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**A STUDY OF PLAY-ORIENTED CONTINGENCY  
INTERVENTION STRATEGIES ON SKILL  
ACQUISITION OF A MULTIPLY  
HANDICAPPED PRESCHOOLER\***

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**ABSTRACT**

The purpose of this study was to investigate the impact of a play-oriented contingency management intervention strategy on readiness skill acquisition of a young child with multiple handicapping conditions. The subject, a 2-year-old female with cerebral palsy classified at the severe to profound level, was non-ambulatory, non-verbal, and manifested significant mental retardation and sensory-motor deficiencies as determined by a multidisciplinary team. The subject failed to make any noticeable progress in any of target skill areas (vocalization, smiling, pursuit skill, and object manipulation) after being served in a homebound and center-based program for 17 months. A play intervention program was recommended and implemented. This was a single-subject experiment with a modification of ABA design. This experiment used a frequency measure: the operant within-subject design, and treatments employing both behavior principles and cognitive-field theory. Equipment in the experimental setting included a wide variety of toys, sandbox, and mirrors. The play intervention session was conducted for 30 minutes after the warm-up period and took place about 3:00 in the afternoon for two or three times per week. Frequency measures of the subject's vocalization, smiles, successful attempts to grasp and manipulate objects, and pursuit skills were recorded immediately following each treatment session throughout six different phases of the study. The results of this experimental study documented the positive impact of encouraging participation in play experience through teacher

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priming and social manipulation of objects, attending visually to the environment, and imitating actions and vocalizations. Findings from this study affirm the importance of including play combined with contingency management techniques as an intervention strategy for developing skills in handicapped preschoolers. These strategies can be easily implemented by a teacher in the classroom setting.

Play, as a key to understanding the development of normal children, has been extensively studied, and the value of thematic play experiences for enhancing the intellectual and emotional growth of young child has been widely explicated (Almy, 1968; Herron & Sutton-Smith, 1971; Wolfgang, 1974; Brown & Gottfried, 1985; Schaefer & O' Connor, 1983). Less is understood about the play patterns of handicapped young children and how play might be used to further their development.

Recent studies have indicated that child-centered play can provide both the context and the material for assessment and intervention with at-risk and language-impaired young children (Fewell, 1986; Rogers, 1986). Therapeutic play intervention with special needs young children has been found to be effective in improving verbal skills (Wishon, Spangler, & Bower, 1981; Weber, Kushnir, & Weber, 1982; Hornby & Jensen-Procter, 1984; Sparling, Walker, & Singdahlsen, 1984; Rogers, 1984), motor skills (Roswal & Frith, 1983; Sparling et al., 1984; Salomon, 1983), and social-emotional skills (Fraiberg, 1971; Sparling et al., 1984; Odom & Strain, 1984).

Wishon et al. (1981) used teacher priming and reinforcement of interaction with play materials as a procedure to increase social interactions, verbalization, and higher levels of play performance of a 4-year-old female subject with developmental delays. Keogh, Miler, and LeBlanc (1973) employed teacher priming and the presence of gross motor play equipment to increase the levels and duration of appropriate social interactions of a 2 1/2-year-old male. Priming techniques have also been used effectively to ameliorate social interaction deficits among young behaviorally handicapped children (Shores, Hester, Strain, & Dorofrio, 1976) and to accelerate play equipment utilization (Buel, Stoddard, Hanis, & Baer, 1968). The intent of this study is to investigate the impact of various play intervention strategies combined with contingency management techniques on skill acquisition of a young child with cerebral palsy, who was tested and identified in the severe/profound range of mental retardation.

## Subject and Setting

The subject was a 2-year-old female with cerebral palsy classified at the "severe/profound" level. The subject was non-ambulatory, non-verbal and manifested significant mental retardation and sensory-motor deficiencies as determined by a multidisciplinary team. In addition, "Lori's" inability to attend naturally to relevant cues in the environment resulted in deficits in her development of visual tracking, imitation, and searching skills. "Lori" had received homebound services from the time she was 7 months old until she was 17 months old at which time she was enrolled in the Weld County (Colorado) Community Center Board's center-based Preschool Training Program.

The teacher reported that "Lori" failed to make any noticeable progress in any of the target skill areas (vocalization, smiling, pursuit skill, and object manipulation) although "Lori" had received a center-based intervention program for seven months immediately preceding this study. At that point, another multidisciplinary review staffing was held. The decision was made to implement a play-oriented contingency management intervention program to facilitate "Lori's" performance in the four target skill areas.

The experiment took place in the subject's home during the afternoon hour immediately following the subject's regular nap time. A small area was set aside in the subject's living room for conducting the intervention program. Equipment in the experimental setting included an assortment of miniature-life toys and blocks; a wide variety of materials presented to encourage tactile exploration; a large collection of magazines and picture books containing illustrations of children, adults, and animals; a large bucket for water and sand play; and a wide assortment of devices and objects that produced music or other sounds, or movements when touched or manipulated. Several mirrors of varying shapes and sizes were also made available for the subject to explore. Equipment in the experimental setting also included a specially designed support seat with desk top which was introduced during phase B<sub>2</sub> of the study.

## Design

It was assumed that an increase in the subject's utilization of play materials in concert with the therapist's encouragement would act as an

antecedent allowing for the reinforcement of desired behaviors. Each play intervention session of 30 minutes would be followed by a brief "test" period (usually 3 to 6 minutes) during which the subject's frequency of pursuit skills, vocalizations, smiles, and object manipulations was recorded. Data were recorded by two research assistants. The inter-rater reliability was .92. The inter-rater reliability was computed by dividing the agreements by the number of agreements and disagreements recorded on each of four tasks by two research assistants and multiplying by 100 (Axelrod, 1983). The data were then displayed on Daily Behavior Charts (Lindsley, Penny-packer, & Koenig, 1972). This was a single-subject experiment implementing a modification of the ABA design; specifically, A<sub>1</sub>, B<sub>1</sub>, B<sub>2</sub>, A<sub>2</sub>, B<sub>3</sub>, B<sub>4</sub>. This experiment used the frequency measure (Skinner, 1968), the operant within-subject design (Sidman, 1960), and treatments using both behavior principles and cognitive-field theory. According to Vargas (1978), frequency (or rate) is the most sensitive measure of human behavior. It was truly a hybrid: behavior principles, cognitive field theory, and continuous direct measurement.

### Procedures

On each day of treatment, the treatment procedure was preceded by a warm-up episode. Activities of the therapist during the warm-up episode included dressing the subject, cuddling and holding the subject, leading the subject to the experimental setting, acquainting the subject with play materials. The warm-up episodes varied in length from 15 to 40 minutes, depending on the subject's mood and state of physical wellness. The treatment session was conducted for thirty (30) minutes after the warm-up period and took place about 3:00 in the afternoon each time. Two or three treatment sessions were conducted per week. Following each treatment session, frequency measures of the subject's vocalizations, smiles, successful attempts to grasp and manipulate objects, and pursuit skills (reaching, pointing, tracking, etc.) were recorded by two research assistants. Testing periods varied in length from 3 to 6 minutes. Frequency measures on these variables were recorded throughout each of the six different phases of the study.

## Description of Phases

### Baseline (A<sub>1</sub>)

No treatment was conducted during this phase. This condition lasted 3 days. For a period of 4 minutes each session, the subject was presented a variety of objects suitable for infant stimulation and play/exploration. Data were collected on the dependent variables using frequency measures before manipulation of the independent variables. The same procedures for data collection were employed throughout all six phases of this experimental study. During the two-week summer vacation period following the B<sub>2</sub> FR-1 treatment phase, Lori received no therapy. The length of each phase was varied depending on the consequence of each treatment procedure. Phases during which outcomes were perceived as less than desirable were terminated no later than the fourth day. On the other hand, phases during which more desirable outcomes were observed were sustained for a longer period of time in order to reinforce the exercise of the target skills (Wishon et al., 1981; Wishon & Eller, 1986; Wishon & Huang, in press).

### Teacher Prime and Smiles (B<sub>1</sub>)

The therapist primed the subject's interaction with play materials and provided social reinforcement (smiles) contingent upon the subject's interacting with the materials, smiling and vocalizing. Priming consisted of presenting play and exemplary materials to the subject, placing the subject's hands on the materials, and using the materials to stimulate the subject tactically, visually and auditorily. Lasting 4 days, priming also constituted using verbal questions and declarations to encourage the subject's interaction with the materials.

### Teacher Prime and Verbal Praise

#### ◎FR-1 (B<sub>2</sub>)

A specially designed support seat with desk top was introduced for the subject's use at the beginning of this phase. Teacher-initiated priming continued as in the previous phase. In addition, the subject's performance of desired behaviors prompted verbal praise from the therapist at a fixed rate-1 schedule of reinforcement. This phase lasted 10 days.

Extinction (A<sub>2</sub>)

Date were collected on the subject's performance of desired behaviors in the absence of experimenter manipulations. This phase was functionally equivalent to Baseline and lasted 4 days.

Teacher Prime, Verbal Praise, and Hugs ©FR-2 (B<sub>3</sub>)

During this phase, teacher-initiated priming continued as in phases B<sub>1</sub> and B<sub>2</sub>. In addition, reinforcement with verbal praise and hugs at a fixed rate-2 schedule was delivered contingent upon the subject's performance of desired behaviors (smiling, vocalizing, pursuing and interacting with materials). This phase lasted 5 days.

Teacher Prime, Verbal Praise, and Hugs ©VR-3(B<sub>4</sub>)

Lasting 9 days, teacher-initiated priming continued during this phase. Reinforcement of desired behaviors with verbal praise and hugs also continued as in the previous phase, except that the reinforcement schedule was changed from a fixed rate-2 to a variable rate-3.

A third extinction phase (A<sub>3</sub>) was not possible because of severe illness suffered by the subject. The study was terminated 85 calendar days after it began.

Results

Figure 1 illustrates the frequencies of the subject's vocalizations. During Baseline, frequency of vocalizations did not exceed .25 behaviors per minute (BPM), and on all but one occasion was below record floor signifying that the behavior did not occur. Noticeable increases in frequency of vocalizations were demonstrated during each of the subsequent treatment phases, as a range from .25 BPM during B<sub>1</sub> to a high of 10.0 BPM in the B<sub>4</sub> phase, was recorded. Mean number of vocalizations (total number of behaviors divided by number of treatment days) manifested an acceleration profile in all of the treatment phases with a range from 6.5 in B<sub>1</sub> to 64.667 in B<sub>4</sub> (see figure 2).

Frequency of pursuit skills can be seen in Figure 3. Frequencies of this behavior remained below or at the record floor signifying that only one

behavior occurred during that observational period during Baseline. Beginning with the first treatment phase during which the frequency of pursuit skills ranged from 1.25 to 3.25 BPM, the data show an acceleration trend across treatment phases. As shown in Figure 4, the mean number of times the subject demonstrated pursuit events increased steadily across early treatment phases reaching a high of 37.1 during B<sub>2</sub>. After dropping off during the extinction phase, the accelerative posture was resumed as mean figures for pursuit skills ranged from 35.6 during B<sub>3</sub> to 38.0 during B<sub>4</sub>.

The frequency of smiling is illustrated in Figure 5. Frequency of smiling behavior was somewhat variable throughout the first five phases of the study as levels of this behavior ranged from below the record floor to 4.50 BPM. Less variance can be observed during the final treatment phase as frequency levels reached a high of 6.167 BPM. Data in Figure 6 reflecting steady increases in mean observations of smiling during treatment phases ranged from 5.25 in B<sub>1</sub> to 24.22 during B<sub>4</sub>.

Figure 7 illustrates the frequencies of the subject's grasping and manipulation of objects. Throughout Baseline and the first treatment phase, frequency points remained below the record floor (the behavior did not occur). Noticeable increases in frequency of grasping and manipulating objects were observed during each of the subsequent treatment phases, as a range from .333 BPM (record floor) in B<sub>2</sub> to a high of 6.833 BPM in B<sub>4</sub>.

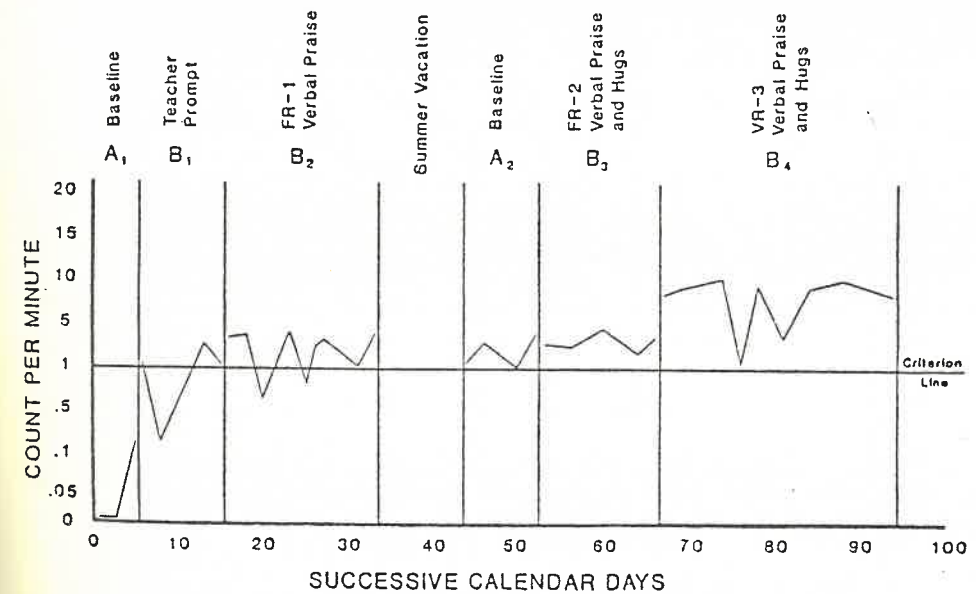


Figure 1. Impact of Play Intervention on Frequency of Vocalization

was recorded. Treatment effects as reflected in mean number of grasping and manipulating behaviors during the last three treatment phases revealed steadily increasing levels ranging from 10.8 (B<sub>2</sub>) to 19.67 (B<sub>4</sub>) (See Figure) 8.

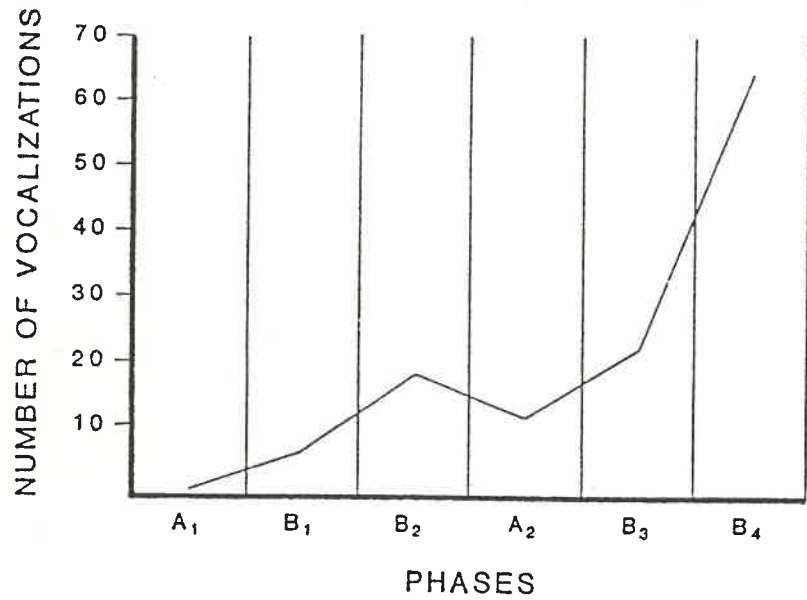


Figure 2. Mean Number of Vocalizations Per Phase

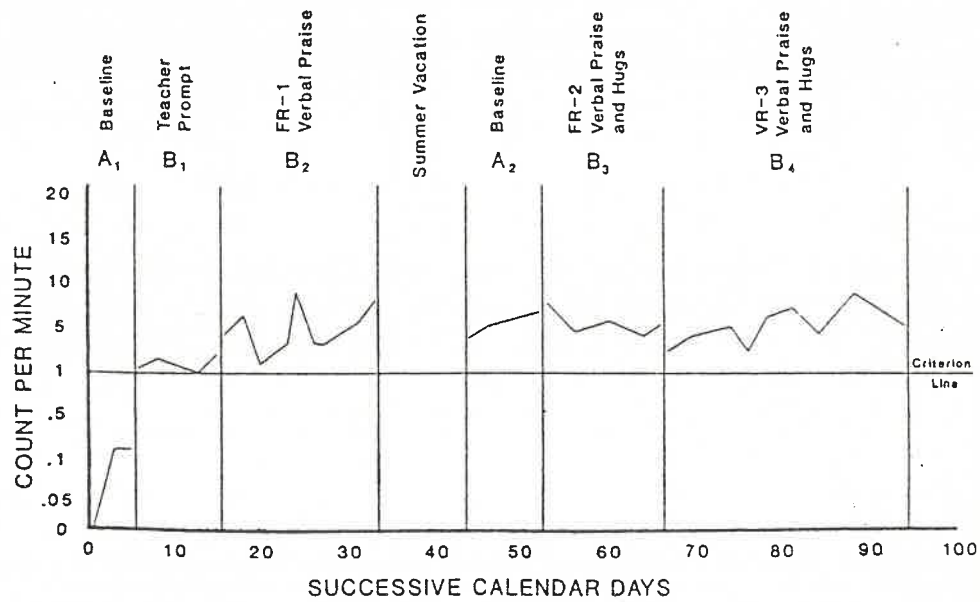


Figure 3. Mean Number of Pursuit Skills Per Phase

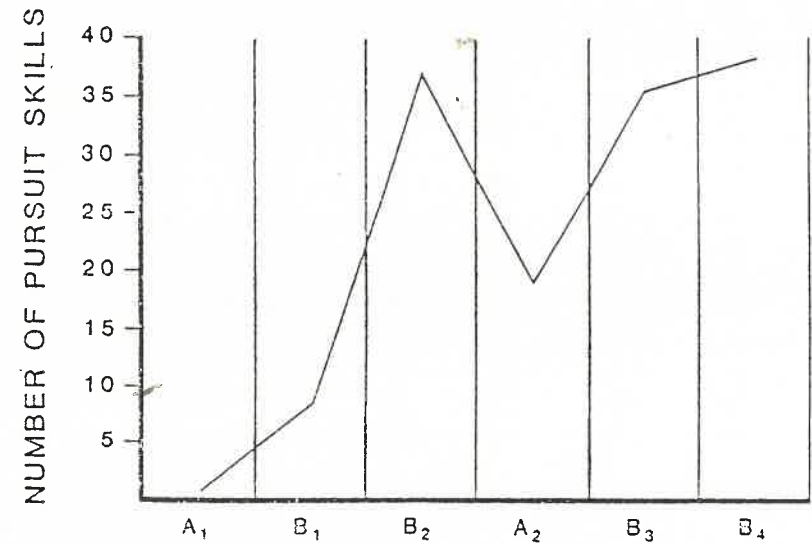


Figure 4. Impact of Play Intervention on Frequency of Pursuit Skills

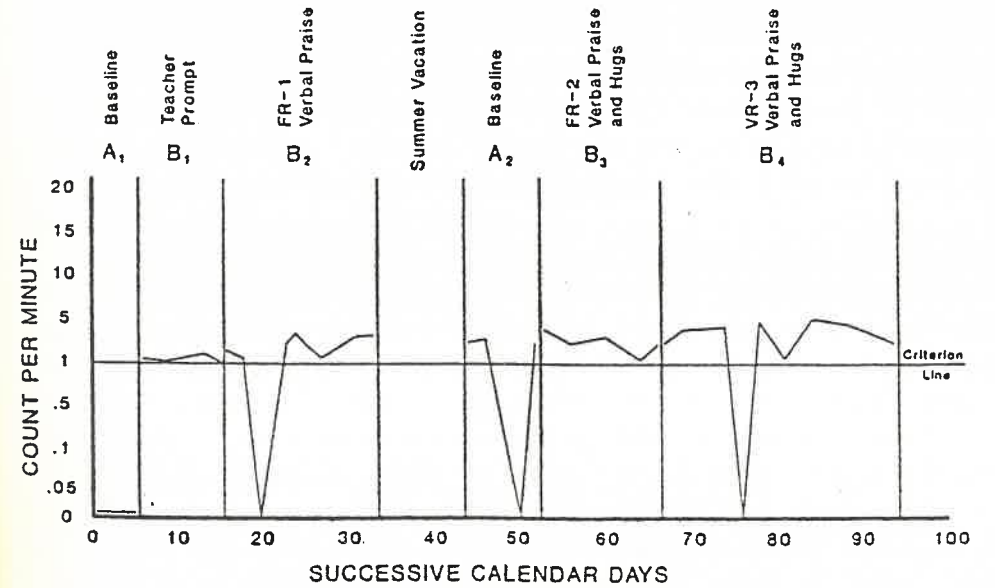


Figure 5. Impact of Play Intervention on Frequency of Smiles

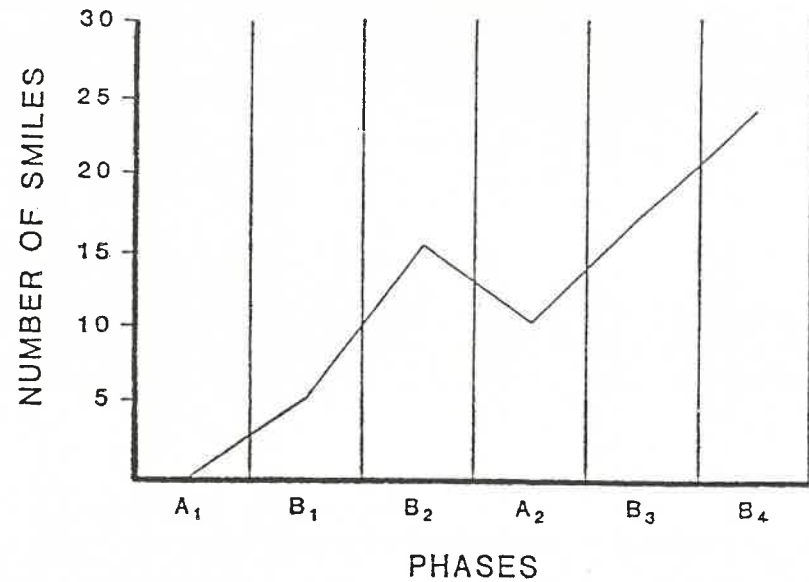


Figure 6. Mean Number of Smiles Per Phase

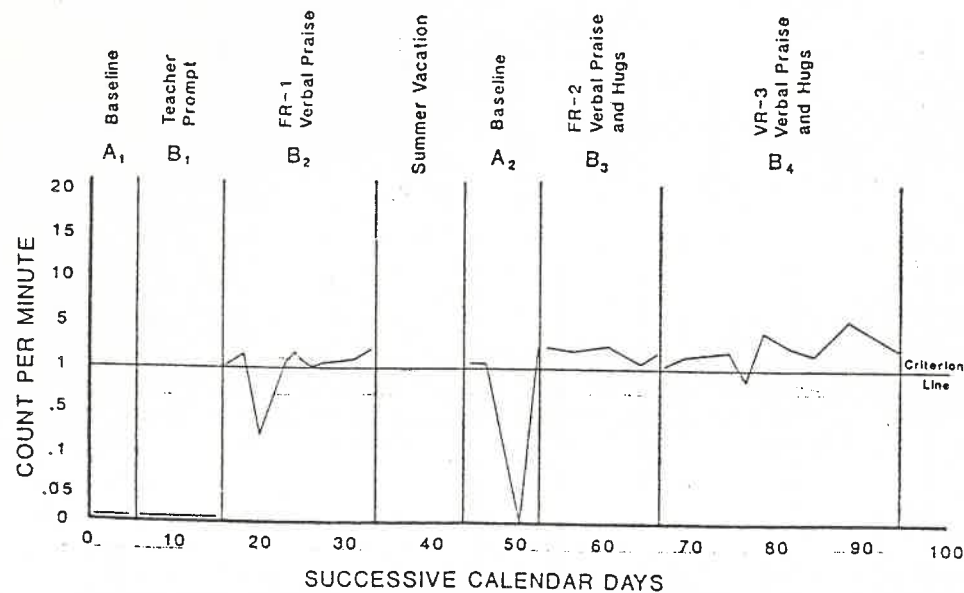


Figure 7. Impact of Play Intervention on Frequency of Object Manipulation

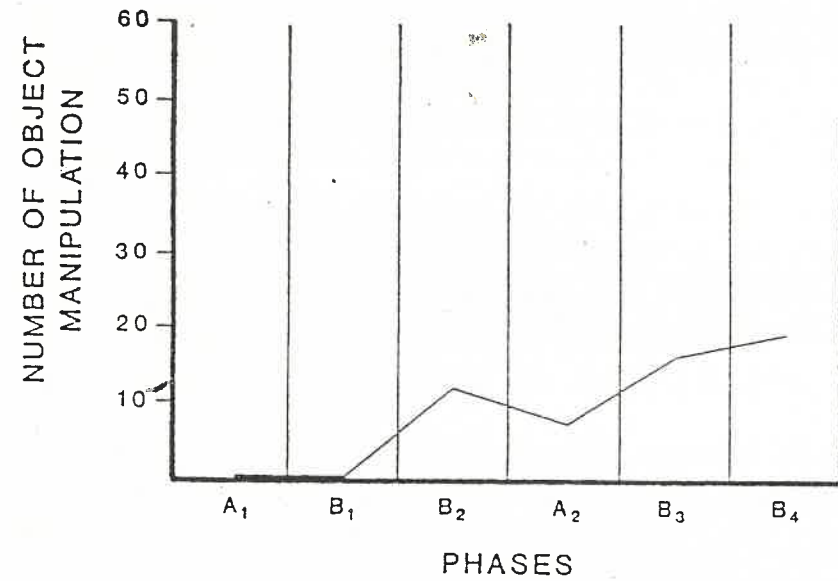


Figure 8. Mean Number of Object Manipulation Per Phase

### Discussion

The treatment-related data demonstrated the efficacy of teacher priming and utilization of play materials in increasing desirable social and pre-functional skills of a mentally and physically handicapped 2-year-old female. Baseline data indicated that prior to treatment, the subject did not smile or grasp and manipulate objects. Only seldom did she vocalize or pursue objects. Substantial improvements resulting from each treatment phase of the experiment can be seen in the charts.

Application of treatment procedures was pragmatic, inexpensive, and transferable to any home or preschool situation. Social reinforcement consisting of verbal praise, smiles and hugs, and priming were techniques that can be learned and used by any teacher or caregiver. Treatment procedures were also similar to naturally occurring behavioral consequences.

Although frequency levels of behaviors dropped from treatment levels during the reversal phase implemented following B<sub>2</sub>, they maintained at a consistently higher level than during Baseline. This finding accents the reliability of treatment effects and the power of intervention processes to manifest themselves under non-contingent circumstances. The results suggest that the subject was being reinforced vicariously for some behaviors as a direct consequence of her involvement in the planned experiences.

In this study, the positive impact of encouraging participation in play experiences through teacher priming and social manipulation of objects, attending visually to the environment, and imitating actions and vocalizations was demonstrated. Findings from this study affirm the importance of including play combined with contingency management techniques as an intervention strategy for developing skills in handicapped preschoolers

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## 遊戲導向介入策略對多重障礙 幼童的技能學習的研究

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本研究旨在研討以遊戲導向介入的策略對多重障礙幼童的預備技能學習的影響。實驗對象是一位兩歲有腦麻痺、重度智障及感官動作殘障的女孩，她不會走動也不會說話。在經過17個月的特殊輔導教學（包括在家及在校）後，這位小女孩的學習技能（發聲、微笑、追尋物件及使用東西）之後沒有任何顯著進步。經過會商之後，決定使用以遊戲為導向的學習策略。研究計畫是採單一對象及修改型的 ABA（基線期，處理期，基線期）實驗設計。採用了頻率評量，對象內在變數的設計，行為原則和認知界場原理的處理實驗。實驗設備包括多種玩具，沙箱、和多面鏡子。在案主做好預備工作之後，即有30分鐘的處理過程（通常是在下午3點鐘進行，每週二到三次）。在6個不同的實驗時期內，每次處理過程結束後，案主的發聲、微笑、追尋物件，和使用東西等的學習技能均被系統地記錄下來。實驗的結果證明以遊戲導向的介入，對案主的學習成就有正面的影響。實驗結果也確定以遊戲為導向的介入對於學前殘障幼童的發展和學習技能有很重要的關係。老師可以將這種簡單的實驗設計運用在自己的教室內。

## 「基礎數學編序教材」在啟智班 應用成效之研究\*

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「基礎數學編序教材」係根據美國 Cawley 等 (1976) 編訂之 Project Math 為藍本增刪修訂而成，教材及評量表內容包括幾何、集合、範圍、量與實測、數、分數等六大領域，並依年齡劃分為四個層次，是一套融合數學概念、運算技巧與社會成長三大目標的完整教材。本研究的主要目的在探討初步編訂完成的「基礎數學編序教材」對智能不足學生數學科學習成效的影響及其適用性。研究對象為 335 名國中小啟智班學生，其中 163 名為實驗組，另 172 名為控制組，以數學能力診斷測驗及基礎數學編序教材概念評量表為研究工具，所得資料經：考驗、共變數分析、多變項變異數分析等統計處理，結果發現：(1) 國中小啟智班學生應用「基礎數學編序教材」後，在概念及整體數學能力與成就上均顯著超過未使用本教材進行教學之國中小啟智班學生；(2) 使用本套教材對國中小啟智班學生運算能力的發展並未造成顯著影響；(3) 無論國中小或輕中度智能不足者之數學能力均有超越其智齡的表現；(4) 隨年級的逐漸增長，數學能力有愈趨進步之趨勢；(5) 智力愈高，進步亦愈顯著；(6) 本套教材對不同年段、不同智力程度的啟智班學生均適用，唯使用於輕度智能不足者及中度智能不足者成效可能更大；(7) 本套教材依年齡分四個層次的設計頗為符合國中小啟智班教學的實際需要。

### 緒論

數學教學的重要性與價值常被一般人低估，Bartel (1982) 即曾指出有關數學學習方面的研究比語文及其他學科方面受到的重視少。唯事實上在日常生活中許多獨立生活所需之基本技能，如預算的編擬、採購、烹飪、簡易家庭修護工作，以及準時上下班、薪資計算等相關職業技巧均需依賴所習得之數學知識與技能。Silbert (1981) 即指出數學成就對學生未來學業及職業的發展皆有相當之重要性，Ingalls (1978) 亦認為數學基本概念的理解是達成獨立生活目標的重要因素。尤其對智能不足者而言，教育的終極目標即在培養學生的職業技能與獨立自主能力 (Radabaugh, 1982)，Kolstoe (1976) 表示除非一些基本職業與日常生活的獨立自主技能都已學會，否則為智能不足者修訂的其他課程都是空談；McGinty 和 Meyerson (1980) 的研究結果中指出解決數學應用問題的方式與解決日常生活上問題的方式有很大的相關；Krutetskii (1976) 發現由解決數學問題的過

\* 本研究係「基礎數學編序教材」試用實驗研究專案之報告，該計畫承教育部、臺北市教育局資助經費，主持人為師大特教中心吳主任武典，參與編輯人員尚有岡仁三天苗小姐（目前在美進修）及林美女、陳淑萍、陳文技、林煌輝、單無雙、葉修、鄭雪珠、楊美玉、陳佩珍等教師，由筆者負責執行。