



Investigating the Step Size in a Progressive-Ratio Schedule of Reinforcement for Young Children Diagnosed with Autism

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Introduction

Therapists who provide behavioral therapy to young children with autism need to identify preferred items to use as reinforcers in order to teach appropriate and functional skills. Many researchers have previously used a variety of preference assessments to gauge which items the child prefers relative to other items (Fisher et al., 1992; Windsor, Piche, & Locke, 1994; DeLeon & Iwata, 1996). Research has shown that preference assessments may not be accurate indicators of which items will function as reinforcers under increasing response requirements (Tustin, 1994; DeLeon et al., 1997).

More recently, researchers discovered progressive-ratio schedules of reinforcement produces a more accurate conclusion of which items will function as reinforcers (Roane, Lerman, & Vorndran, 2001). A progressive ratio schedule consists of an increase in the response requirement after each obtained reinforcer until a previously determined session criterion has been met. There are two types of progression, or step sizes, that can be used while implementing a PR schedule, additive and geometric.

Many studies conducted in the applied setting have either used an additive step size or a non-systematic step size. Roane (2008) urged more researchers to examine the effect of the step size in a PR schedule in applied settings. The current study examined the differences between a PR schedule with an additive step size and a geometric step size, which subsequently lead to an examination of other procedural considerations for implementing a PR schedule with young children with autism.

Method

EXPERIMENT 1.

Participant and Setting. Three boys, Calvin, Brutis, and Wesli, participated in the study. All had a diagnosis of autism, and were between the ages of 6 and 9 years old. All sessions took place in a therapy room either at the participant's home or at the participant's school.

Participant Responses. Easy maintenance tasks were selected. Calvin was required to solve simple math problems on flashcards. Brutis was required to read simple sight words, and Wesli was required to touch pictures of actions.

Preference Assessment. Researchers selected 5 edible items to use during the PA. The participants selected one item every four sessions. The selected item was used as the reward during the next four sessions.

Instructions. Immediately prior to the PR schedule, the researcher read instructions to the participant that stated: 'You will be able to have some (item). In order to have some (item) you have to (task). When you don't want any more (item) say 'all done.'

Progressive Ratio Schedule. Researchers implemented a PR schedule with either an additive step size or a geometric step size depending on the condition. Researchers terminated the session after the participant did not respond for 30 seconds, after the occurrence of problem behavior, or after the participant requested to be 'all done.'

Additive Condition. The progression was as follows: 2, 4, 6, 8, etc., increasing after each obtained reward.

Geometric Condition. The progression was as follows: 2, 4, 8, 16, etc., increasing after each obtained reward.

Dependent Variables. The first DV was the break point, defined as the last completed response requirement. The second DV was the total number of responses each session. The third DV was the total items obtained. The fourth DV was the overall session length in minutes.

Experimental Design. An alternating treatments design was used to evaluate the differences between conditions.

Interobserver Agreement (IOA) and Procedural Integrity (PI). IOA and PI were calculated for 31-33% of the sessions, and was 100% for all participants.

EXPERIMENT 2

Participant, setting, and responses. Wesli participated in this experiment, and the setting and responses were the same as in Experiment 1.

Procedure A. This was the same procedure in Experiment 1, except different PR schedules were implemented.

PR1 Condition. The progression was as follows: 1, 2, 3, etc., increasing after each obtained reward.

PR5 Condition. The progression was as follows: 5, 10, 15, etc., increasing after each obtained reward.

Procedure B. Procedure B was implemented to mirror an actual therapy session. This condition consisted of the same PR schedule conditions as Procedure A, except the researcher gave praise after each correct response.

Item Selection. There were no toys or other preferred items in the therapy room. At the beginning of each session the research asked the participant 'what should we play with?' The selected item was used as the reward.

Termination Criterion. The researcher terminated the session after the participant did not respond for 30 seconds, after the occurrence of problem behavior, after a total session length of 15 minutes, after the participant asked to use the bathroom, or after the participant requested to play with a new item.

Dependent Variables. The DVs were the same as in Experiment 1.

Experimental Design. An alternating treatments design embedded within a reversal design was used.

IOA and PI. IOA and PI were calculated for 53% of the sessions. IOA was 98% and PI was 99%.

EXPERIMENT 1

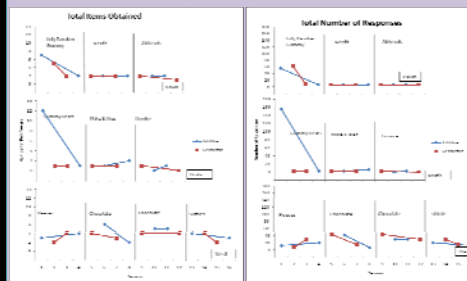


Figure 1. The last completed ratio across sessions for both PR schedules for all participants.

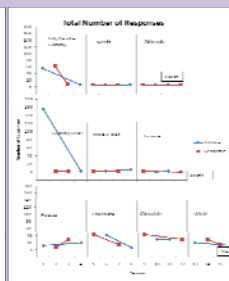


Figure 2. The total number of responses across sessions for both PR schedules for all participants.

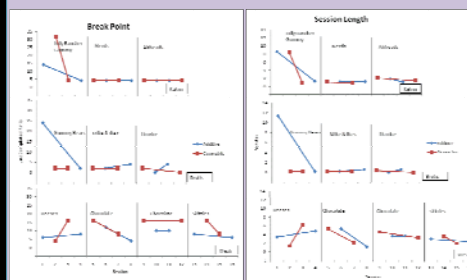


Figure 3. The number of items obtained across sessions for both PR schedules for all participants.

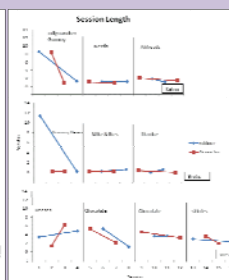


Figure 4. The session length across sessions for both PR schedules for all participants.

EXPERIMENT 2

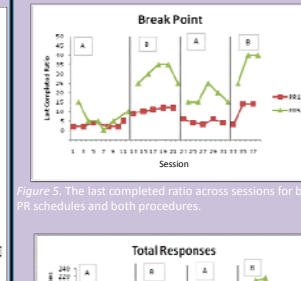


Figure 5. The last completed ratio across sessions for both PR schedules and both procedures.



Figure 6. The total number of responses across sessions for both PR schedules and both procedures.

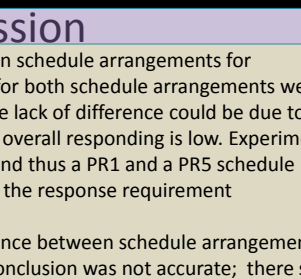


Figure 7. The session length across sessions for both PR schedules and both procedures.

Brief Discussion

Figures 1-4 all portray a lack of difference between schedule arrangements for Experiment 1. The first two response requirements for both schedule arrangements were the same (2, 4) so researchers initially concluded the lack of difference could be due to the two schedules not being sensitive enough when overall responding is low. Experiment 2 was implemented in response to this conclusion, and thus a PR1 and a PR5 schedule was used since both schedules immediately differ in the response requirement progression.

Figure 5, 6, and 7 all demonstrate a lack of difference between schedule arrangements for the first phase of Procedure A. Thus, the initial conclusion was not accurate; there still weren't any differences between two schedules that differed greatly in progression. The researchers then concluded that a component of Procedure A was affecting responding. Procedure B was implemented in response to this conclusion.

As seen in phase 2 of all figures for Experiment 2, Procedure B produced higher trends for all dependent variables compared to trends in Procedure A, as well as differences between the two schedule arrangements. The researchers were accurate in the conclusion that a component of Procedure A was affecting responding, but were not able to pinpoint the sole component since there were several differences between the two procedures.

Results indicate that there may be differences in responding due to schedule arrangements and other procedural components (i.e., instructions, item used for reward, or session termination criterion). Future researchers should interpret previous results from PR schedules with caution since responding may be sensitive to other aspects of the procedural arrangements. Future research should closely examine which components affect responding during a PR schedule in applied settings. Also, once more knowledge is gained pertaining to the correct implementation of PR schedules in applied settings, researchers should more consistently implement the same schedule across studies so the generalization of results can be assessed.

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