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A Comparison of Two Procedures for Increasing Spontaneous Requests in Children with Autism [1]

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The missing-item format and interrupted behaviour chain strategy have been used to increase spontaneous requests among children with developmental disabilities, but their relative effectiveness has not been compared. The present study compared the extent to which each strategy evoked spontaneous requests and challenging behaviour in three children with autism. Sessions where a needed item was withheld (missing-item format) were compared to sessions involving the removal of a needed item (interrupted behaviour chain strategy). Comparisons were conducted across three activities in an alternating treatments design. Both strategies evoked spontaneous requests with no significant difference in effectiveness. Few differences were obtained in the amount of challenging behaviour evoked by the two conditions, although a moderate inverse relationship between spontaneous requesting and challenging behaviour was observed. The results suggest that these two procedures yield similar outcomes. Concurrent use of both strategies may enable teachers to create a greater number of opportunities for requesting.

A Comparison of Two Procedures for Increasing Spontaneous Requests in Children with Autism

THE ACQUISITION of verbal behaviour is a critical area of need for children with developmental disabilities and increasing spontaneous requests is an important goal of intervention. A request is considered more spontaneous when it occurs under appropriate motivational conditions (Halle, 1987), instead of only when prompted by the trainer (e.g., "Tell me what you want. Say drink.").

Several strategies have been used to increase spontaneous requests in children with developmental disabilities. One often used strategy is the missing-item format (Cipani, 1988) or blocked-response conditioned establishing operation (Michael, 1993). With this technique an item needed to access a reinforcer is unavailable until the child makes an appropriate request. For example, the child might be given a jigsaw puzzle with some of its pieces missing (Duker & Moonen, 1986). Withholding parts of the puzzle is designed to establish those pieces as an effective type of reinforcement and, thereby, increase the probability that the child will request the missing items. Studies have demonstrated that the missing-item format can increase spontaneous requests in persons with severe disabilities (e.g., Duker, 1992 ; Hall & Sundberg, 1987 ; Sigafoos, Doss, & Reichle, 1989 ; Tirapelle & Cipani, 1992).

Another promising approach for increasing spontaneous requests is the interrupted behaviour

chain strategy (Goetz, Gee, & Sailor, 1985). This strategy, involves interrupting the child in the midst of an on-going and preferred activity. Continuation of the reinforcing activity is contingent upon the child making an appropriate request. For example, a toy might be momentarily removed to interrupt the child's play, but if a request occurred within a reasonable period of time, the toy would be returned. The effectiveness of this strategy has been demonstrated in several studies (e.g., Goetz et al., 1985 ; Hunt, Goetz, Alwell, & Sailor, 1986).

Despite the demonstrated effectiveness and applicability of these two procedures, studies comparing their relative effectiveness are lacking. The purpose of the present study, therefore, was to compare the missing-item format with the interrupted behaviour chain strategy for increasing spontaneous requests in three children with autism. In addition, because both procedures depend on creating a state of deprivation to ensure the "need" for a request, it is possible that such deprivation may evoke challenging behaviour (Durand & Crimmins, 1988). Thus, a further purpose of the present study was to determine the extent to which each strategy evoked challenging behaviour among the participating children. These comparisons may be useful when designing interventions to increase spontaneous requests in persons with developmental disabilities.

Method

Subjects

Three boys with autism participated. Phil and Dan were 8 years old. Alan was 5. All had been diagnosed as autistic based on DSM-III-R criteria (American Psychiatric Association, 1987). IQ scores were not available for these children, but their adaptive behaviour was assessed by the classroom teacher using the TARC Assessment Inventory for Severely Handicapped Children (Sailor & Mix, 1975). This device was standardised on 283 severely handicapped

children from 3 to 16 years of age. It yields an overall standard score with a mean of 50 and a standard deviation of 20. The obtained standard scores were 39 (Dan), 41 (Alan), and 59 (Phil), indicating that all three children fell within one standard deviation of the mean when compared to other severely handicapped children. In terms of communication skills, Phil was said to understand speech and usually responded when someone talked to him. In addition, he imitated speech and used short sentences to request (e.g., "Want drink."). Dan tended to ignore people when they spoke to him and rarely made eye contact. He did not speak nor make any speech like sounds. Alan also tended to ignore others and rarely made eye contact, but he could produce a few understandable words. Phil, Dan, and Alan were selected for this study because their requests (see Prior Training History), failed to occur without verbal prompting from the teacher (e.g., "Tell me what you want.").

Setting and Session Parameters

Phil, Dan, and Alan attended the same classroom at a therapy centre for children with autism. Three other autistic boys attended this classroom. Staff consisted of a teacher and teaching assistant.

The procedures associated with this study were conducted in the classroom by the teacher. The initial assessment activities (see Materials) were conducted individually with each child at a table in the classroom. Intervention sessions were conducted at the same table with all three children present. Sessions were implemented twice a day (i.e., morning and afternoon), three days per week. One of these daily sessions involved the missing-item format ; the other involved the interrupted behaviour chain strategy. The order of implementation varied across days. That is, if the missing-item format was used in the morning session, then the interrupted behaviour chain strategy was used in the afternoon. On the next day, however, the interrupted behaviour chain

strategy was used in the morning and the missing-item format was used in the afternoon.

All sessions occurred in the context of an existing snack routine (Object Set 1) or during a leisure skills program (Object Sets 2 and 3). Each child received three opportunities to request per session. A child's three opportunities were each separated by a 20-30 s pause as the teacher provided opportunities to the other two children in turn. The order of these opportunities was fixed within a session (e.g., Phil, Dan, Alan), but varied across sessions as to who was first, second, and third.

Materials

Three object sets were used : Juice and straw; puzzle board and pieces ; beads and string. The children had a history of selecting and using these materials appropriately during snack (drink/ straw) and leisure times (puzzle/pieces, beads/ string). Because these materials were selected frequently by each, the associated activities (i.e., drinking the juice through the straw, completing the puzzle, and threading the beads onto the string) appeared to represent effective types of reinforcement. A matching test was implemented to ensure that the children correctly paired the items. For example, the child was given the string and required to select a bead from an array containing two other non-matching items (i.e., a straw and a puzzle piece). Similar tests were conducted with each set until the child correctly selected the matching item on three consecutive trials. One object from each set was designated as the "given" item (i.e., straw, puzzle board, or string), whereas the other elements (i.e., juice, puzzle pieces, or beads) were missing or removed as required for the missing-item format or interrupted behaviour chain strategy, respectively.

Prior Training History

Prior to the study proper, each child had been taught some relevant communication skills using fairly standard procedures (see Reichle, York, and Sigafoos, 1991, for a review). Phil had been taught to request preferred or needed items by saying "Want + object label". His verbal repertoire included the phrases required for the present study (i.e., "Want drink." "Want puzzle." "Want beads."). Due to his lack of speech, Dan had been taught to request using some manual signs (i.e., "eat" "drink" and "help"). To request the other items used in this study, he pointed to black and white line drawings. The three drawings needed for the present study (i.e., DRINK, PUZZLE, BEADS) were placed on the table in front of him prior to each session. Alan also had acquired three manual signs ("eat" "drink" "help") and used line drawing to request juice, puzzle pieces, and beads. Thus, each child had acquired the requests relevant to this study. However, they rarely emitted these requests spontaneously, that is in the absence of a verbal prompt (e.g., "Tell me what you want."). Hence, the procedures described below were designed to compare the rate of spontaneous requesting when a needed item was missing versus when that item was temporarily removed.

Response Definitions

For each trial, the presence or absence of a spontaneous request was recorded. In the first phase, a spontaneous request for Phil was defined as saying "Want drink." within 10 s of the start of a trial (see Procedures). Spontaneous requests for Dan and Alan were counted if they produced the manual sign for "drink." In the second and third phase, Phil's requests consisted of saying "Want puzzle." and "Want beads.", respectively ; whereas Dan and Alans' responses consisted of pointing to the line drawings of puzzle and beads. Again these requests had to occur within 10 s and without verbal, gestural, or physical prompting from the teacher in order to be counted

as an instance of spontaneous requesting. In addition, part of making a request was to first gain the attention of the teacher. For Phil, this involved saying her name, while Dan and Alan did this by tapping the teacher lightly on the forearm.

Challenging and stereotypic behaviours also were recorded. An instance of challenging behaviour was counted if the child engaged in self-injury, aggression, or property destruction at any time during a trial. Self-injury could include head-banging, self-biting, or self-scratching. Aggression was defined as hitting, pulling hair, or spiting at the teacher or another chid. Property destruction consisted of pushing or throwing objects off the table and ripping or otherwise breaking objects (e.g., folding the puzzle pieces in half or punching the juice carton until it was flat). Stereotypic behaviours included body rocking, head weaving, and hand flapping that continued for 5 s or more.

Procedures

Missing-item format. Sessions involving the missing-item format began with the children gathered together at the table. The teacher then approached the first child and handed him the given item from the object set. Specifically, in the first phase, the teacher gave the child the straw and then waited 10 s for the child to make a spontaneous request for the missing cup of juice. In the second phase, the child was given the puzzle board and the teacher waited for the child to request the missing pieces. In the third and final phase, the child received the string and a request was required before he received any beads. During this 10 s, the missing item was not visible. If the child produced a spontaneous request for the missing item within 10 s, he was given some of that missing item. For instance, if the child requested "drink" within 10 s of being given a straw, he was given a cup containing approximately 2 oz of juice. This cup was constructed so that the juice could only be consumed using the straw. Similarly, if the child

requested "puzzle" after being given the board, he received one third of the missing pieces. A request for beads after receiving the string, resulted in the child obtaining a third of the missing beads, which could then be threaded onto the string. If a spontaneous request did not occur within 10 s, the teacher prompted the required response and then delivered the missing item. Prompting involved a least-to-most hierarchy, beginning with a verbal cue (i.e., Tell me what you want.") and ending with physical assistance, if necessary. Verbal cuing was always effective with Phil. However, Dan and Alan sometimes required gestural (i.e., pointing towards the appropriate line drawing) or physical prompting (i.e., moving their finger towards the correct symbol or moulding their hands to make the correct sign). After the first trial had been completed with the first child, the teacher directed her attention to the next child, and so on until all three children had received one turn. The second and third trials were conducted in the same manner, except that to initiate these trials, the teacher merely brought the child's hand into contact with the given item. During the first phase, the cup of juice was first removed so that it could be replenished. This variation was necessary because after the first trial, the child was already in possession of the given item. It was expected that by giving the child only a small portion of juice and only a third of the puzzle pieces or beads on any given trial, relevant establishing operations would be maintained across the three trials which comprised a session. Thus, by the end of the third trial, each child would have received 6 oz of juice, all of the pieces necessary to complete the puzzle, and enough beads to fill up the string.

Interrupted behaviour chain. Sessions involving the interrupted behaviour chain strategy also began with gathering the three children at the table. With this procedure, however, the teacher initially gave the children both of the items from the set. After the child

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had about 5 s to interact with the materials, the teacher then removed one of the items and waited 10 s for a spontaneous request. The removed item was held by the teacher and remained visible to the child. If a spontaneous request occurred, the item was returned. If not, the teacher prompted a request before returning the item. For instance, in the first phase, the child was initially given both the straw and the cup containing 2 oz of juice. As the child began to drink the juice, the teacher gently interrupted by removing the cup, timing it so that the child could have consumed only about half (1 oz) of the available juice. If a spontaneous request occurred, the cup was returned and the child could finish drinking the remaining juice while the teacher provided a trial to the next child. In the second phase, children were given both the puzzle board and a third of the puzzle pieces. After the child had correctly placed one of these pieces into the board, the other pieces were removed. When a request for "puzzle" occurred, these pieces were returned and the teacher moved on to the next child. Similarly, in the third phase, children were given the string and a third of the beads. After the child had threaded one of the beads, the other beads were removed until the child requested their return. Interrupting the child in this manner was intended to establish the return of the removed items as an effective type of reinforcement and, therefore, set the occasion for spontaneous requesting. Other aspects of this procedure (e.g., prompting, trial sequencing) were identical to those used during sessions involving the missing-item format.

Experimental Design

An alternating treatment design (Barlow & Hayes, 1979) was used to compare the missing-item format with the interrupted behaviour chain strategy. Sessions involving one of these strategies were alternated with sessions involving the other strategy, providing a comparison of their respective effects on spontaneous requesting and challenging/stereotypic behaviour. This comparison was replicated across three object sets for each child.
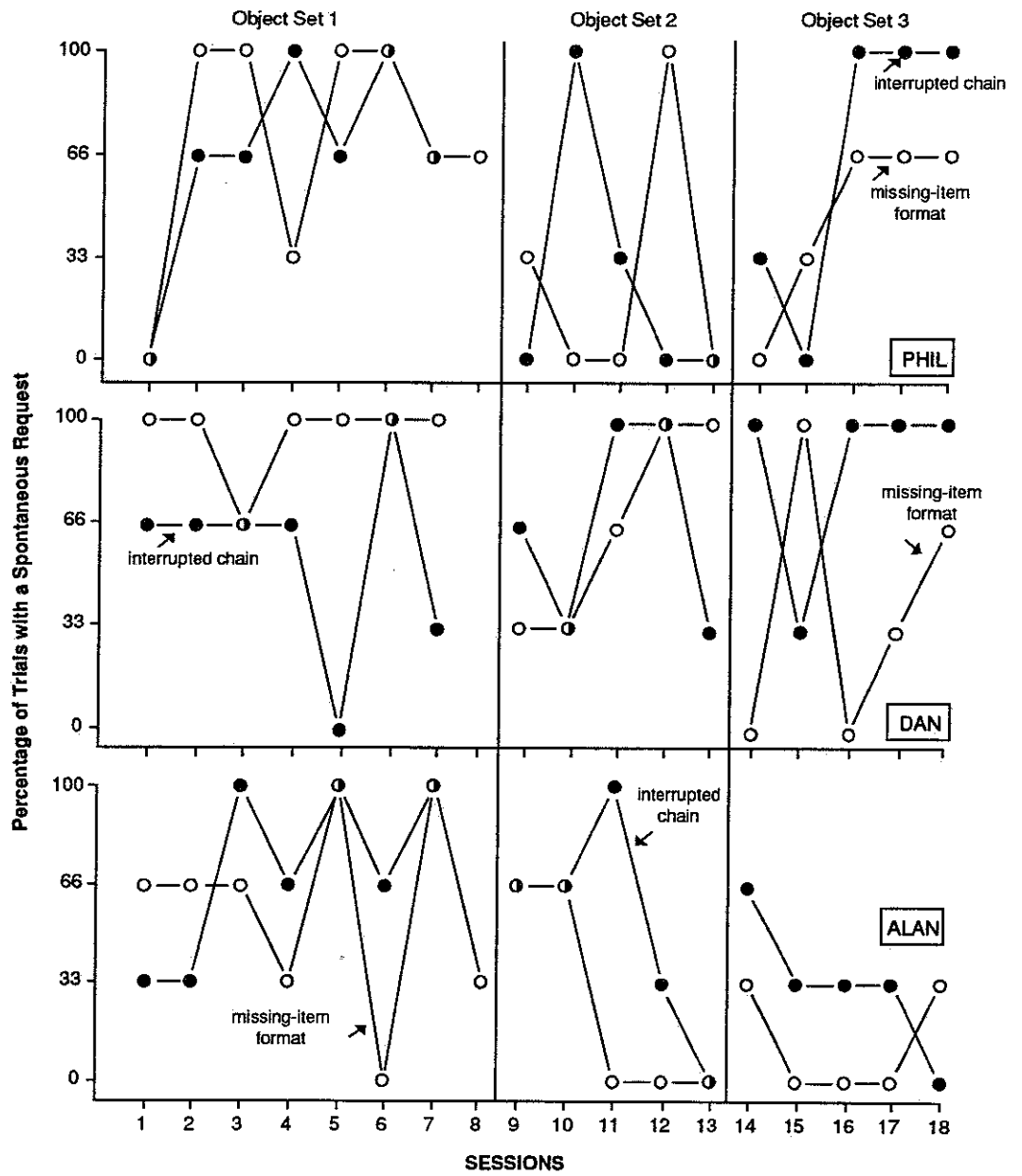
Interobserver Agreement

An independent observer recorded instances of spontaneous requesting and challenging/stereotypic behaviour on at least 33 % of the sessions. These independent observations were made for each child during all phases of the study. Instances of agreement and disagreement between the teacher and observer were compared on a trial by trial basis. Percentages of agreement were calculated after each session and for each child using the formula : Agreements/ (Agreements + Disagreements) x 100 %. The resulting figures were always above 80 %.

Results

Figure 1 shows the percentage of spontaneous requests during the missing-item format (open circles) and interrupted behaviour chain strategy (closed circles). After the initial session in Object Set 1, Phil (upper panel) emitted similar percentages of spontaneous requests during both conditions. His performance was more variable with Object Set 2, but increased to 66 % (missing-item format) and 100 % (interrupted chain) by the end of the final phase. As shown in the middle panel, Dan exhibited similar and variable percentages of spontaneous requests in both conditions and across all three object sets. There also was little difference between the two conditions for Alan, with both strategies generating similar and variable percentages of spontaneous requests. Unlike Phil and Dan, however, Alan's performance deteriorated across the three object sets. Overall, Figure 1 shows little consistent difference between the missing-item format and the interrupted behaviour chain strategy in terms of the percentage of trials with a spontaneous request. In fact, comparison of the mean percentages of spontaneous request across the two conditions, using the Kruskal-Wallis test, revealed no statistically significant differences for any learner in any phase of the study.

Figure 1 : Percentage of trials with a spontaneous request during the missing-item format (open circles) and interrupted behaviour chain strategy (closed circles)

Figure 2 shows the percentage of trials with challenging behaviour. Alan is not included because he showed no challenging behaviour during the study. For Phil, challenging behaviour occurred frequently during both conditions and across all three phases of the study. Kruskal-Wallis tests revealed one significant difference :

The missing-item format was associated with significantly less (p = .042) challenging behaviour in Phil, but only during the first phase of the study. Otherwise, similar amounts of challenging behaviour were associated with each strategy, although Dan displayed comparatively less challenging behaviour than Phil.

Figure 2 - Percentage of trials with challenging behaviour during the missing-item format (open circles) and interrupted behaviour chain strategy (closed circles)
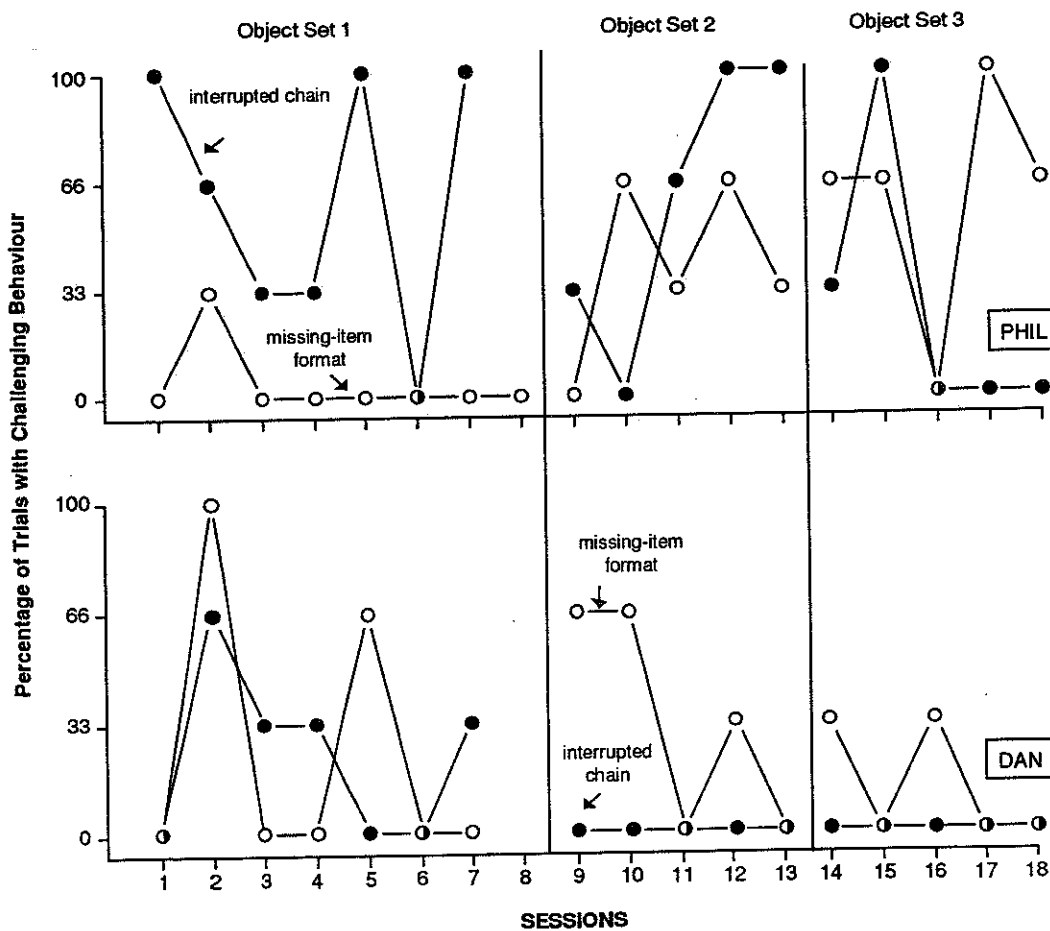
Figure 3 - Percentage of trials with stereotypic behaviour during the missing-item format (open circles) and interrupted behaviour chain strategy (closed circles)
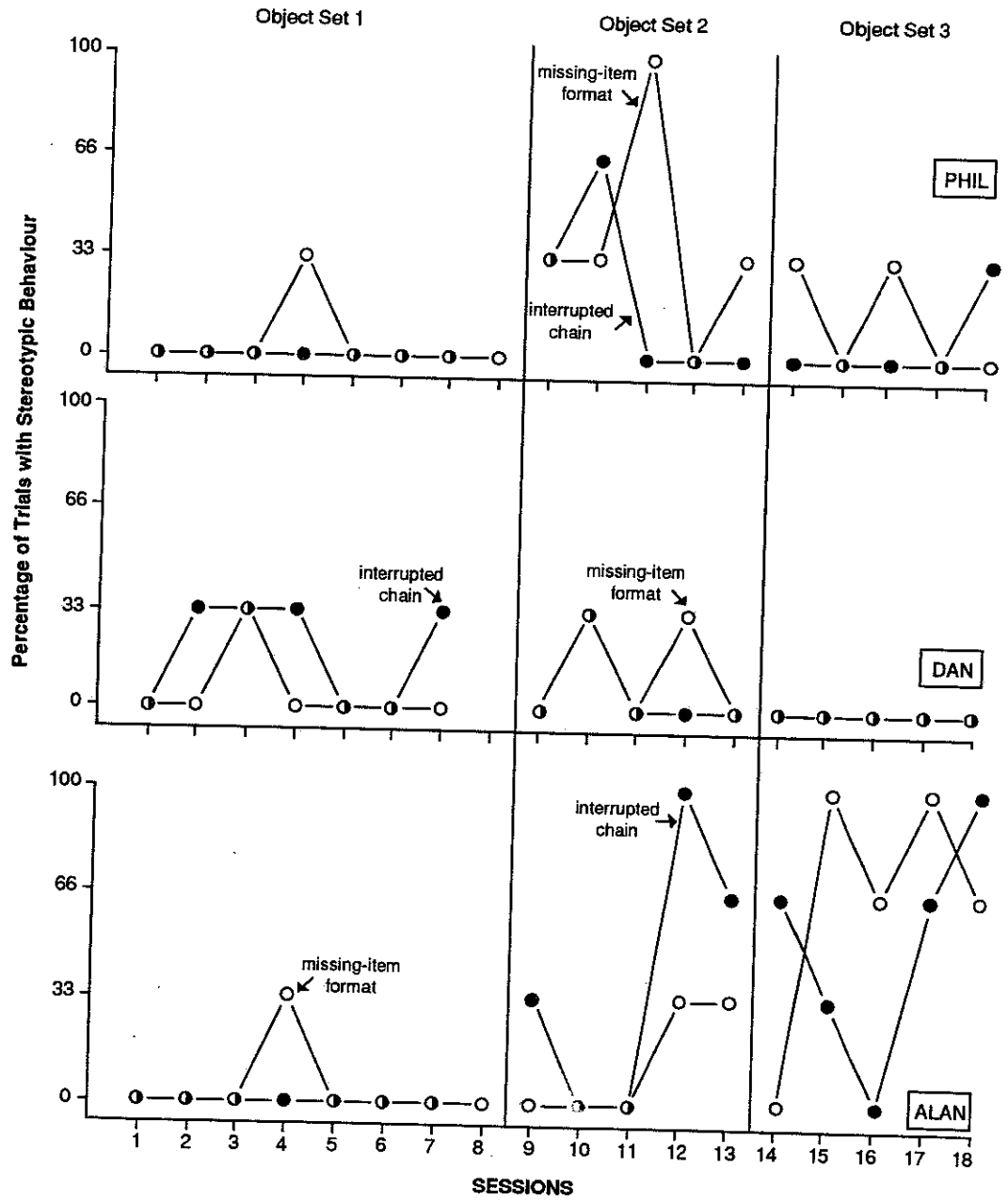
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Figure 3 shows the percentage of trials with stereotypic behaviour. Stereotypic behaviour was initially low with Phil, but it increased during the second phase. By the end of the study, stereotypic behaviour was observed on about one third of his trials. Low rates of stereotypic behaviour also were observed initially with Dan, but these disappeared during his final phase. Unlike Dan, Alan showed increased stereotypic behaviour as the study progressed. Again, Kruskal-Wallis tests showed no significant differences in stereotypic behaviour across the two conditions.

The trends obtained with Alan across the three object sets suggested an inverse relationship between spontaneous requesting and stereotypic behaviour. That is, as spontaneous requesting decreased from Set 1 to Set 3 (Figure 1), stereotypic behaviour increased (Figure 3). The relationship between requesting and challenging/ stereotypic behaviour was further examined for all three learners with the results shown in Figures 4 and 5.

Figure 4 shows the number of sessions with each possible combination of the percentage

Figure 4 - Number of sessions with each combination of percentage spontaneous requests against percentage challenging behaviour

Possible Combinations of Percentage Requests/Persenctage CHallenging Behaviour
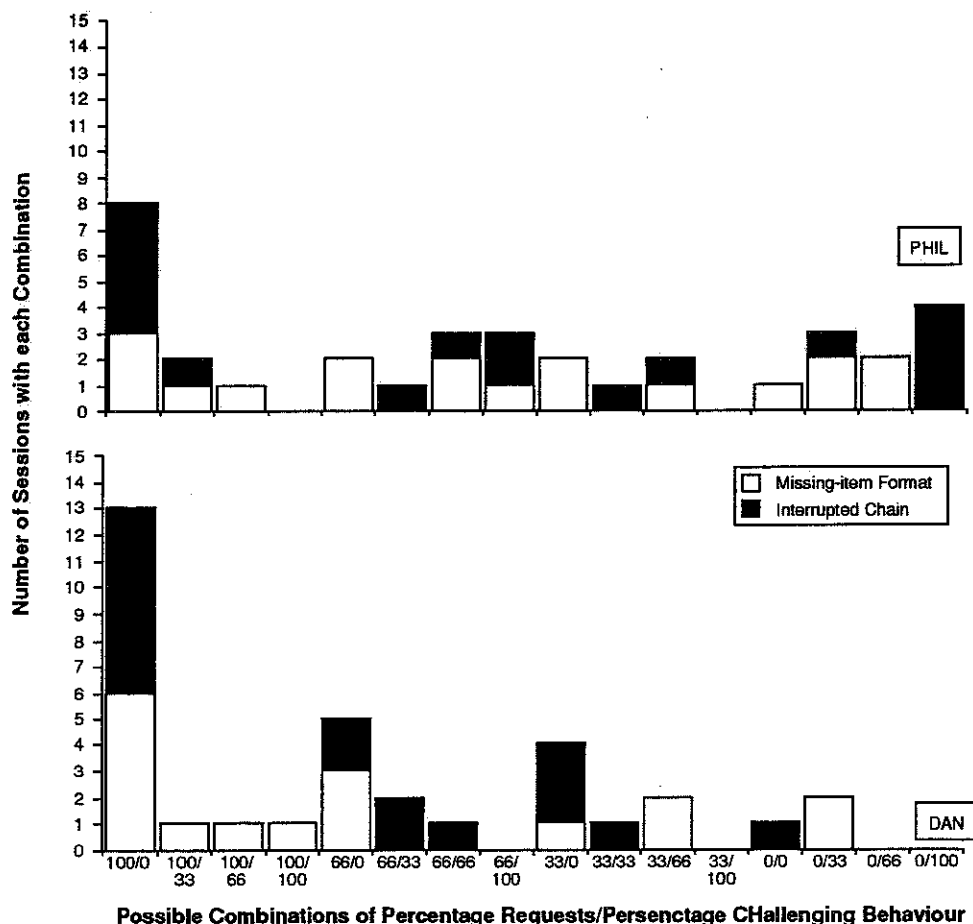
requests against the percentage of challenging behaviour. Alan is omitted because he never displayed challenging behaviour. For example, the far left stack in the upper panel shows eight sessions during which Phil had 100 % spontaneous requesting, but 0 % challenging behaviour (100/0). Of these eight sessions, three involved the missing-item format and five involved the interrupted behaviour chain strategy. In comparison, Dan had 13 sessions with 100 % requesting and 0 % challenging behaviour. Of these, six involved the missing-item format with the interrupted behaviour chain strategy in effect during the other seven sessions. The 100/0 combination was the most frequent for both Phil and Dan. In addition, there were several sessions when challenging behaviour was observed, but not spontaneous requesting, as indicated by the stacks on the far right of the figure (e.g., 0/33, 0/66, 0/100). These combinations suggest an inverse relationship between requesting and challenging behaviour. However, there were also instances when spontaneous requesting and challenging behaviour occurred with the same or similar percentages (e.g., 100/100, 100/66, 66/66, 33/33). Overall then, Figure 4 reveals a moderate inverse relationship between requesting and challenging behaviour. Of course, it is possible that different results would have been obtained if the relationship between requesting and challenging behaviour had been examined on a trial by trial basis. However, a finer grain analysis did not seem warranted given that only three trials were conducted per session.

Figure 5 shows the relationship between requesting and stereotypic behaviour. Again the most frequent combination consisted of sessions with 100 % spontaneous requests and 0 % stereotyped behaviour. There were also sessions with moderate percentages of spontaneous requests and no stereotyped behaviour (e.g., 66/0, 33/0). Also indicative of an inverse relationship between these two dependent variables, especially for Alan, are the cluster of sessions with moderate to high rates of stereotyped

behaviour combined with little or no spontaneous requesting (e.g., 0/66, 0/100, 33/100). Again, however, a strong inverse relationship is mitigated by sessions with similar or equal percentages of these two behaviours (e.g., 66/66, 33/33). Nonetheless, the distribution in Figure 5 suggests a moderate inverse relationship between spontaneous requesting and stereotyped behaviour.

Discussion

The missing-item format and the interrupted behaviour chain strategy have been used to promote more spontaneous requesting in persons with developmental disabilities (Duker, 1992 ; Goetz et al., 1985 ; Hall & Sundberg, 1987 ; Hunt et al., 1986 ; Sigafoos et al., 1989 ; Tirapelle & Cipani, 1992). Our present comparison suggests that these two procedures may be equally effective in evoking and maintaining unprompted requests in children with autism. This is an important extension of previous research. It suggests that teachers may be able to implement concurrently more than one strategy to increase functional, spontaneous requesting in children with developmental disabilities. Because certain strategies may lend themselves more readily to some activities than others, the availability of several equally effective procedures may enable teachers to create a greater number opportunities for requesting. This, in turn, may facilitate the acquisition, generalisation, and maintenance of functional communication skills among children with developmental disabilities.

As an indication of the potential for generalised applicability, the results of the present study suggest that both strategies were effective in evoking spontaneous requesting across a range of materials and activities. Of course, Alan's results highlight the need for some caution. He did not maintain equally high rates of spontaneous requesting in Objects Sets 2 and 3, relative to Object Set 1. Nonetheless it is promising that all three learners exhibited some

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Figure 5 - Number of sessions with each combination of percentage spontaneous requests against percentage stereotypic behaviour

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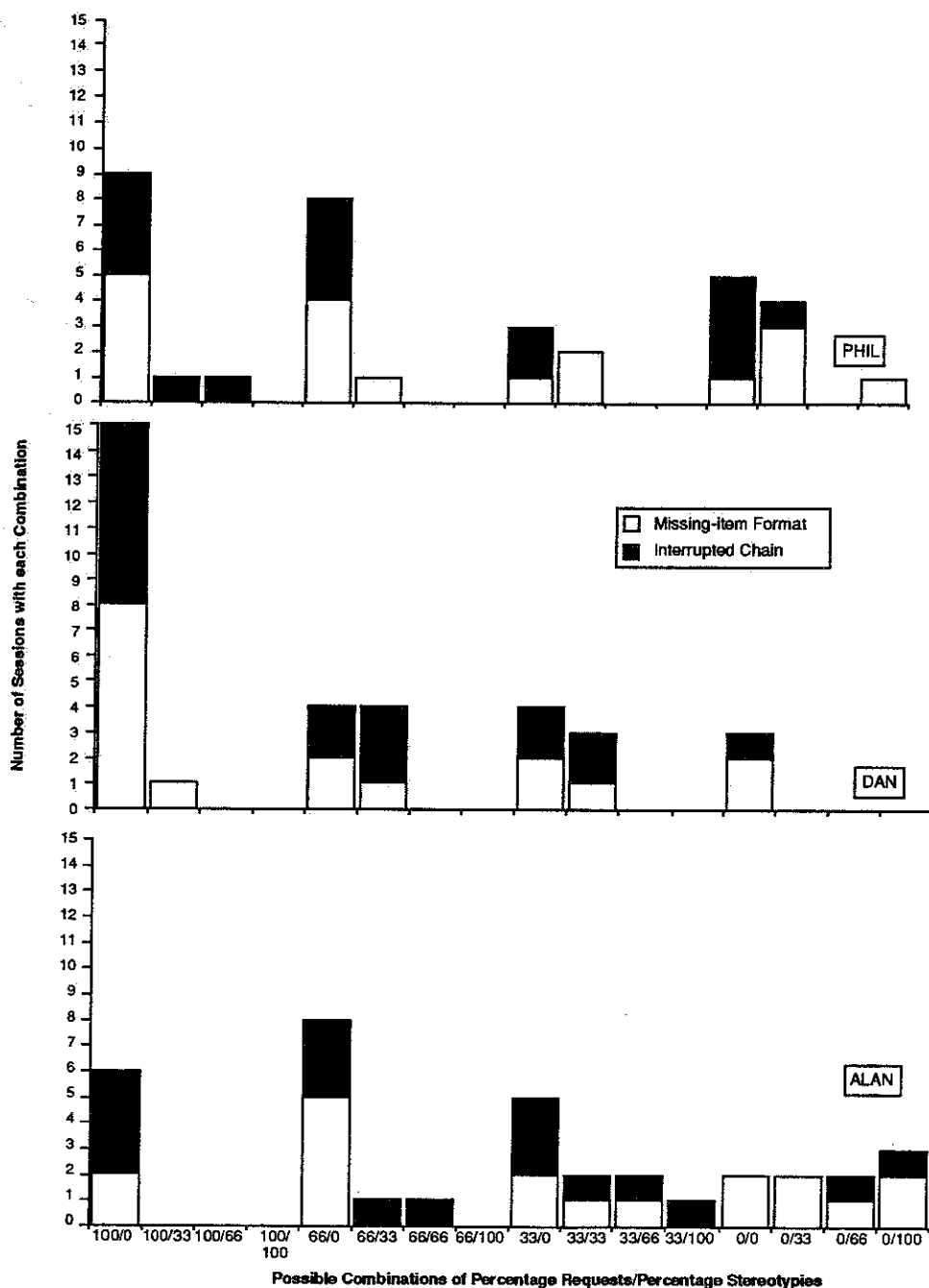
spontaneous requests during both conditions and across all phases of the study, particularly when one considers that these children were selected because of their limited spontaneity.

Alan's deterioration did not seem related to changes in the reinforcing value of the activities associated with Object Sets 2 and 3, as he continued to play with the puzzle and beads. A more likely explanation is that the decrease in spontaneous requesting was related to the increase in stereotypic behaviour. Stereotypic behaviour has been shown to disrupt performance on a variety of learning tasks (Foxx & Azrin, 1973 ; Koegel & Covert, 1972 ; Lovaas, Litrownik, & Mann, 1971 ; Risley, 1968). It is unclear, however, why Alan's stereotypic behaviour increased.

As with stereotypic behaviour, an inverse, but more moderate relationship between spontaneous requesting and challenging behaviour was obtained with Phil and Dan. This is consistent with research showing that problem behaviours are sometimes related to task demands (Carr, Newsom, & Binkoff, 1980 ; Gaylord-Ross, 1982) and often covary with appropriate verbal behaviour (Durand, 1990 ; Schroeder, Schroeder, Smith, & Dalldorf, 1978 ; Talkington, Hall, & Altman, 1971). For some children, participation in communication intervention may represent a task demand likely to evoke challenging behaviour (Koegel, Koegel, & Surratt, 1992).

Challenging behaviour which occurs in relation to task demands is often maintained by negative reinforcement in the form of escape from those demands (Iwata, Dorsey, Slifer, Bauman, & Richman, 1982). However, escape was not a consistent consequence for challenging behaviour in the present study. Instead the teacher ignored challenging behaviour by continuing the procedures required for the relevant condition in effect at the time (i.e., missing-item or interrupted chain). Thus if Phil and Dans' challenging behaviours were indeed escape-motivated, then these behaviours might have been expected to extinguish as the study progressed (Iwata, Pace, Kalsher, Cowdery, & Cataldo, 1990). This appeared to be true of Dan, but no such trend was evident for Phil.

During any given trial, challenging behaviour was likely to be followed by any number of consequences (e.g., attention, prompting, withholding, removing, or presenting one of the items, or withdrawal of attention as the teacher moved to the next child). These procedures represented a true random control in the sense that challenging behaviour had no consistent effect on the teacher's on-going instructional behaviour (Durand & Crimmins, 1991). However, challenging behaviour may have occurred occasionally just as the trial was ending. If so, this intermittent and inadvertent "escape" may have been sufficient to maintain Phil's challenging behaviour. Or, other teacher actions within a trial (e.g., attention, prompting, withholding or removing a needed item, withdrawal of attention as the teacher moved to the next child) may have been responsible for evoking and maintaining challenging behaviour. Unfortunately, our simple documentation of the presence or absence of challenging behaviour within a trial was not sufficient to isolate the specific controlling variables. What is clear, however, is that removing the needed item (interrupted behaviour chain strategy) was not associated with any more [or less] challenging behaviour than withholding a needed item (missing-item format), except for Phil with Object Set 1.

The range of possible controlling variables described above highlights the potential complexity of challenging behaviour which occurs in relation to task demands. Challenging behaviour evoked by participation in a particular task may not necessarily represent escape behaviour. Instead such behaviour could be maintained by various teacher actions which occur as part of the task or by setting events independent of the task (Halle & Spradlin, 1993). Future research might be able to isolate the exact nature of such control with different observation

methods, such as lag sequential analysis (Emerson, 1993 ; Sackett, 1979).

The basis for the missing-item format and interrupted behaviour chain strategy is similar. Both involve creating effective establishing operations for requesting. Withholding or removing a needed item is designed to establish that object as an effective type of reinforcement and, therefore, strengthen any behaviour which has in the past been followed by receipt of that item (Michael, 1993). In the past, spoken, signed, or selection-based requests had been effective in obtaining these same items. However, requesting previously occurred only after prompting. In the present study, by contrast, requests occurred more spontaneously, that is in the absence of prompting and in the presence of relevant establishing operation.

It is difficult to determine if this greater spontaneity was acquired during the present study or if participation in the study merely provided the opportunity for these children to display their previously acquired requests under different conditions. This difficulty stems in part from the fact that baseline data were not obtained. Baseline data were not obtained because we used an alternating treatment design. This seemed the most appropriate design given our goal to compare the relative effectiveness of the missing-item format and interrupted behaviour chain strategy. Demonstration of experimental control with alternating treatment designs depends on obtaining consistent differences between the strategies being compared. For the most part, such differences were not observed. In retrospect, experimental control may have been improved by incorporating a multiple-baseline design into the present study.

Despite their similar basis, differences were expected because the two strategies involve different operations (i.e., withholding versus removing a needed item) and present the learner with different antecedent stimuli. For example, after removing an object from the learner - as was done with the interrupted behaviour chain strategy - that item remained visible to the learner.

In contrast, the item withheld from the learner during the missing-item format was not visible. The former configuration (i.e., requesting in the presence of the needed item) more closely matched the conditions under which these requests were taught initially. Thus the interrupted behaviour chain strategy might have been expected to generate more spontaneous requesting. It also might have been expected to generate more challenging/stereotypic behaviour because previous assessments indicated that this strategy may generate tantrums and self-injury, depending on when the activity is interrupted (Goetz et al., 1985). The fact that there was actually little difference between the two strategies suggests that further research is needed to determine how various configurations of instructional procedures influence effectiveness. For now, it appears that withholding and removing needed items are equally effective ways to create relevant establishing operations for requesting.

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