the other assistant produced a different auditory cue ("b-l-o-c-k" in a slow low tone). The tester then placed the pen in the hands of the research assistant who produced the matching auditory cue.

A guided trial was then implemented, whereby the same sequence of words presented in the demonstration trial was repeated (by the same persons), and the tester guided the participant to place the pen in the appropriate hands. The sequence of words was repeated a third time, and the client was prompted to make an independent response. The same

procedure was repeated with a block and the auditory cue "b-l-o-c-k" which was spoken slowly by the tester in a deep tone. One assistant produced a similar auditory cue (e.g., "b-l-o-c-k" in a slow low tone), and the other assistant produced a different auditory cue (e.g., "pen, pen" in a high rapid tone). Near the beginning of the study, auditory cues were shortened from those used in the Lin et al. (1995) study from three repetitions to two repetitions of the same word for auditory cues produced in a high rapid tone, and from three repetitions to one repetition of the same word for auditory cues produced in a slow low tone. There was some concern that repeated repetition of the same word, by the experimenter and observers, might result in too long a lapse between the presentation of the initial stimulus (experimenter's auditory cue) and the participant's opportunity to respond. Participants who were tested prior to this change, who failed this "pen"-"pen" task and passed the rattle-rice task were retested on the "pen"-"pen" task, with the alteration. The findings for these participants did not change.

Test trials and scoring began when the client was able to perform an independent correct response for both auditory cues on the practice trials. A response was considered correct if the client placed an object in the assistant's hand who produced the identical auditory cue to that of the tester. For individuals with limited upper body use, an

independent response consisted of pointing to the desired person, or placing a piece of foam in a box that was in front of the desired person.

Across trials, the sample stimulus was randomly alternated. Further, the assistants responded in a randomized fashion such that, on each trial, one assistant produced the auditory cue matching that of the tester.

Auditory-auditory nonidentity matching with vocal sounds ("ball"-"field" task). For this task, the tester sat next to the participant, and two assistants sat across from the participant, placing their hands on the table in a palms-up position. The tester began the demonstration trial by producing an auditory cue (e.g., "ball, ball" in a high rapid tone). Following the auditory cue produced by the tester, the assistants each produced an auditory cue, with one assistant following the other in a randomized fashion. One assistant produced an auditory cue that matched, in pitch, the auditory cue produced by the tester ("field, field" in a high rapid tone), and the other assistant produced an auditory cue that differed in pitch from that of the tester ("i-c-e" in a low slow tone). The tester pointed to the hands of the assistant who produced the matching auditory cue.

A guided trial was then implemented whereby the same sequence of words presented in the demonstration trial were repeated (by the same persons), and the tester guided the

participant to point to the assistant who produced the matching auditory cue. The sequence of words were then repeated a third time and the client was prompted to make an independent response. The same procedure was repeated with (a) the tester saying "i-c-e" in a slow deep tone, (b) one assistant producing an auditory cue that matched, in pitch, that of the tester ("r-i-n-k" in a slow deep tone), and (c) the other assistant producing an auditory cue that differed, in pitch, from that of the tester ("field, field" in a high rapid tone). Near the beginning of the study, the auditory cues were shortened from those used in the Lin et al. study in the same manner as was described for the "pen"-"pen" task. Participants who were tested prior to this change, who failed the "pen"-"pen" task and passed the rattle-rice task, were retested on the "pen"-"pen" task, with the alteration. The findings for these participants did not change. Test trials and scoring began when the client was able to perform an independent correct response, with both auditory cues, on the practice trials. A response was considered correct if the client pointed to the assistant who produced an auditory cue that matched, in pitch, the auditory cue produced by the tester. For individuals with limited upper body use, an independent response consisted of placing a piece of foam in a box that was in front of the desired person.

Assessment of Communicative Ability

Communication Status Survey. The CASS was administered in the form of a checklist to a primary care worker of each client (for a copy of the CASS, see Appendix C). The CASS took approximately 15 minutes to complete. The CASS, in a Likert-scale format, allowed the care worker to provide information concerning the client's needs and wants, the extent of social interaction, and the degree to which each mode of communication was used. Before filling out the checklist, the care worker was instructed to answer the questions based on what the client has been observed to do, and not what the care worker thinks the client could do.

Vineland Adaptive Behavioral Scales. The communication domain of the VABS scale was administered to the primary care worker of each participant (for a copy of the communication portion of the VABS and a listing of subscales, see Appendix D). Administration of the communication domain of the VABS took approximately 20 minutes to complete. Similar to the CASS, before filling out the checklist, the care worker was instructed to answer the questions based on what the client had been observed to do, and not what the care worker thought the client could do.

Reliability assessments

Interobserver reliability (IOR) checks for trial outcome were conducted on 83% of ABLA sessions, and 79% of auditory matching sessions. For IOR checks, two observers independently recorded the responses of each participant. An

agreement was scored if both observers agreed that a behavior occurred on a given trial. In contrast, a disagreement was scored if both observers did not agree that a behavior occurred on a given trial. IOR scores for trial outcome were calculated on a trial by trial basis, by dividing the number of agreements by the number of agreements plus disagreements and then multiplying by 100. IOR scores for individual participants on ABLA sessions ranged from 98% to 100%, with a mean of 99%. IOR scores for individual participants on auditory matching sessions ranged from 89% to 100%, with a mean of 98%.

Procedural reliability checks were conducted during training sessions to ensure that the procedures were implemented as outlined above. Two observers recorded whether key treatment components were implemented by the experimenter when required (e.g., modelling, opportunities for the participant to respond, and verbal feedback). An agreement was scored if both observers agreed that a treatment component was implemented on a given trial. In contrast, a disagreement was scored if both observers did not agree that a treatment component was implemented on a given trial. Procedural reliability checks were calculated in the same manner as IOR assessments. Procedural reliability checks were conducted on 24% of ABLA sessions and 44% of auditory matching sessions. Procedural reliability was 100% across all sessions.

Results

Participants' classification levels on the ABLA test and the four auditory matching tasks are presented in Table 4. A hierarchical ordering exists among the four auditory matching tasks in relation to each other and in relation to the ABLA test. A two-choice task to produce a matching sound was positioned between ABLA Levels 4 and 6, and a two-choice task to produce a nonmatching sound, auditory-auditory identity matching, and auditory-auditory nonidentity matching were positioned higher than ABLA Level 6, with one exception. Participant 6 (see Table 4) passed a two-choice task to produce a matching sound and a two-choice task to produce a nonmatching sound, but failed ABLA Level 6. Test re-test reliability was computed for the 23 participants included in both the Harapiak et al. (1997) study and the present study (r = .94, p < .0001). The Harapiak et al. study was conducted approximately six to eight months prior to the present study.

Order Analysis

Order analysis was used to test hierarchical relations between adjacent discriminations (Krus et al., 1975). Pairs of adjacent discriminations were tested in order to examine, statistically, the proposed hierarchical ordering among the discriminations. Participants were classified as confirmations (C) or disconfirmations (D). A confirmation indicated that a participant passed a presumably less

difficult task, and failed a more difficult one. A disconfirmation indicated that a participant failed a presumably less difficult task, and passed a more difficult one. Participants who passed or failed both discriminations were excluded from the analysis because their performance could not be used to evaluate ordering among the discriminations. A standard score was derived by the formula $[(C-D) / \sqrt{C+D}]$ for each pair of discriminations, using a binomial distribution to test the significance of each standard score. The top portion of Table 7 shows the results of the order analysis for six pairs of adjacent discriminations. Comparisons 1 and 2 were significant at $p < .001$. Although Comparisons 3, 4, 5, and 6 supported the proposed hierarchy, N was too small to attain significance. Sample size was increased for Comparisons 4, 5, and 6 by combining the results of studies conducted by Walker et al.(1994), Lin et al. (1995), and Ward (1995) that used the same auditory matching tasks. The bottom portion of Table 7 shows the combined results of the order analysis. Comparison 5 was significant at $p < .01$, and the significance level of Comparison 6 was significant at $p < .001$. For Comparison 4, the results of only one participant (Ward, 1995) was added to the present study. The participant was a disconfirmation to the proposed hierarchy.

Table 7

Order Analyses of Paired Discriminations

Comparisons	C	D	Z	Combined with
1. AANM > AAIM	12	0	3.46***	
2. AAIM > TPNS	15	0	6.71***	
3. TPNS > TPMS	3	0	1.73	
4. TPNS > Level 6	2	1	.58	
5. Level 6 > TPMS	1	0	1.00	
6. TPMS > Level 4	4	0	2.00	
Present results combined with Walker et al. (1994), Lin et al. (1995), and Ward (1995)				
4. TPNS > Level 6	2	2	0	Ward
5. Level 6 > TPMS	8	0	2.83**	Walker et al.,& Lin et al
6. TPMS > Level 4	13	0	3.61***	Walker et al., & Lin et al.

Note. The abbreviations in the table refer to ABLA Levels 4 and 6, two-choice task to produce a matching sound (TPMS), two-choice task to produce a nonmatching sound (TPNS), auditory-auditory identity matching task (AAIM), and auditory-auditory nonidentity matching task (AANM).

*p < .05. **p < .01. ***p < .001.

Regression Analyses

To examine whether adding auditory matching tasks to the ABLA test increased its correlation with communicative ability, a forward multiple regression analysis was used. First, the correlations between ABLA Level (4 vs. 6) and measures of communicative ability were examined. Measures of communicative ability included raw scores on the two individual subscales of the VABS (receptive and expressive communication), total raw score on the VABS, and total raw score on the three subscales (current communication behaviours, participation in social interactions, and modes of communication) included in the CASS. All three subscales were included in the total raw score because they assessed aspects of receptive and expressive communication. Correlation analyses of the ABLA test and measures of communicative ability, with ABLA test as a predictor variable, are shown in Table 8. The ABLA test was significantly correlated ($p < .0001$) with all measures of communicative ability.

Second, individual multiple correlations between (a) highest level passed on the ABLA test and total number of auditory matching tasks passed, and (b) measures of communicative ability (listed previously) were examined. Forward multiple regression analysis, with ABLA test and auditory matching tasks as predictor variables of communicative ability, are presented in Table 9. This

Table 8

Correlation Analyses with ABLA Test as Predictor Variable

Outcome Variables	Predictor Variables	r^2
VABS		
Receptive	ABLA	.25****
Expressive	ABLA	.37****
Total VABS	ABLA	.38****
CASS	ABLA	.30****

Note. The abbreviations in the table refer to Levels 4 and 6 of the Assessment of Basic Learning Abilities (ABLA) test, and the auditory matching tasks (AMT).

****$p < .0001$.

Table 9

Forward Multiple Regression Analyses with ABLA Test and Auditory Matching Tasks as Predictor Variables

Outcome Variables	Predictor Variables	r^2
VABS		
Receptive	AMT	.61****
	ABLA + AMT	.61
Expressive	AMT	.53****
	ABLA + AMT	.56
Total VABS	AMT	.58****
	ABLA + AMT	.60
CASS	AMT	.52****
	ABLA + AMT	.54

Note. The abbreviations in the table refer to Levels 4 and 6 of the Assessment of Basic Learning Abilities (ABLA) test, and the four auditory matching tasks (AMT).

****$p < .0001$.

analysis was used to determine whether adding auditory matching tasks to the ABLA test provides better covariation with communicative measures, in comparison to the ABLA test alone.

Forward multiple regression determines (a) which predictor (ABLA Levels 4 and 6, or auditory matching levels) best predicts scores on communicative measures, and (b) whether the remaining predictor contributes relevant and unique variance from that of the first predictor (Glass & Hopkins,1996). As shown in Table 9, for all communication measures, classification levels on auditory matching tasks best predicted scores on communicative measures ($p < .0001$). After the first predictor, levels of auditory matching, ABLA Levels 4 and 6 added minimal relevant or unique variance to the regression model. For example, AMT predicted 61% of the variance in the VABS receptive outcome variable. When the ABLA test was added to AMT (the best predictor), no unique variance was contributed (the r remained at .61). Interestingly, AMT alone predicts communicative ability better then Levels 4 and 6 of the ABLA test on all communication measures.

Discussion

Order analysis results of the current study, in combination with Walker et al. (1994), Lin et al. (1995), and Ward (1995), confirm the hierarchical ordering of the auditory matching tasks in relation to each other, and in

relation to the ABLA test. Combining several studies for analysis is often recommended for the "scientist-practitioner" (Barlow, Hayes, & Nelson, 1984). More specifically, the bell-tambourine task was positioned between ABLA Levels 4 and 6, and the two auditory-auditory tasks ("pen"-"pen" task and "ball"-"field" task) were hierarchically ordered beyond ABLA Level 6. However, the present study, in conjunction with previous studies (Ward, 1995; Harapiak et al., 1997), failed to provide support for the hypothesis that the rice-rattle task (TPNS) is more difficult than ABLA Level 6. However, in order to test this hypothesis, only four participants were included in the comparison. Therefore, in future studies, additional participants need to be tested to determine the position of the rice-rattle task within the ABLA hierarchy.

One practical implication of the hierarchical ordering among the auditory matching tasks may be that it allows further differentiation among clients classified at ABLA Level 6. That is, an auditory matching assessment may provide instructors with a means for determining what types of stimuli an individual is able to respond to. For example, a client who has passed tasks requiring visual-visual discriminations and auditory-visual discriminations, but failed tasks requiring auditory-auditory discriminations, would most likely require the presence of a visual stimulus during training.

In addition to providing support for hierarchical ordering of tasks, this study demonstrated that, in replication of previous findings, ABLA levels 4 and 6 were correlated with a client's performance on receptive and expressive communication measures. That is, a client's performance on the ABLA test was significantly correlated with his/her raw scores on the VABS and the CASS. This is in accordance with the findings of Barker-Collo et al. (1995). That is, individuals classified at higher ABLA levels possessed greater communication skills, as measured by the VABS and the CASS, than individuals classified at lower ABLA levels. This finding has also been supported by direct observation of expressive communication (Casey & Kerr, 1977; Ward, 1995).

However, although ABLA level was a significant predictor of communication skills, the four auditory matching tasks were a better predictor. In general, the higher number of auditory matching levels passed by an individual, the higher the communication scores. Given this finding, there is considerable potential for adding the auditory matching tasks to the ABLA test to enhance its predictiveness of communication skills. However, future studies need to address whether or not auditory matching tasks, in themselves, are predictive of language development. That is, is performance on specific auditory tasks related to performance on specific types of

communication skills? For example, does passing the "pen-pen" task indicate the presence or absence of prepositions, function words, expression of complex ideas? This is of considerable importance when considering the use of the ABLA test for predicting appropriate training tasks based on an individual's classification level (Stubbings & Martin, 1995). Unfortunately, in the current study, due to a limited sample size, a comparison of individual auditory matching levels and their relation to communication development was not possible.

In addition to examining hierarchical ordering and predictive validity, future studies should address whether or not the four auditory matching tasks possess other characteristics common to ABLA levels. First, several studies (e.g., Meyerson, 1977; Wacker et al., 1983) have indicated that failed ABLA levels are resistant to training using standard reinforcement and prompting procedures. Is this also a characteristic common to auditory matching tasks? Second, several studies indicate that there is considerable potential for use of multiple-component training packages for teaching failed two-choice visual and auditory discriminations (Dube, McIlvane, & Green, 1992; Saunders & Spradlin, 1989, 1990; Walker & Martin, 1994; Walker, Graham, & Martin, 1991; Yu & Martin, 1986). If auditory matching tasks, similar to ABLA levels, are resistant to standard training, will multiple-component

treatment packages aid in teaching failed auditory matching discriminations? Further, if failed auditory matching tasks are taught, using standard reinforcement and prompting procedures or a multiple-component training package, does this lead to an increase in communication skills? Future studies should address these questions.

In the current study, a comment may be made concerning the VABS subscale of expressive communication, which focuses heavily on speech and language abilities. The VABS guidelines specify that, for developmentally-disabled persons, a maximum score of '2', meaning 'yes-usually', can be scored if "the activity is usually performed, but in a somewhat different way because of a handicap." Further, the respondent is instructed to answer according to "what the individual usually does, not what the individual can do". However, in some cases, given these guidelines, non-verbal participants were at a disadvantage. Many non-verbal individuals did not possess a communication board, or if they did, the board did not contain symbols required to answer the items (e.g.,'Are you a boy or a girl?'). In these situations, a '0' was scored, despite the fact that, in many cases, respondents reported that participants could probably have performed the particular item with more elaborate communication devices. Although consistent findings did emerge concerning the relationship between auditory matching tasks and the VABS subscale of communication, the

correlation may have been higher if these difficulties were taken into consideration.

In summary, the present study supported the hierarchical ordering of the four auditory matching tasks in relation to each other, and in relation to the ABLA test. Second, the addition of auditory matching tasks improved the ABLA's predictive validity for communication skills. These findings indicate that it may be beneficial to add the auditory matching tasks to the ABLA test in order to improve its value as an assessment and training tool for developmentally-disabled persons.

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Appendix A

Participant Consent Form

Basic Learning Abilities and their Relationship to Communication Skills

---

DATE _____

I _____**, WOULD LIKE TO WORK ON VARIOUS ACTIVITIES WITH TRICIA VAUSE AND HELP HER COMPLETE SOME TASKS.**

WITH TRICIA, I WILL INDICATE WHICH SOUNDS ARE THE SAME, AND WHICH SOUNDS GO WITH WHICH CONTAINERS.

I WILL WORK ON THESE TASKS WITH TRICIA DURING THE NEXT SEVERAL WEEKS. I KNOW THAT IF I WANT TO STOP AT ANY TIME I AM FREE TO DO SO. AFTER THE TASKS ARE FINISHED, TRICIA WILL EXPLAIN THE RESULTS TO ME.

_____

SIGNATURE OF PERSON GIVING CONSENT

_____

SIGNATURE OF STAFF MEMBER

Appendix B

Project Description and Legal Guardian Consent Form

Basic Learning Abilities and their Relationship to Communication Skills

PROJECT DESCRIPTION

During this past year, a Psychology student, Shayla Harapiak, and her advisor, Dr. Garry Martin, conducted a study that assessed the basic learning abilities on a test called the Assessment of Basic Learning Abilities Test. The study also assessed the ability to match common sounds.

During the next few months, a Psychology student, Trish Vause, and her advisor, Dr. Garry Martin, would like to conduct additional studies, in order to examine the extent to which basic learning abilities are related to communication skills. If successful, the research will enable staff to determine the communication skills that are present in an individual's repertoire, and how they can be extended. It may help to determine the types of communication training needed to help improve in such areas as understanding language, effectively expressing physical and social needs, and engaging in social interaction.

The study will involve an initial assessment to determine an individual's approximate skill level, and a follow-up session to assess communication skills. Within each session, we will use standard educational and reinforcement procedures. Participation by each individual is voluntary, and we will immediately terminate a training session if there is any indication by a participant that he/she would prefer to leave the training room. Our experience in conducting these kinds of sessions indicates that they are typically enjoyed by the participants. During the study, researchers will have access to records concerning each participant's age and intellectual level.

Any question or concern that you may have can be addressed to the following individuals:

Tricia Vause, Psychology student, St. Amant Centre (256-4301, ext, 293)
Dr. Dickie Yu, Research Director, St. Amant Centre (256-4301, ext. 399)
Ms. Valdine Scott-Huyghebaert, Director of Psychology, St. Amant Centre (256-4301, ext. 292)
Dr. Garry Martin, University of Manitoba (474-8589)

LEGAL GUARDIAN CONSENT FORM

Basic Learning Abilities and their Relationship to Communication Skills

---

DATE _____

I DO HEREBY GIVE MY CONSENT FOR _____ **PARTICIPATE IN A BEHAVIORAL RESEARCH STUDY ON COMMUNICATION ABILITIES OF DEVELOPMENTALLY-DISABLED PERSONS CONDUCTED BY TRICIA VAUSE, AND SUPERVISED BY DR. GARRY MARTIN.**

I UNDERSTAND THAT THE PARTICIPANT WILL ATTEND SEVERAL TRAINING SESSIONS DURING THE NEXT SEVERAL WEEKS. DURING THESE SESSIONS, THE RESEARCHER WILL ATTEMPT TO TEACH THE PARTICIPANT TO PERFORM VARIOUS EDUCATIONAL TRAINING TASKS USING POSITIVE REINFORCEMENT PROCEDURES. I UNDERSTAND THAT THE RESEARCHER WILL OBTAIN PERSONAL INFORMATION CONCERNING AGE AND INTELLECTUAL ASSESSMENT FROM RECORDS AT ST. AMANT. I UNDERSTAND THAT PARTICIPATION IS ENTIRELY VOLUNTARY, AND THAT I CAN WITHDRAW MY CONSENT AT ANY TIME.

_____

Signature of Person Giving Consent

_____

Relation to Participant

For more information: Tricia Vause, St. Amant Centre, 440 River Road, Winnipeg, Manitoba, R2M 3Z9. Tel: 256-4301, ext. 293.

Appendix C

Communication Ability Screening Survey

Date of Birth: _____

Completed By: _____

Present Date: _____

Section One: Overview

1. Have they ever been assessed by a Speech Language Pathologist?

   Yes ☐ No ☐ Do Not Know ☐

   Date: _____

2. How long have you known this client? _____

   Who do they interact with? _____

3. How do they presently communicate? (More than one can be ticked off)

   ☐ Speech
   ☐ Gestures
   ☐ Sign Language
   ☐ Picture Displays
   ☐ Pictograms/Picsyms
   ☐ Blissymbolics
   ☐ Other, please specify _____

4. If they have speech, please indicate to what extent

   ☐ One word
   ☐ Two words
   ☐ Incomplete sentences
   ☐ Complete sentences

5. Can you understand their speech?

   ☐ No
   ☐ Sometimes
   ☐ All the time

6. Do other people have difficulty understanding their speech?

   ☐ Yes ☐ No

   Please give an example:_____

   _____

7. Do they appear to be trying to communicate?

   ☐ Yes ☐ No

   Please indicate how: _____

   _____

8. Do they interact with:
   Other Residents ☐ Yes ☐ No
   Staff ☐ Yes ☐ No
   Family ☐ Yes ☐ No

9. Do they have any behaviour problems?
   ☐ Yes ☐ No
   Please specify: _____
   _____

10. Attention Span
    ☐ 0 - 5 minutes ☑ 15 - 30 minutes
    ☐ 5 - 15 minutes ☐ 30 - 60 minutes

11. Eye Sight
    Glasses ☐ Yes ☐ No
    Vision ☐ Poor ☐ Fair ☐ Good ☐ Very Good

12. Manual Dexterity
    Gross Motor Skills ☐ Poor ☐ Fair ☐ Good ☐ Very Good
    Fine Motor Skills ☐ Poor ☐ Fair ☐ Good ☐ Very Good
    Physical Disabilities: _____
    _____
    _____

13. Hearing
    Hearing Aid ☐ Yes ☐ No
    Hearing ☐ Poor ☐ Fair ☐ Good ☐ Very Good ☐ Unsure

14. Please indicate any other information that you feel would be relevant in considering this client for a communication program.
    _____
    _____
    _____

Section Two: Current Communication Behaviours

Please circle the number which most accurately describes how often each of the following behaviours is performed by the client with whom you work.

1. Asks for objects/activities (either through pointing, grabbing, vocalizations, speech or other means) that are in plain view:

1	2	3	4
never	when prompted	sometimes	always

2. Asks for objects/activities (either through pointing, grabbing, vocalizations, speech or other means) that are not in plain view:

1	2	3	4
never	when prompted	sometimes	always

3. Shows that a choice has been made between two objects (e.g., if you held up an apple and an orange, would the individual indicate a choice):

1	2	3	4
never	when prompted	sometimes	always

4. Will reject or indicate displeasure of an item/activity or indicates "no" in some way:

1	2	3	4
never	when prompted	sometimes	always

5. Confirms (or uses a "yes" response) and will reach for or otherwise accept items that are offered:

1	2	3	4
never	when prompted	sometimes	always

6. Will look at you, grab you or exhibit other behaviours (e.g., tantrum) when an activity has been interrupted to indicate the wish for the activity to continue:

1	2	3	4
never	when prompted	sometimes	always

7. Requests assistance through pointing, vocalizations, facial expressions, grabbing etc. when in need of help:

1	2	3	4
never	when prompted	sometimes	always

Section Three: Participation in Social Interactions

Please circle the number which most accurately describes how often each of the following behaviours is performed by the client with whom you work.

1. Watches/pays attention to you during an interaction:

1	2	3	4
never	when prompted	sometimes	always

2. Has some means of getting attention:

1	2	3	4
never	when prompted	sometimes	always

3. Indicates hello (e.g. waves, vocalizes, grabs, initiates eye contact) or goodbye (e.g., waves, turns away, pushes partner away, avoids eye contact):

1	2	3	4
never	when prompted	sometimes	always

4. Labels, describes or provides other information about objects, activities or people that are in plain view when asked:

1	2	3	4
never	when prompted	sometimes	always

5. Labels, describes or provides other information about objects, activities or people that are *not* in plain view when asked:

1	2	3	4
never	when prompted	sometimes	always

6. Attempts to clarify meaning when a partner does not understand a communication:

1	2	3	4
never	when prompted	sometimes	always

7. Asks for information about people, activities or objects (e.g., points to or stares at unfamiliar objects):

1	2	3	4
never	when prompted	sometimes	always

8. Indicates when a partner's intended message has not been understood (e.g., stares at partner, shakes head, ignores message):

1	2	3	4
never	when prompted	sometimes	always

9. Is able to express positive emotions effectively:

1	2	3	4
never	when prompted	sometimes	always

10. Is able to express negative emotions effectively:

1	2	3	4
never	when prompted	sometimes	always

Section Four: Modes of Communication

1. How often does this individual use speech to communicate?

always often sometimes never

2. How often does this individual use sign language to communicate?

always often sometimes never

3. How often does this individual use symbols to communicate?

always often sometimes never

4. How often does this individual use spelling to communicate?

   always often sometimes never

5. How often does this individual use eye gaze to communicate?

   always often sometimes never

6. How often does this individual use pointing to communicate?

   always often sometimes never

7. How often does this individual use vocalization to communicate?

   always often sometimes never

8. How often does this individual use facial expression to communicate?

   always often sometimes never

9. How often does this individual use body language to communicate?

   always often sometimes never

Section Five: General Information

1. Has the client received communication training? If so, what agency provided this service?

   _____

   _____

2. If yes, how long ago did this assessment/training occur?

   _____

3. If yes, how long did the training last and how often did it occur (e.g., twice a week for one year)?

   _____

4. What mode of communication was being trained (speech, sign language, symbols)?

   _____

Appendix D

Vineland Adaptive Behavioral Scales

Receptive Subdomain

<1 1 2

A. Beginning to understand

1. Turns eyes and head toward sound. ____
2. Raises arms when caregiver says, "Come here" or "Up." ____
3. Demonstrates understanding of the meaning of "no." ____
4. Demonstrates understanding of the meaning of at least 10 words. ____
5. Demonstrates understanding of the meaning of "shhhh." ____
6. Demonstrates understanding of the meaning of "yes" or "okay." ____

SUM ____ 12

B. Beginning to listen

1. Listens at least momentarily when spoken to by caregiver. ____
2. Listens attentively to instructions. ____
3. Listens to a story for at least five minutes. ____

SUM ____ 6

3 to 18+

C. Pointing to body parts

1. Points accurately to at least one major body part when asked. ____
2. Points accurately to at least three major body parts when asked. ____
3. Points accurately to at least five minor body parts when asked. ____
4. Points accurately to all body parts when asked. DO NOT SCORE 1 ____

SUM ____ 8

D. Following instructions

1. Follows instructions requiring only one action ____
2. Follows instructions requiring an action and an object ____
3. Follows instructions requiring two actions or an action and two objects. ____
4. Follows instructions requiring two actions in sequence ____
5. Follows instructions in "if-then" form. ____

SUM ____ 10

E. Listening and attending

1. Listens to teacher at least five minutes. ____
2. Listens to a story at least 30 minutes ____
3. Attends to entertaining material at least 60 minutes ____
4. Listens to teacher at least 15 minutes. ____
5. Attends to school or public lecture more than 15 minutes. ____

Assign the highest possible sum to clusters before the basal. SUM ____ 10

RECEPTIVE RAW SCORE (Total of cluster sums) ____ 46

COMMENTS ____

Expressive Subdomain

<1 1

A. Beginning affective expression

1. Smiles spontaneously ____
2. Vocalizes pleasure. ____
3. Makes cooing, gurgling, or other sounds when spoken to or fondled by caregiver. ____
4. Smiles in response to presence of caregiver. ____
5. Smiles in response to presence of familiar person other than caregiver. ____

SUM ____ 10

B. Pre-speech sounds

1. Babbles or vocalizes spontaneously. ____
2. Imitates sounds of adults. ____
3. Imitates sounds of adults immediately after hearing them. ____

SUM ____ 6

C. Pre-speech nonverbal expression

1. Waves good-bye ____
2. Gestures appropriately to indicate "yes," "no," and "I want." ____
3. Indicates preference when offered a choice ____

SUM ____ 6

D. Beginning to talk

1. Says "Dada," "Mama," or another name for caregiver ____
2. Says at least one word other than "Dada," "Mama," or another name for caregiver ____
3. Imitates one-syllable words immediately ____
4. Says "yes" or "no" appropriately when asked a simple question ____
5. Delivers a simple message ____

SUM ____ 10

2

E. Vocabulary

1. Names at least 20 familiar objects without being asked. DO NOT SCORE 1 ____
2. Says at least 50 recognizable words. DO NOT SCORE 1 ____
3. Says at least 100 recognizable words. DO NOT SCORE 1 ____

SUM ____ 6

F. Talking in sentences

1. Uses phrases containing a noun and a verb, or two nouns ____
2. Uses sentences of four or more words ____
3. Uses sentences containing negatives. ____
4. Speaks in full sentences ____

SUM ____ 8

G. Using names

1. States own first name or nickname when asked. ____
2. Uses first names or nicknames of siblings, friends, or peers, or states their names when asked. ____
3. States parents' or caregivers' first names when asked. ____
4. States own first and last name when asked. ____

SUM ____ 8

Survey Form Item — SCORE

H. Asking questions

1. Asks questions by changing inflection of words or simple phrases. ____
2. Asks questions beginning with "what." ____
3. Asks questions beginning with "where." ____
4. Asks questions beginning with "who." ____
5. Asks questions beginning with "why." ____
6. Asks questions beginning with "what," "where," "who," "why," and "when." DO NOT SCORE 1 ____ 29

SUM ____ [12]

(3)

I. Using abstract concepts

1. Uses simple generalizations. ____
2. Demonstrates understanding of simple adjectives expressing quality. ____
3. States which of two objects is bigger when both are present. ____
4. States which of two objects not present is bigger. ____ 30

SUM ____ [8]

J. Relating experiences

1. Relates experiences in simple terms when asked ____
2. Spontaneously relates experiences in simple terms. ____ 20
3. Relates experiences in narrative form when asked ____
4. Spontaneously relates experiences in narrative form. ____
5. Relates experiences in detail when asked. ____ 31

SUM ____ [10]

K. Using prepositions

1. Uses "in," "on," or "under" as a preposition in a phrase ____
2. Uses "over" as a preposition in a phrase ____
3. Uses either "beside" or "in front of" as a preposition in a phrase ____
4. Uses either "behind" or "between" as a preposition in a phrase ____ 32
5. Uses "around" as a preposition in a phrase ____ 33

SUM ____ [10]

L. Using function words

1. Uses possessives in phrases or sentences ____
2. Uses "a" and "the" in phrases or sentences. ____ 26
3. Uses phrases or sentences containing "and." ____
4. Uses pronouns in phrases or sentences ____
5. Uses phrases or sentences containing "but" and "or." ____ 34

SUM ____ [10]

(4) (5)

Survey Form Item — SCORE

M. Articulating

1. Pronounces *b, p, m,* and *w* correctly in words ____
2. Speaks intelligibly ____
3. Articulates clearly, with no more than two sound substitutions ____
4. Articulates clearly, without sound substitutions. ____ 35

SUM ____ [8]

N. Reciting

1. Attempts to sing nursery rhyme or simple song. ____
2. Recites at least two simple nursery rhymes, prayers, or songs. ____
3. Recites material at least four lines in length ____
4. Tells popular story, fairy tale, lengthy joke, or television show plot. ____ 36

SUM ____ [8]

(6) to (18+)

O. Using plural nouns and verb tense

1. Uses regular plural nouns. ____
2. Uses present tense verbs ending in *ing*. ____
3. Uses regular past tense verbs. ____
4. Uses past tense verbs with other words to tell about past events. ____
5. Uses irregular past tense verbs correctly
6. Uses irregular plurals. ____ 40

SUM ____ [12]

P. Giving information about self

1. Answers correctly when asked, "Are you a boy or a girl?" ____
2. Holds up correct number of fingers when asked age ____
3. Correctly states age when asked ____
4. Correctly states age at next birthday when asked ____
5. States month and day of birthday when asked. ____ 39
6. States telephone number when asked. N MAY BE SCORED ____ 42
7. States complete home address, including city and state, when asked. ____ 43

SUM ____ [14]

Q. Expressing complex ideas

1. Expresses ideas in more than one way, without assistance ____ 46
2. Gives complex directions to others. ____ 54
3. Has realistic long-range goals and describes in detail plans to achieve them. ____ 64

Assign the highest possible sum to clusters before the basal.

SUM ____ [6]

EXPRESSIVE RAW SCORE (Total of cluster sums) 152

Continue on the next page

COMMENTS: ____

Appendix E

ABLA Test and Auditory Matching Recording Sheets

The ABLA Test

ABLA Data Recording Form

Level 1 (Imitation)

Red Box:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Yellow Can:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

Level 2 (Position Discrimination) Correct container is yellow can (can & box remain stable)

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

Level 3 (Visual) 'L' and 'R' indicate correct placement of can, left or right. Correct response is foam in can.

L	R	L	L	R	L	R	R	R	L	L	R	L	R	R	L
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
L	L	R	L	R	R	L	R	R	R	L	R	L	L	R	L
17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32

Level 4 (Match to Sample) 'L' and 'R' indicate placement of can.
'B' indicates Box, present cube.
'C' indicates Can, present cylinder.

R	R	L	R	L	L	R	L	L	L	R	R	R	L	L	R
C	B	B	C	B	C	C	B	B	C	B	B	C	B	C	C
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

L	L	R	L	R	R	L	R	L	R	L	L	R	R	L	L
B	B	C	B	C	C	B	C	C	B	C	C	B	C	B	B
17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32

Level 5 (Auditory) Ask for Red Box (B) or Yellow Can (C).

B	B	C	B	C	C	B	C	C	B	C	C	B	C	B	B
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

C	B	B	C	B	C	C	B	B	C	B	B	C	B	C	C
17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32

Level 6 (AVC) 'L' and 'R' indicate placement of can.
Ask for Red Box (B) or Yellow Can (Y).

R	R	L	L	R	R	L	L	L	L	R	R	L	L	R	R
B	C	C	B	C	B	C	B	C	C	B	C	B	B	B	C
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

L	L	R	L	R	R	L	L	R	L	R	R	L	L	R	R
C	C	B	C	B	C	C	B	B	C	B	B	C	C	B	C
17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32

Two-Choice Task to Produce A Matching Sound

Participant: _____

Tester: _____

IOR: _____

"Make the same sound?"

Trials: (Bell and tambourine)

B	B	T	B	T	T	B	T	T	T	B	B	B	T	T	B	T	T	B	T
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20

B	B	T	B	T	B	T	T	B	B	T	T	T	B	T	T	B	B	T	T
21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40

Two-Choice Task to Produce A Nonmatching Sound

Participant: _____

Tester: _____

IOR: _____

"Ch, ch, ch, ch... or rattle, rattle, rattle, rattle...?"

Trials: (Rice and rattle)

C	C	R	C	R	R	C	R	R	C	C	C	R	C	R	C	R	C	R	R
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20

R	C	R	C	R	C	C	C	R	R	C	C	C	R	C	C	R	R	C	C
21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40

Auditory-Auditory Identity Matching

Participant: _____

Tester: _____

IOR: _____

T:	P	B	B	P	P	B	P	B
A:	(1)P	(1)B	(1)P	(2)B	(2)P	(2)B	(1)B	(2)P
B:	(2)B	(2)P	(2)B	(1)P	(1)B	(1)P	(2)P	(1)B

T:	B	B	P	B	P	P	B	P
A:	(2)B	(1)P	(2)B	(1)B	(1)B	(2)P	(2)P	(1)P
B:	(1)P	(2)B	(1)P	(2)P	(2)P	(1)B	(1)B	(2)B

T:	B	B	P	B	P	P	B	P
A:	(1)B	(1)P	(2)B	(2)B	(2)P	(1)P	(2)P	(1)B
B:	(2)P	(2)B	(1)P	(1)P	(1)B	(2)B	(1)B	(2)P

Auditory-Auditory Nonidentity Matching

Participant: _____

Tester: _____

IOR: _____

T:	I	B	B	I	I	B	I	B
A:	(1)R	(1)F	(1)R	(2)F	(2)R	(2)F	(1)F	(2)R
B:	(2)F	(2)R	(2)F	(1)R	(1)F	(1)R	(2)R	(1)F

T:	B	B	I	B	I	I	B	B
A:	(2)F	(1)R	(2)F	(1)F	(1)F	(2)R	(2)R	(2)F
B:	(1)R	(2)F	(1)R	(2)R	(2)R	(1)F	(1)F	(1)R

T:	B	B	I	B	I	I	B	I
A:	(1)F	(1)R	(2)F	(2)F	(2)R	(1)R	(2)R	(I)F
B:	(2)R	(2)F	(1)R	(1)R	(1)F	(2)F	(1)F	(2)R

Appendix F

Procedural Reliability Checklist

ABLA Level 4

Subject: _____

Tester: _____

IOR: _____

Date: _____

Levels 4	Y	N	Y	N	Y	N	Y	N	Y	N
Set Up										
Demonstration										
Guided Trial										
Independent Response										
"Where does it go?"										
If Correct ...Praise										
If Incorrect ... "No ..." demo										
If student does not respond within 10 secs. of a verbal prompt, repeat verbal prompt										

ABLA Levels 5 and 6

Subject: _____

Tester: _____

IOR: _____

Date: _____

Levels 5 and 6	Y	N	Y	N	Y	N	Y	N	Y	N
Set Up										
Demonstration										
Guided Trial										
Independent Response										
"Red Box / Yellow Can"										
If Correct ...Praise										
If Incorrect ... "No ..." demo										
If student does not respond within 10 secs. of a verbal prompt, repeat verbal prompt										

Two-Choice To Produce A Matching Sound

Subject: _____

Tester: _____

IOR: _____

Date: _____

Two-Choice Task / Matching										
Set Up										
Demonstration										
Guided Trial										
Independent Response										
"Make the same sound."										
If correct...Praise										
If incorrect..."No..." Then go back to Demo										
If student does not respond within 10 secs. of a verbal prompt, repeat verbal prompt										

Two-Choice Task to Produce a Nonmatching Sound

Subject: _____

Tester: _____

IOR: _____

Date: _____

Two-Choice Task / Nonmatching										
Set Up										
Demonstration										
Guided Trial										
Independent Response										
"Rattle, rattle, rattle..." or "ch, ch, ch..."										
If correct...Praise										
If incorrect..."No..." Then go back to Demo										
If student does not respond within 10 secs. of a verbal prompt, repeat verbal prompt										

Auditory-Auditory Identity Matching

Subject: _____

Tester: _____

IOR: _____

Date: _____

Auditory-Auditory Identity										
Set Up										
Demonstration										
Guided Trial										
Independent Response										
"pen, pen, pen..." or "block, block block..."										
If correct...Praise										
If incorrect..."No..." Then go back to Demo										
If student does not respond within 10 secs. of a verbal prompt, repeat verbal prompt										

Auditory-Auditory Nonidentity Matching

Subject: _____

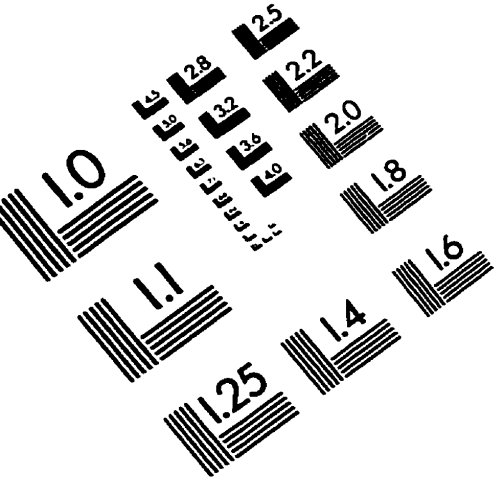
Tester: _____

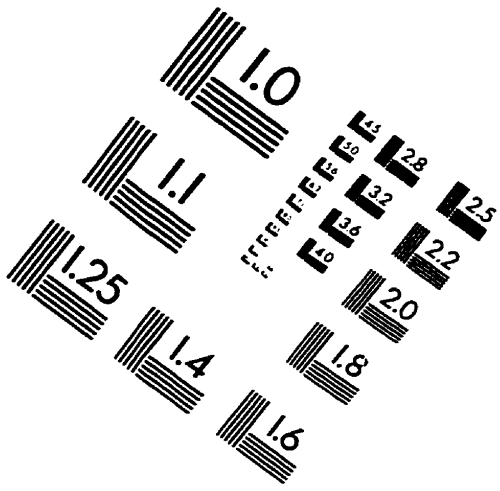
IOR: _____

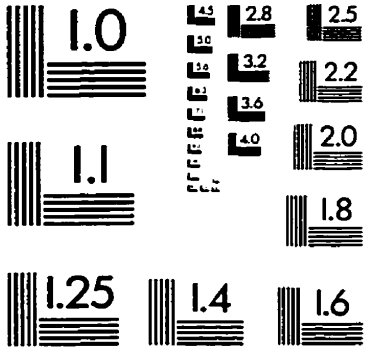
Date: _____

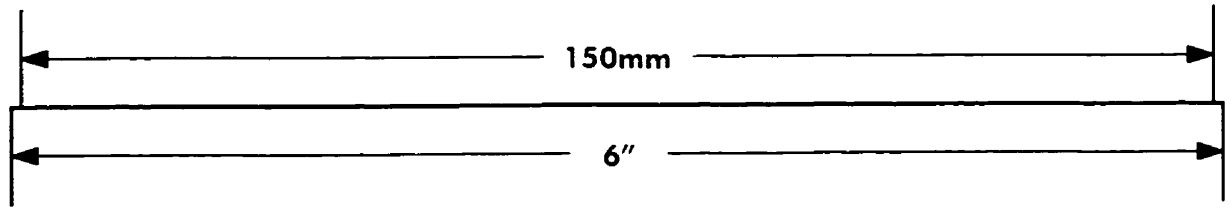
Auditory-Auditory Nonidentity										
Set Up										
Demonstration										
Guided Trial										
Independent Response										
"Ball" / "Field" or "Ice" / "Rink"										
If correct...Praise										
If incorrect..."No..." Then go back to Demo										
If student does not respond within 10 secs. of a verbal prompt, repeat verbal prompt										

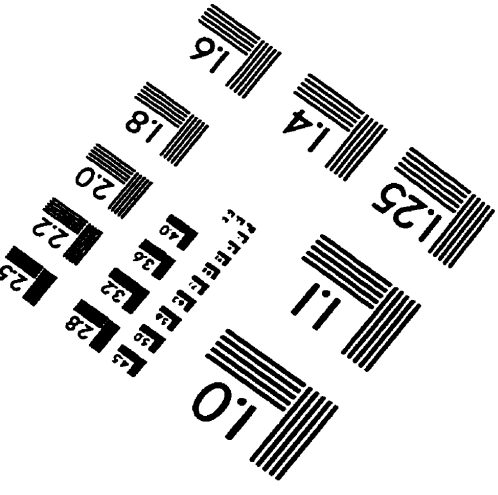
IMAGE EVALUATION
TEST TARGET (QA-3)

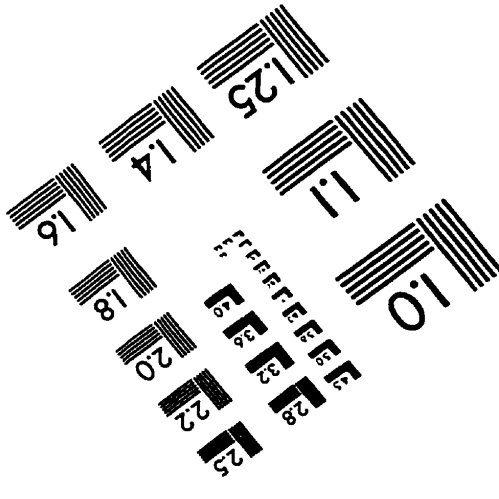












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