Comparing levels of dysfluency among students with mild learning difficulties and typical students

Claire McDowell, Michael Keenan and Ken P. Kerr
University of Ulster at Coleraine

This study compared the extent to which two groups of learners, one mildly learning disabled and the other typically developing, were dysfluent in a compound task they had difficulty learning and performing and two component skills of that compound. The results showed that all fifteen learners were dysfluent in both the component skills identified and the compound task itself. Further more there were only slight differences in the extent to which either group were dysfluent.

DESCRIPTORS: Dysfluency, compound behaviour, component behaviour

Fluency orientated educators have stressed the important role fluent component skills play in facilitating student's progress through the curriculum. They state that students who are dysfluent in basic components and prerequisites find learning and performing more complex skills that depend on these components difficult. They highlight that dysfluent behaviour components, despite being accurate, accumulate to form an unstable foundation of core skills. Through classroom-based research they have found that dysfluent skills mount and make the acquisition of higher composite skills more difficult. Learning each new skill becomes more strenuous because learners will always experience difficulty with certain elements of the task (Johnson & Layng, 1992). Proponents of fluency call this accumulation of dysfluent skills "cumulative dysfluency," and believe that it may be the most important factor in long-term student failure (Binder, 1996).

Given the findings of PT research into component fluency, conducted with both learning disabled (LD) and typical students, it may be hypothesised that children experiencing difficulties learning new skills may be dysfluent to some degree in one or more components of the target composite behaviour, irrespective of educational labels. This study was conducted in order to assess the extent to which a group of students experiencing difficulties learning and performing compound tasks were dysfluent in the related component skills of these tasks. Part of the data in this study, Mc Dowell and Keenan, (2001) has been previously published as "Cumulative dysfluency - still evident in our classrooms despite what we know" in the *Journal of Precision Teaching and Celeration.*" This paper presents more recent data collected from a group of typical students and compares it with the data from the original article.

METHOD

Participants

Group 1 comprised seven learners, (five males and two females), who had been diagnosed by educational psychologists as having mild learning difficulties (MLD). Six of the participants (four males and two females) attended a school for children with learning difficulties and one (male) attended a regular primary school where he attended remedial classes for help with reading and mathematics. Three of these children had been identified by their teacher as having difficulties reading key words from their reading series, three had been identified as having difficulty learning x4 multiplication tables, and one had been identified as having difficulty learning addition with the number "2." The participant's ages ranged between 8 and 11 years at the time of the experiment. Group 2 comprised eight typical students (2 females and six males) none of whom had been diagnosed as having learning difficulties and who attended regular primary school. These participants were identified by teachers as having difficulties learning x3 and x4 multiplication tables. These participants' ages ranged from 8-9 years at the time of the experiment.

Tasks

Target compound tasks were selected based on teachers' and parents' recommendations of curriculum areas in which learners were experiencing difficulty. Fluency aims were set based on Precision Teaching (PT) recommendations or by having competent performers (university undergraduates) perform the skill for several, 1 minute timings and taking an average of their highest scores. Compound tasks and learning channel sets were as follows;

Group 1 (MLD):

- Learner M - see/write answers to x4 multiplication problems
- Learners L & P - see/write answers to x2 multiplication problems
- Learner C - see/write answers to +2 addition problems, and Learners D, E & J - hear/see/point to isolated key words.

Group 2 (Typical):
• Learners Mi, N, Da, R & Ch - see/write answers to x4 multiplication problems
• Learners S, F & W see/write answers to x3 multiplication problems

Task Analysis

Each composite skill was analysed for key component skills. Two key component skills of each compound task were selected for testing. Again, aims were based on PT recommendations and on competent performer's average scores Component skills and learning channel sets were as follows:

Group 1 (MLD):
• Learner M - Component Skill 1 - see/dot multiples of 4 on number grid (60-80 dots per min.), Component Skill 2 - see/write answers to add 4 problems (70-90 digits per min.).
• Learners L & P
Component Skill 1 - see/dot multiples of 2 on number grid (80-100 dots per min.)
Component Skill 2 - see/write answers to add 2 problems (70-90 digits per min.)
• Learner C
Component Skill 1 - see/say numbers 1-50 (60-80 numbers per min.)
Component Skill 2 - see/write answers to add 1 problems (70-90 digits per min.)
• Learners D, J & E
Component Skill 1 - see/say letter sounds from flashcards (60-80 sounds per min.)
Component Skill 2 - see/say 2 letter syllable sounds from flashcards (60-80 sounds per min.)

Group 2 (Typical):
• Learners Mi, N, Da, R & Ch
Component Skill 1 - see/dot multiples of 4 on number grid (60-80 dots per min)
Component Skill 2 - see/write answers to adding 4 problems (70-90 digits per min)
• Learners S, F & W
Component Skill 1 - see/dot multiples of 3 on number grid (60-80 dots per min)
Component Skill 2 - see/write answers to adding 3 problems (70-90 digits per min)

PROCEDURE

Figure 1 shows the procedure used in this study. All participants in Group 1 were assessed separately and participants in Group 2 were assessed in groups of four. All were assessed for fluency levels on the compound task by asking them to perform that task for 1 min on 2 successive days. No instruction or teaching occurred during these sessions. Scores were charted as rate of correct and incorrect responses per minute. All participants' performances on each of the component skills were tested by asking them to perform each of the tasks for 1 minute on 2 successive days. Again, no teaching or instruction took place during these sessions and the order in which tasks were presented was randomised to control for practice effects. Scores were recorded as rate of correct and incorrect responses per minute.

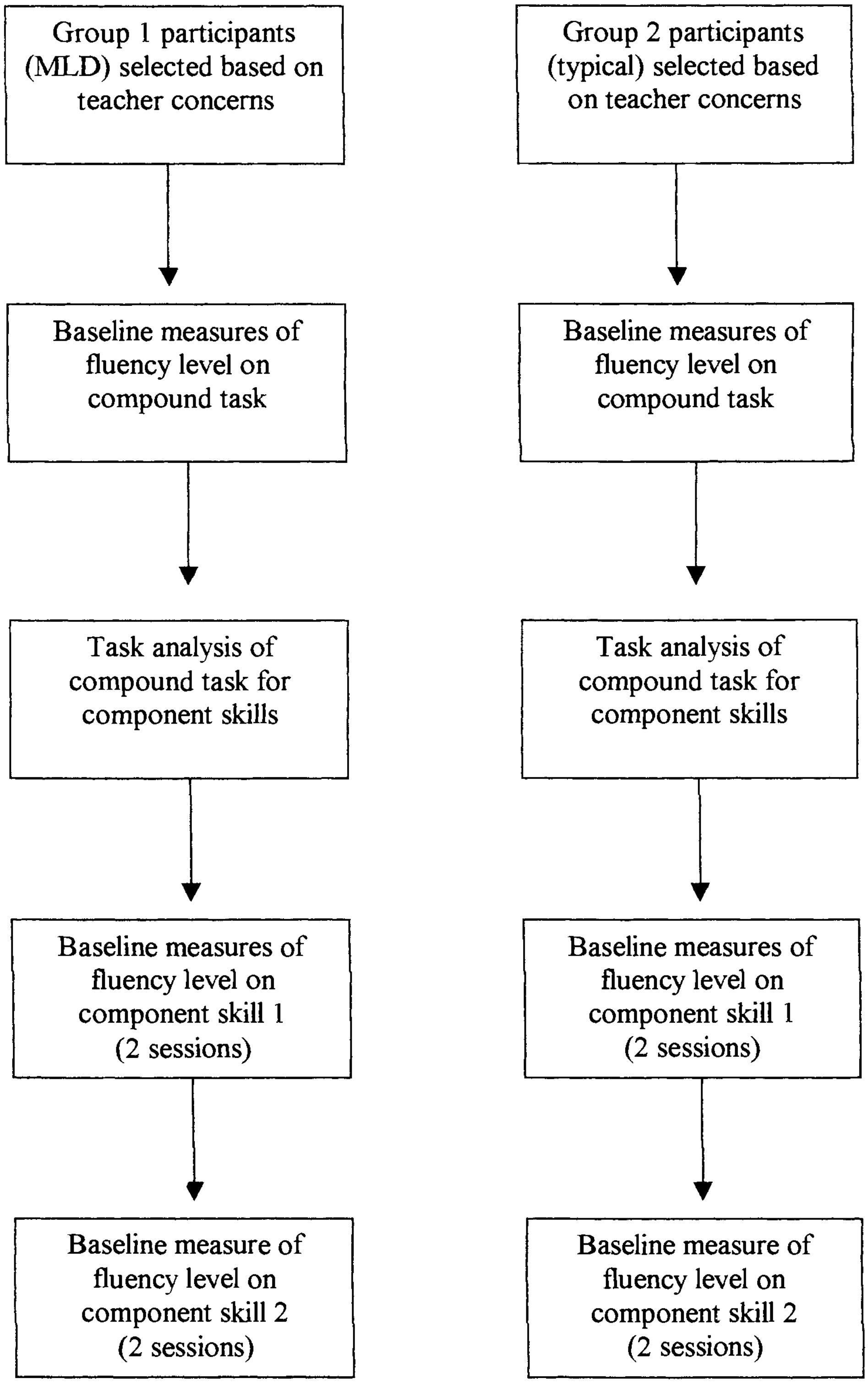
RESULTS

Compound Tasks. Figure 2 presents Group 1 participants' rates of correct and incorrect responding on the compound tasks tested over 2 days. All participants showed varying but significant levels of dysfluency in these tasks. The range of corrects scores on the see/write maths tasks (aim 70-90 digits per min.) was 3-25. Incorrect scores on these tasks ranged from 0-4. The mean rate of correct responding on this task was 13 digits per min., an average of 57 responses less than the minimum fluency aim range. The mean rate of incorrect responding was 1 digit per min. Correct scores on the see/hear/point reading task (aim 40-60 words per min.) ranged from 5-8. Incorrect scores on this task ranged from 3-5. The mean rate of correct responding on this task was 7 words per min, an average of 33 responses below the minimum fluency aim. The mean rate of incorrect responding was 4 words per min.

Figure 3 presents Group 2 participants' correct and incorrect scores on the compound tasks tested over 2 days. Again the results indicate varying, yet significant, levels of dysfluency across tasks and participants. The rate of correct responding on the x3 and x4 see/write math tasks (aim range- 70-90 digits per min.) ranged from 8-34. The rate of incorrect responding on this task ranged from 0-8. The mean rate of correct responding for these participants was 24 digits per min., an average of 46 responses below the minimum fluency aim. The mean rate of incorrect responding was 1 digit per min.

Component Skill 1 Group 1 participants' correct and incorrect responses during baseline testing of Component Skill 1 are presented on Figure 4. Correct rate of responding on math components ranged from 13-31. Rate of incorrect responding on these tasks ranged from 0-12. Mean rate of correct responding was 21, some 59 responses less than the minimum fluency aim for 3 participants and 39 responses less than the minimum fluency aim for 1 participant. Mean rate of incorrect responding was 3. Correct responding on the reading Component Skill 1 ranged from 22-

Figure 1


Group 1 participants (MLD) selected based on teacher concerns
Group 2 participants (typical) selected based on teacher concerns
Baseline measures of fluency level on compound task
Baseline measures of fluency level on compound task
Task analysis of compound task for component skills
Task analysis of compound task for component skills
Baseline measures of fluency level on component skill 1 (2 sessions)
Baseline measures of fluency level on component skill 1 (2 sessions)
Baseline measure of fluency level on component skill 2 (2 sessions)
Baseline measure of fluency level on component skill 2 (2 sessions)

34 letters per min. Incorrect responding on this task ranged from 2-6 letters per min. The mean rate of correct responding was 26 letters per min., some 34 responses less than the minimum fluency aim. The mean rate of incorrect responding was 5, 5 responses above the record floor.

Figure 5 shows Group 2 participants' baseline rates of responding on Component Skill 1. Rates of correct responding ranged from 17-30. Rates of incorrect responding ranged from 0-7. The mean rate of correct responding on this task was 23, some 37 responses below the minimum fluency aim. The mean rate of incorrect responding was 0, below the record floor.

Component Skill 2. Figure 6 shows Group 1 learners' rates of correct and incorrect responding on math Component Skill 2. Rate of correct responding ranged from 8-24 and incorrect responding ranged from 0-2 on this component. The mean rate of correct responding was 15 digits per min., 55 responses less than the minimum fluency aim. The mean rate of incorrect responses was 0.5. Rate of correct responding on the reading component skill ranged from 3-24, and rate of incorrect responding ranged from 1-5. The mean rate of correct responding was 12 sounds per min., some 48 responses less than the minimum fluency aim. The mean rate of incorrect responding was 3 per min. Figure 7 shows Group 2 participants' correct and incorrect scores on Component Skill 2. Rate of correct responding ranged from 6-30 and rate of incorrect responding ranged from 0-8. The mean rate of correct responding was 20 digits per min., some 50 responses less than the minimum fluency aim. The mean rate of incorrect responding was 0, below the record floor.

Group Comparisons. Baseline measures of rates of responding allowed a between-group comparison of levels of dysfluency in compound math tasks and math components. Figure 8 shows Group 1 and Group 2 participants' mean rates of responding on all math tasks. On the math Compound Task Group 1 participants' rate of responding was on average 57 responses less than the minimum fluency aim. Group 2 participants' rate of responding was on average 46 responses less than the minimum aim, a difference of 11 responses per min. On Component Skill 1, Group 1 participants responded on average 59 responses less than the minimum aim. Group 2 participants responded at a rate of 37 responses less than the minimum aim, a difference of 22 responses. On Component Skill 2, Group 1 participants responded an average of 55 responses less than the minimum fluency aim. Group 2 participants made an average of 50 responses less than the minimum aim, a difference of 5 correct responses.

DISCUSSION

These results show that all seven pupils in Group 1 and all eight pupils in Group 2 were dysfluent in the compound task being taught in the classroom and dysfluent in 2 important components of those tasks. The levels of dysfluency in the compound task are expected, given that these skills had been identified as ones in which the participants were experiencing difficulty learning and performing. The levels of dysfluency in the performance of the component skills by all participants are particularly significant however, given that these tasks form the foundations of all Math and English tasks they will encounter in early education. These tasks were no longer under instruction in either classroom which indicates that their teachers may have been unaware of the extent to which the participants were still experiencing difficulty performing these basic skills. More worrying still is that even if they were aware of these difficulties, teachers may have felt unable to do anything to remediate these problems.

Group comparisons on the math tasks show that learners with MLD in Group 1 showed slightly higher levels of dysfluency on all skills than typical learners in Group 2. They were, on average, 11 responses more below the minimum fluency aim on the Compound Task than group 2 participants; 22 responses more below the minimum fluency aim on Component Skill 1 than Group 2 participants; and 5 responses more below the minimum fluency aim than Group 2 participants on Component Skill 2.

As indicated earlier, the differences in the levels of dysfluency between groups are perhaps not surprising given that Group 1 participants have been recognised as having learning difficulties. However, these results may be indicative as to why observed learning difficulties arise and persist in some children. Failure to learn and perform basic prerequisite skills in early education may permanently influence learning and performance on all related skills. The higher the level of dysfluency in component skills, the more difficult it is to learn related skills, which leads to a general label of learning failure.

Given that all fifteen pupils had been selected by teachers as showing difficulty progressing in a particular area, these results support claims made by PT literature, suggesting that cumulative dysfluency is, and continues to be, an important factor in long-term academic failure (Binder, 1996). Despite evidence such as this showing the importance of fluent component skills before compound skills are taught, regular classrooms appear to concentrate on teaching skills

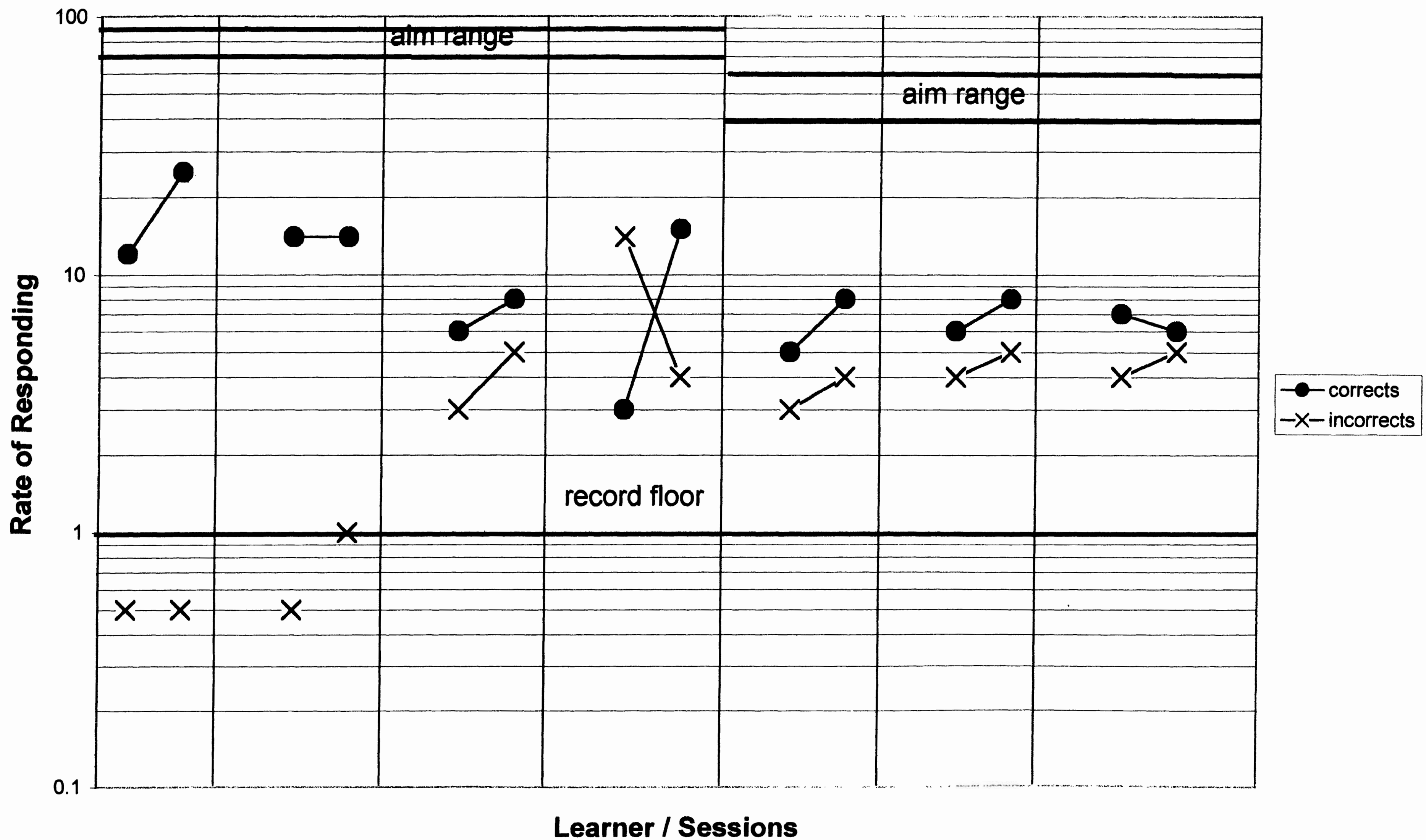

100
10
1
0.1
Rate of Responding
Learner / Sessions
aim range
aim range
record floor
corrects
incorrects

Figure 2

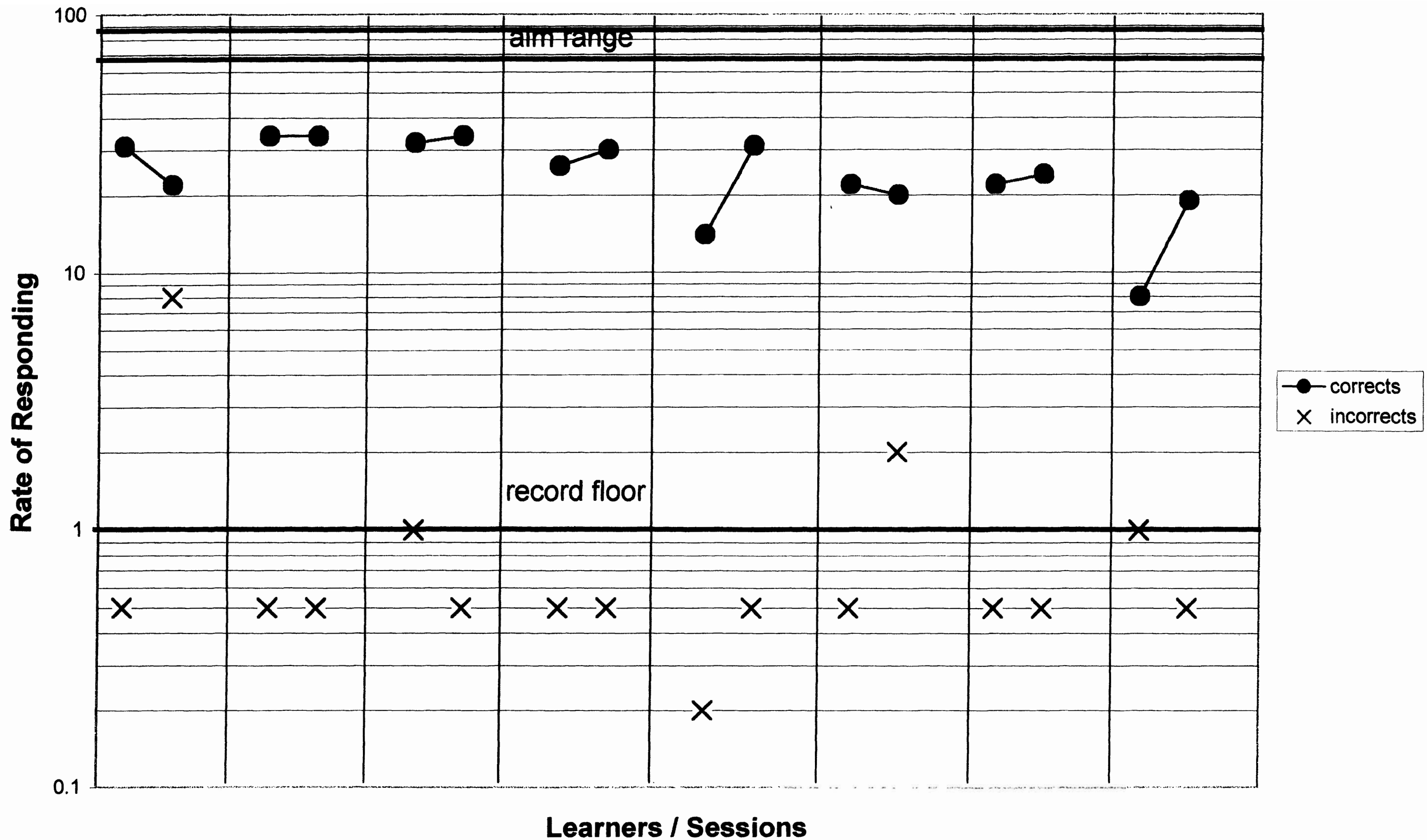

100
aim range
10
record floor
1
0.1
Rate of Responding
Learners / Sessions
corrects
incorrects

Figure 3

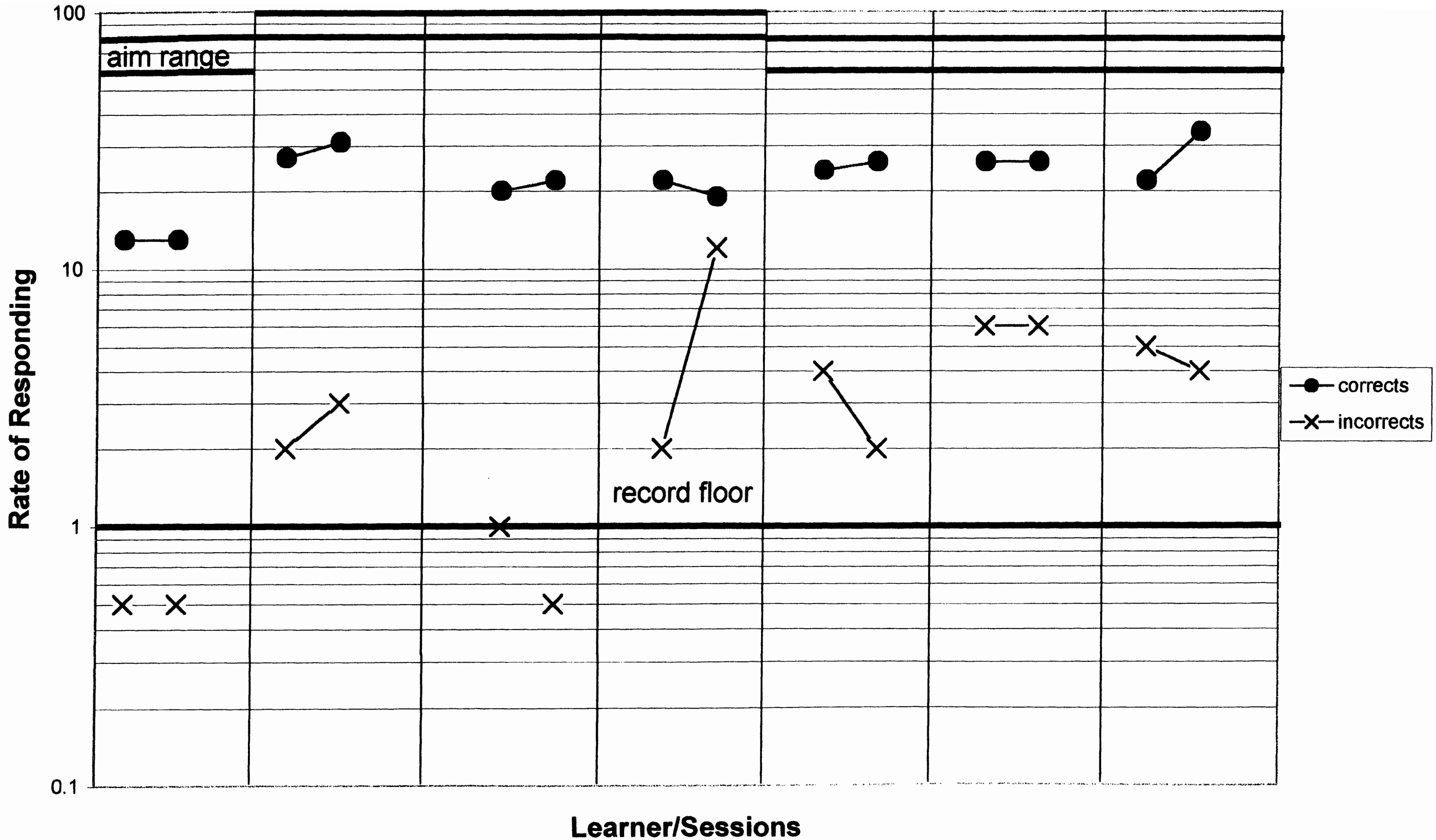

100
10
1
0.1
aim range
record floor
Rate of Responding
Learner/Sessions
corrects
incorrects

Figure 4

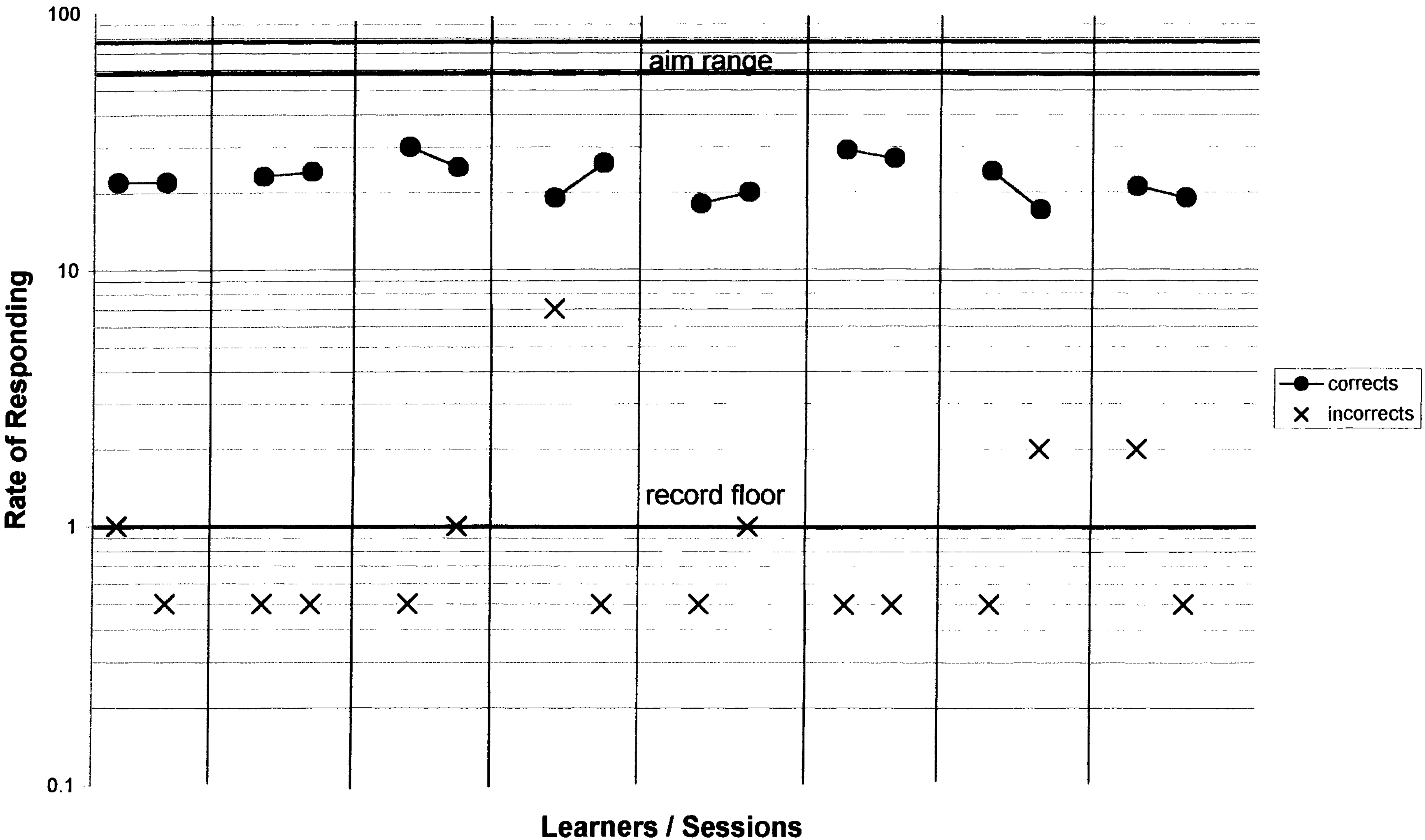

100
10
1
0.1
Rate of Responding
aim range
record floor
Learners / Sessions
corrects
incorrects

Figure 5

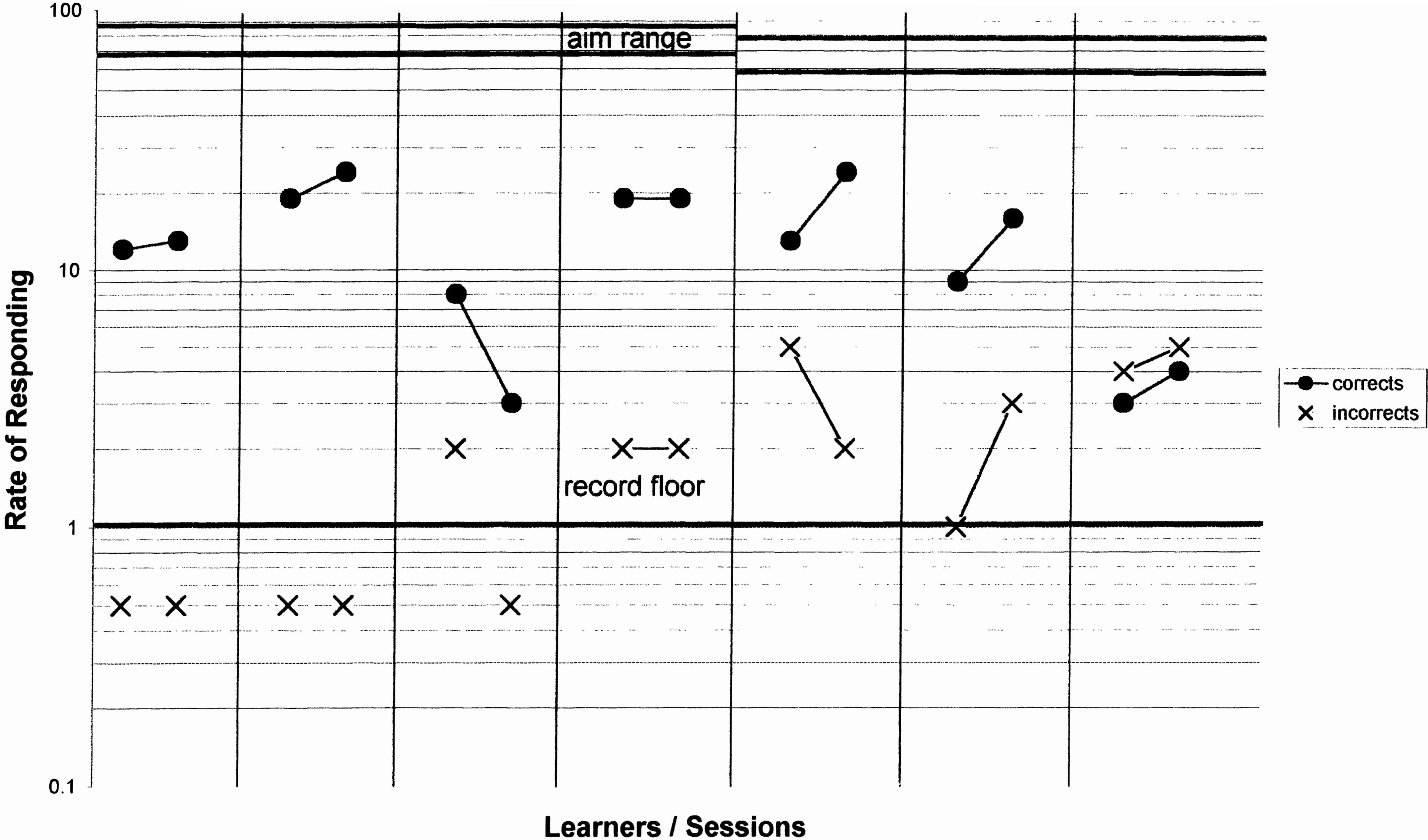

100
10
1
0.1
aim range
record floor
Rate of Responding
Learners / Sessions
corrects
incorrects

Figure 6

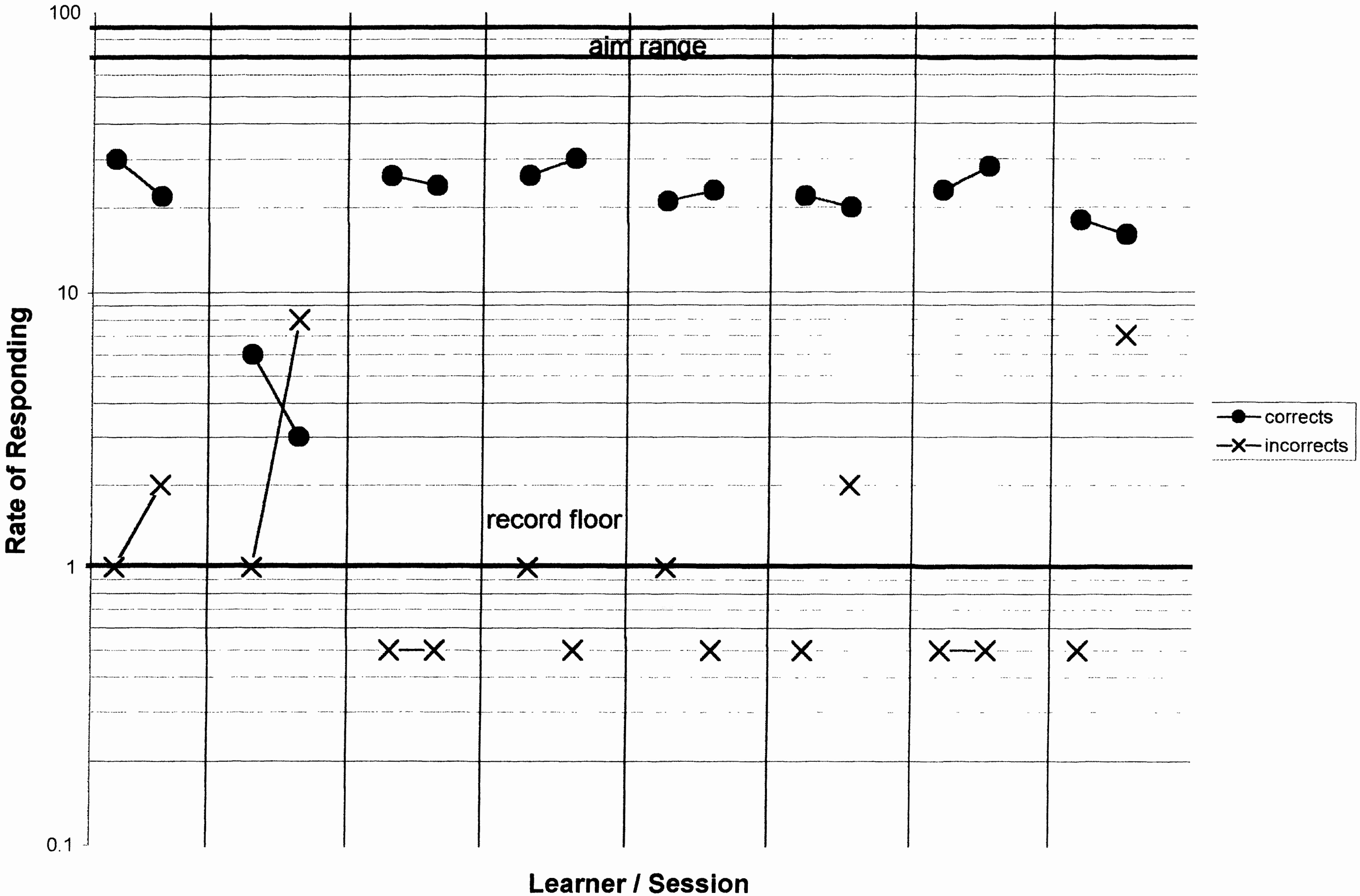

100
10
1
0.1
aim range
record floor
Rate of Responding
Learner / Session
corrects
incorrects

Figure 7

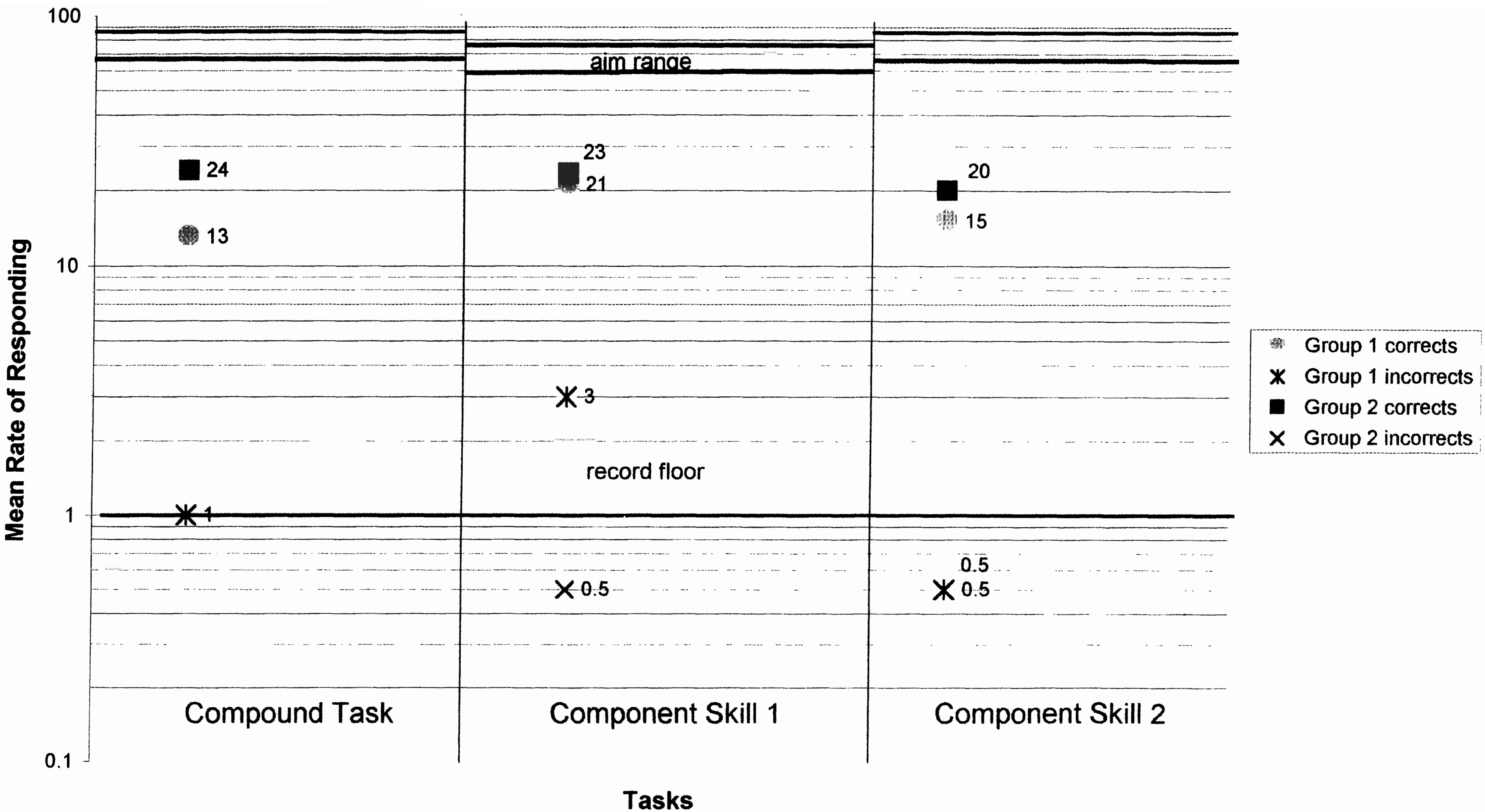

100
10
1
0.1
Mean Rate of Responding
aim range
24
13
23
21
20
15
3
record floor
1
0.5
0.5
0.5
Compound Task
Component Skill 1
Component Skill 2
Tasks
Group 1 corrects
Group 1 incorrects
Group 2 corrects
Group 2 incorrects

Figure 8

to accuracy, in the order the curriculum denotes. They do not test students' behavioural repertoires for fluency upon entry to the education system and so are unaware of, or continue to ignore, the accumulation of dysfluent components. Barrett (1979) wrote that equating accuracy with mastery makes it difficult to detect dysfluency in skills prior to its ultimate cumulative effect. Although based on a very small sample, these results suggest that cumulative dysfluency may very well be a contributing factor in educational failure for both LD children and their typical peers. An important starting point in establishing PT in schools will be in the teaching of component skills to fluent levels to redress the problem of cumulative dysfluency in our classrooms.

REFERENCES

Barret, B. H. (1979). Communitization and the measured message of normal behavior. In R. York & E. Edgar (Eds.), *Teaching the severely handicapped* (Vol. 4). Columbus, OH: Special press.

Binder, C. (1996). Behavioral fluency: Evolution of a new paradigm. *The Behavior Analyst, 19,* 163-197.

Mc Dowell, C. & Keenan, M. (2001). Cumulative dysfluency: Still evident in our classrooms despite what we know. *Journal of Precision Teaching and Celeration, Vol. XVII*(2), 1-6

Johnson, K. R. & Layng, T. V. J. (1992). Breaking the structuralist barrier: Literacy and numeracy with fluency. *American Psychologist, 47,* 1475-1490.