VERBAL SELF-REGULATION OF BEHAVIOR BY CHILDREN WITH INTERNAL AND EXTERNAL LOCUS OF CONTROL

by

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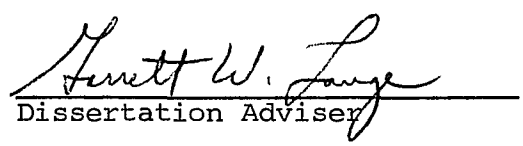

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There was reason to suspect that individual differences in a child's tendency to employ symbolic mediation are predictable on the basis of his/her locus of control status. That is, children who possessed an internal locus of control are those most likely to initiate symbolic mediators for the purpose of controlling their overt behavior. Those individuals who are not certain of their ability to control their overt behavior would seem to be less likely to employ verbal self-instructions even if they had the capability to do so. The reasoning here was that since internal locus of control individuals believe that they have control over their overt behavior, they would exert this control whenever possible via verbal means. On the other hand, since external locus of control individuals believe that they are controlled by factors beyond their control, they would view any self-verbalization as useless in controlling their overt behavior. Hence, the principal question dealt with in this study was whether external locus of control children are those most delayed in their production of symbolic mediation in relation to peers of the same age or grade level with an internal locus of control status.

A second major problem of this study concerned the degree to which individual children show consistent tendencies to produce verbal mediating behaviors over a variety

of different types of cognitive task settings. Previous investigations have focused upon age level analyses of verbal mediation and have neglected analysis of intra-individual consistency.

The study consisted of 120 white children--40 children from each of three grade levels: nursery school, first grade, and third grade. The children were of average intellectual ability and represented families of middle class socio-economic status. At each grade level, half of the children were pre-categorized to have an internal locus of control and half to have an external locus of control. Of those individuals with internal and external locus of control, half were males and half were females.

The design consisted of a split-plot ANOVA model with repeated measures on one factor. The factors included three grade levels (nursery school, first grade, third grade), a sex factor (males, females), a locus of control factor (internal, external), and three instructional conditions (no verbalization, forced verbalization, free condition) intended to examine the effects of children's verbalization behavior. Each subject participated in three different verbal control tasks: a push-button task, a pounding-board task, and a serial-recall task.

The results indicated that performance increased as grade level increased. Furthermore, forced verbalization aided in performance of the sequential tasks (i.e., pounding-board and serial-recall) but hindered the performance on the

push-button task which required rapid repetition of a pushing motion. The results also indicated that the progression from overt to covert self-verbalizations was not only related to the child's chronological age, but was also related to the child's proficiency or competence at a particular task. There was no significant evidence that internals spontaneously verbalized more than externals or performed better than externals on the verbal control tasks. However, there was a trend toward internals performing better than externals on sequential tasks, but not on the speed task. There was little evidence of consistency in spontaneous verbalization performance across the three verbal control tasks. Most of the significant correlations accounted for relatively little of the variance in spontaneous verbalizations. One significant correlation was, however, at the .64 level. More research in the area is needed before any generalizations can be made.

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CHAPTER I

INTRODUCTION

The development of the functional interaction between verbal self-regulation and overt behavior has received a great deal of scrutiny in recent years (Kohlberg, Yaeger, & Hjertholm, 1968; Luria, 1961; Piaget, 1926, 1960; Reese, 1962; Wozniak, 1972). There is now sufficient evidence of a developmental transition between five and eight years of age. That is, prior to five, the child appears to lack the ability to regulate his overt behavior through symbolic or verbal means. On a bulb pressing task, for example, the mere presence of a vocal pulse, such as a nonsense syllable from a child under 4½ years of age, will usually cause a manual pulse even if the child knows the manual pulse should be inhibited (Sokolov, 1972; Zivin, 1973, 1974). There is also evidence of wide individual differences in the age at which children make this shift. One explanation for the finding of individual differences in the time at which children acquire the ability to control their overt behavior through verbal means focuses on whether or not the child has an external or an internal locus of control. The reasoning here is that since children appear to become more internally controlled with age (Nowicki & Strickland, 1973) and that

internal locus of control individuals have greater verbal fluency than externals (Brecher & Denmard, 1969; Penk, 1969), the utilization of verbal mediators may be related to the time at which a child begins to develop an internal locus of control. In other words, since the internal locus of control individual believes that he has control over his overt behavior, he would exert this control wherever possible via verbal means. However, after a comprehensive perusal of the literature (Joe, 1971; Lefcourt, 1966, 1971; MacDonald, 1972, 1973; Throop & MacDonald, 1971; Rotter, 1966), the researcher found no evidence relating a child's locus of control status to his/her use of verbalizations in guiding performance in different cognitive tasks.

The chief purpose of this investigation was to examine the ontogenetic development of children's verbal self-regulation of overt behavior and its present relationship to the development of an internal locus of control. In the present study, the relationship between locus of control and verbal control of overt behavior was examined with reference to several different current explanations of the child's use, or failure of use, of verbal mediators in performance of certain cognitive tasks. Hence, the principal question dealt with in this study was the degree to which the construct of locus of control could predict individual differences in the age or grade level at which children

begin to employ verbal mediating behaviors to facilitate their overt behavior.

Nature of the Study

The developing child has been described by many observers as passing through various stages in which he undergoes changes in his behavior patterns. Perhaps the most obvious period of change in cognitive behavior is that which occurs between five and eight years of age. Prior to this period, there is ample evidence that the child lacks the ability to regulate (mediate) his overt behavior through symbolic or verbal means (See White, 1965, for a review of this literature). At the close of this period, many children show evidence of controlling their overt behavior via verbal means. For these children, language usage and self-instructional guidance serve as vehicles in the self-regulation of overt behavior.

From a more analytical perspective, most of the learning that takes place during the early years (i.e., from birth to five years of age) is in direct response to external stimuli and occurs in rote manner. After several years of formal schooling (i.e., by seven or eight years of age) many children are able to control their overt behavior on the basis of internal stimuli (i.e., verbal or symbolic mediators). Pavlov has described this process as the second signalling system.

Although Piaget does not focus directly upon verbal control principles, his characterization of the shift from preoperational thought to concrete operations, occurring between two and seven years of age, is consistent with recent research on the cognitive shift phenomena (Flavell, 1963; Piaget, 1960).

Evidence for the developmental transition in cognition during the five to eight year shift period has accumulated through the work of Russian scholars (Luria, 1960, 1961; Vygotsky, 1962), as well as from a host of American child development researchers (Reese, 1962; Rondel, 1974; White, 1965; Wozniak, 1972).

Two distinct developmental hypotheses have been advanced to explain the nature of the five to eight year shift. The first, referred to as the mediational deficiency hypothesis (Reese, 1962), suggests that there is a stage in ontogenetic development during which the child is unable to regulate (mediate) his overt behavior verbally. Here the young child is incapable of effectively utilizing symbolic or verbal labels in the regulation of his overt task performance even when such mediators have been produced. This occurs in spite of the fact that the young child understands and uses the correct verbal responses for labeling purposes.

The second, referred to as the production deficiency hypothesis (Flavell, Beach, & Chinsky, 1966; Keeney, Cannizzo, & Flavell, 1967; Maccoby, 1964), suggests that the

young child simply fails to use the appropriate verbal or symbolic mediators which are presumably available to him. It is, therefore, the lack of production which accounts for the non-mediated character of his overt behavior. In other words, the young child is unaware that he can change his cognitive style and that behavior control rests within himself. The young child fails to produce those verbalizations or instructions which, if produced at appropriate times, would serve as mediators to enhance his overt task behavior. In this case, the difficulty does not lie in his lack of ability to use the words which he produces, but rather in his lack of ability to produce or emit these words on appropriate occasions.

While many researchers have been interested in the transition during the five to eight year shift period, few have focused their attention on the individual differences in the time at which children complete the cognitive shift transition. In subsequent sections of this paper the scrutiny of previously obtained data will show wide individual differences in the cognitive shift transition. As a result, the investigation undertaken here considered the above mentioned deficiency hypotheses in helping to explain differences in individual use of self-verbalization and how it relates to the construct of locus of control.

Definitions

It was reasoned by this researcher that a child's locus of control status can account for individual differences in children's cognitive transitional behavior. The locus of control construct refers to the degree to which an individual believes that he has control over the reinforcements that occur relative to his behavior. The individual who tends to believe that he controls his own destiny, and believes that he is an effective agent in determining the occurrence of reinforcements, is described as having an internal locus of control. In other words, internal control refers to the perception of positive and/or negative events as being a consequence of one's own actions, and thereby under one's own behavioral control (Liverant, Rotter, & Seeman, 1962).

The individual who tends to see forces beyond his control as being essential factors in determining the occurrence of reinforcement such as fate or change is described as having an external locus of control. In other words, external control refers to the perception of positive and/or negative events as being unrelated to one's own behavior in certain situations and, therefore, beyond personal control. The external locus of control individual believes that he is controlled by outside factors over which he has no control.

Statement of the Problem

There is some reason to suspect that individual differences in a child's tendency to employ symbolic mediation may be predictable on the basis of his/her locus of control status. That is, children who possess an internal locus of control (i.e., believing that they can bring about a change in the effectiveness of their performance) are those most likely to initiate symbolic mediators for the purpose of controlling their overt behavior. Those individuals who are not certain of their ability to control their environments would seem to be less likely to employ verbal self-instructions even if they had the capability to do so. The reasoning here is that since internal locus of control individuals believe that they have control over their overt behavior, they would exert this control whenever possible via verbal means. On the other hand, since external locus of control individuals believe they are controlled by outside factors beyond their control, they would view any self-verbalization as useless in controlling their overt behavior. Hence, the principal question to be dealt with in this study was whether or not external locus of control children were those most delayed in their production of symbolic mediation in relation to peers of the same age or grade level with an internal locus of control status.

A second major purpose of this study was concerned with the degree to which individual children show consistent

tendencies to produce verbal mediating behaviors over a variety of different types of cognitive task settings. Without exception, previous investigations have limited their focus to age level analyses of verbal mediation and have neglected analysis of intra-age group individual consistency.

Assumptions

The major assumption was that there is a shift period between ages 5 and 8 during which the child goes through different stages of development in becoming independent in his overt behavior. That is, prior to age five, the child appears to lack the ability or disposition to regulate his overt behavior through symbolic or verbal means. There appears to be sufficient evidence in the literature that this transitional period does exist (Lester, 1974; White, 1965).

Secondly, the researcher followed the assumption that children during this period appear to become more internally controlled with age (Nowicki & Strickland, 1973), and that internally controlled children have a greater verbal fluency than externally controlled children (Brecher & Denmark, 1969; Penk, 1969).

The last assumption was the view by Luria (Beiswenger, 1968) that speech is the mechanism by which the ability to

prefigure and control one's future overt behavior is obtained, thereby, achieving voluntary behavior.

Hypotheses

The present study involved a developmental analysis and comparison of the effectiveness of verbal mediators on the performance of certain tasks by children of different grade levels with different locus of control. The following hypotheses were tested in order to investigate the problems cited above, concerning locus of control and the utilization of verbal mediators by children between the ages of five and eight, as well as the consistency in the amount of spontaneous verbalization across different overt tasks.

Age

Hypothesis (a_1): The performance on each of the verbal control tasks increases with the children's ages or grade level.

Locus of Control

Hypothesis (b_1): Children with internal locus of control show higher levels of overt task performance than same age children with external locus of control.

Hypothesis (b_2): Under forced verbalization, the performance on different verbal control tasks by external locus of control children is equivalent to the performance of same age internal locus of control children.

Hypothesis (b_3): The more internal a child's locus of control within any age or grade level, the greater the spontaneous overt task performance.

Verbalization

Hypothesis (c_1): Children with an internal locus of control show a higher degree of spontaneous verbalizations than same age or grade level children with external locus of control.

Hypothesis (c_3): Both internal and external locus of control children increase their overt task performance by the degree to which they employ verbal mediating behaviors (i.e., spontaneous verbalizations).

Hypothesis (c_3): The more internal a child's locus of control, the more effective is his utilization of verbal mediators on different verbal control tasks.

Consistency

Hypothesis (d_1): The use or absence of spontaneous verbal mediating behaviors by children is consistent across different verbal control tasks.

Limitations

One significant limitation of this research was related to the sampling. Only white children between the ages of five and eight were selected as participants. These children were from middle-class socioeconomic families.

Initial contact with these children was made on the basis of availability in the Greensboro and Reidsville areas of North Carolina. Generalizations from this research to larger populations was limited, due to the fact that a repeated measures design was used. Any generalizations pertained to white children of middle-class socioeconomic status.

CHAPTER II

RELATED LITERATURE

Since ancient times, man's acquisition of speech and language (i.e., one's ability to communicate verbally with himself and his environment) has been considered to be one of the most significant characteristics of humans. Presently, the examination of how speech is used for the self-regulation of overt behavior is of major interest to many researchers throughout the world. This linguistic control behavior appears to undergo significant developmental changes during the years from five to eight (Lester, 1974; White, 1965). The present investigation focused on the degree to which locus of control is related to this transitional period and the development of verbal regulating mediators on overt behavior. As a result, the following review of literature will consider only those studies which are directly related to this transitional period and to the use of verbalization in the self-regulation of overt behavior.

To facilitate clearer understanding, the literature reviewed is sub-divided into three categories according to the major research related to this topic: (a) evidence for the five to eight year cognitive shift; (b) transitional

and developmental stages of children's speech; and (c) previous research related to the locus of control construct.

Evidence for the Five to Eight Year Cognitive Shift

Many of the explanations of the five to eight year shift in young children's learning, thinking, and memory behavior stress linguistic activity as the principal determinant (Lester, 1974; White, 1965). There appears, for example, to be a shift from a narrow to a broad transposition (Alberts & Ehrenfreund, 1951; Kuenne, 1946; Reese, 1962; White, 1963).

Transposition can best be understood if one imagines a series of six cubes numbered sequentially from 1 to 6 with cube number 1 being the smallest and cube number 2 being double the volume of cube number 1, etc. If a child is repeatedly presented with cubes 1 and 2, and trained always to select cube number 2, the question arises as to whether or not the child has learned the solution in absolute terms (always selecting cube 2), or in relative terms (always selecting the larger one). To check this, one presents the child with cubes 2 and 3 (a "near" test). If he chooses 2, he is said to have made an absolute choice. If he chooses 3, he is said to have transposed or to have made a relative choice. If the child chooses 4, or a far test (using cubes 4 and 5), he has made an absolute choice because it is closer to the absolute size of the correct training stimuli.

If he chooses 5, the child would have made a relative choice (White, 1963). Kuenne (1946) demonstrated transposition by showing that a young child is able to choose the larger of two stimuli on a "near" test, but not on a "far" test. The older child will be able to choose the larger stimuli on both the "near" and "far" tests.

Reese (1962) showed transposition by teaching nursery school and kindergarten children to choose the middle-sized one of three blocks. He found that the older subjects could transpose on a "far" test (i.e., respond in terms of the relation of stimulus values), while the younger subjects did not. The younger children chose the block whose absolute size corresponded more closely to that of the correct training stimuli.

According to Kendler and Kendler (1959, 1962), conceptual thought is attained as words come to be used covertly as mediating responses to stimuli, such that the child can use words to select new responses and, thereby, facilitate performance in tasks where problem-solving is involved. For example, the change in ability to perform reversal as compared to non-reversal shifts emerges during this five to eight shift (Kendler, 1963). Flavell (1966); however, stated:

> While the five-year-old has learned to translate linguistic competence into verbal utterances in a number of contexts where an adult would do the same--in communicative ones, notably--he may well not have learned to do this in all appropriate

> contexts. Thus, the genesis of language in its broadest sense may partly entail a progressive "linguification" of more and more situations. Initially, only a limited number of behavioral contexts will call forth speech activity, but this number gradually increases as development proceeds (p. 297).

Kuenne (1946), as a result of her research on developmental changes in transposition behavior, stated the following:

> . . . there are at least two developmental stages so far as the relation of verbal responses to overt choice behavior is concerned. In the first, the child is able to make differential verbal responses to appropriate aspects of the situation, but this verbalization does not influence his overt choice behavior. Later, such verbalizations gain control and dominate choice behavior (p. 488).

Similarly, Kendler, Kendler, and Wells (1960) proposed that:

> . . . there is a stage in human development in which verbal responses, though available, do not readily mediate between stimuli and overt responses (p. 87).

Vygotsky (1962), however, referred to the union of thought and language as one based on Pavlov's (1927) notion that language represents the formation of a second signalling system which is an elaboration of the first signalling system or classical conditioning. Pavlov (1941) stated:

> If our sensations and concepts relating to the surrounding world are for us the primary signals of reality, the concrete signals--then the speech, chiefly the kinesthetic stimulations flowing into the cortex from the speech organs, are the secondary signals, the signals of signals. They represent in themselves abstractions of reality and permit of generalizations, which indeed makes up our special human mentality, creating first a general human empiricism, finally science--the weapons of the higher orientation of the human in the surrounding milieu and in himself (p. 93).

Vygotsky (1962) viewed the period from three to seven years of age as a period when a portion of speech becomes the nucleus of abstract and symbolic thought. Toward the kindergarten years, speech becomes an instrument to regulate the self, as well as the environment. Vygotsky suggested that during this period, speech becomes internalized and an instrument of planning and representation. He viewed the internalization of verbal commands as a critical step in the child's development of voluntary control of one's overt behavior.

Luria (1960b) stated:

> . . . it is interesting that we find a decisive turning point in all our experiments between the ages of four and five years. Something very important happens in the human being in this period. It is the period when speech is interiorized, when voluntary movements are developed and performed, and I think there must be some very intimate relation to maturation (p. 418).

Quite early, speech can initiate behavior in the child, but it usually cannot regulate it (i.e., stop it or change it, when it is ongoing). At the age of 4½ years, it is possible to arrange matters so that speech can regulate behavior, but speech serves as only one of a class of exteroceptive stimuli which have this regulating power. The important fact is that a noise has been made, rather than what is said. When the semantic content of utterances begins to have regulatory influence, speech simultaneously begins the transitional shift from external to internal covert control.

Transitional and Developmental Stages of Children's Speech

The development of a child's speech begins very early in life. In fact, for a long time it had been thought that sounds emitted during the so called phonetic period (6-12 mos.) was merely phonetic play. It appears now that certain groups of sounds, phonologic oppositions, and the rhythm of their emission already have a communicative function that is structured and universal. Richs (1972) found four types of cries (Gregoire, 1947; Sinclair, 1972) between 8-11 months (distress, pleasant surprise, want, and contentment).

Vygotsky (1962) described the child's speech development in four stages. First, there is the "primitive or natural stage." Here the child possesses preintellectual speech and preverbal thought. Second, there is the "naive psychology" stage. Here the child demonstrates the first signs of human intelligence such as "the correct use of grammatical forms and structures for which they stand" (1962, p. 46). Third is the "egocentric speech" stage. This stage is characterized by external signs, external operations that may be used to aid in the solution of internal problems. The fourth stage is the "ingrowth stage" during which the child develops internalized speech.

Stage I (1½-3 years of age)

During Stage I, the child's speech is insufficiently developed to serve as a regulator of his overt behavior. He

may be able to speak, pronounce words, and understand their meanings, but he is unable to use speech to direct his own overt behavior. The speech of others, however, can direct and control this behavior to some extent (Joynt & Cambourne, 1968; Meichenbaum & Goodman, 1969). Luria stated that at this period, it is possible to initiate, but not to inhibit action of the very young child (under two years of age) by means of verbal directions (Luria, 1960, 1961; Luria & Yudovich, 1959). Furthermore, action cannot be controlled by meaning if there is a conflict between meaning and sound (Brown, 1965; Conrad, 1971; Luria, 1961) or between meaning and rhythm (Luria, 1961; Meacham, Harris, & Blaschko, 1973).

Tikhomirov (1958) stated the following:

> In the first stage, where we basically find preschool children and only occasionally three-year-olds, there simply exists no regulatory influence of the connections which stand behind the word. The impulsive influence of the word stands in the front rank. Regulation of positive motor reactions by means of a speech impulse is hindered by the difficulty in creating a system of speech-motor reactions (Wilder, 1973, p. 6).

While the directive function of straightforward, "deictic" speech is formed around the age of two, the kind of speech that involves more complicated preliminary connections (connections which precede the action and organize it in advance) will acquire a regulative function considerably later. Its development occupies the entire third and part of the fourth year of life (Luria, 1959).

During the period of nine months to two years of age, a command directed to the child instigates direct simple behavior (i.e., behavior that involves a direct simple action, requiring neither preliminary analysis nor sequential organization such as "give me your hands" or "clap hands"). If the commands given to a child are more complex, his response will be to a direct salient element, probably that one embodied in the most vivid content words. Not only is the child in the first stage unable to respond adequately to psychologically complex commands, but even direct simple commands are subject to three neurologically based constraints:

First, the ability to respond to a given command may be over-ridden by the influence of novelty in the environment. Luria attributed this to the fact that the child's strong orienting responses, still unconditional, are not yet under conscious (verbal) control (Luria, 1959a). This neurological constraint is illustrated by putting two toys before the child, a brightly colored cat placed closer to the child (one of his favorite toys) and a toy fish farther away. The child is given the command to bring the fish to the experimenter. The child of thirteen or fourteen months orients initially toward the fish as a result of the command, but then reaches out for the cat, bringing it instead to the experimenter. Here the directive function of the word was maintained only up to the moment when it came into conflict

with the conditions of the external situation. While the word easily directs behavior in a situation that lacks conflict, it loses its directive role if the immediate orientational reaction is evoked by a more closely located, brighter, or more interesting object. It is only at the age of sixteen months to eighteen months that this phenomenon disappears.

Secondly, commands which change a previously established motor pattern frequently do not control behavior because there is a strong tendency for the previously established motor pattern to perseverate. For example, a child has set before him two toys, a fish and a horse. He is asked to give the fish to the experimenter a number of times and then asked to give him the horse; however, he will continue to give the fish showing the perseveration of the motor sterotype (Luria, 1959a). Despite the fact that the meaning of this word is well known to the child, the inertia of the connections evoked by the first word is so great that in many cases the child again offers the experimenter the fish. The directive function of the changed verbal instructions is here vitiated by the inertia of the connection that has been established.

Third, the very young child, in certain experimental situations, does not seem to be able to retain a memory trace of the command for more than approximately ten seconds. If at the age of twenty to twenty-four months, a child is

told that "a coin is under the cup, find the coin," and then told "the coin is under the tumbler, find the coin," he will be able to perform correctly. If he is asked three times however, to find the coin under the cup and then is given the instruction "the coin is under the tumbler, find the coin," with a ten second delay in execution, the verbal instruction will lose its effectiveness (Luria, 1959a) and again the motor sterotype previously learned dominates his behavior (i.e., he looks for the coin under the cup).

Luria concludes that: (a) simple commands will easily control behavior in non-conflict situations, but the orienting response takes over when objects are present that are more interesting than those which are the object of the command; (b) motor learning, when it has preceded a verbal instruction, tends to override the effects of the instruction; and (c) the visual image to which the child's attention is directed verbally may override a motor sterotype toward the end of the first stage. If a delay, however, is interposed between the command and its performance, the memory trace fades and renders the command ineffective.

The child of $1\frac{1}{2}$-$2\frac{1}{2}$ years of age can also lose the directive function of a word whose meaning is well known. Researchers such as Ljamina, Poljakova, and Shchelovanov (Luria, 1960a) have found that if one asks the child to put rings on a stick, he can do this easily. If the child, nevertheless, has several times put on a ring and is holding

the next ring in his hands, the instruction "take off the ring" loses its directive meaning and begins to function non-specifically, merely accelerating the activity of putting the ring onto the stick (Luria, 1959). The directive role of the word at an early age is maintained only if the word does not conflict with the inert connections which arose at an earlier instruction or which began with the child's own activity.

Jakovleva (1959) showed that during the period from two to two and a half years of age, the child has difficulty coordinating his verbal commands with the signal and frequently begins to utter excessive, stereotyped commands. Even if the child could say "Press" or "now" when a signal appeared, his entire energy is soon diverted to the utterance of this word, and the motor reaction which is supposed to be associated with it becomes extinct. The child at this age cannot yet create a system of neural processes that includes both verbal and motor links.

Children under three years of age also show a conflict between the instructions given and the immediate perception. This is called exhopraxia. If a child is asked to raise a finger at the same time the experimenter raises his fist, the child will raise his fist (Luria, 1960). Subbolskii (1972) demonstrated this in another way. He had the child and the experimenter each with a toy rattle in one hand and a small furry dog in the other. If the experimenter

tells the child to raise the rattle and at the same time he (the experimenter) raises the small furry dog, the child will raise the small furry dog.

Stage II (3-4 years of age)

The child at this stage is able to respond adequately to commands of somewhat more complex psychological content. The verbal directive role is now played not by a separate word, but by a relation (Luria, 1959a). The child's speech acts impulsively rather than selectively. Speech does not only help initiate an act of motor behavior, but begins to inhibit behavior as well. Inhibition does not take place, however, if the impulsive and selective semantic content are not in the same direction. If the child is to say "don't push" to a stimuli, his speech will have an impulsive rather than an inhibiting action (i.e., the child will push despite his counter-manding verbalization) (Luria 1959a, 1959b, 1960, 1961).

Tikhomirov (1958) stated the following fact:

> In the second stage, with children of age 3-4 years, a clear regulation of motor reactions is formed with the aid of an auxiliary speech impulse. The word, which forms the signal meaning of the stimulus, acts not selectively but impulsively, and hence regulates the motor reactions only when the impulsive and selective influence are of the same sign. When they are of opposite sign, the impulsive influence of the word dominates, and for this reason adding the response "must not" to an inhibitory signal leads to an inhibition of a delayed motor reaction (Wilden, 1973, p. 6).

Luria's experimental program centers on the conditional sentence such as "When I say go, clap your hands." A slightly more complex one is "Every time I say go, clap your hands." This grammatical form, as compared with the simple direct imperative sentence, requires the imposition of a delay on the immediate execution of the command. It also requires a preliminary analysis by the child, the formation of a program of sequential sub-acts, and a readiness for a flexible rather than a sterotyped running off of the action. In other words, the child is able to master simple forms of conditional actions in response to a preliminary command, but not to more complex commands. Such an easy conditional command as "When the light flashes, press the bulb," at first does not precisely control the behavior of a 2½-3 year old. The child usually orients to the separate components of the command and may respond to one or the other. For example, he watches for the light flashes, but does not press the bulb, or he presses the bulb before the light flashes and continues to press it after the light stops flashing. He does not make a synthesis of the components of the action to form a pre-established system of connections (a program) which is then able to control his behavior to the conditional signal when it appears (Beiswenger, 1968; Luria, 1959; Wilder, 1969). In fact, Ferreiro (1971) and Clark (1970) indicated that the comprehension of a subordinate temporal clause of the "When you see the light, squeeze the

balloon" type cannot be properly understood before the age of six years of age.

Before the age of 3½, the child, despite his understanding of the conditional command (i.e., "Every time a light goes on, press the bulb") and his eagerness to execute it, the motor excitation of the pressing often continues during inter-stimulus intervals and the child is not able to inhibit them.

If the command to the 3½ year old is made slightly more complicated, verbal control is again lost. Thus, if the child is asked to press only to a red light and not to press to a blue light, he is unable to inhibit the tendency to press to the blue light (Luria, 1960a).

In other words, activation (Luria, 1959; Strommen, 1971) appears much earlier in development than does inhibition. Until about three, what can be called the coordination of a motor response and a visual stimulus is not yet possible. The infant, given an immediate orienting response to the word "when you see the light," squeezes the balloon in response to the word "squeeze the balloon" even though no light has yet appeared. This type of verbal instruction is a syntactically complex, conditional sentence. The directive role played here is not a separate word, but a relationship (Jakovleva, 1958; Luria, 1959; Tikhomirov, 1958). After a long period of training, it is said that this coordination is possible. In this case, however, the

constant tactile stimulation leads to a perseveration of the motor response. The suppression of this response perseveration can be achieved by procedures of non-verbal inhibition such as telling the child to remove his hand from the balloon in order to do something else or by teaching him that the motor response suppresses the visual stimulus and consequently becomes functionally useless. In other words, when the spoken instructions fail to mediate naturally, instructions can be continuously repeated in order to assume significance over the natural tendency to squeeze impulsively, or the child can receive continuous verbal reinforcement concerning the correctness of his response to each stimuli, or nonverbal reinforcement such as altering the flashing light so that it remains on until the hand squeeze occurs (Wilder, 1973; Wozniak, 1972).

O. K. Tikhomirov (1958) showed that a child of three and a half years of age responds to each light signal with the required word (i.e., "press" when a red light appears; "don't press" when a blue light appears), but in uttering the command "don't press" in response to the blue signal, he not only fails to restrain his motor responses, but presses the ball even harder. Consequently, the child's own verbal reaction "don't press" exerts its influence not in its semantic aspect (i.e., not by the selective connections which are behind it, but by its immediate impulsive impact). This is why the directive influence of a child's own speech

at this stage still has a non-selective, non-specific character. It is only at the age of 4 to 4½ years that verbal response "don't press" actually acquires the inhibitory effect specific to speech (Luria, 1959).

Subbotskii (1972b) stated that the ability to judge the accuracy of a peer's performance does not emerge in children until about the age of three and a half. As a result, the ability to perform simple tasks appropriately preceeds the ability to perceive the appropriateness of another's action.

The child between 3-4 years of age will fail to regulate his behavior if his self-instructions are not phonetically and semantically congruent. Luria suggested that each phonetic element of a word serves to initiate motor movement in the young child (Joynt & Cambourne, 1968). A child will not be able to say "twice" and then squeeze a bulb in response to a visual stimuli. If, however, the child accompanies his response by the word "go go" (Bronckart uses the words "boom boom" and "sing sing"), he succeeds on this task (Bronckart, 1969, 1970; Luria, 1961; Rondal, 1972, 1974). In other words, initially there is a motor influence and only from 4½ on is there a semantic influence on the speech system upon other motor systems (Gal'perin, 1969; Luria, 1961, 1969; Shapiro, 1973; Sokolov, 1969b; Tikhomirov, press; Zivin, 1973). Bronkart (1973) stated that:

> . . . up to a certain age level there must be a rhythmic similarity between the verbal and motor response. For if one asks to squeeze twice (--) by saying "twice (-) or "I squeeze twice" (---) or if one asks not to squeeze (0) by saying "no" (-) or I don't squeeze (---), one practically always obtains a deteriorization of the motor response (p. 428).

Wilder (1968) did not find speech to facilitate the performance of three year olds nor did it hinder the performance of five year olds in a bulb squeezing task. Jarvis (1964, 1968) also found no support that verbalization facilitated a child's performance on a push-don't push button task. He found, however, that children's ability to perform the task improved with age. Jarvis' results are counter to Luria's possibly because of the age range of his subjects, or his giving extensive training before testing, or due to some individual differences between subjects. Miller, Flavell, & Shelton (1970) did not find self-instructions on a squeeze-don't squeeze bulb task to interact with age. Miller, however, gave substantial pretraining.

Stage III (4½-5 years of age)

This stage is characterized by the transfer of the regulatory function of language from the impulsive side of speech to the analytic (selective) system of elected connections which are produced by speech and from the external to the internal speech of the child (Luria, 1961). During this period, the child can succeed very well in such complex tasks as differentiation and he can regulate his behavior by

this signification aspect of the external language ("I squeeze twice" in the double response task). The child now succeeds in the regulation of his overt behavior by an internal "memorized rule" which the instruction had furnished. By the child's fifth year, the need for overt speech is replaced by covert responses mediated by speech which serves to regulate his sensorimotor behavior (Luria, 1957). Only in the third stage does the semantic content of the child's speech-for-self become dominant, directive, and internalized.

Meichenbaum (1973), however, found that children as young as 2½-3 years of age produce private speech which seems to aid the child's organization. He gives the example of a girl playing doll house. Here the child overtly tells what she is doing as she plays with the doll. Meichenbaum suggests that the progression from overt to covert self-verbalizations is not related to the child's chronological age per se, but rather is more closely related to the child's proficiency or competence at a particular task. The child seems to self-verbalize aloud when confronted by a new task or when he encounters difficulty and/or frustration on an old task. As the child becomes more proficient at the task, the child's self-verbalizations becomes more abrupt, incomplete, whispered speech, and then completely vanishes. In other words, the process of abbreviated and interiorization of private speech does not seem to be tied to

chronological age per se, but to general abilities on specific tasks.

Meichenbaum & Goodman (1969) on a finger tapping task found no significant differences in tapping speed of children in kindergarten who verbalized the word "faster" or "slower" overtly or covertly. However, for first graders, the overt verbalization of the word "faster" or "slower" interfered significantly more with tapping speed than did the covert expression of the word. Furthermore, the first graders performed better or equal to the kindergarten group in all conditions.

During this stage, language has a double regulatory effect. There is now regulation through a progressively more internalized language (internal language), as well as regulation through the signification (meaning) of the verbal response (Bronckart, 1973).

Tikhomirov (1958) stated:

> In the third stage, with five-year-olds, movement regulation is effected by the system of selective connections actualized by the word. Even when the impulsive and selective influences of the word come into conflict, the specifically selective influence of the word predominates, which organizes the realization of the motor reactions in the execution of the instruction.
>
> Subsequent development presumably consists of an ever increasing selective influence of speech, but no longer in the form of external pronounciation, but in the form of inner speech or of the traces of connections which are set up in accordance with the preparatory instruction and which becomes so solid that it is unnecessary to present these in external speech (Wilder, 1973, p. 6).

In stage III, the child is able to use external speech to stabilize responses both to excitatory and inhibitory signals in the conditional excitatory-inhibitory command, and the child is able to use his verbal system to bring his diffuse motor impulsiveness under control (Luria, 1960a).

Luria stated that conditional behavior, which requires the ability to inhibit a direct automatic response to a stimulus, is one of the most important features of behavior which the verbal system is able to efficiently control, once it has developed sufficiently (Beiswenger, 1968). As mentioned above, the semantic (or meaningful) aspect of the child's speech now begins to become dominant (Luria, 1961). He is able to respond to the meaningful content of his own verbal self-instructions; that is, even when the instructions are phonetically and semantically incongruent (Joynt & Cambourne, 1968).

Stage IV (5½ plus years of age)

In stage IV, the child no longer audibly expresses verbal self-instructions, but silently produces behavior which appears to be regulated by rules formulated internally. Not until about age five years does a child's overt speech reach a functional stage which would justify internalization (Conrad, 1971, 1972). After five years of age, there is a systematic progressive advantage when pictures in a

serial recall task have unlike sounding names. This change is taken to represent the onset of the use of a verbal code as an aid to memorizing.

Children younger than five years of age who have been forced to verbalize task-related words aloud, have shown improvement in their motor performance across such diverse tasks as number identification (Ben, 1967), lever pressing (Lovaas, 1964), and finger tapping (Meichenbaum & Goodman, 1969). Children beyond age six, however, profit as well by overt verbalization but even more so from whispering (Meichenbaum & Goodman, 1969).

Luria stated that the child's comprehension of a command does not guarantee the child's ability to carry out the command. His experiments suggest that the maturational process of the brain affects the verbal regulation of behavior and that these processes are still maturing during the whole preschool period (Beiswenger, 1971).

Not until ages 4½ (Luria, 1961), 5 (Conrad, 1971, 1972; Kendler & Kendler, 1959; Vygotsky, 1962), or 6 (Kohlberg, Yaeger, & Hjertholm, 1968), is there predominately smooth motor functioning in situations that require choice, contemplation, forethought, or other freedom from the immediate pull of sensory-motor continuations of situations. Furthermore, this shift from motoric to semantic predominance is not smooth.

Luria assumes that at first speech acts like any other physical stimulus--impelling or terminating behavior through its physical properties alone; only later in development do its semantic properties become dominant. In Pavlov's terms, the locus of verbal control shifts from the first to the second signalling system.

The findings of Kendler (1962), Kuenne (1946), and Reese (1961, 1962, 1966), suggest that there is an important relationship between age, language development, and the efficiency of verbally mediated problem solving behavior. According to Vygotsky (1962), the infant acquires new functional systems through the types of relations he has with the adult world, via language, the cultural mediator. Overt self-instructions of kindergartners appear to serve the same function as older children's covert verbalizations (Birch, 1966, 1974; Kendler & Kendler, 1962; Reese, 1962). Kendler, Kendler, and Carrick (1966), using an inferential problem solution task (i.e., requiring the spontaneous integration of two separate behavior segments to attain a goal), also found that overt labeling facilitated the performance of kindergartners, but interfered with the performance of third graders. These findings are just a few that suggest that language gains functional significance by means of a developmental sequence. First motor behavior is brought under the control of an adult's or experimenter's overt verbalizations; then under the child's overt self-verbalization;

such as talking quietly to oneself; and finally, under the control of covert self-verbalization (Meichenbaum & Goodman, 1969).

Locus of Control Construct

A perusual of the locus of control construct is found in four comprehensive reviews (Joe, 1971; Lefcourt, 1966, 1971; Rotter, 1966) and two bibliographies of studies on locus of control (MacDonald, 1972; Throop & MacDonald, 1971). Furthermore, a current review of locus of control research in progress may be obtained from the Smithsonian Science Information Exchange. In examining summaries of over 600 studies on locus of control done mainly in the past ten years, the researcher finds that there is a wide variety of behaviors to which locus of control orientation has been related. Some of the different behaviors in which the locus of control construct has been examined are homosexuality (Porter, 1970); civil rights activities (Evans & Alexander, 1970; Forward & Williams, 1970); delinquency (Bobbit, 1967; Froehle, 1970); smoking (Hjelle & Clouser, 1970; James, Woodruff & Werner, 1965); drugs and alcoholics (Carroll, 1968; Goss & Morosko, 1970; Gozal, 1970; Jessor; Young, B.; Young, E.; & Tesi, 1970); birth control (MacDonald, 1970); and job satisfaction (Evan & McKee, 1970; Tseng, 1970).

To facilitate a clearer understanding of locus of control, the literature reviewed will be subdivided into eleven categories: (a) personality; (b) ethnic group and social class differences; (c) parent-child relationships; (d) anxiety; (e) attempts to control the environment and information utilization; (f) reaction to social stimuli; (g) strategy preferences and learning; (h) reaction to threat; (i) risk-taking; (j) adjustment; and (k) achievement and motivation.

Personality

Phares (1955) made the first attempt to measure the locus of control construct as a personality variable. He was followed by James (1957) who found a curvilinear relationship in which extreme internals and extreme externals appeared more maladjusted. Hersch and Scheibe (1967) found that internally oriented subjects were more sociable. Internals think of themselves as assertive, achieving, powerful, independent, effective, and industrious.

Externals appear to be less trustful, more suspicious of others and more dogmatic than are internals (Clouser & Hjelle, 1970; Hamsher, Geller, & Rotter, 1968; Miller & Minton, 1969). Externals are more anxious, aggressive and dogmatic (Altrocchi, et al., 1968; Feather, 1967; Tolor & Reznifoff, 1967). Internals lack in self-confidence and insight. They have a low need for social approval and have

a greater tendency to use sensitizing modes of defenses. Odell (1959) found that externals show greater tendencies to conformity; Crowne and Liverant (1963) and Sherman (1973) found that not only were externals more influenced by others but showed less confidence in their own judgment.

Ethnic Group and Social Class Differences

Negroes and lower-class individuals are generally more external than whites and middle-class individuals (Battle & Rotter, 1963; Gurin, Gurin, Lao, & Beattie, 1969; Lefcourt & Ladwig, 1965, 1966). In reports of studies of ethnic differences (Graves, 1961; Coleman, Campbell, Hodson, McPartland, Mood, Weinfeld, & York, 1966), whites appeared to be the most internally oriented, followed by Spanish-Americans and Negroes. Indians appeared to be the most external group. Furthermore, hard-core unemployed white males appeared to be more internally oriented than hardcore unemployed Negroes or Mexican-American males (Scott & Phelan, 1969).

In studies of prison inmates, it was found that Negro prison inmates appeared to have higher externally controlled expectancies than did white prison inmates (Lefcourt & Ladwig, 1965, 1966). Other studies (Hsieh, Shybut, & Lotsof, 1969; Parsons, Schneider, & Hansen, 1970), showed externals as individuals who are more apt to be restricted by environmental barriers and to feel subjected to limited

opportunities. Furthermore, since social class is related to race, individuals from lower classes and minorities tend to be more external. In other words, when social position is one of minimal power via class or race, the individual will usually have an external locus of control. Lefcourt (1966) pointed out that the so called lower-class lack of motivation to achieve may be explained by this disbelief that effort pays off.

Parent-Child Relationships

Internal children appear to see their mothers as being more nurturant, having predictable behavior standards for their children, and using achievement pressures to control behavior; fathers are described by internal children as nurturant and using more physical punishment. External children describe their mothers as over-protective, inclined to use affective punishment and deprivation of privileges (Chance, 1965; Davis, 1969; Davis & Phares, 1969; Katkovsky, Crandall, & Good, 1967; Shore, 1968; Tolor & Jalowiec, 1968). Furthermore, the father's behavior appears to influence a child's locus of control more than the mother's behavior (Davis & Phares, 1969; Katkovsky, et al., 1967). MacDonald (1971) found that internality was associated with nurturant, predictable parents and externality was associated with protective parents. Nowicki & Segal (1974) found that perceived paternal nurturance was found to be associated

with female internality and perceived maternal nurturance was associated with male internality. They also found that internality was associated with higher achievement for males and with greater social involvement for females and that paternal internality was associated with greater female achievement.

Anxiety

External individuals appear to describe themselves as anxious, less able to overcome frustration, and more concerned with fear of failure than with achievement. Internal individuals view themselves as more concerned with achievement, more constructive in overcoming frustration, and less anxious (Feather, 1967; Hountras & Scharf, 1970; Liberty, Burnstein, & Moulton, 1966; Platt & Eisenman, 1968; Tolor & Reznikoff, 1967).

Butterfield (1964), for example, found that less external individuals see themselves as goal-directed workers striving to overcome hardships and that high-external individuals see themselves as suffering, anxious, and concerned with fear of failure rather than achievement. The problem is whether external control is a defense against anxiety learned on the basis of past experiences in stressful situations or whether anxiety is a reaction to the perception that the world is unpredictable, predetermined, or controlled by powerful others (Feather, 1967, Watson, 1967).

Attempts to Control the Environment and Information Utilization

Internals do not only show more initiative and effort in controlling their environment (Phares, 1965; Seeman, 1963; Seeman & Evans, 1962), but also control their own impulses better than externals (Straits & Sechrest, 1963; James, Woodruff, & Werner, 1965). Phares and others (Phares & Wilson, 1972; Phares, Wilson, & Klyver, 1971) have shown that internally oriented people see actors rather than external circumstances as responsible for negative consequences.

In studies concerning smokers, it was found that smokers are more external than nonsmokers. Those individuals who stopped smoking following the Surgeon General's report were more internally oriented than those who did not stop smoking (Hjelle & Clouser, 1970; James, Woodruff, & Werner, 1965). Internals appear to be more willing than externals to remedy personality problems (Phares, Ritchie, & Davis, 1968). Furthermore, internals appear to make more attempts to seek actively relevant information and, once obtained, to make better utilization of this information than externals (Davis & Phares, 1967; Phares, 1968; Hersch & Scheibe, 1967). Internals appear to be more efficient than externals in their assimilation of information (Lefcourt & Wine, 1969).

MacDonald (1970) even found that internals are more inclined to practice some form of birth control than externals. He found that of unmarried individuals, 62% of the internals and 37% of the externals reported using birth control. Of married individuals, birth control was practiced by 87% of the internals and 63% of the externals.

In contrast to the above studies, Hersch, Kulik, and Scheibe (1969) found no difference between locus of control and whether or not individuals volunteered. Evans and Alexander (1970) and Thomas (1970) found no relationship between internal control and political participation. But, Brown and Strickland (1970) found that internally controlled males participated more in campus political activities and to the holding of an office in various organizations. This was not true for females. Other research (Evans & Alexander, 1970; Forward & Williams, 1970; Gore & Rotter, 1963; Gurin, et al., 1969; Lao, 1970; Strickland, 1965) found that externals can also become involved in social actions or civil right activities to improve their circumstances. Finally, Hjille and Clouser (1970) found little evidence that externals smoke more than internals.

Reaction to Social Stimuli

Internals appear to be more resistive to manipulation from the environment if they are aware of the manipulation (Getter, 1966; Rotter, 1966; Strickland, 1970). Lichtenstein

and Craine (1969), Baron (1969), Hamsher, et al. (1968) and Klemp (1969) have contradicted this finding.

In response to a high-prestigious source, externals are more affected (Ritchie & Phares, 1969). Furthermore, externals have more of an attitude change than internals when receiving communications from a high-prestigious source.

Strategy Preferences and Learning

Internals appear to perform better than externals when skill controls the outcome, while externals perform better than internals when chance controls the outcome (Baron, 1967, Bortner, 1964; Dembroski & Lasater, 1970; Fazio & Hendricks, 1970; Gale, 1970; Gold, 1966, 1967; Julian & Katz, 1968; Lasater & Dembroski, 1970; Lefcourt, Lewis & Silverman, 1968; Levy & Youse, 1970; McKelvie, 1969; Rotter & Mulry, 1965; Schneider, 1968). Watson and Baumal (1967) and Petzel and Gynther (1970) concluded that the reason for the above was that perception of no control in a chance-determined situation would increase anxiety for individuals who view themselves as self-controllers. Phares (1957) stated that with any individual, categorizing a situation as skill would lead one to use the results of past performance in formulating expectancies for future performance.

Reaction to Threat

Externals appear to accept failure more so than do internals because failure can be explained through their external orientation. Internals, however, need to avoid their experiences of failure that they believe would reflect their inability to deal with the environment (Efran, 1964). Lipp, Kolstoe, James, and Randall (1968), however, found that internals were more denying than externals.

Risk-Taking

Liverant and Scodel (1960), Lichtman and Julian (1964), and Julian, Lichtman and Ryckman (1968) viewed internals as being more cautious and conservative than externals in risk-taking situations. Liverant and Scodel (1960) found, for example, that low externals chose more bets of intermediate probability and fewer bets of low-probability than did high-external subjects. They also found that low externals in comparison with high externals never selected an extreme high- or low-probability bet. In other words, the low externals waged more money on cautious than risky bets. Lefcourt (1965) in a near replication, found that external Negroes chose less low-probability bets and were generally less risk-taking than external whites. This reversal of internal-control reflecting behavior in skill versus chance situations was explained as being due to Negroes' disbelief that achievement in self-evaluation,

skill-demanding tasks is controllable. Success in externally controlled situations of luck or chance seem more controllable for the Negro who believes that goals derived through achievement will be denied him regardless of his effort. Externally controlled goals, on the other hand, are at least obtained fairly.

Other researchers (Baron, 1968; Krauss & Blanchard, 1970; Strickland, Lewicki, and Katz, 1966) view internals as showing greater risk-taking behavior than externals because internals are more likely to try to outwit the odds for reinforcement. Other studies (Lefcourt & Steffy, 1970, Minton & Miller, 1970) found no relationship between locus of control and risk-taking behaviors. Overall, the evidence appears to favor the Liverant and Scodel hypothesis.

Adjustment

External expectancy of control can be changed to an internal frame of reference (Crego, 1970; Platt & Eisenman, 1968; Wall, 1970). Lefcourt (1967) stated that externals were more achievement conscious than internals when informed that achievement reinforcements were available. He suggested that lack of goal striving behavior of externals was due to their being less perceptive of reinforcement opportunities rather than to lack of motivation.

Shybut (1968) stated that prolonged hospitalization could reduce an individual's belief in obtaining any

long-range goals and increase one's belief in external control. This finding is consistent with other researchers (Bialer, 1961; Cromwell, Rosenthal, Shakow, & Zahn, 1961). Harrow and Ferrante (1969) found schizophrenics more external than nonschizophrenics. Externality has also been found related to suicide proneness (Abramowitz, 1969; Williams & Nickels, 1969). Externals tend to have more feelings of anger and depression than do internals. In regard to alcholics, Goss and Morosko (1970) found that alcoholics may appear more internal because they perceive alcohol as a means to control unpleasant affective states.

Achievement and Motivation

Internals appear to have a greater interest and drive in achievement-related activities than externals (Rotter, 1966). In other words, internals spend more time in intellectual activities, exhibit more intense interest in academic pursuits, and score higher on academic tests than externals (Chance, 1965; Crandall, Katkovsky & Crandall, 1965; Crandall, Katkovsky & Preston, 1960, 1962). Many studies have shown that internals make higher course grades and achievement test scores (Balfour, 1970; Bartel, 1969; Butterfield, 1964; Dain, 1970; Entwisle & Greenberger, 1970; Katkovsky, Crandall & Good, 1967; Federic, 1970; Lesiak, 1970; McGhee & Crandall, 1968; Reimanis, 1970; Shaw & Uhl, 1969). In contrast, Eisenman and Platt

(1968) and Hjelle (1970) have found no evidence that locus of control is a determinant of academic achievement.

In summary, the locus of control construct is a generalized expectancy operating across many situations. Furthermore, locus of control appears to play a major role in the learning process and in achievement by influencing an individual's strategy preferences in problem-solving. Contrary to Rotter's research (1966), sex differences appear to influence an individual's belief regarding locus of control. These differences may be related to the cultural roles assigned to each sex, to social class, and to regional effects.

When one considers the fact that verbal control of behavior is, according to the Soviets, a product of socialization (Wilder, 1973), rather than conditioning in the child's cognitive development, the researcher believed that there was a possibility of locus of control being a factor in one's use of verbal mediators. In fact Bandura and Walters (1963) suggested that socialization factors play an important role in the development of speech-for-self and cognitive styles. Cognitive styles are the ways in which people typically process the information they receive from the world around them. Cognitive styles are broad dimensions of psychological functioning that show themselves throughout an individual's perceptual and intellectual activities, and in his personality and social behavior as well (Witkin, 1974).

Although most research on locus of control has been done with college students and adults, some has also been done with children (McGhee & Crandall, 1968; Keller, 1969; Ludwigsen & Rollins, 1971; Norwicki & Roundtree, 1971) with results consistent with older subjects. But, none of the above studies have focused on the cognitive shift period. The researcher did find that an individual's locus of control has a significant positive correlation with achievement (Gurin, et al., 1969; Lao, 1970; McGhee & Crandall, 1968; Nowicki & Duke, 1973; Nowicki & Segal, 1974; Weinfeld & York, 1966). That is, students with a high sense of personal control have higher achievement test scores and grades. Intelligence, however, is not related significantly with locus of control (Hersch & Scheibe, 1967; Nowicki & Roundtree, 1971; Rotter, 1960). Individuals with an internal locus of control, however, have a greater verbal fluency than those with an external locus of control (Brecher and Denmark, 1969; Penk, 1969). Furthermore, a child's locus of control appears to become more internal with age (Nowicki & Strickland, 1973). Many older people tend to have a lesser sense of mastery over the conditions of their lives (i.e., an external locus of control) than younger people (Riley & Foner, 1968; Shea, 1973). Katz (1971) even found that children before four and individuals after eighty have a weak and unstable verbal control. The researcher, therefore, wonders whether or not locus of control might be a factor in

the use of verbalization in the control of one's overt behavior.

Only one study, however, has been found by this researcher which considers locus of control and the utilization of verbal self-control of overt behavior. Ludwigsen (1972), working with 11-12 year olds, found that verbalization did not result in significantly better concept-solution efficiency for either internal or external locus of control Ss; the verbalization group, however, did make fewer redundancy errors than the no verbalization group. She, therefore, concluded that verbalization promoted better task attention.

CHAPTER III

METHODS OF PROCEDURE

To facilitate a clearer understanding of the researcher's methods and procedure, this chapter is subdivided into four categories: (a) subjects; (b) tasks and materials; (c) design; and (d) procedures. The tasks and materials category is further subdivided into three sections: (a) instrument; (b) experimental tasks, and (c) task materials. The procedure category is also subdivided into three sections: (a) push-button task; (b) pounding-board task, and (c) serial-recall task.

Subjects

The experimental sample consisted of 120 white children, 40 children from each of three grade levels: nursery school ($3\frac{1}{2}$-$4\frac{1}{2}$ years old), first grade, and third grade. The children were of normal intellectual ability, and represented families of middle class socio-economic status as ascertained from cumulative records. At each grade level, half of the children were precategorized to have an internal locus of control and half to have an external locus of control. Of those individuals with internal and external locus of control, half were males and half were females.

To acquire the sample, 217 children were pretested with the Nowicki and Duke Preschool and Primary Locus of Control Scale (PPNS-IE). The first and third grade Ss were selected from the South End Graded School and the Franklin Street Graded School in Reidsville, North Carolina, as well as the General Greene Elementary School in Greensboro, North Carolina. The nursery school Ss were selected from the Nursery School and the North Carolina Training Center for Infant-Toddler Care of The University of North Carolina at Greensboro.

From the locus of control scores, means and standard deviations were calculated by grade level, sex, and the total population (see Table 1). All means and standard deviations were comparable to each other except for the means from nursery school Ss which were about one point lower than the rest of the means. For the most part, the Ss used for this study were at least one standard deviation above and below the grand mean of 12.31. There were not enough nursery school Ss, however, who were one standard deviation above the mean. As a result, the E had to use three locus of control scores which were just inside the one standard deviation upper boundary for nursery school Ss. The Ss used in this study were chosen randomly from the locus of control scores which were one standard deviation above and below the grand mean. Ss who scored below the grand mean were designated as internal Ss and Ss who scored

Table 1

Composition of All Locus of Control Scores

Grade Level	Sex	N	$\bar{X}$	SD
Nursery School		63	11.56	3.26
	Males	32	11.53	3.24
	Females	31	11.58	3.31
First		77	12.79	3.18
	Males	37	12.65	3.05
	Females	40	12.92	3.36
Third		77	12.45	2.32
	Males	40	12.38	2.09
	Females	37	12.54	2.48
Grand Total		217	12.31	2.98
	Males	109	12.22	2.85
	Females	108	12.41	3.07

above the grand mean were designated as external Ss. The composition of the experimental sample is presented in Table 2.

Tasks and Materials

Instrument

After an extensive search of recent literature, the researcher found that there were at least ten locus of control scales for adults, and seven locus of control scales for children (Battle & Rotter, 1963; Bialer, 1961; Crandall, Katkovsky & Crandall, 1965; Dean, 1961; Dies, 1968; Gozali & Bialer, 1968; Harrison, 1968; Morrison, 1966; Nowicki & Strickland, 1973; Rotter, 1966). There were, however, only three scales available for children younger than third grade (Mischel, Zeiss, & Zeiss, 1973; Nowicki & Duke, 1973; Stephens & Deleys, 1971). The Stephens and Deleys was an open ended question scale; the Mischel, Zeiss and the Nowicki and Duke were not. All three of the above scales showed evidence of acceptable reliability and validity, but neither the Stephens and Deleys scale nor the Mischel, Zeiss, and Zeiss scale had satisfactory comparable forms for older children. Furthermore, the Steven and Deleys scale needed to be administered individually. As a result, the Nowicki and Duke scale (PPNS-IE) was used to test the construct of locus of control. MacDonald (1973), stated that "In short, it (Nowicki-Strickland's Locus of Control Scale)

Table 2

Composition of the Sample

Grade Level	Sex	Internal Locus of Control N	Internal Locus of Control $\bar{X}$ (Age mos.)	Internal Locus of Control SD	External Locus of Control N	External Locus of Control $\bar{X}$ (Age mos.)	External Locus of Control SD
Nursery School	Males	10	50.5	6.06	10	50.8	8.85
	Females	10	52.4	6.17	10	51.9	7.99
First	Males	10	84.8	2.86	10	82.7	4.62
	Females	10	81.4	4.12	10	81.2	2.70
Third	Males	10	105.9	5.04	10	105.2	5.37
	Females	10	108.3	6.15	10	109.9	7.53

appears to be the best measure of locus of control . . . presently available for children" (p. 231). The Preschool and Primary form (PPNS-IE) of Nowicki-Strickland's Locus of Control Scale (CNS-IE) was used with all grade levels--nursery school children (3½-4½ years old), first grade, and third grade. The validity correlation between the PPNS-IE and the CNS-IE for eight year olds was .78 (Nowicki & Duke, 1973); the test-retest reliability for seven year olds was .79. Both of these correlations were found significant to the .001 level with a sample of 60 subjects.

The PPNS-IE was a 26 item forced-choice instrument in cartoon format and is presented in Appendix A. On the PPNS-IE, the cartoons were of two small children facing each other. One of the children was shown as presenting the item in a cartoon bubble above his/her head while the other child had above his/her head a bubble with the words "yes" or "no" inside it. The E stated to the child, "Let's pretend that this is me (pointing to the cartoon figure asking a question) asking you some questions and this is you (pointing to the cartoon figure with the words 'yes' and 'no' inside its bubble). You are to answer either 'yes' or 'no' depending on how you feel about the question." Male cartoons were provided for males (PPNSIE-M) and a female form (PPNSIE-F) for females. A high score indicated a belief in external control. A low score, on the other hand, indicated a belief in internal control.

Experimental Tasks

Before the actual experiment took place, the researcher performed a pilot study at the Carter Center of the University of North Carolina at Greensboro, North Carolina in an effort to work out technique and any other difficulties found in the experiment. Once this was accomplished, the actual study began. The researcher had each S perform three randomized tasks: (a) pushing a button (PB); (b) hitting a pounding board's color pegs in certain sequences (ST); and (c) a serial-recall task (SR). The PB task consisted of having the S hold a hand counter in his/her hand and pushing it as fast as he/she could in a certain amount of time. The ST task consisted of hitting certain color pegs with a wooden hammer in a certain sequence on a pounding-board. The number of colors increased until the S could no longer perform correctly. The SR task consisted of seven randomized pictures which the S had to point to in certain sequences which also increased in number until the S could no longer perform correctly. Within each task, the S performed under three randomized conditions: (a) no instructions (NI) to verbalize or not to verbalize; (b) no verbalization (NV); and (c) forced verbalization (FV).

Task Materials

The push-button (PB) task consisted of a Lightning's hand tally counter. It was approximately 4 inches around

and fitted very easily in one's hand. The counter registered when the S pushed a button with his/her thumb while holding the apparatus in his/her hand.

In the pounding-board (ST) sequence task, the experimenter used the Milton Bradley's Playskool Pounding Bench. It consisted of one hardwood pounding bench (adjustable for tension), six multi-colored wood pegs (red, green, purple, orange, yellow, and blue), and a wood mallet. The bench was 10½" x 4", the pegs were 3½" x 3/4 inches, and the wood mallet was 6 inches long with a 1" x 1" head.

In the serial-recall (SR) task, there were seven randomized 5" x 6" picture index cards. Each card depicted either a fork, roof, watch, deer, bell, rake or moon. All of the non-related pictures were in color and came from The Ginn Prereading Kit B. Photographic reproductions of the pictures are displayed in Appendix B.

Throughout all of the different tasks, the E used a Brenet's stop watch to record time limits for the different time trials and rest periods. Furthermore, under the NV condition in each task, a plastic straw 5 inches long was used by each S to prevent verbalizations from occurring. Ziven (1972) in an earlier study had used a piece of foam rubber for the same purpose.

Design

The researcher used a split-plot design with a repeated measures across one variable. In this design, each S was observed under all of the three randomized treatment conditions (NI, NV, FV). The Ss at each grade level were also randomly observed under all of the three different overt tasks (PB, ST, SR). The three different overt tasks and conditions were randomized for each S in order to prevent fatigue or any carry-over effects being a factor in the results.

The design under each task consisted of a four-way analysis of variance model with repeated measures across the treatment conditions. The variables included then were: three grade levels (nursery school, first grade, and third grade); sex (males, females); three treatment conditions (FV, NV, NI); two levels of locus of control (internal, external). This design was used for the analysis of data for each of three different overt tasks (PB, ST, SR).

The present design was developed to measure children's utilization of symbolic (verbal) mediators in regulating their overt behavior on certain tasks. Furthermore, any deficiencies in the utilization of these symbolic mediators were examined in terms of locus of control, grade level, and sex. The order of the different overt tasks administration for this experiment is presented in Table 3.

Table 3

Order of Task Administration

No.	Order for all Age Levels		TASKS PB	ST	SR
1.	Male	Internal	1	2	3
2.	Female	Internal	2	3	1
3.	Male	Internal	3	1	2
4.	Male	External	1	2	3
5.	Female	Internal	2	3	1
6.	Female	Internal	3	1	2
7.	Female	External	1	2	3
8.	Female	Internal	2	3	1
9.	Female	Internal	3	1	2
10.	Female	Internal	1	2	3
11.	Male	External	2	3	1
12.	Female	External	3	1	2
13.	Male	External	1	2	3
14.	Female	Internal	2	3	1
15.	Male	Internal	3	1	2
16.	Female	External	1	2	3
17.	Male	External	2	3	1
18.	Male	External	3	1	2
19.	Male	External	1	2	3
20.	Female	External	2	3	1
21.	Male	Internal	3	1	2
22.	Female	External	1	2	3
23.	Female	External	2	3	1
24.	Female	Internal	3	1	2
25.	Male	External	1	2	3
26.	Male	Internal	2	3	1
27.	Female	External	3	1	2
28.	Female	External	1	2	3
29.	Male	Internal	2	3	1
30.	Male	External	3	1	2
31.	Male	Internal	1	2	3
32.	Male	Internal	2	3	1
33.	Female	External	3	1	2
34.	Male	Internal	1	2	3
35.	Male	Internal	2	3	1
36.	Female	External	3	1	2
37.	Male	External	1	2	3
38.	Male	External	2	3	1
39.	Female	Internal	3	1	2
40.	Female	Internal	1	2	3

The order of the administration of the conditions within each task is presented in Table 4.

Procedure

The Ss were tested individually, in a non-distractive setting in each S's school building. Each S was seated across from the E and to the side of an observer who was very efficient at lip reading. The observer had 60 per cent hearing with the use of a hearing aid. Once seated, the S was told, "We are going to play some games."

Push-Button Task (PB)

This task was similar to the lever-pressing task used by Lovaas (1964); the finger-tapping task used by Meichenbaum and Goodman (1969); and the foot-depression task used by Meichenbaum (1973). This task consisted of having the S to hold a Lightning's hand tally counter in his/her hand and to press it as many times as possible in 15 seconds with a 15 second rest between conditions. Thus, all Ss had three pushing trials, namely: one under no instructions (NI) to verbalize or not to verbalize; one no verbalization (NV) trial; and one under forced verbalization (FV) of continuously saying "push."

Before each trial, the experimenter demonstrated what the task was to be done and how to do it. During the free no instructions (NI) condition, the E said:

Table 4

Order of Administration of Conditions Within Tasks

No.	TASKS			FIRST TASK CONDITION			SECOND TASK CONDITION			THIRD TASK CONDITION		
	PB	ST	SR	NI	NV	FV	NI	NV	FW	NI	NV	FV
1.	1	2	3	1	2	3	2	3	1	3	1	2
2.	2	3	1	2	3	1	3	1	2	1	2	3
3.	3	1	2	3	1	2	1	2	3	2	3	1
4.	1	2	3	1	2	3	2	3	1	3	1	2
5.	2	3	1	2	3	1	3	1	2	1	2	3
6.	3	1	2	3	1	2	1	2	3	2	3	1
7.	1	2	3	1	2	3	2	3	1	3	1	2
8.	2	3	1	2	3	1	3	1	2	1	2	3
9.	3	1	2	3	1	2	1	2	3	2	3	1
10.	1	2	3	1	2	3	2	3	1	3	1	2
11.	2	3	1	2	3	1	3	1	2	1	2	3
12.	3	1	2	3	1	2	1	2	3	2	3	1
13.	1	2	3	1	2	3	2	3	1	3	1	2
14.	2	3	1	2	3	1	3	1	2	1	2	3
15.	3	1	2	3	1	2	1	2	3	2	3	1
16.	1	2	3	1	2	3	2	3	1	3	1	2
17.	2	3	1	2	3	1	3	1	2	1	2	3
18.	3	1	2	3	1	2	1	2	3	2	3	1
19.	1	2	3	1	2	3	2	3	1	3	1	2
20.	2	3	1	2	3	1	3	1	2	1	2	3
21.	3	1	2	3	1	2	1	2	3	2	3	1
22.	1	2	3	1	2	3	2	3	1	3	1	2
23.	2	3	1	2	3	1	3	1	2	1	2	3
24.	3	1	2	3	1	2	1	2	3	2	3	1
25.	1	2	3	1	2	3	2	3	1	3	1	2
26.	2	3	1	2	3	1	3	1	2	1	2	3
27.	3	1	2	3	1	2	1	2	3	2	3	1
28.	1	2	3	1	2	3	2	3	1	3	1	2
29.	2	3	1	2	3	1	3	1	2	1	2	3
30.	3	1	2	3	1	2	1	2	3	2	3	1
31.	1	2	3	1	2	3	2	3	1	3	1	2
32.	2	3	1	2	3	1	3	1	2	1	2	3
33.	3	1	2	3	1	2	1	2	3	2	3	1
34.	1	2	3	1	2	3	2	3	1	3	1	2
35.	2	3	1	2	3	1	3	1	2	1	2	3
36.	3	1	2	3	1	2	1	2	3	2	3	1
37.	1	2	3	1	2	3	2	3	1	3	1	2
38.	2	3	1	2	3	1	3	1	2	1	2	3
39.	3	1	2	3	1	2	1	2	3	2	3	1
40.	1	2	3	1	2	3	2	3	1	3	1	2

> We are going to play a button game. What I want you to do is to push this button on this toy (The E points to the botton.) as fast as you can like this until I say "stop." (The E models the task.) Now you do it. (The E gives the counter to the S and after it is evident that the S understands, the E will say "good.") Let's do some more. Get ready! Go! Do it as fast as you can. (After 15 seconds, the E will say "stop." There will then be a 15 second rest period.)

Under the no verbalization (NV) condition, the E said:

> We are going to play a button game. What I want you to do is to push this button on this toy (The E points to the button.) as fast as you can like this until I say "stop." (The E models the task.) Now you do it. (The E gives the counter to the S and after it is evident that the S understands, the E will say "good.")
>
> To make this game more fun, hold this straw between your teeth like this. (The E demonstrates.) Okay! Let's see how many times you can push the toy until I say "stop." Get ready! Go! Do it as fast as you can. (After 15 seconds, the E will say "stop." There will then be a 15 second rest period.)

Under the forced verbalization (FV) condition, the E said:

> We are going to play a button game. What I want you to do is to say the word "push" and then push the button. Do this as many times and as fast as you can until I say "stop." Watch me. (The E demonstrates the task.) Now you do it. (After the S demonstrates that he understands, the E will say "good." Now, let's see how many times you can say "push" and then push the button until I say "stop." Get ready! Go! Do it as fast as you can. (After 15 seconds, the E will say "stop." There will then be a 15 second rest period.)

The scores on this task were the total number of times under each condition that the S pushed the botton on the counter.

Pounding-Board Sequence (ST)

This task was similar to that presently being used by Wozniak at the University of Minnesota. On this task, the S hit in sequence the color pegs mentioned by the E. There were two trial sequences for 3-, 4-, and 5-color arrays. These sequences are presented in Table 5. The individual's scores were the total number of sequences done correctly under each condition.

Under the free no instruction (NI) condition of the pounding-board task, the E said the following to the S:

> In this game, we hit certain color pegs. When I call out the names of certain colors, I want you to hit the peg that has that color. Hit the color pegs in the same order that I call out the colors. Be sure to hit the peg only once. For example, if I say "purple, yellow," you would hit the purple peg once and then the yellow peg once like this. (The E demonstrates the task.) Now, you try it. (The E gives the wooden hammer to the S and then calls out "green, orange." This would continue until the S understood the task. The E would then proceed with the test sequences.)

Under the no verbalization (NV) condition, the E said the following to the S being tested:

> In this game, we hit certain color pegs. When I call out the names of certain colors, I want you to hit the peg that has that color. Hit the color pegs in the same order that I call out the colors. Be sure to hit the peg only once. For example, if I say "yellow, green," you would hit the yellow peg once and then the green peg once like this. (The E demonstrates the task.) Now, you try it. (The E gives the wooden hammer to the S and then calls out "green, blue." (This continued until the S understood the task.)
>
> To make this game a little different, place this straw between your teeth like this. (The E

Table 5

Sequences of Color Arrays

COLOR SEQUENCES	TRIAL	ARRAYS				
		Practice Trials				
2-color sequences (NI)	E	Purple	Yellow			
	S	Green	Orange			
2-color sequences (NV)	E	Yellow	Green			
	S	Green	Blue			
2-color sequences (FV)	E	Blue	Red			
	S	Orange	Purple			
3-color sequences	Trial 1	Blue	Yellow	Orange		
	Trial 2	Red	Blue	Green		
4-color sequences	Trial 1	Purple	Green	Yellow	Red	
	Trial 2	Yellow	Red	Blue	Purple	
5-color sequences	Trial 1	Red	Green	Yellow	Blue	Orange
	Trial 2	Green	Purple	Orange	Blue	Yellow

> demonstrated the task.) Now in the same order that I call out certain colors, I want you to hit those color pegs on the pounding-board. Hit each peg only once. (The E then started with the different color sequences.)

In the forced verbalization (FV) condition of the pounding-board task, the E said the following to the S:

> In this game, we hit certain color pegs. When I call out the names of certain colors, I want you to say the color and then hit the peg that has that color. Say and hit the color pegs in the same order that I call out the colors. Be sure to hit the peg only once. For example, if I say "blue, red," you would first say "blue" and then hit the blue peg once. You would then say "red" and then hit the red peg once like this. (The E demonstrated the task using verbal mediators.) Now, you try it. (The E then gave the wooden hammer to the S and then called out "orange, purple." Once the task was understood, the E proceeded with the different color sequences.)

Serial-Recall Task (SR)

The serial-recall task was similar to that used by Flavell, Beach, and Chinsky (1970) and that used by Keeney, Cannizzo, and Flavell (1967). It consisted of seven 5" x 6" index cards. Each card depicted a single object of either a fork, roof, watch, deer, bell, rake or moon. The task consisted of having the S see all seven of these nonrelated pictures spread out randomly before him. The E then slowly pointed to some of the pictures in succession at the rate of one card every two seconds. After a 15 second delay, the S was presented with a duplicate set of pictures, but in a different random arrangement. As a result, spatial position did not serve as a memory aid. The S's task was to point to

the same pictures in the same sequence the E had pointed to previously.

Of the seven non-related pictures presented on each serial-recall trial, the E and then the S pointed to one sequence of two pictures under each serial-recall condition during the instruction period. The S during the actual serial-recall test proceeded with two sequences of 3-, 4-, and 5-picture arrays under each SR condition. The sequences were performed in increasing order. The S continued in the task until he/she missed two consecutive sequences of the same length. These sequences were randomly picked. They are presented in Table 6.

Under the free no instruction (NI) condition, the E said:

> Now we are going to do some things with these pictures. I am going to point to some of the pictures. After a few seconds (15 seconds), I am going to show you the same pictures, but they will be in different places. What I want you to do is to point to the same pictures and in the same order that I pointed to before. For example, if I did the following (The E pointed to the bell and the watch.), after a few seconds (15 seconds), you will hear the word "point." You will then do this. (The E pointed to the bell and the watch.) Now, you try it. (The E then pointed to the moon and the roof. After 15 seconds, the E said "point." The S then pointed to the pictures to which the E had previously pointed.)

Once it was evident that the S knew what to do, the E started the different test sequences. Upon completion of the last task, the E said, "By the way, can you tell me the names of each picture? What's this (points), and this . . .?"

Table 6

Sequence of Non-Related Picture Arrays

PICTURE SEQUENCES	TRIAL	ARRAYS				
		Practice Trials				
2-picture sequences (NI)	E	Bell	Watch			
	S	Moon	Roof			
2-picture sequence (NV)	E	Watch	Fork			
	S	Fork	Rake			
2-picture sequences (FV)	E	Rake	Deer			
	S	Deer	Roof			
3-picture sequences	Trial 1	Moon	Bell	Roof		
	Trial 2	Rake	Moon	Deer		
4-picture sequences	Trial 1	Deer	Fork	Roof	Watch	
	Trial 2	Moon	Roof	Deer	Rake	
5-picture sequences	Trial 1	Watch	Bell	Roof	Rake	Fork
	Trial 2	Deer	Watch	Moon	Bell	Roof

Under the no verbalization (NV) condition, the E said:

> Now we are going to do some things with these pictures. I am going to point to a number of pictures. After a few seconds (15 seconds), I am going to show you the same pictures, but they will be in different places. What I want you to do is to point to the same pictures and in the same order that I pointed to before. For example, if I did the following (The E pointed to the watch and the fork.), after a few seconds (15 seconds), you will hear the word "point." You will then do this. (The E pointed to the watch and the fork.) Now you try it. (The E then pointed to the fork and the rake. After 15 seconds, the E said "point.")

Once it was evident that the S knew what to do, the E started the different test sequences. The E said:

> To make this task a little different, place this straw between your teeth like this. (The E demonstrated the procedure.) Now, let's begin.

Under the forced verbalization (FV) condition, the E said the following:

> Now we are going to do some things with these pictures. As I point to each one, you say out loud what it is a picture of. (The E pointed to each picture and the S said the names of each.) Now I am going to point to a numbber of pictures and you are to say the names of each one as I point to it. Continue to repeat the names over and over again until I say "point." You are then to point to the same pictures and in the same order that I pointed to before. For example, if I do the following (The E pointed to the rake and the deer.), you would say "rake, deer," "rake, deer," over and over again until I say "point." You would then say and point to the rake and the deer. Now you try it. (The E pointed to the deer and the roof. After 15 seconds, the E said "point."

This continued until the S understood the instructions. After the S understood the directions, the E began with the

different test sequences. Furthermore, the E reiterated, whenever necessary, the instructions, "Be sure to keep saying the names over and over again to help you remember in what order they come."

Each S was scored on the basis of the total number of correct trials under each condition. A correct trial was one in which the S pointed to only the same pictures that were previously pointed to by the E and in exactly the same order.

CHAPTER IV

ANALYSIS OF THE DATA AND RESULTS

The purpose of this study was to examine individual differences in children's tendencies to employ symbolic mediation based on children's locus of control status. It was expected that children who possessed an internal locus of control (i.e., believed that they could bring about a change in the effectiveness of their performance) would be those most likely to initiate symbolic mediators for the purpose of controlling their overt behavior. In contrast, it was expected that those children who were not certain of their abilities to control their environments would be less likely to employ verbal self-instructions even if they were capable of doing so. Hence, the principal question dealt with in this study was whether or not external locus of control children would be observed to be delayed in their production of symbolic mediation in relation to peers of the same age with an internal locus of control status.

A second major purpose of this study was to determine the degree to which individual children would show consistent tendencies to produce verbal mediating behaviors over a variety of different types of cognitive task settings.

In Chapter IV, the results of the study are presented and summarized as they pertain to the hypotheses presented in Chapter I.

Preliminary Analyses of Task Performance and Verbalization Scores

Push-Button (PB) Performance

A S's performance score for the push-button task was the total number of times the S pressed a Lightning's hand tally counter within a period of 15 seconds. A summary of the grade by sex by locus of control by condition analysis of variance (ANOVA) of these data is presented in Table 7. As indicated in Table 7, the main effects for grade level (A) and condition (D) were statistically significant ($p < .01$). The main effects for sex (B) and locus of control (C) were not statistically significant ($p > .05$). However, there were statistically significant interactions for grade by locus of control (F (2,108) = 3.108, $p < .05$), grade by sex by locus of control (F (2, 108 = 3.37, $p < .05$), and grade by condition (F (4,216) = 5.54, $p < .05$). The data in Table 7 are intended to provide an overview of the results and will be analyzed in greater detail during the consideration of specific hypotheses.

Verbalizations on Push-Button Task

The score on the number of verbalizations for the push-button task was the number of times the S spoke in

Table 7

A Summary of the Grade by Sex by Locus of Control by Condition Analysis of Variance on Push-Button Performance (Number of pushes per 15 seconds)

Source	df	MS	F
Between Subjects			
(A) Grade	2	6324.82	74.76**
(B) Sex	1	243.38	2.88
(C) Locus of Control	1	5.88	0.07
A x B	2	146.62	1.73
A x C	2	278.34	3.29*
B x C	1	154.71	1.83
A x B x C	2	284.95	3.37*
Error	108	84.60	
Within Subjects			
(D) Condition	2	622.61	43.22**
A x D	4	79.82	5.54**
B x D	2	22.60	1.57
C x D	2	7.72	0.54
A x B x D	4	18.93	1.31
A x C x D	4	19.26	1.33
B x C x D	2	12.84	0.89
A x B x C x D	4	5.40	0.38
Error	216	14.40	

*$p < .05$
**$P < .01$

order to perform the task more efficiently. This would be, for example, each time the S said "push," "go," or "press" while performing the push-button task. In preliminary analysis, it was found that sex (B) was not statistically significant in any main effects or interactions ($p > .05$), and therefore, was deleted from further analysis. A summary of the grade by locus of control by condition ANOVA of these data is presented in Table 8. As indicated in Table 8, the main effects for grade (A) and condition (D) were statistically significant ($p < .01$). The main effects for locus of control (C) were not found to be statistically significant ($p > .05$). There was a statistically significant grade by condition interaction (F (2,114) = 34.82, $p < .01$). The data presented in Table 8 are intended to provide an overview of the results and will be analyzed in greater detail during the consideration of specific hypotheses.

Pounding-Board (ST) Performance

A S's score on the pounding-board task was the total number of color sequences performed correctly. There were two trials for each of three, four, and five color sequences, respectively. Thus, Ss' scores could range from zero to six. A summary of the grade by sex by locus of control by condition of these data is presented in Table 9. As indicated in Table 9, the main effects for grade (A) and condition (D) were statistically significant ($p < .01$). The main

Table 8

A Summary of the Grade by Locus of Control by Condition Analysis of Variance on Push-Button Verbalizations (Number of verbalizations per 15 seconds)

Source	df	MS	F
Between Subjects			
(A) Grade	2	1480.62	32.72**
(C) Locus of Control	1	8.07	0.18
A x C	2	25.31	0.56
Error	114	45.25	
Within Subjects			
(D) Condition	1	64222.82	1458.28**
A x D	2	1540.09	34.82**
C x D	1	13.04	0.29
A x C x D	2	31.20	0.70
Error	114	44.23	

*$p < .05$
**$p < .01$

Table 9

A Summary of the Grade by Sex by Locus of Control by Condition Analysis of Variance on Pounding-Board Performance (Total number of color sequences hit correctly)

Source	df	MS	F
Between Subjects			
(A) Grade	2	282.71	65.72**
(B) Sex	1	7.80	1.81
(C) Locus of Control	1	5.62	1.31
A x B	2	5.21	1.21
A x C	2	0.90	0.21
B x C	1	3.40	0.79
A x B x C	2	7.24	1.68
Error	108	4.30	
Within Subjects			
(D) Condition	2	28.55	55.32**
A x D	4	2.95	5.72**
B x D	2	1.12	2.17
C x D	2	0.06	0.11
A x B x D	4	0.25	0.49
A x C x D	4	0.33	0.64
B x C x D	2	0.37	0.72
A x B x C x D	4	1.36	2.64*
Error	216	0.52	

*$p < .05$
**$p < .01$

effect for sex (B) and locus of control (C) were not statistically significant ($p > .05$). The grade by condition interaction was also found to be statistically significant (F (4,216) = 5.72, $p < .01$), as well as, the grade by sex by locus of control by condition interaction (F (4,216) = 2.64 $p < .05$). The data in Table 9 are intended to provide an overview of the results and will be analyzed in greater detail during the consideration of specific hypotheses.

Verbalizations on Pounding-Board Task

The score on the number of verbalizations for the pounding-board task was the total number of times the S correctly spoke the names of the different color sequences in which he/she performed. For example, if the color sequence to be performed was "red, blue, green" and the S said, "red, blue, green" two times, the S would obtain a score of two. A summary of grade by sex by locus of control by condition ANOVA for these data is presented in Table 10. As indicated in Table 10, the main effects for grade (A) and condition (D) were statistically significant ($p < .01$). The main effects for sex (B) and locus of control (C) were not statistically significant ($p > .05$). However, there was a statistically significant grade by condition interaction (F (2, 108) = 6.42, $p < .01$), as well as, the grade by locus of control by condition interaction (F (2,108) = 3.60, $p < .05$). The data in Table 10 are intended to provide an

Table 10

A Summary of the Grade by Sex by Locus of Control by Condition Analysis of Variance on Pounding-Board Verbalizations (Total number of verbalizations of color sequences)

Source	df	MS	F
Between Subjects			
(A) Grade	2	122.64	37.45**
(B) Sex	1	3.50	1.07
(C) Locus of Control	1	0.10	0.03
A x B	2	3.55	1.08
A x C	2	1.58	0.48
B x C	1	0.01	0.01
A x B x C	2	1.68	0.51
Error	108	3.27	
Within Subjects			
(d) Condition	1	130.54	95.37**
A x D	2	8.79	6.42**
B x D	1	2.60	1.90
C x D	1	5.10	3.73
A x B x C	2	0.40	0.30
A x C x D	2	4.93	3.60*
B x C x D	1	0.10	0.07
A x B x C x D	2	1.03	0.75
Error	108	1.37	

*$p < .05$
**$p < .01$

overview of the results and will be analyzed in greater detail during the consideration of specific hypotheses.

Serial-Recall (SR) Performance

A S's performance score on the serial-recall task was the total number of picture sequences performed correctly. There were two trials for each of three, four, and five non-related picture sequences. Scores could range from zero to six. A summary of the grade by sex by locus of control by condition ANOVA for these data is presented in Table 11. As indicated in Table 11, the main effects for grade (A) and condition (D) were statistically significant ($p < .01$). The main effects for sex (B) and locus of control (C) were not statistically significant ($p > .05$). There was also a significant grade by condition interaction (F (4, 216) = 4.46, $p < .01$), as well as, a grade by sex by locus of control interaction (F (2,108) = 4.03, $p < .05$). The data in Table 11 are intended to provide an overview of the results and will be analyzed in greater detail during the consideration of specific hypotheses.

Verbalizations on Serial-Recall Task

A S's score for the number of verbalizations on the serial-recall task was the total number of times the S correctly spoke the names of each of the different non-related picture sequences while performing the serial-recall task. For example, the first picture sequence was "moon, bell,

Table 11

A Summary of the Grade by Sex by Locus of Control by Condition Analysis of Variance on Serial-Recall Performance (Total number of picture sequences pointed to correctly)

Source	df	MS	F
Between Subjects			
(A) Grade	2	114.77	57.84**
(B) Sex	1	1.22	0.62
(C) Locus of Control	1	5.62	2.83
A x B	2	1.22	0.62
A x C	2	1.16	0.58
B x C	1	0.14	0.07
A x B x C	2	8.00	4.03*
Error	108	1.98	4.03*
Within Subjects			
(D) Condition	2	74.44	89.45**
A x D	4	3.72	4.46**
B x D	2	0.03	0.04
C x D	2	0.43	0.52
A x B x D	4	0.87	1.05
A x C x D	4	0.35	0.42
B x C x D	2	1.24	1.50
A x B x C x D	4	1.70	2.04
Error	216	0.83	

*$p < .05$
**$p < .01$

roof." If the S said, "moon, bell, roof" twice, the S would obtain a score of two for that sequence. There were two trials for each of three, four, and five non-related picture sequences. A summary of the grade by sex by locus of control by condition ANOVA for these data is presented in Table 12. As indicated in Table 12, the main effects for grade (A) and condition (D) were statistically significant ($p < .01$). The main effects for sex (B) and locus of control (C) were not statistically significant ($p > .05$). There was a significant grade by condition interaction (F (2,198) = 20.49, $p < .01$). There was also a significant grade by locus of control interaction (F (2,108) = 3.13, $p < .05$), as well as a grade by sex by locus of control interaction (F (2,108) = 4.03, $p < .05$). The data in Table 11 are intended to provide an overview of the results and will be analyzed in greater detail during the consideration of specific hypotheses.

Grade Level Trends and Interactions in Task Performance

In hypothesis (a_1) it was stated that performance on each of the verbal control tasks increases with the children's ages. The grade level comparisons of the Ss' performance on the three different verbal control tasks--push-button, pounding-board, and serial-recall--are shown in Figure 1. As indicated earlier, grade was a significant main effect in each of the analyses of variance performed on

Table 12

A Summary of the Grade by Sex by Locus of Control by Condition Analysis of Variance on Serial-Recall Verbalizations (Total number of verbalizations of non-related picture sequences)

Source	df	MS	F
Between Subjects			
(A) Grade	2	1884.87	36.27**
(B) Sex	1	0.01	0.00
(C) Locus of Control	1	182.00	3.50
A x B	2	9.87	0.20
A x C	2	162.86	3.13*
B x C	1	17.60	0.34
A x B x C	2	209.26	4.03*
Error	108	51.97	
Within Subjects			
(D) Condition	1	9213.20	241.76**
A x D	2	780.72	20.49**
B x D	1	5.70	0.15
C x D	1	11.70	0.31
A x B x C	2	26.01	0.68
A x C x D	2	2.11	0.05
B x C x D	1	10.83	0.28
A x B x C x D	2	63.06	1.65
Error	108	38.11	

*$p < .05$
**$p < .01$

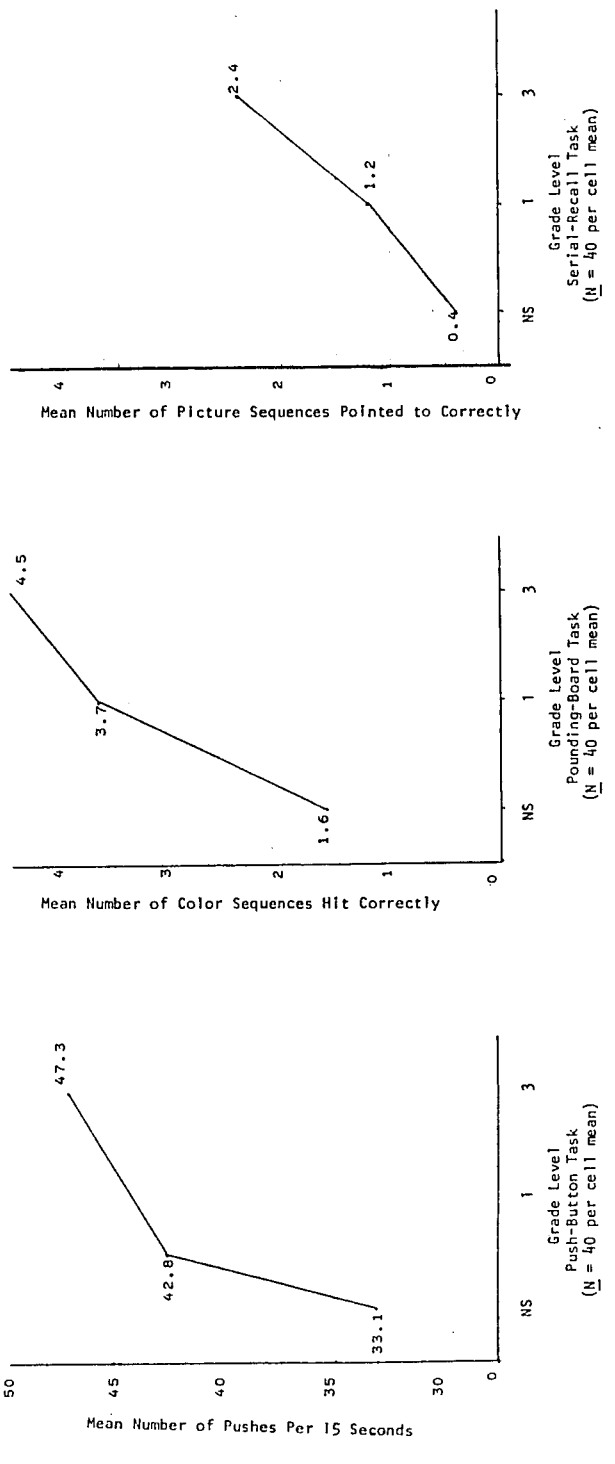

Figure 1. Grade Level Comparisons of Subjects' Performance on Each Task

the three tasks. This was shown earlier for the push-button task (F (2,108) = 74.76, p <.01), the pounding-board task (F (2,108) = 65.72, p<.01), and the serial-recall task (F (2,108) = 57.84, p<.01) in Tables 7, 9, and 11, respectively.

In all three verbal control tasks, there was a statistically significant grade by condition interaction. The interactions for each of the tasks are shown in Figure 2. The statistical significance for the grade by condition interactions for the push-button task (F (4,216) = 5.54, p <.01), the pounding-board task (F (4,216) = 5.72, p<.01), and the serial-recall task (F (4,216) = 4.46, p <.01) were shown earlier in Tables 6, 8, and 10 respectively. Means and standard deviations for the grade by condition interaction on the three tasks are presented in Tables 13, 14, and 15. In each of these tables it is shown that increasing grade level paralleled an increase in performance on the three different verbal control tasks and across the three different conditions. Data in Table 13 reveal that at each grade level on the push-button task, Ss performed the best under the free condition followed by the no verbalization condition and then the forced verbalization condition.

On the two sequential tasks, as shown in Tables 14 and 15, however, performance on both the pounding-board and the serial-recall tasks were best performed by Ss under the

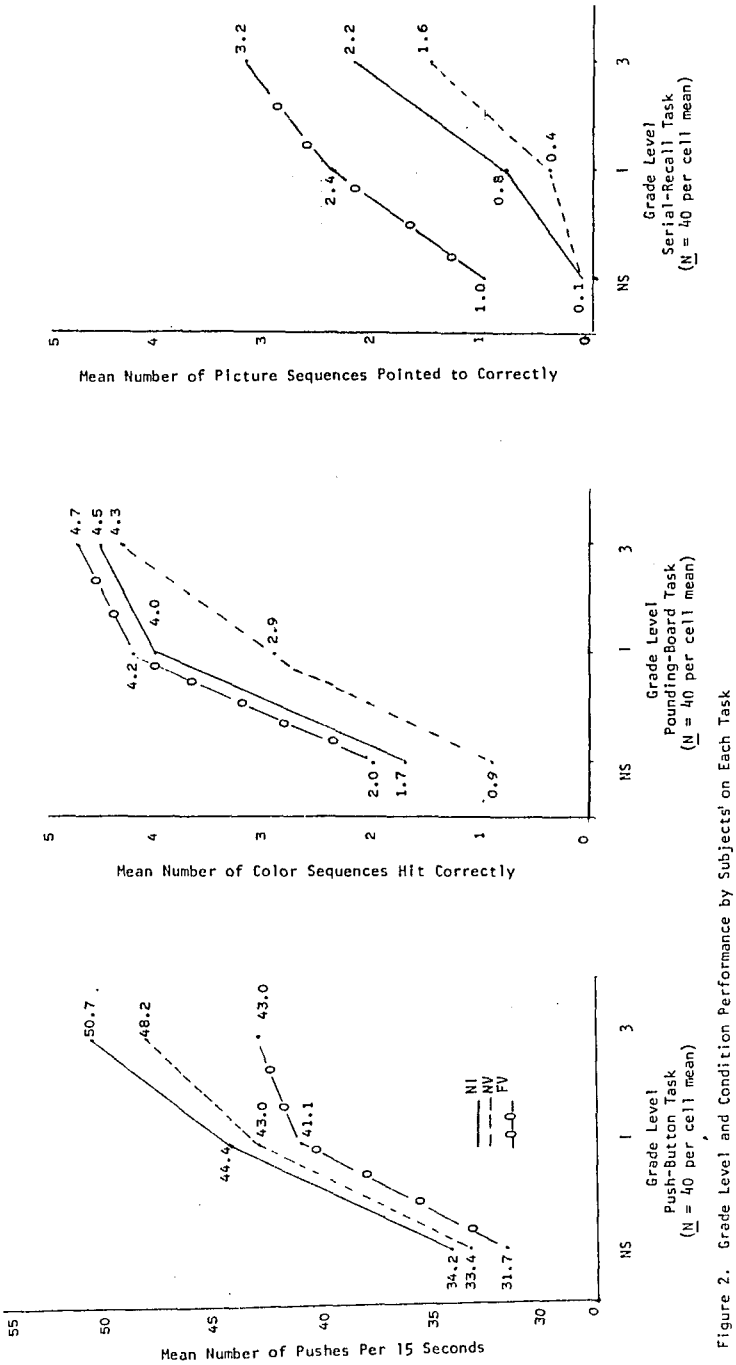

Figure 2. Grade Level and Condition Performance by Subjects' on Each Task

Table 13

Means and Standard Deviations for the Push-Button Task Performance (Number of pushes per 15 seconds) by Grade and Condition Variables

Condition	Grade		
	Nursery School (N = 40 per cell mean)	First Grade (N = 40 per cell mean)	Third Grade (N = 40 per cell mean)
NI			
$\bar{X}$	34.20	44.40	50.68
SD	5.35	6.49	6.62
NV			
$\bar{X}$	33.45	43.00	48.20
SD	5.90	5.40	5.73
FV			
$\bar{X}$	31.67	41.10	43.05
SD	7.00	6.57	7.99

Table 14

Means and Standard Deviations for the Pounding-Board Task Performance (Total number of color sequences hit correctly) by Grade and Condition Variables

Condition	Grade		
	Nursery School (N = 40 per cell mean)	First Grade (N = 40 per cell mean)	Third Grade (N = 40 per cell mean)
NV			
$\bar{X}$	0.92	2.92	4.32
SD	1.16	1.61	1.23
NI			
$\bar{X}$	1.70	4.02	4.52
SD	1.62	1.35	1.18
FV			
$\bar{X}$	2.05	4.22	4.72
SD	1.58	1.12	1.06

Table 15

Means and Standard Deviations for the Serial-Recall Task Performance (Total number of non-related picture sequences pointed to correctly) by Grade and Condition Variables

Condition	Grade		
	Nursery School ($\underline{N}$ = 40 per cell mean)	First Grade ($\underline{N}$ = 40 per cell mean)	Third Grade ($\underline{N}$ = 40 per cell mean)
NV			
$\bar{X}$	0.12	0.40	1.60
SD	0.33	0.78	1.46
NI			
$\bar{X}$	0.10	0.78	2.25
SD	0.38	0.97	1.56
FV			
$\bar{X}$	1.02	2.38	3.22
SD	1.14	1.51	1.10

forced verbalization condition followed by the free condition and then the no verbalization condition.

The performance on the three different tasks is illustrated in Tables 16 and 17. The percentages of *Ss* who performed at certain levels of difficulty on the push-button task at different grade levels and conditions are illustrated in Table 16. The percentage of *Ss* who performed at certain levels of difficulty on the pounding-board and serial-recall tasks at the different grade levels and conditions is illustrated in Table 17.

In an attempt to understand more clearly the effects of grade level, a summary of *a priori* comparisons of the grade level performances by conditions is presented in Table 18. The data showed that on the push-button task under the free (NI) condition, first grade *Ss* performed significantly better than nursery school *Ss* $[(A_2 - A_1)NI = 7.13, p < .01]$ and third grade *Ss* performed significantly better than first grade *Ss* $[(A_3 - A_2)NI - 4.38, p < .01]$. Under the no verbalization (NV) condition, significant differences were again found between nursery school *Ss*, first grade *Ss*, and third grade *Ss*. First grade *Ss* performed significantly better than nursery school *Ss* $[(A_2 - A_1)NV = 6.68, p < .01]$ and third grade *Ss* performed significantly better than first grade *Ss* $[(A_3 - A_2)NV = 3.64, p < .01]$. Under the forced verbalization (FV) condition, first grade

Table 16

Percentages of Ss by Grade and Condition Who Performed at Different Levels of Difficulty on the Push-Button Task (Pushing a button as many times as possible in 15 seconds) (N = 40 per grade)

	Number of Times Pushed Button	Push-Button Task NI	cum %	NV	cum %	FV	cum %
Nursery School	11 - 15	0.0	100.0	0.0	100.0	2.5	100.0
	16 - 20	0.0	100.0	0.0	100.0	0.0	97.5
	21 - 25	5.0	100.0	12.5	100.0	15.0	97.5
	26 - 30	12.5	95.0	17.5	87.5	27.5	82.5
	31 - 35	52.5	82.5	42.5	70.0	25.0	55.0
	36 - 40	15.0	30.0	15.0	27.5	17.5	30.0
	41 - 45	12.5	15.0	10.0	12.5	12.5	12.5
	46 - 50	2.5	2.5	2.5	2.5	0.0	0.0
First Grade	26 - 30	0.0	100.0	0.0	100.0	5.0	100.0
	31 - 35	10.0	100.0	7.5	100.0	17.5	95.0
	36 - 40	17.5	90.0	27.5	92.5	17.5	77.5
	41 - 45	35.0	72.5	37.5	65.0	35.0	60.0
	46 - 50	37.5	17.5	20.0	27.5	20.0	25.0
	51 - 55	15.0	20.0	7.5	7.5	5.0	5.0
	56 - 60	2.5	5.0	0.0	0.0	0.0	0.0
	61 - 65	2.5	2.5	0.0	0.0	0.0	0.0
Third Grade	21 - 25	0.0	100.0	0.0	100.0	2.5	100.0
	26 - 30	0.0	100.0	0.0	100.0	5.0	97.5
	31 - 35	0.0	100.0	0.0	100.0	10.0	92.5
	36 - 40	5.0	100.0	10.0	100.0	15.0	82.5
	41 - 45	20.0	95.0	25.0	90.0	27.5	67.5
	46 - 50	27.5	75.0	22.5	65.0	22.5	40.0
	51 - 55	20.0	47.5	27.5	42.5	10.0	17.5
	56 - 60	20.0	27.5	12.5	15.0	5.0	7.5
	61 - 65	7.5	7.5	2.5	2.5	2.5	2.5

Table 17

Percentages of Ss by Grade and Condition Who Performed at Different Levels of Difficulty on Two Different Sequential Tasks--the Pounding-Board Task (Hitting increasing lengths of different color sequences) and the Serial-Recall Task (Pointing to increasing lengths of non-related picture sequences) (N = 40 per grade)

	Sequences of	Pounding-Board						Serial-Recall					
		NV	cum %	NI	cum %	FV	cum %	NNV	cum %	NI	cum %	FV	cum %
Nursery School	2	72.5	100.0	55.0	100.0	42.5	100.0	100.0	100.0	97.5	100.0	70.0	100.0
	3	22.5	27.5	22.5	45.0	30.0	57.5	0.0	0.0	2.5	2.5	25.0	30.0
	4	5.0	5.0	22.5	22.5	27.5	27.5	0.0	0.0	0.0	0.0	5.0	5.0
	5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
First Grade	2	17.5	100.0	2.5	100.00	2.5	100.0	87.5	100.0	77.5	100.0	25.0	100.0
	3	47.5	82.5	32.5	97.5	22.5	97.5	12.5	12.5	22.5	22.5	47.5	75.0
	4	30.0	35.0	50.0	65.0	60.0	75.0	0.0	0.0	0.0	0.0	25.0	27.5
	5	5.0	5.0	15.0	15.0	15.0	15.5	0.0	0.0	0.0	0.0	2.5	2.5
Third Grade	2	2.5	100.0	0.0	100.0	0.0	100.0	52.5	100.0	40.0	100.0	2.5	100.0
	3	20.0	97.5	22.5	100.0	10.0	100.0	32.5	47.5	37.5	60.0	57.5	97.5
	4	60.0	77.5	50.0	77.5	60.0	90.0	15.0	14.0	20.5	22.5	40.0	40.0
	5	17.5	17.5	27.5	27.5	30.0	30.0	0.0	0.0	2.5	2.5	0.0	0.0

Table 18

Simple Effect Comparisons of Grade Level Performance by Condition on the Push-Button Task (Pushing a button as many times as possible in 15 seconds), Pounding-Board Task (Hitting increasing lengths of different color sequences), and the Serial-Recall Task (Pointing to increasing lengths of non-related picture sequences) Using A Priori Test of Analysis Based Upon Student's t[1] (N = 40 per cell mean)

	Condition					
	NI		NV		FV	
Task	A_2-A_1	A_3-A_2	A_2-A_1	A_3-A_2	A_2-A_1	A_3-A_2
Push-Button	7.13**	4.38**	6.68**	3.64**	6.59**	1.36
Pounding-Board	7.73**	1.67	6.67**	4.67**	7.23**	1.67
Serial-Recall	2.72**	5.88**	1.12	4.80**	5.44**	3.36**

*p < .05
**p < .01

[1] A_1 = Nursery School; A_2 = First Grade; A_3 = Third Grade.

Ss performed significantly better than nursery school Ss [$(A_2 - A_1)FV = 6.59$, $p < .01$]. However, the third grade versus first grade comparison was not significant [$(A_3 - A_2)FV = 1.36$, $p > .05$].

On the pounding-board task under free (NI) condition, first grade Ss performed significantly better than nursery school Ss [$(A_2 - A_1)NI = 7.73$, $p < .01$]. However, there was no significant difference between third grade Ss and first grade Ss [$(A_3 - A_2)NI = 1.67$, $p > .05$]. Under the no verbalization (NV) condition, first grade Ss performed significantly better than nursery school Ss [$(A_2 - A_1)NV = 6.67$, $p < .01$] and third grade Ss performed significantly better than first grade Ss [$(A_3 - A_2)NV = 4.67$, $p < .01$]. Under the forced verbalization (FV) condition, first grade Ss performed significantly better than nursery school Ss [$(A_2 - A_1)FV = 7.23$, $p < .01$]. The third grade versus first grade comparison was not significant [$(A_3 - A_2)FV = 1.67$, $p > .05$].

On the serial-recall task under the free (NI) condition, first grade Ss performed significantly better than nursery school Ss [$(A_2 - A_1)NI = 2.72$, $p < .01$] and third grade Ss performed significantly better than first grade Ss [$(A_3 - A_2)NI = 5.88$, $p < .01$]. Under no verbalization (NV) condition, the difference between first grade Ss and nursery school Ss was not significant [$(A_2 - A_1)NV = 1.12$, $p > .05$]. There was, however, a significant difference between third

grade Ss and first grade Ss [$(A_3 - A_2)NV = 4.80$, $p < .01$]. Third grade Ss performed significantly better than first grade Ss. Under the forced verbalization condition, first grade Ss performed significantly better than nursery school Ss [$(A_2 - A_1)FV = 5.44$, $p < .01$] and third grade Ss performed significantly better than first grade Ss [$(A_3 - A_2)FV = 3.36$, $p < .01$].

Summary of the Grade Level Analysis

The results reported above confirms hypothesis (a_1). It was hypothesized that the performance on each of the verbal control tasks increases with the children's grade level. The results indicated that the performance on the push-button task, pounding-board task, and the serial-recall task increased significantly as grade level increased from nursery school to third grade.

In examining the statistically significant grade by condition interaction, it was found that under the free condition and no verbalization condition on the push-button task, third grade Ss performed significantly better than first grade Ss and that first grade Ss performed significantly better than nursery school Ss. Under the forced verbalization condition first and third grade Ss performed significantly better than nursery school Ss; however, there was no difference between first and third grade Ss.

On the pounding-board task under the free condition, there was no difference between the third grade Ss and the first grade Ss. However, on performance, both third and first grade Ss performed significantly better than nursery school Ss. Under the no verbalization condition, third grade Ss performed significantly better than first grade Ss; first grade Ss performed significantly better than nursery school Ss. Under forced verbalization, there was no difference in performance between third grade Ss and first grade Ss. However, both third grade Ss and first grade Ss performed significantly better than nursery school Ss.

On the serial-recall task under the free condition and forced verbalization condition, third grade Ss performed significantly better than first grade Ss and first grade Ss performed significantly better than nursery school Ss. Under the no verbalization condition, there was no difference in performance between first grade Ss and nursery school Ss. However, third grade Ss performed significantly better than first grade Ss and nursery school Ss.

Age Trends and Interactions in Task Verbalizations

As demonstrated earlier in Tables 8, 10, and 12, grade level was statistically significant for the degree of verbalization on the push-button task (F (2,114) = 32.72, $p < .01$), the pounding-board task (F (2,108) = 37.45, $p < .01$),

and the serial-recall task (F (2,108) = 36.27, $p < .01$), respectively.

In all three verbal control tasks, there was a statistically significant grade level by condition interaction. These interactions are shown in Figure 3. The statistical significance for the grade level by condition interaction for the push-button task (F (2,114) = 34.82, $p < .01$), the pounding-board task (F (2, 108) = 6.42, $p < .01$), and the serial-recall task (F (2,108) = 20.49, $p < .01$) is illustrated in Tables 8, 10, and 12, respectively. Means and standard deviations for the grade level by condition interaction on the push-button, pounding-board, and serial-recall tasks are presented in Tables 19, 20, and 21, respectively. In Table 19, it is shown that on the push-button task under the free condition, there was virtually no spontaneous verbalization at any grade level. Under the forced verbalization condition, the number of verbalizations increased as the grade level increased. In Table 20, it is shown that on the pounding-board task under the free condition, the number of spontaneous verbalizations increased from nursery school to first grade. Third grade Ss, however, gave fewer spontaneous verbalizations than first grade Ss. Under the forced verbalization condition, the number of verbalizations increased as grade level increased. For the serial recall task, however, the number of spontaneous and forced verbalizations increased with grade level as shown in Table 21.

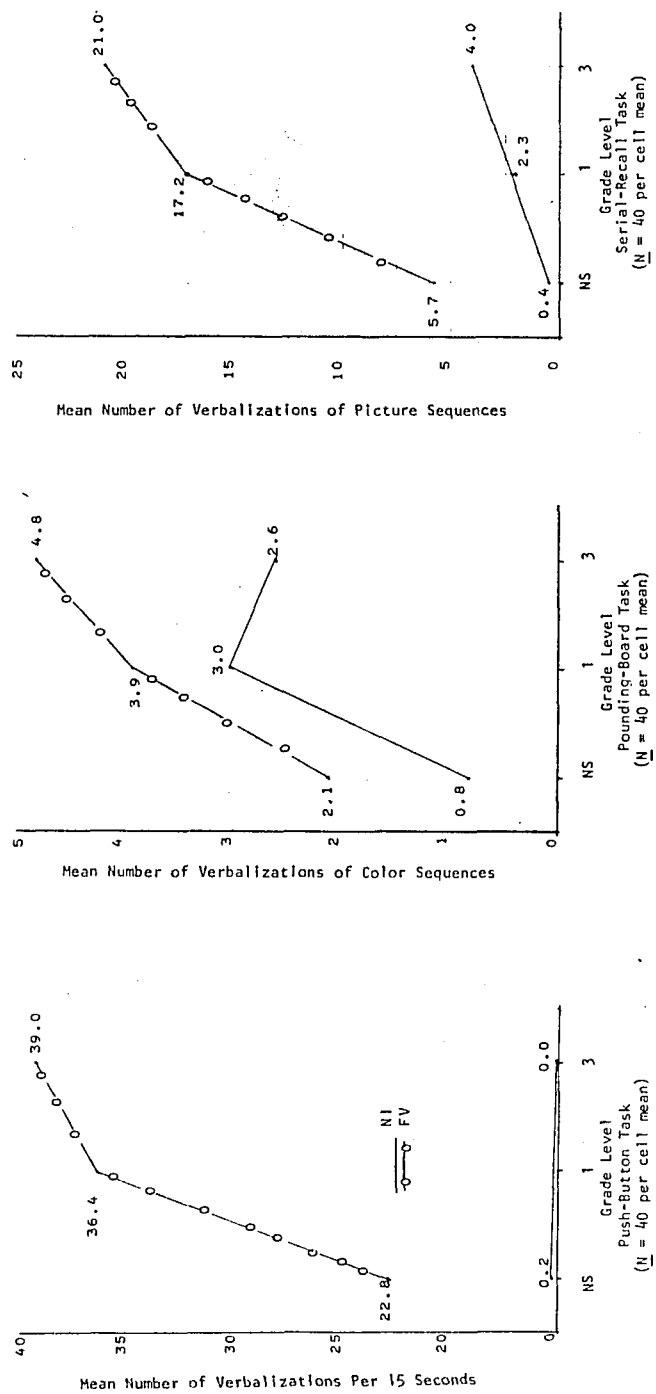

Figure 3. Grade Level and Condition Verbalizations by Subjects on Each Task

Table 19

Means and Standard Deviations for the Push-Button Task Verbalizations (Number of verbalizations per 15 seconds) by Grade and Condition Variables

Condition	Grade		
	Nursery School (N = 40 per cell mean)	First Grade (N = 40 per cell mean)	Third Grade (N = 40 per cell mean)
NI			
$\bar{X}$	0.15	0.00	0.00
SD	0.95	0.00	0.00
FV			
$\bar{X}$	22.85	36.40	39.05
SD	12.32	5.88	8.82

Table 20

Means and Standard Deviations for the Pounding-Board Task Verbalizations (Total number of verbalizations of color sequences) by Grade and Condition Variables

Condition	Grade		
	Nursery (N = 40 per cell mean)	First Grade (N = 40 per cell mean)	Third Grade (N = 40 per cell mean)
NI			
$\bar{X}$	0.75	3.00	2.55
SD	1.37	1.80	1.93
FV			
$\bar{X}$	2.08	3.90	4.75
SD	1.54	1.26	1.01

Table 21

Means and Standard Deviations for the Serial-Recall Task Verbalizations (Total number of verbalizations of non-related picture sequences) by Grade and Condition Variables

Condition	Grade		
	Nursery School (N = 40 per cell mean)	First Grade (N = 40 per cell mean)	Third Grade (N = 40 per cell mean)
NI			
$\bar{X}$	0.45	2.28	4.05
SD	2.85	4.49	6.52
FV			
$\bar{X}$	5.72	17.20	21.02
SD	7.24	9.72	7.87

To clarify the nature of the grade by condition interaction, a priori comparisons of grade level verbalizations were performed on these data and are presented in Table 22. On the push-button task under the free (NI) condition, the nursery school versus first grade comparison was not significant [$(A_2 - A_1)NI = -0.10$, $p > .05$]. There were no spontaneous verbalizations from the third grade Ss or the first grade Ss. Under the forced verbalization (FV) condition on the push-button task, first grade Ss verbalized significantly more than nursery school Ss [$(A_2 - A_1)FV = 0.09$, $p < .01$]. Third grade Ss, however, showed no greater tendency to verbalize than first grade Ss [$(A_3 - A_2)FV = 1.78$, $p > .05$].

On the pounding board task under the free condition, first grade Ss verbalized significantly more than nursery school Ss [$(A_2 - A_1)NI = 5.62$, $p < .01$]. However, there was no significant difference in the number of spontaneous verbalizations between first grade Ss and third grade Ss [$(A_3 - A_2)NI = -1.12$, $p > .05$]. Third grade Ss did, however, give significantly more spontaneous verbalizations than nursery school Ss [$(A_3 - A_1)NI = 4.50$, $p < .01$]. Under the forced verbalization condition on the pounding-board task, first grade Ss verbalized significantly more than nursery school Ss [$(A_2 - A_1)FV = 4.55$, $p < .01$], and third grade Ss verbalized significantly more than first grade Ss [$(A_3 - A_2)FV = 2.12$, $p < .01$].

Table 22

Simple Effect Comparisons of Grade Level Verbalizations by Condition on the Push-Button Task (Number of verbalizations per 15 seconds), Pounding-Board Task (Total number of verbalizations of color sequences), and the Serial-Recall Task (Total number of verbalizations of non-related picture sequences) Using A Priori Test of Analysis Based Upon Student's t (N = 40 per cell mean)

	Condition				
	NI			FV	
Task	A_2-A_1	A_3-A_2	A_3-A_1	A_2-A_1	A_3-A_2
Push-Button	-0.10	---	---	9.09**	1.78
Pounding-Board	5.62**	-1.12	4.50**	4.55**	2.12*
Serial-Recall	1.20	1.16	2.35*	7.50**	2.50*

*$p < .05$
**$p < .01$

A_1 = Nursery School
A_2 = First Grade
A_3 = Third Grade

On the serial-recall task under the free condition, the difference between first grade Ss and nursery Ss was not significant [$(A_2 - A_1)NI = 1.20$, $p > .05$]. The third grade versus first grade comparison also was not significant [$(A_3 - A_2)NI = 1.16$, $p > .05$]. Third grade Ss did, however, verbalize significantly more than nursery school Ss [$(A_3 - A_1)NI = 2.35$, $p < .05$]. Under the forced verbalization condition, first grade Ss verbalized significantly more than nursery school Ss [$(A_2 - A_1(FV = 7.50$, $p < .01$], and third grade Ss verbalized significantly more than first grade Ss [$(A_3 - A_2)FV = 2.50$, $p < .05$].

Summary of the Grade Level Analysis of Verbalizations

In summary, it was found that the number of spontaneous verbalizations did not necessarily increase with increasing grade level, but was somewhat dependent on the task. On the push-button task, there was virtually no spontaneous verbalization by nursery school Ss, first grade Ss, or third grade Ss. Under the forced verbalization condition on the push-button task, first grade Ss verbalized significantly more than nursery school Ss. Third grade Ss showed no greater tendencies to verbalize than first grade Ss.

On the pounding-board task, first and third grade Ss spontaneously verbalized significantly more than nursery school Ss. First grade Ss showed no greater tendencies to

verbalize than third grade Ss. Under the forced verbalization condition, first grade Ss verbalized significantly more than nursery school Ss, and third grade Ss verbalized significantly more than first grade Ss.

On the serial-recall task, first grade Ss showed no greater tendencies to verbalize than nursery school Ss. Third grade Ss also showed no greater tendencies to verbalize than first grade Ss. However, third grade Ss did spontaneously verbalize significantly more than nursery school Ss. Under forced verbalization on the serial-recall task, first grade Ss verbalized significantly more than nursery school Ss and third grade Ss verbalized significantly more than first grade Ss.

Condition Effects on Task Performance at Different Grade Levels

On all three of the verbal control tasks, the main effects of condition (D) were found to be statistically significant. The statistical significance for condition on the push-button task (F (2,216) = 43.22, $p < .01$), the pounding-board task (F (2,216) = 55.32, $p < .01$), and the serial-recall task (F (2,216) = 89.45, $p < .01$) has been presented earlier in Tables 7, 9, and 11, respectively. The main effects of the different conditions are further demonstrated by Figure 4. In Figure 4 on the push-button task, Ss performed best under the free condition followed by the no verbalization condition and then the forced verbalization

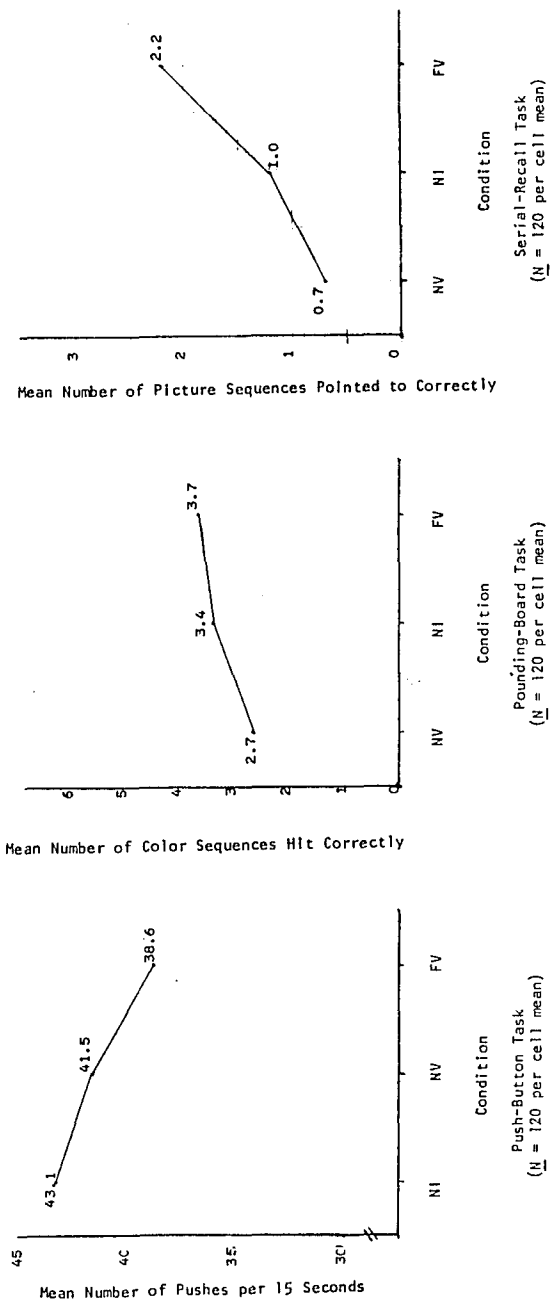

Figure 4. Condition Comparisons of Subjects' Performance on Each Task

condition. On the pounding-board task and the serial-recall task, however, Ss performed these sequential types of tasks (i.e., tasks requiring sequences of steps or operations) best under the forced verbalization condition followed by the free condition and then the no verbalization condition.

In order to understand more fully the effects of the verbalization conditions, the significant grade level by condition interaction, as shown earlier in Figure 3, was examined. A priori comparisons of verbalization conditions on task performance by grade level were performed on these data and are presented in Table 23. On the push-button task, nursery school Ss performed significantly better under the free condition than under the forced verbalization condition $[(FV - NI)A_1 = -2.97, p < .01]$. Nursery school Ss also performed significantly better on the push-button task under the no verbalization condition than under the forced verbalization condition $[(NV - FV)A_1 = 2.09, p < .01]$. However, for nursery school Ss there was no significant difference in performance on the push-button task between the free condition and the no verbalization condition $[(NI - NV)A_1 = 0.88, p > .05]$. For first grade Ss, the difference in performance on the push-button task under the free condition and under the no verbalization condition also was not significant $[(NI - NV)A_2 = 1.65, p > .05)]$. However, Ss performed significantly better under the free condition $[(FV - NI)A_2 = -3.88, p < .01]$ than under the forced

Table 23

Simple Effect Comparisons of Condition on Performance by Grade Level on the Push-Button Task (Pushing a button as many times as possible in 15 seconds), Pounding-Board Task (Hitting increasing lengths of different color sequences), and the Serial-Recall Task (Pointing to increasing lengths of non-related picture sequences) Using A Priori Test of Analysis Based Upon Student's t (N = 40 per cell mean)

	Grade								
	Nursery School			First Grade			Third Grade		
Task	NI-NV	FV-NI	NV-FV	NI-NV	FV-NI	NV=FV	NI-NV	FV=NI	NV-FV
Push-Button	0.88	-2.97**	2.09**	1.65	-3.88**	2.24*	2.90**	-8.96**	6.06**
Pounding-Board	4.88**	2.19*	---	6.88**	1.25	---	1.25	1.25	-2.50*
Serial-Recall	-0.10	4.60**	-4.50**	1.90	8.00**	---	3.25**	4.85**	---

*p <.05
*pp <.01

verbalization condition. Ss also performed significantly better under the no verbalization condition [$(NV - FV)A_2 = 2.24$, $p < .05$] than under the forced verbalization condition. Unlike the nursery school Ss and first grade Ss, third graders on the push-button task performed significantly better under the free condition than under the no verbalization [$(NI - NV)A_3 = 2.90$, $p < .01$]. Third grade Ss also performed significantly better on the push-button task under the free condition than under the forced verbalization condition [$(FV - NI)A_3 = -8.96$, $p < .01$]; third grade Ss also performed significantly better under the no verbalization condition than under the forced verbalization condition [$(NV - FV)A_3 = 6.06$, $p < .01$].

On the pounding-board task, nursery school Ss performed significantly better under the free condition than under the no verbalization condition [$(NI - NV)A_1 = 4.88$, $p < .01$]. Nursery school Ss also performed significantly better [$(FV - NI)A_1 = 2.19$, $p < .05$] under the forced verbalization than under the free condition. For first grade Ss on the pounding-board task, performance was significantly better under the free condition than under the no verbalization condition [$(NI - NV)A_2 = 6.88$, $p < .01$]. However, there was no significant difference in performance between first grade Ss under the forced verbalization condition than under the free condition [$(FV - NI)A_2 = 1.25$, $p > .05$]. Third graders on the pounding-board task performed significantly

better under forced verbalization than under the no verbalization condition [$(NV - FV)A_3 = -2.50$, $p < .05$]. However, there was no significant difference in performance between third grade Ss under the free condition and under the no verbalization condition [$(NI - NV)A_3 = 1.25$, $p > .05$]. For third grade SS, the difference between performance under forced verbalization and under free verbalization was not significant [$(FV - NI)A_3 = 1.25$, $p > .05$].

On the serial-recall task, the difference between nursery school Ss under the free condition and under the no verbalization condition was not significant [$(NI - NV)A_1 = -0.10$, $p > .05$]. Nursery school Ss did, however, perform significantly better under the forced verbalization condition than under the free condition [$(FV - NI)A_1 = 4.60$, $p < .01$] and the no verbalization condition [$(NV - FV)A_1 = -4.50$, $p < .01$]. For first grade Ss on the serial recall task, Ss performed significantly better under forced verbalization than under the free condition [$(FV - NI)A_2 = 8.00$, $p < .01$]. There was no significant difference between the performance by first grade Ss under the free condition and under the no verbalization condition [$(NI - NV)A_2 = 1.90$, $p > .05$]. Third grade Ss on the serial-recall task, however, performed significantly better under the free condition than under the no verbalization condition [$(NI - NV)A_3 = 3.25$, $p < .01$]; third grade Ss also performed

significantly better under the forced verbalization than under the free condition [$(FV - NI)A_3 = 4.85$, $p < .01$].

Summary of Condition Analysis on Task Performance

This study was conducted with the premise that verbalization aids overt performance on different types of tasks at different grade levels. Through the examination of the grade by condition interaction, it was found that this premise is true for tasks requiring sequences of steps or operations, as in the pounding-board task and in the serial-recall task. Forced verbalization tended to hinder performance on the push-button task.

On the push-button task, nursery school Ss and first grade Ss performed significantly better under the free condition and under the no verbalization condition than under the forced verbalization condition. The difference between performance under the free condition and under the no verbalization condition was not significant for either nursery school Ss or first grade Ss. For third grade Ss, performance under the free condition was significantly better than under the no verbalization condition; performance under the no verbalization condition was significantly better than under the forced verbalization condition.

On the pounding-board task, nursery school Ss performed significantly better under the forced verbalization condition than under the free condition. Furthermore,

performance under the free condition was significantly better than under the no verbalization condition. For first grade Ss, performance was significantly better on the pounding-board task under the free condition than under the no verbalization condition. There was no significant difference in performance under forced verbalization and under the free condition. Third grade Ss performed significantly better on the pounding-board task under the forced verbalization than under the no verbalization condition. Although the performance of this sample was better under the free condition than under the no verbalization condition, the difference was not statistically significant. There was also no significant difference in performance under forced verbalization and under the free condition.

On the serial-recall task, nursery school Ss and first grade Ss performed significantly better under the forced verbalization condition than under the free and under the no verbalization condition. For those Ss, the difference between the free condition and the no verbalization condition was not significant. For first grade Ss, there was no significant difference in performance under the free condition and under the no verbalization condition. However, third grade Ss on the serial-recall task performed significantly better under the forced verbalization condition than under the free condition and under the no verbalization condition. Performance was also significantly better under

the free condition than under the no verbalization condition.

Locus of Control Differences in Task Performance

Hypotheses (b_1), (b_2), and (b_3) dealt with individual differences in performance based on locus of control status and under different verbalization conditions. In hypothesis (b_1) it was stated that children with internal locus of control show higher levels of overt task performance than same age children with external locus of control. In hypothesis (b_2) it was stated that under forced verbalization, the performance on different verbal control tasks by external locus of control children is equivalent to the performance of internal locus of control children. In hypothesis (b_3) it was stated that the more internal a child's locus of control within any age group, the greater the spontaneous verbalizations during task performance. Earlier in Tables 7, 9, and 11, it was shown that the difference in performance between internal and external locus of control Ss was not significant on the push-button task (F (1,108) = 0.07, $p > .05$), the pounding-board task (F (1,108 = 1.31, $p > .05$), or the serial-recall task (F (1,108) = 2.83, $p > .05$), respectively. In order to examine further the different hypotheses above, the E examined the grade by locus of control by condition comparisons of Ss' performances on the three different overt tasks which are illustrated in Figures 5, 6, and 7.

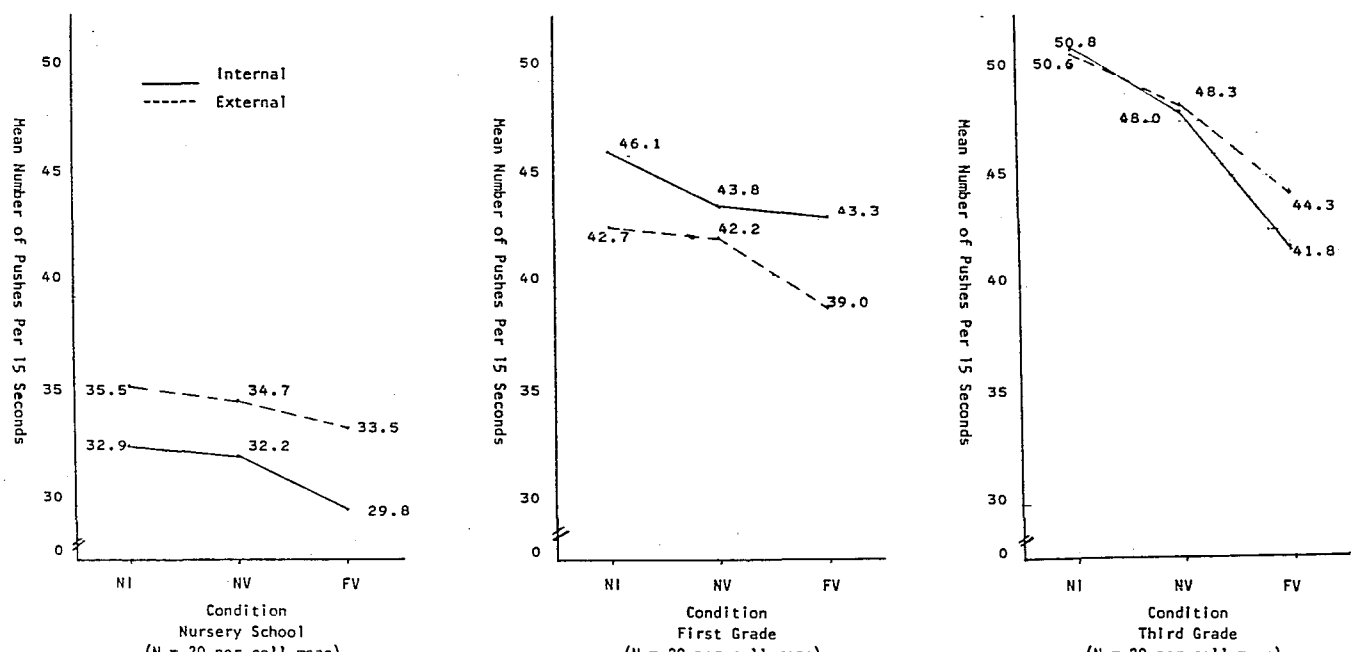

Figure 5. Grade Level by Locus of Control by Condition Comparisons of Subjects' Performance on the Push-Button Task

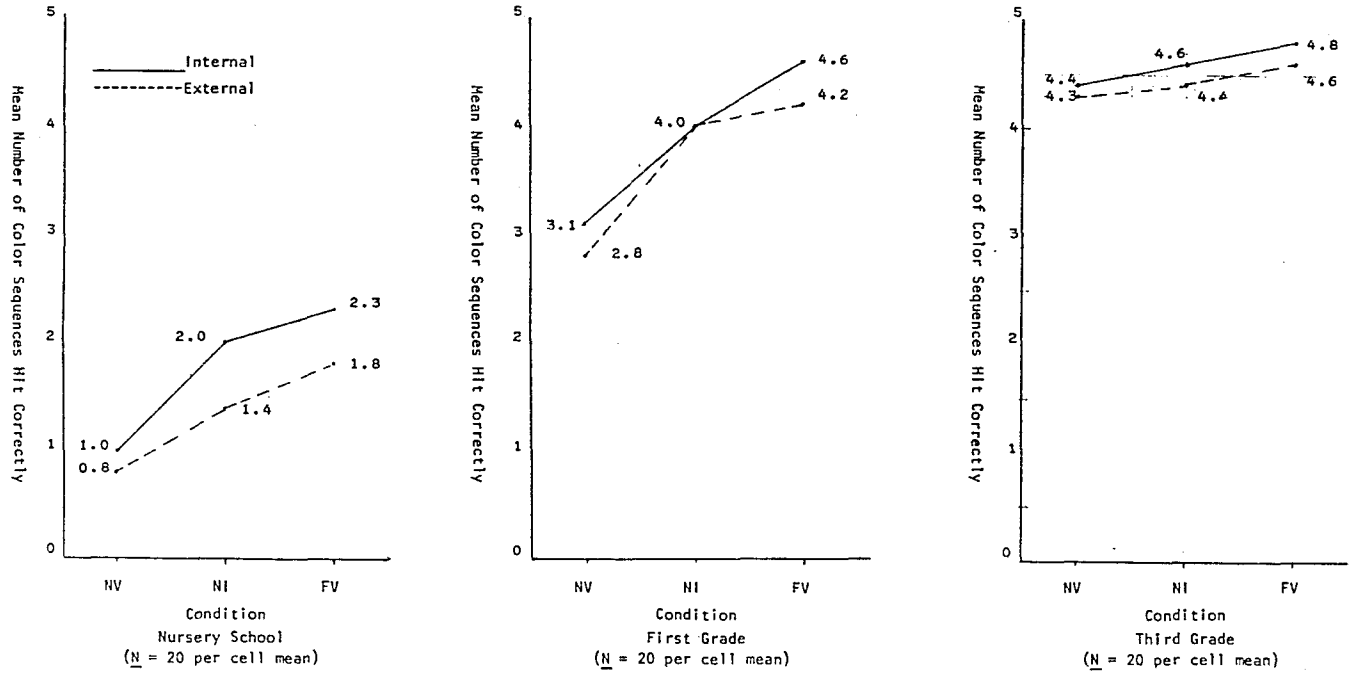

Figure 6. Grade Level by Locus of Control by Condition Comparisons of Subjects' Performance on the Pounding-Board Task

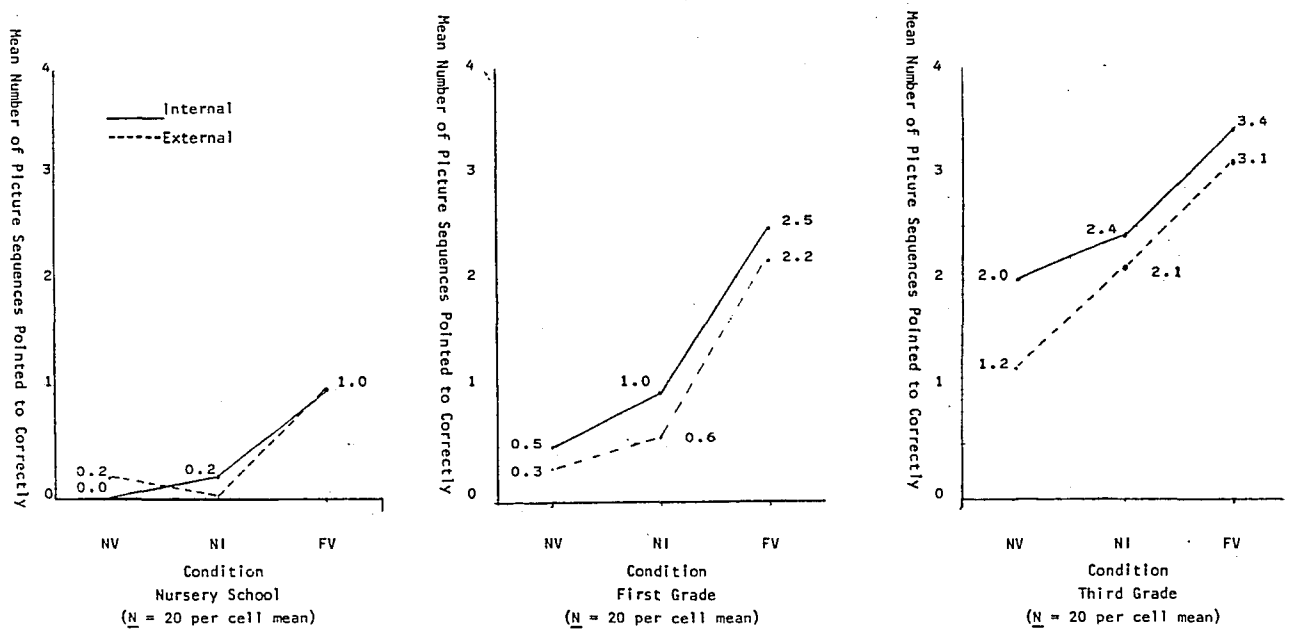

Figure 7. Grade Level by Locus of Control by Condition Comparisons of Subjects' Performance on the Serial-Recall Task

Although the grade by locus of control by condition interactions did not reach significance ($p > .05$), internals tended to perform better than externals at each grade level and under all conditions on the pounding-board task and on the serial-recall task. On the push-button task, externals tended to perform better, but not significantly better than internals in nursery school. Internal first graders tended to perform better than external first graders and third graders performed about the same except under the forced verbalization condition, where externals tended to perform better than internals.

There were four interactions involving locus of control which were significant. On the push-button task, there was a grade by locus of control interaction which was significant (F (1,108) = 3.29, $p < .05$), as well as a grade by sex by locus of control interaction which was statistically significant (F (1,108) = 3.37, $p < .05$). The significant grade by locus of control interaction and the grade by sex by locus of control interaction for the push-button task are presented in Figures 8 and 9. Means and standard deviations for the above significant interaction are presented in Tables 24 and 25.

To clarify the nature of the grade by locus of control interaction, *a priori* comparisons on performance for the push-ubtton task were performed and are presented in Tables 26 and 27. Within grade levels, as shown in

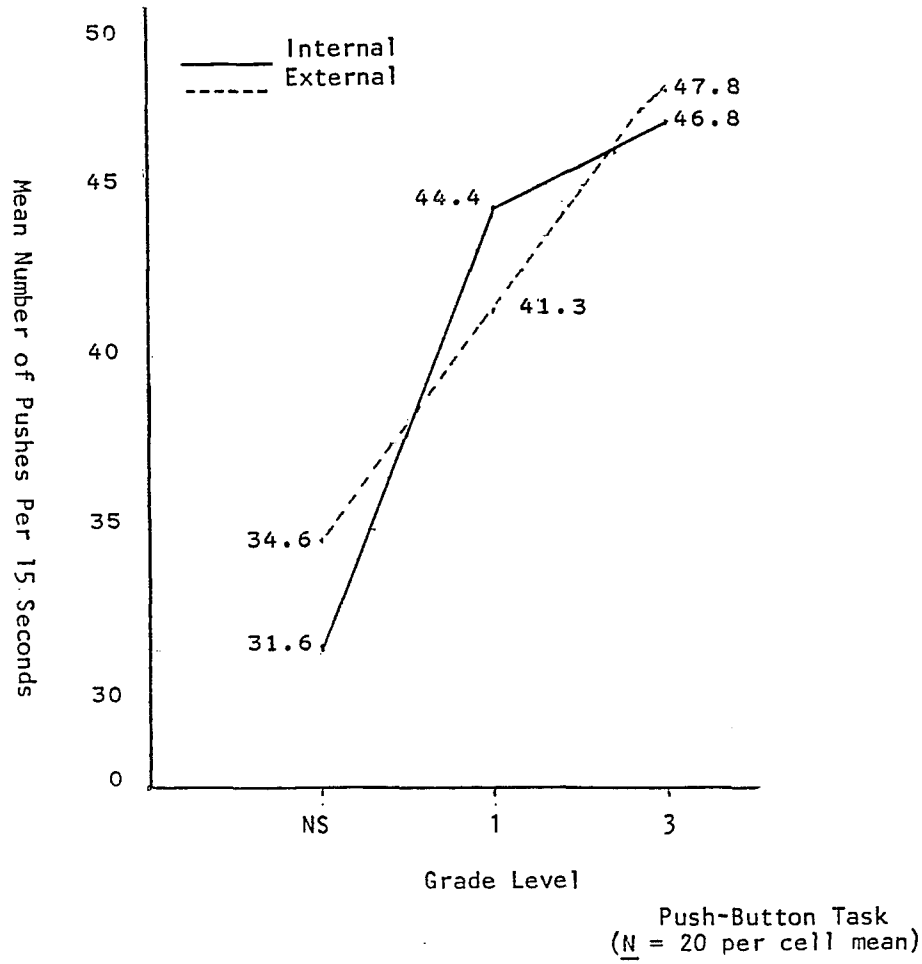

Figure 8. Grade by Locus of Control Comparisons of Subjects' Performance on the Push-Button Task

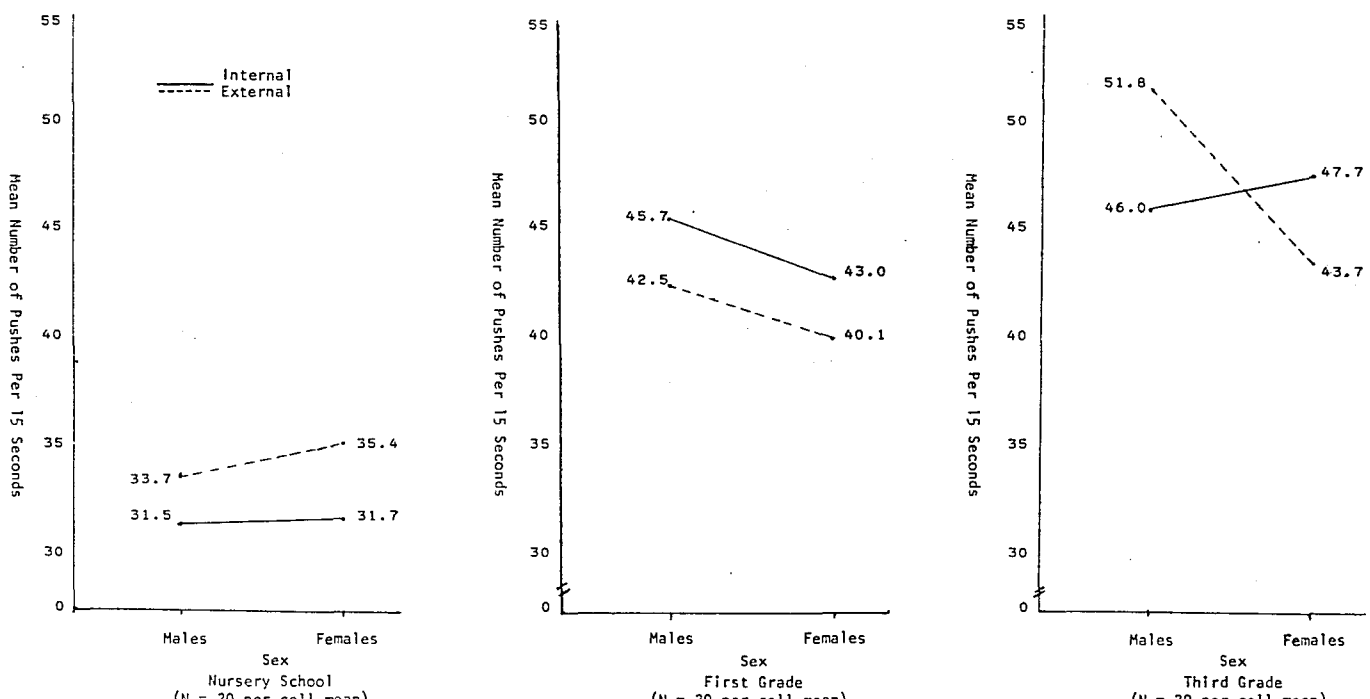

Figure 9. Grade by Sex by Locus of Control Comparisons of Subjects' Performance on the Push-Button Task

Table 24

Means and Standard Deviations for the Push-Button Task Performance (Total number of pushes per 15 seconds) by Grade and Locus of Control Variables

	Grade Level					
	Nursery School		First Grade		Third Grade	
	Internal	External	Internal	External	Internal	External
$\bar{X}$	31.65	34.57	44.37	41.30	46.85	47.77
SD	4.26	6.58	5.93	4.66	5.27	6.04

Table 25

Means and Standard Deviations for Push-Button Performance (Total number of pushes per 15 seconds) by Grade, Sex, and Locus of Control Variables (N = 10 per cell mean)

	Grade Level											
	Nursery School				First Grade				Third Grade			
	Female		Male		Female		Male		Female		Male	
	Internal	External	Internal	External	Internal	External	Internal	External	Internal	External	Internal	External
$\bar{X}$	31.70	35.40	31.60	33.73	43.00	40.07	45.73	42.53	47.67	43.73	46.03	51.80
SD	3.41	4.66	5.16	8.25	4.84	2.84	6.83	5.86	3.56	3.30	6.67	5.47

Table 26

Simple Effect Comparisons of Grade Level Performance by Locus of Control on the Push-Button Task (Pushing a button as many times as possible in 15 seconds) Using A Priori Test of Analysis Based Upon Student's t (N = 20 per cell mean)

Locus of Control	Grade $A_2 - A_1$	$A_3 - A_2$
Internal	$t = 4.37^{**}$	$t = 0.85$
External	$t = 2.31^{*}$	$t = 2.22^{*}$

$^{*}p < .05$
$^{**}p < .01$

Table 27

Simple Effect Comparisons of Locus of Control Performance by Grade Level on the Push-Button Task (Pushing a button as many times as possible in 15 seconds) Using A Priori Test of Analysis Based Upon Student's t (N = 20 per cell mean)

Grade Level	Internal - External
Nursery School	$t = 1.00$
First Grade	$t = 1.05$
Third Grade	$t = 0.92$

*$p < .05$

Table 27, internal Ss tended to perform better than external Ss. However, since the difference between internals and externals at each grade level was not found to be significant [$(I - E)A_1 = 1.00$, $p > .05$; $(I - E)A_2 = 1.05$, $p > .05$; $(I - E)A_3 = 0.92$, $p > .05$], this interaction was difficult to interpret statistically.

To clarify the nature of the grade by sex by locus of control interaction for the push-button task, a priori comparisons on performance were made and are presented in Table 28. In this analysis, none of the internal versus external comparisons were significant ($p > .05$). The significant interaction can be partially explained since nursery school external Ss tended to perform better than nursery school internal Ss, but the opposite effect occurred for first grade Ss. In third grade, internal females tended to perform better than external females, whereas, external males tended to perform better than internal males.

On the pounding-board task, there was a grade by sex by locus of control by condition interaction which was significant (F (1,108) = 2.64, $p < .05$). The significant grade by sex by locus of control by condition interaction for the pounding-board task is displayed in Figure 10. Means and standard deviations for the above significant interaction are presented in Table 29.

On the grade by sex by locus of control by condition interaction for the pounding-board task, a priori

Table 28

Simple Effect Comparisons of Locus of Control Performance by Grade Level and Sex on the Push-Button Task (Pushing a button as many times as possible in 15 seconds) Using *A Priori* Test of Analysis Based Upon Student's *t* (*N* = 10 per cell mean)

Grade Level	Sex	Internal - External
Nursery School	Female	$t = -0.90$
	Male	$t = -0.52$
First Grade	Female	$t = 0.71$
	Male	$t = 0.78$
Third Grade	Female	$t = 0.96$
	Male	$t = -1.40$

*$p < .05$

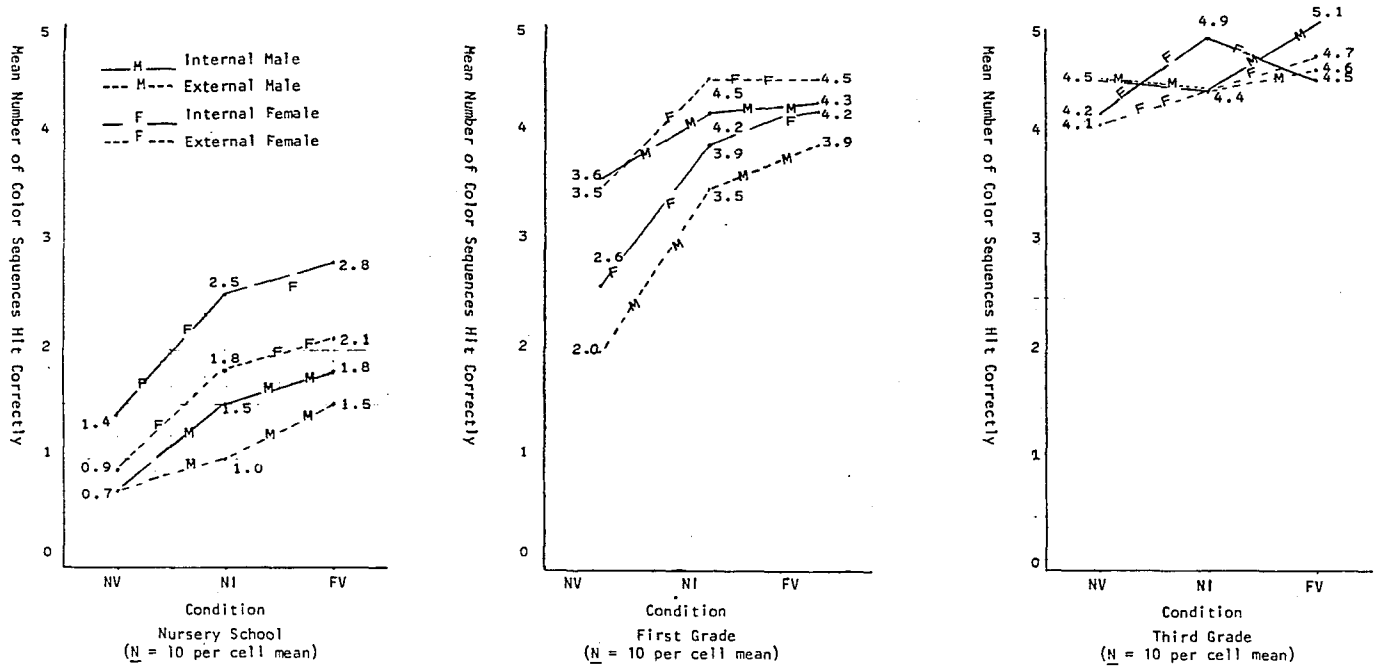

Figure 10. Grade by Sex by Locus of Control by Condition Comparisons of Subjects' Performance on Pounding-Board Task

Table 29

Means and Standard Deviations for Pounding-Board Performance (Total number of color sequences hit correctly) by Grade, Sex, Locus of Control, and Condition Variables
(N = 10 per cell mean)

Condition	Grade Level											
	Nursery School				First Grade				Third Grade			
	Female		Male		Female		Male		Female		Male	
	Internal	External	Internal	External	Internal	External	Internal	External	Internal	External	Internal	External
NV												
$\bar{X}$	1.40	0.90	0.70	0.70	2.60	3.50	3.60	2.00	4.20	4.10	4.50	4.50
SD	1.51	0.88	0.82	1.34	1.78	1.43	1.58	1.25	1.62	1.20	1.27	0.85
NI												
$\bar{X}$	2.50	1.80	1.50	1.00	3.90	4.50	4.20	3.50	4.90	4.40	4.40	4.40
SD	1.35	1.40	1.65	1.89	1.85	1.08	1.32	0.97	1.29	1.17	1.43	0.84
FV												
$\bar{X}$	2.80	2.10	1.80	1.50	4.20	4.50	4.30	3.90	4.50	4.70	5.10	4.60
SD	1.32	1.85	1.40	1.65	1.32	1.18	1.16	0.88	1.27	1.16	0.99	0.84

comparisons were also performed and presented in Table 30. First grade male internal Ss performed significantly better than first grade male external Ss under the no verbalization condition [$(I - E)A_2M = 2.67$, $p < .01$]. None of the other internal versus external comparisons were significant ($p > .05$).

On the serial-recall task, there was a statistically significant grade by sex by locus of control interaction (F (1,108) = 4.03, $p < .05$). The statistically significant grade by sex by locus of control interaction for the serial-recall task is displayed in Figure 11. Means and standard deviations for the above significant interaction are presented in Table 31.

On the grade by sex by locus of control interaction for the serial-recall task, a priori comparisons were again made and are presented in Table 32. None of the internal versus external comparisons on the grade by sex by locus of control were significant ($p > .05$). The significant interaction can, however, be partially explained due to the opposite effect on performance by sex at the different grade levels. Nursery school internal females tended to perform better than external females; male externals tended to perform better than male internals. The opposite occurred for first grade Ss. Third grade internal females tended to perform better than external females; there was no difference between performance of male internals or externals.

Table 30

Simple Effect Comparisons of Locus of Control Performance by Grade and Sex and Condition on the Pounding-Board Task (Hitting increasing lengths of different color sequences) Using A Priori Test of Analysis Based Upon Student's t (N = 10 per cell mean)

Grade Level	Sex	Condition	Internal - External
Nursery School	Female	Free	t = 1.17
		No Verbalization	t = 0.83
		Forced Verbalization	t = 1.17
	Male	Free	t = 0.83
		No Verbalization	t = 0.00
		Forced Verbalization	t = 0.50
First Grade	Female	Free	t = -1.00
		No Verbalization	t = -1.50
		Forced Verbalization	t = -0.50
	Male	Free	t = 1.17
		No Verbalization	t = 2.67**
		Forced Verbalization	t = 0.67
Third Grade	Female	Free	t = 0.83
		No Verbalization	t = 0.17
		Forced Verbalization	t = -0.33
	Male	Free	t = 0.00
		No Verbalization	t = 0.00
		Forced Verbalization	t = 0.83

*p <.05
**p <.01

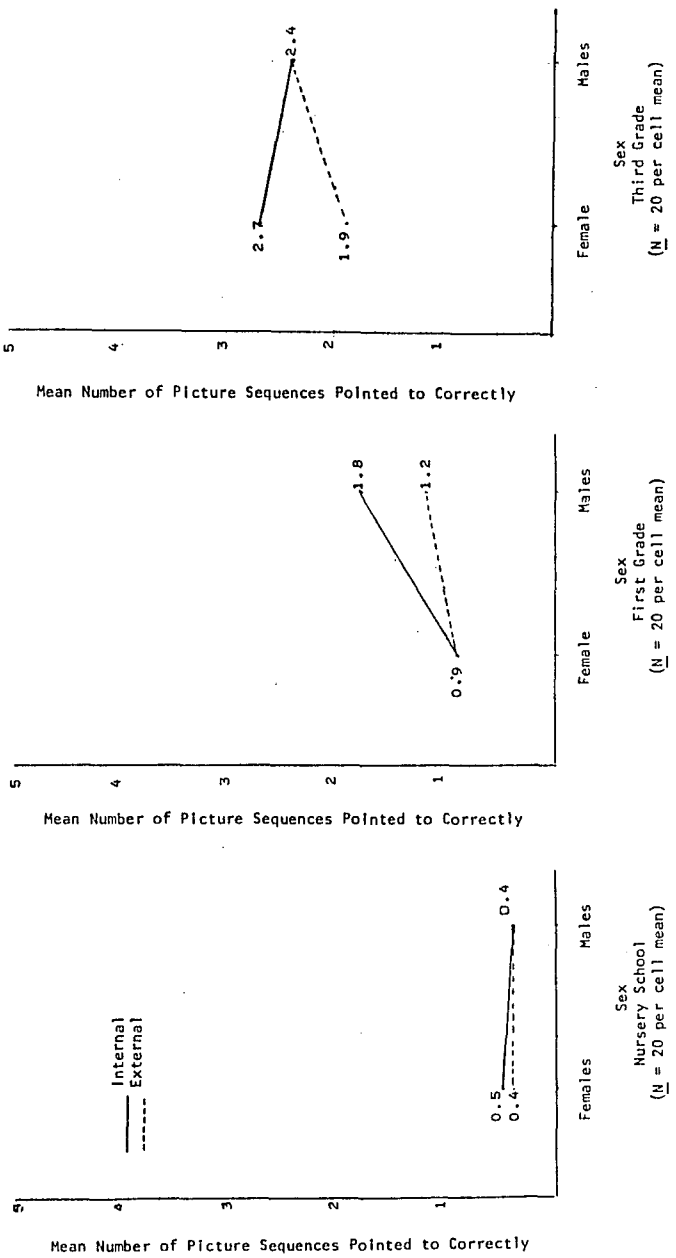

Figure 11. Grade by Sex by Locus of Control Comparisons of Subjects' Performance on the Serial-Recall Task

Table 31

Means and Standard Deviations for Serial-Recall Performance (Total number of non-related picture sequences pointed to correctly) by Grade, Sex, and Locus of Control Variables ($\underline{N}$ = 10 per cell mean)

	Grade Level											
	Nursery School				First Grade				Third Grade			
	Female		Male		Female		Male		Female		Male	
	Internal	External	Internal	External	Internal	External	Internal	External	Internal	External	Internal	External
$\bar{X}$	0.50	0.40	0.37	0.40	0.87	1.17	1.80	0.90	2.73	1.90	2.40	2.40
SD	0.42	0.56	0.40	0.62	0.63	0.86	0.90	0.72	0.91	1.25	1.11	0.89

Table 32

Simple Effect Comparisons of Locus of Control Performance by Grade and Sex on the Serial-Recall Task (Pointing to increasing lengths of non-related picture sequences) Using A Priori Test of Analysis Based Upon Student's t
(N = 10 per cell mean)

Grade Level	Sex	Internal - External
Nursery School	Female	t = 0.16
	Male	t = -0.05
First Grade	Female	t = -0.48
	Male	t = 1.43
Third Grade	Female	t = 1.32
	Male	t = 0.00

*p <.05

Summary of Locus of Control Analysis on Task Performance

The results reported above lend minimal support for hypothesis (b_1) since the analyses yielded no significant locus of control main effects for any of the tasks.

On the significant grade by sex by locus of control by condition interaction for the pounding-board task, first grade male internals performed significantly better than first grade male externals under the no verbalization condition.

Hypothesis (b_2) also received minimal support since there were no significant grade by locus of control by condition interactions. On the push-button task under forced verbalization, nursery school and third grade external Ss performed better, but not significantly better than internal Ss, and first grade internal Ss performed better, but not significantly better, than externals under forced verbalization. On the pounding-board task under forced verbalization, internals performed better, but not significantly better, than externals. On the serial-recall task, nursery school externals performed just as well as internal nursery school children under the forced verbalization condition. First grade and third grade internal Ss performed better, but not significantly better, than first and third grade externals under the forced verbalization condition.

Since there were no significant main effects for locus of control, hypothesis (b_3) was not supported; therefore, it was not pursued with additional analyses.

Locus of Control Analysis on Verbalization

Hypotheses (c_1), (c_2), and (c_3) dealt with the degree of verbalization displayed by internal and external locus of control children under the various verbalization conditions. In hypothesis (c_1), it was stated that children with an internal locus of control show a higher degree of spontaneous verbalizing behavior than same age children with external locus of control. In hypothesis (c_2), it was stated that both internal and external locus of control children increase their overt task performance by the degree to which they employ verbal mediating responses (i.e., spontaneous verbalizations). In hypothesis (c_3), it was stated that the more internal a child's locus of control, the more effective is his utilization of verbal control tasks.

Locus of control, as shown earlier in Tables 10, 12, and 14, was not a significant main effect for the verbalization data on the push-button task (F (1,114) = 0.18, $p > .05$), the pounding-board task (F (1,108) = 0.13, $p > .05$), and the serial-recall task (F (1,108) = 3.50, $p > .05$). In and of itself, locus of control does not appear to be a significant factor in determining one's degree of

verbalization on tasks of the nature employed here. In order to examine the problem further, it is necessary to analyze the grade by locus of control by condition interactions, for the push-button task, shown in Figure 12, the pounding-board task, shown in Figure 13, and the serial-recall task, shown in Figure 14. However, the grade by locus of control by condition interactions for the push-button task (F (2,114) = 0.70, $p > .05$) and the serial-recall task (F (2,108) = 0.05, $p > .05$) were not significant. There was a significant grade by locus of control by condition interaction for the pounding-board task (F (2,108) = 3.60, $p < .05$).

As shown in Figure 12, on the push-button task under the free condition, there were almost no spontaneous verbalizations by any individual at any grade level or locus of control. Nursery school internal Ss tended to give slightly more spontaneous verbalizations than nursery school external Ss. As shown in Figure 14 on the serial-recall task, external nursery school Ss tended to give more spontaneous verbalizations than internal nursery school Ss. Internal first grade Ss and third grade Ss on the serial-recall task, however, tended to give more spontaneous verbalizations than external first grade Ss and external third grade Ss.

For a further examination of the significant grade by locus of control by condition interaction on the

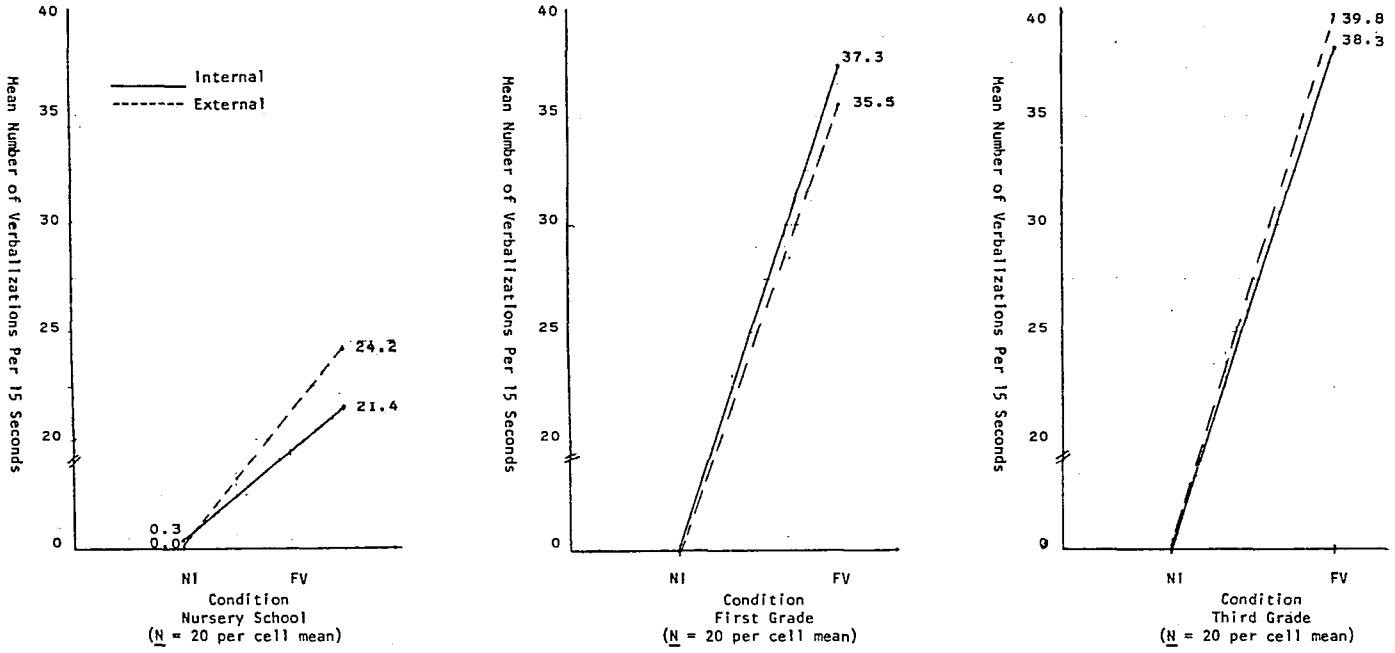

Figure 12. Grade by Locus of Control by Condition Comparisons of Subjects' Verbalizations on the Push-Button Task

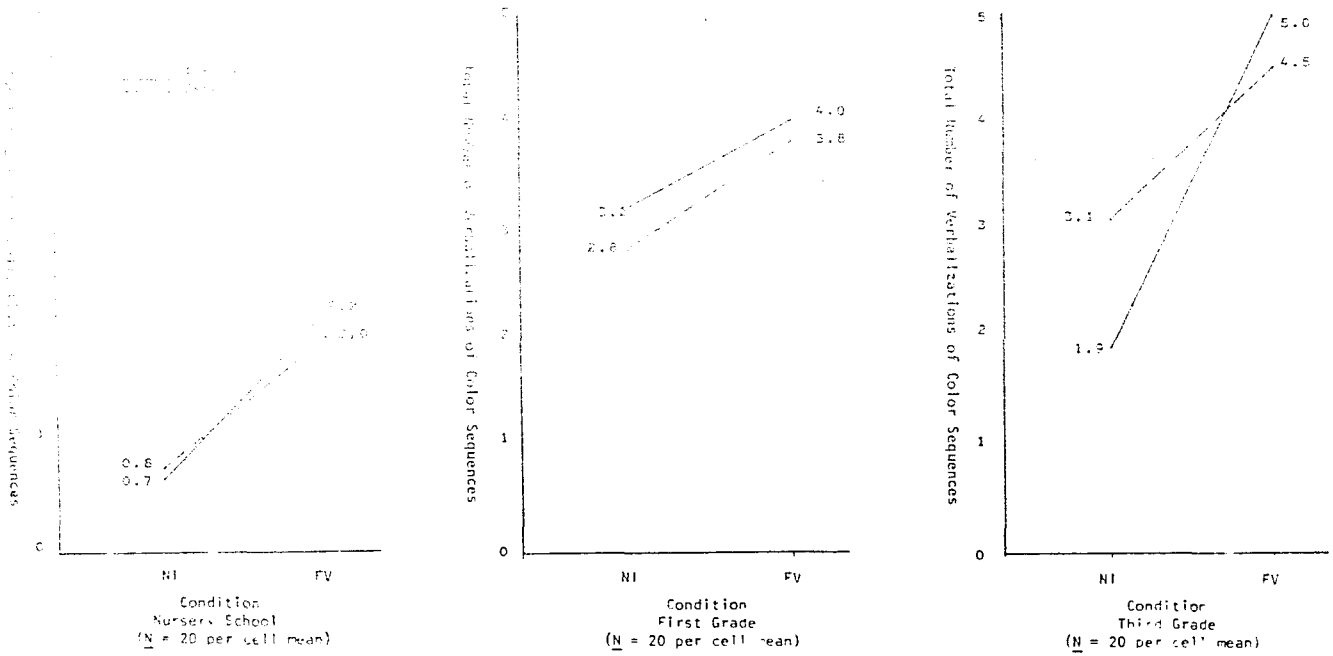

Figure 13. Strategy by Locus of Control by Condition Comparisons of Subjects' Verbalizations on the Pounding-Board Task

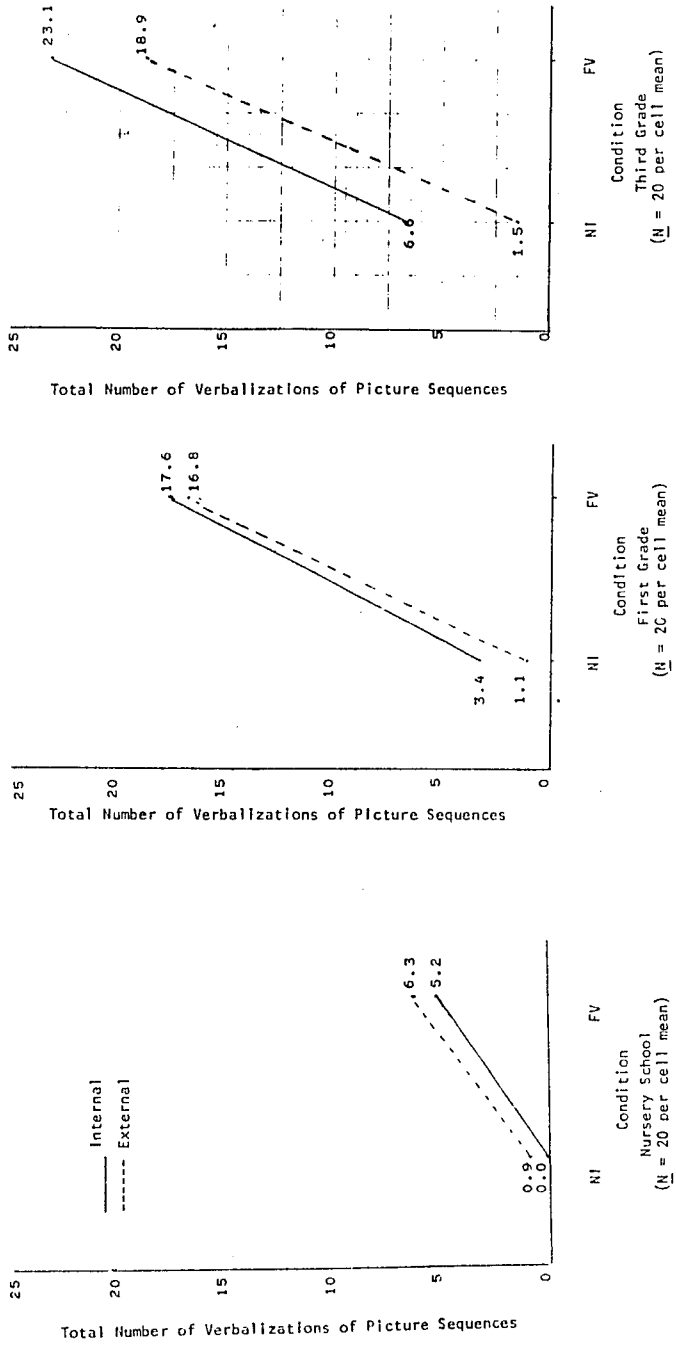

Figure 14. Grade by Locus of Control by Condition Comparisons of Subjects' Verbalizations on the Serial-Recall Task

pounding-board task, means and standard deviations are presented in Table 33. A *priori* comparisons among the means are presented in Table 34. On the pounding-board task under the free condition, there was virtually no difference between the number of spontaneous verbalizations for nursery school internal Ss and nursery school external Ss [$(I - E)A_1NI = -0.21$, $p > .05$]. Internal first grade Ss gave more spontaneous verbalizations, but not significiantly more, than external first grade Ss [$(I - E)A_2NI = 0.62$, $p > .05$]. Curiously, third grade externals gave significantly more spontaneous verbalizations than third grade internals [$(I - E)A_3NI = -2.50$, $p < .05$]. As a result, hypothesis (c_1) received little support.

There were two other significant interactions--both of which pertain to the verbalizations on the serial-recall task. First, there was a significant grade by locus of control interaction as shown earlier in Table 12 (F (2,108) = 3.13, $p < .05$). This interaction is graphed in Figure 15. The means and standard deviations for the grade by locus of control interaction are shown in Table 35. To clarify the nature of the grade by locus of control interaction, a *priori* comparisons of locus of control verbalizations by grade level on the serial-recall task were performed on these data and are presented in Table 36. There was no significant difference between the amount of verbalization by nursery school internal Ss [$(I - E)A_1 = -0.45$, $p > .05$], nor was there any

Table 33

Means and Standard Deviations for the Pounding-Board Verbalizations (Total number of verbalizations of color sequences) by Grade, Locus of Control and Condition Variables (N = 20 per cell mean)

Condition	Grade Level					
	Nursery School		First Grade		Third Grade	
	Internal	External	Internal	External	Internal	External
NI						
$\bar{X}$	0.70	0.80	3.15	2.85	1.95	3.15
SD	1.22	1.54	1.95	1.66	1.90	1.81
FV						
$\bar{X}$	2.15	2.00	3.95	3.85	5.00	4.50
SD	1.42	1.69	1.36	1.18	0.97	1.00

Table 34

Simple Effect Comparisons of Locus of Control Verbalizations (Mean number of verbalizations of color sequences) by Grade and Condition on the Pounding-Board Task Using A Priori Test of Analysis Based Upon Student's t (N = 20 per cell mean)

	Condition	
	NI	FV
Grade Level	Internal - External	Internal - External
Nursery School	t = -0.21	t - 0.31
First Grade	t = 0.62	t = 0.43
Third Grade	t = -2.50*	t = 1.04

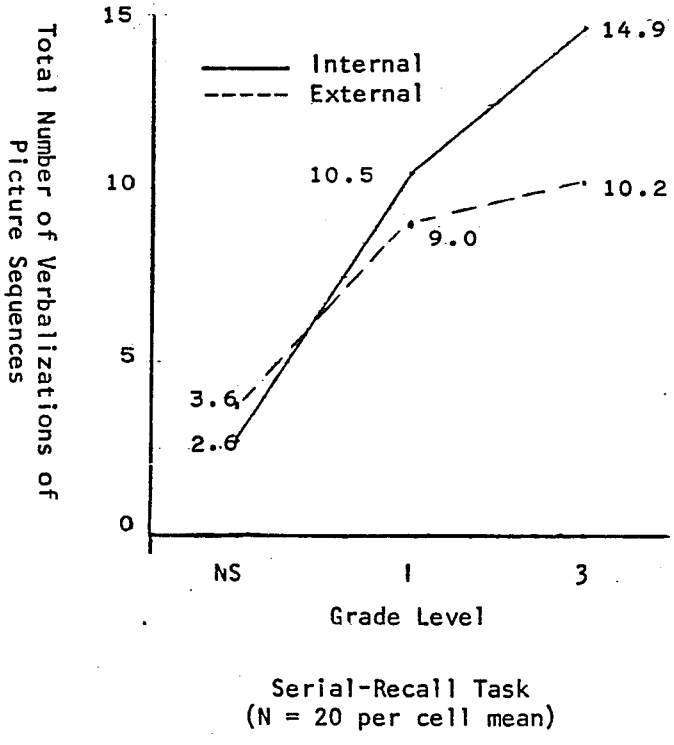

Figure 15. Grade by Locus of Control Comparisons of Subjects' Verbalizations on the Serial-Recall Task

Table 35

Means and Standard Deviations for the Serial-Recall Verbalizations (Total number of verbalizations of non-related picture sequences) by Grade and Locus of Control Variables ($\underline{N}$ = 20 per cell mean)

	Grade Level					
	Nursery School		First Grade		Third Grade	
	Internal	External	Internal	External	Internal	External
$\bar{X}$	2.58	3.60	10.52	8.95	14.88	10.20
SD	2.79	5.52	5.72	6.16	6.06	3.76

Table 36

Simple Effect Comparisons of Locus of Control Verbalizations (Mean number of verbalizations of non-related picture sequences) by Grade Level on the Serial-Recall Task Using *A Priori* Test of Analysis Based Upon Student's *t* (N = 20 per cell mean)

Grade Level	Internal - External
Nursery School	$t = -0.45$
First Grade	$t = 0.69$
Third Grade	$t = 2.05^*$

$^*p < .05$

significant difference in the amount of verbalization by first grade internal Ss and external first grade Ss [$(I - E)A_2 = 0.69$, $p > .05$]. However, third grade internal Ss verbalized significantly more on the serial-recall task than third grade external Ss when all verbalization conditions were combined [$(I - E)A_3 = 2.05$, $p < .05$].

Secondly, on the serial-recall task, there was the significant grade by sex by locus of control interaction as shown earlier in Table 12 (F (2,108) - 4.03, $p < .05$). This interaction is graphed in Figure 16. The means and standard deviations for the grade by sex by locus of control interaction are shown in Table 37. A priori comparisons of the means are presented in Table 38. Here, it was shown that there was no significant difference in the amount of verbalization between nursery school external males and females and internal males and females [$(I - E)A_1M = -0.48$, $p > .05$; $(I - E)A_1F = -0.16$, $p > .05$ when all conditions of verbalization were combined. There was also no significant difference in the amount of verbalization between first grade internal males and females and first grade external males and females. [$(I - E)A_2M = 1.78$, $p > .05$; $(I - E)A_2F = -0.81$, $p > .05$. In third grade, internal males verbalized more than external males, but not significantly more [$(I - E)A_3M - 0.36$, $p > .05$], when all conditions of verbalization were combined. However, third grade internal females did verbalize significantly more than third grade external

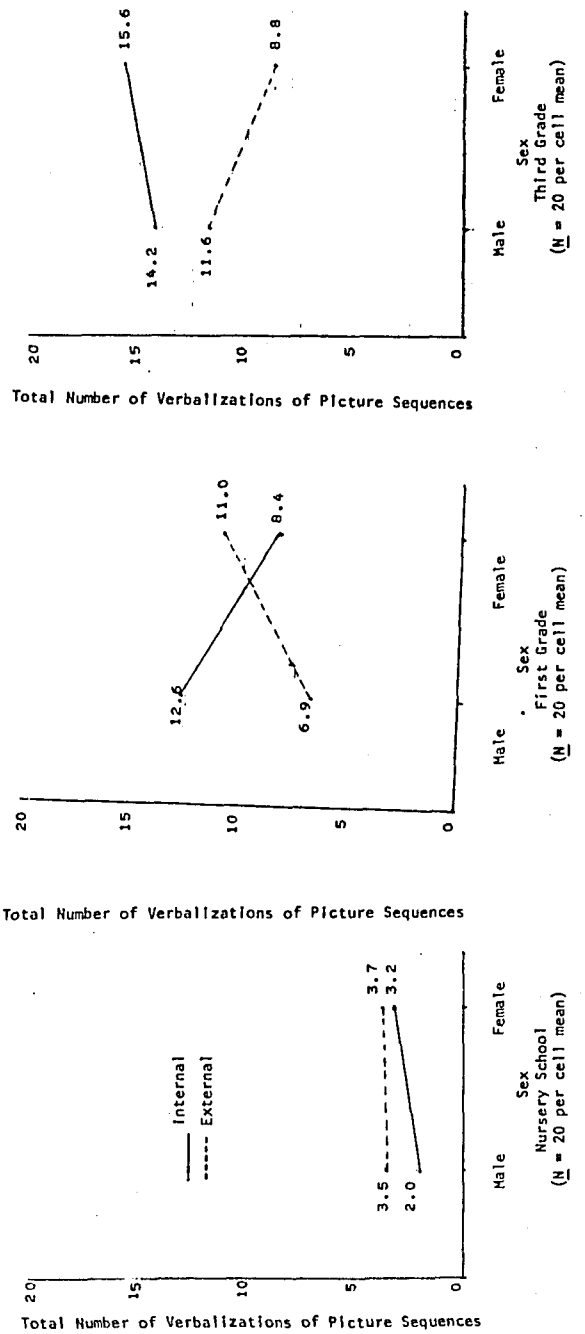

Figure 16. Grade by Sex by Locus of Control Comparisons of Subjects' Verbalizations on the Serial-Recall Task

Table 37

Means and Standard Deviations for Serial-Recall Verbalizations (Total number of verbalizations of non-related picture sequences) by Grade, Sex, and Locus of Control Variables (N = 10 per cell mean)

	Grade Level											
	Nursery School				First Grade				Third Grade			
	Female		Male		Female		Male		Female		Male	
	Internal	External	Internal	External	Internal	External	Internal	External	Internal	External	Internal	External
$\bar{X}$	3.20	3.70	1.95	3.50	8.40	11.00	12.65	6.90	15.55	8.85	14.20	11.55
SD	3.08	4.88	2.47	6.35	5.68	7.55	5.18	3.72	6.52	3.37	5.82	3.81

Table 38

Simple Effect Comparisons of Locus of Control Verbalizations (Mean number of verbalizations of non-related picture sequences) by Grade and Sex on the Serial-Recall Task Using A Priori Test of Analysis Based Upon Student's t (N = 10 per cell mean)

Grade Level	Female Internal - External	Male Internal - External
Nursery School	t = -0.16	t = -0.48
First Grade	t = -0.81	t = 1.78
Third Grade	t - 2.08*	t - 0.36

Table 39

A Summary of the Grade by Sex by Locus of Control by Condition Analysis of Variance on Push-Button Verbalizations (Number of verbalizations per 15 seconds)

Source	df	MS	F
Between Subjects			
(A) Grade	2	1480.62	32.60**
(B) Sex	1	1.35	0.03
(C) Locus of Control	1	8.07	0.18
A X B	2	78.95	1.74
A X C	2	25.31	0.56
B X C	1	38.40	0.84
A X B X C	2	28.35	0.62
Error	108	45.41	
Within Subjects			
(D) Condition	1	64222.82	1458.28**
A X D	2	1540.01	34.97**
B X D	1	3.73	0.08
C X D	1	13.04	0.30
A X B X D	2	90.62	2.06
A X C X D	2	31.20	0.71
B X C X D	1	48.59	1.10
A X B X C X D	2	26.25	0.60
Error	108	44.04	

*$p < .05$
**$p < .01$

females [$(I - E)A_3F = 2.08$, $p < .05$] on the serial-recall task.

With regard to verbalization, sex was not significant on the push-button task (F (1,108) = 0.03, $p > .05$) nor in any interactions as shown in Table 39. As a result, sex was deleted from the analysis of the push-button task. Sex was also not significant as a main effect on the pounding-board task (F (1,108) = 1.07, $p > .05$) or on the serial-recall task (F (1,108) = 0.00, $p > .05$), as shown earlier in Tables 10 and 12.

Summary of Locus of Control Analysis on Verbalization

The results reported above lend minimal support to hypothesis (c_1). There were no significant main effects for the locus of control variable on the number of verbalizations spoken on three verbal control tasks. There was also no significant grade by locus of control by condition interaction for the push-button task or the serial-recall task. However, this interaction was significant for the pounding-board task.

On the push-button task, there was virtually no spontaneous verbalization by any individual at any grade level. On the serial-recall task, there was no significant difference in the amount of spontaneous verbalizations between external nursery school Ss and internal nursery school Ss. Internal first grade Ss and third grade Ss on

the serial-recall task tended to give more spontaneous verbalizations but not significantly more than external first grade Ss and third grade Ss.

In considering the significant grade by locus of control by condition interaction on the pounding-board task, it was found that under the free condition, there was virtually no difference between the number of spontaneous verbalizations for nursery school internal Ss and nursery school external Ss, nor for first grade internal Ss and external Ss. However, third grade external Ss gave significantly more spontaneous verbalizations than third grade internal Ss which was in contradiction to hypothesis (c_1).

For the significant grade by locus of control interaction on the serial-recall task, third grade internals verbalized significantly more than third grade externals; however, this trend was not apparent at the younger grade levels.

For the significant grade by sex by locus of control interaction on the serial-recall task, there was no significant difference in the amount of verbalization between nursery school external Ss, both females and males, and internals when all conditions of verbalization were combined. Likewise, there was no significant difference in the amount of verbalization between first grade internal males and females when all conditions of verbalizations were combined. In third grade, internal males verbalized more than external

males, but not significantly more, when all conditions of verbalizations were combined. However, third grade internal females verbalized significantly more than third grade external females.

Hypothesis (c_2) gained some support as task performance improved under forced verbalization on the two sequential types of tasks--the pounding-board task and the serial-recall task. Performance did not, however, improve under forced verbalization on the push-button task.

Hypothesis (c_3) was not supported since there were no significant main effects for locus of control in either the verbalization data or the performance data.

Consistency in Spontaneous Verbalizations Across Tasks

In hypothesis (d_1), it is stated that the use or absence of verbal mediating behaviors by children is consistent across different verbal control tasks. In order to investigate this hypothesis, Pearson correlation coefficients were conducted for the total sample between the number of verbalizations spoken on the three different verbal control tasks, as shown in Table 40. Only the relationship between the pounding-board task and the serial-recall task was statistically significant ($\underline{r}$ - 0.23, $\underline{p} < .05$).

Separate Pearson correlations were then calculated for internal and external locus of control Ss in order to determine the role of locus of control in the consistency of

Table 40

Pearson Correlation Coefficients by Total Ss on Consistency of Spontaneous Verbalizations Made on Three Different Verbal Control Tasks (N = 120 per cell mean)

Task	Push-Button	Pounding-Board	Serial-Recall
Push-Button	1.00	-0.05	-0.04
Pounding-Board		1.00	0.23*
Serial-Recall			1.00

*$p < .05$

spontaneous verbalizations across different tasks. These coefficients are presented in Table 41. As shown in Table 40, there are two statistically significant correlations pertaining to one's consistency in spontaneous verbalizations across tasks. For internal Ss there was a significant correlation ($r = 0.23$, $p < .05$) for consistency in spontaneous verbalization between the pounding-board task and the serial-recall task. External Ss also had a significant correlation ($r = 0.32$, $p < .01$) for consistency in spontaneous verbalizations between the pounding-board task and the serial-recall task. However, these two significant correlations accounted for relatively little of the variance.

The researcher then performed Pearson correlations on the number of spontaneous verbalizations across the three different tasks by grade level as shown in Table 42. There were again two significant correlations between the spontaneous verbalizations on the pounding-board task and the serial-recall task. Nursery school Ss had a significant correlation ($r = 0.50$, $p < .01$) for consistency in spontaneous verbalizations between the pounding-board task and the serial-recall task. First grade Ss also displayed a significant correlation ($r = 0.27$, $p < .05$) for consistency in spontaneous verbalizations on the pounding-board and serial-recall tasks.

In Table 43, the coefficients by grade level and by locus of control are shown. Again, there were two significant

Table 41

Pearson Correlation Coefficients[1] by Locus of Control on the Consistency of Spontaneous Verbalizations Made on Three Different Verbal Control Tasks
($\underline{N}$ = 60 per cell mean)

Tasks	Push-Button		Pounding-Board		Serial-Recall	
	Internal	External	Internal	External	Internal	External
Push-Button	1.00	1.00	-0.06	---	-0.07	---
Pounding-Board			1.00	1.00	0.23*	0.32**
Serial-Recall					1.00	1.00

*$\underline{p} < .05$
**$\underline{p} < .01$

[1]The blank places are due to the fact that Pearson Correlations could not be made due to zero spontaneous verbalizations.

Table 42

Pearson Correlation Coefficients by Grade Level on the Consistency of Spontaneous Verbalizations Made on Three Different Verbal Control Tasks (N = 40 per cell mean)

	Push-Button			Pounding-Board			Serial-Recall		
	Nursery School	First	Third	Nursery School	First	Third	Nursery School	First	Third
Push-Button	1.00	1.00	1.00	0.03	---	---	-0.02	---	---
Pounding-Board				1.00	1.00	1.00	0.50**	0.27*	-0.03
Serial-Recall							1.00	1.00	1.00

*p <.05
**p <.01

Table 43

Pearson Correlation Coefficients by Grade Level and Locus of Control on the Consistency of Spontaneous Verbalizations Made on Three Different Verbal Control Tasks (N = 20 per cell mean)

Grade Level	Tasks	Push-Button		Pounding-Board		Serial-Recall	
		Internal	External	Internal	External	Internal	External
Nursery School	Push-Button	1.00	0.00	0.06	---	---	---
	Pounding-Board			1.00	1.00	---	0.64**
	Serial-Recall					1.00	1.00
First Grade	Push-Button	1.00	1.00	---	---	---	---
	Pounding-Board			1.00	1.00	0.19	0.37*
	Serial-Recall					1.00	1.00
Third Grade	Push-Button	1.00	1.00	---	---	---	---
	Pounding-Board			1.00	1.00	0.13	0.06
	Serial-Recall					1.00	1.00

*$p < .05$
**$p < .01$

correlations pertaining to the relationship between spontaneous verbalizations for the pounding-board task and the serial-recall task. Nursery school external Ss had a significant correlation ($r = 0.64$, $p < .01$) for consistency in spontaneous verbalizations for the pounding-board task and the serial-recall task. First grade external Ss also had a significant correlation ($r = 0.37$, $p < .05$) for consistency in spontaneous verbalizations for the pounding-board task and the serial-recall task.

Summary on Consistency of Spontaneous Verbalizations Across Tasks

Pearson correlations were performed on the number of spontaneous verbalizations across three different verbal control tasks by the total sample, by locus of control, by grade level, and by the combination of grade level and locus of control. The only significant correlations were between the spontaneous verbalizations on the two sequential tasks--the pounding-board and the serial-recall. There was one significant correlation for nursery school external Ss ($r = 0.64$) which accounted for 41 per cent of the variance in spontaneous verbalizations between the pounding-board task and the serial-recall task. For first grade external Ss, this significant correlation was only 0.37, which accounted for 14 per cent of the variance. The correlation for third grade external subjects was not significant ($r = 0.06$, $p > .05$).

As a result, there is only modest evidence to support hypothesis (d_1). The two sequential types of tasks did show some significant correlations in the number of spontaneous verbalizations utilized by Ss, particularly among Ss at the younger grade levels having an external locus of control.

CHAPTER V

DISCUSSION

The present investigation involved a developmental analysis of performance and of verbalization effects on three different verbal control tasks. The study focused upon two issues which appeared to be critical in gaining an accurate understanding of differences in young children's learning abilities and their preferred verbal strategies across different tasks. The first issue involved the relative effects of locus of control as a major factor in a child's spontaneous tendency to utilize verbal mediating responses in task performance. The second issue involved the child's tendency to be consistent in the number of spontaneous verbalizations spoken across different tasks.

The study concentrated upon a broad range of children's ages in order to maximize the detection of developmental differences in verbal learning performance under certain conditions. This was successful in the sense that dependent measures of performance and of verbalizations on three different tasks were clearly differentiated among the three grade levels. In fact, in all of the analyses, the largest source of between-treatment variation in the Ss

performance and in the Ss verbalization were attributed to the grade level variable.

Associated with the research strategy were certain procedural problems inherent in the task situation. The task situation used ought to be such that the most mature Ss would follow a verbal-mediational approach in trying to cope with the task. This situation was met for the pounding-board and serial-recall task, but not for the push-button task. Secondly, the E needed to be able to distinguish verbal mediated from nonmediated overt responses on the tasks performed. The E in this study was able to make this discrimination for each individual response. Third, the E had devised a procedure for establishing whether a S actually produced any potentially mediating verbalization at each of the various points in the task sequence. In this study, the E was accompanied by an observer who read the Ss' lips as they performed the tasks. The observer has been reading lips most of her life and had 60 per cent hearing with the use of a hearing aid. Fourth, the E insured that the younger Ss had about the same reception and production command of the words in question as the older Ss. In this study, the E made sure that each S understood and knew all the colors and pictures involved in the pounding-board and serial-recall tasks, as well as, the meaning of the word "push" for the push-button task. The tasks used were ones

which appeared to be attractive for the grade levels involved.

Interpretation of Results

Performance on Tasks

The results indicated that the performance on the push-button task, the pounding-board task, and the serial-recall task increased significantly as grade level increased from nursery school to third grade. Furthermore, under the free condition, and also under the no verbalization condition, it was found that on the push-button task, performance increased significantly with each increasing grade level. Under the forced verbalization condition, first and third grade Ss performed significantly better than nursery school Ss. Third grade Ss performed better, but not significantly better, than first grade Ss. The reason for this may be that under the forced verbalization condition, the push-button task became more complex for third graders than for first graders. Since third graders use covert speech to a greater degree than first graders in the controlling of their behavior, forcing overt verbalizations may have made the push-button task more complex for third graders than for first graders.

On the pounding-board task under the free condition, there was no significant difference in performance between third grade Ss and first grade Ss. However, third and first

grade Ss performed significantly better than nursery school Ss. Under the no verbalization condition, performance increased significantly as grade level increased. Under forced verbalization, there was no significant difference in performance between third grade Ss and first grade Ss. First and third grade Ss, again, performed significantly better than nursery school Ss. The reason that third grade Ss did not perform significantly better than first grade Ss under the free condition was probably due to a low range of possible scores (i.e. from zero to six) on the pounding-board task, as well as a rather small sample size. Under the forced verbalization condition, the reason that third grade Ss did not perform significantly better than first grade Ss was probably the same as on the push-button task.

On the serial-recall task, under the free and forced verbalization conditions, performance increased significantly with increasing grade levels. Under the no verbalization condition, there was no significant difference in performance between first grade Ss and nursery school Ss. However, third grade Ss performed significantly better than first grade Ss and nursery school Ss. The reason that performance on the serial-recall task under the forced verbalization condition was significantly better for third grade Ss than for first grade Ss, but not on the push-button and pounding-board task, may be because the serial-recall task was more difficult than the other two tasks. As a result,

third grade Ss were more prone to overt verbalization rather than covert, thereby improving performance. Meichenbaum (1973) stated that the progression from overt to covert self-verbalizations was not related to the child's chronological age per se, but rather was more closely related to the child's proficiency or competence on a particular task.

Verbalization During Tasks

The results also showed that the number of spontaneous verbalizations does not necessarily increase with increasing grade level but depends on the task. On the push-button task, there was virtually no spontaneous verbalization by nursery school children, first graders, or third graders. Under the forced verbalization condition on the push-button task, first grade Ss verbalized significantly more than nursery school children. Third graders verbalized more, but not significantly more, than first graders.

On the pounding-board task, first and third grade Ss spontaneously verbalized significantly more than nursery school Ss. First grade Ss spontaneously verbalized more, but not significantly more, than third graders. Probably the third grade Ss were using covert speech rather than overt speech. Under the forced verbalization condition, verbalizations increased significantly with increasing grade level. In fact, when talking to third graders after their

completion of the tasks, many of them stated that they had talked to themselves during the task.

On the serial-recall task, there were no significant differences in the amount of spontaneous verbalization between first grade Ss and nursery school Ss. Third grade Ss spontaneously verbalized more but not significantly more than first graders. Third grade Ss did, however, spontaneously verbalize significantly more than nursery school Ss. Under forced verbalization on the serial-recall task, the number of verbalizations significantly increased with each increasing grade level. Since the serial-recall task was a more difficult task than the other two tasks, third grade Ss gave more spontaneous overt verbalization than covert verbalization which they had emitted on the simpler pounding-board task. From these results, it appeared that the nature and difficulty of the task must be considered as factors in determining the spontaneous verbalization behavior of children in this age range.

Performance on Tasks Under Different Verbalization Conditions

This study was conducted with the premise that verbalization aids performance on different types of tasks at different grade levels. The results supported this premise on the sequential types of tasks (i.e., when the task involved sequential steps or operations) such as on the pounding-board or the serial-recall tasks. However, forced

verbalization tended to hinder performance on the push-button task.

On the push-button task, nursery school Ss and first grade Ss performed significantly better under the free and the no verbalization conditions than under the forced verbalization condition. However, the difference between the free condition and the no verbalization condition was not significant for either nursery school or first grade Ss. For third grade Ss, performance was significantly better as the Ss moved from the forced condition, to the no verbalization condition, to the free condition. The results mentioned earlier suggest that overt verbalizations tended to hinder performance on the push-button task. The forced verbalization condition may have made the task more complex in that the child was required (a) to vocalize the word "push" and then (b) to push the button. In short, this additional verbalization requirement may have interferred with the button-pressing response.

Kendler, Kendler, and Carrick (1966) also found overt speech to hinder performance for third graders; whereas, covert speech improved performance. The reason there was a significant difference in favor of the free condition over the no verbalization condition for third grade Ss was probably due to the fact that Ss were possibly using covert speech. This enabled them to concentrate more on pushing

the button; whereas overt speech interferred with performance.

On the pounding-board task, performance improved significantly for nursery school Ss from the no verbalization condition, to the free condition, to the forced verbalization condition. For first graders, Ss performed significantly better on the pounding-board task under the free condition and under the forced condition than under the no verbalization condition. However, there was no significant difference between the free and the forced conditions for first grade Ss. Possibly, the first graders were beginning to use covert speech under the free condition. For third graders, there was no significant difference in performance between the free and the no verbalization conditions nor between the free and the forced verbalization comparison. However, third grade Ss performed significantly better under the forced verbalization condition than under the no verbalization condition. In other words, performance appeared to increase at all grade levels as the Ss moved from the no verbalization condition to the free condition to the forced verbalization condition.

On the serial-recall task, nursery school Ss and first grade Ss performed significantly better under the forced verbalization condition than under the free and under the no verbalization condition. Here the difference between the free condition and the no verbalization condition was

significant. The same result was found for first graders. Possibly since this task was more difficult than the pounding-board, first graders did not use covert speech to any high degree in significantly improving performance. However, third graders performed significantly better under forced verbalization than under free or no verbalization conditions. Here again, on this sequential type of task, performance would probably increase significantly at all grade levels as one moves from the no verbalization condition to the free condition to the forced verbalization condition.

Locus of Control and Task Performance

The main effects of locus of control were not found to be significant on task performance on either the push-button, pounding-board, or serial-recall tasks. However, in examining the grade by locus of control by condition interactions, internals tended to perform equal to or better than externals at each grade level and under all conditions on the pounding-board task and the serial-recall task. Had a better measuring instrument been used, significance possibly would have been reached on the sequential types of task.

On the significant grade by sex by locus of control by condition interaction for the pounding-board task, first grade male internals did perform significantly better than first grade male externals under the no verbalization condition.

On the push-button task, external Ss tended to perform better than internal nursery school Ss under all conditions.

There was no difference in performance by third grade Ss except under the forced verbalization condition where external Ss tended to perform better than internal Ss. On the push-button task, the nursery school externals may have believed that performance on this type of task was due to chance alone and not subject to any mental or internal controls. As a result, their performance tended to be better than internal nursery school Ss. The fact that externals perform better on chance rather than on skill types of task has been shown in many studies (Baron, 1967; Bortner, 1964; Dembroski & Lasater, 1970; Gale, 1970; Lefcourt, Lewis, & Silverman, 1968). For first graders, however, the internals may have believed that they had full control over the task and believed pushing the button was a skill. As a result, first grade internals under all conditions tended to perform better than externals. Since third grade externals tended to perform better than third grade internal Ss under the forced verbalization condition, the forced overt verbalization may have interfered more with third grade internals than with third grade externals. Internal third graders would possibly have been more used to covert speech than third grade externals. As a result, their performance was hindered to a greater degree than third grade externals.

The negative effects of overt speech by third graders has been shown by Kendler, Kendler, and Carrick (1966).

Locus of Control and Verbalization Performance

There was no significant main effect for the locus of control variable on the number of verbalizations spoken on the three verbal control tasks. There was also no significant grade by locus of control by condition interaction for the push-button task or the serial-recall task. There was a significant grade by locus of control by condition interaction for the pounding-board task.

In looking at this interaction, it was found that under the free condition, there was virtually no difference between the number of spontaneous verbalizations for internal Ss and external Ss at the nursery school and first grade levels. However, third grade external Ss gave significantly more spontaneous verbalizations than third grade internal Ss under this free condition. As mentioned earlier, it may be the case that third grade internals used more covert speech.

On the significant grade by locus of control interaction on the serial-recall task, there was no significant difference in the amount of verbalization between nursery school internal Ss and external Ss nor between first grade internal Ss and external Ss. Third grade internals verbalized significantly more, however, than third grade external Ss. There was no significant difference in the amount

of verbalization for nursery school children of either sex and their locus of control, nor was there any significant difference in amount of verbalization for first graders. In third grade, however, internal female Ss verbalized significantly more than third grade external female Ss.

Consistency in Spontaneous Verbalizations Across Tasks

Pearson correlations were performed on the number of spontaneous verbalizations emitted by Ss across the three verbal control tasks by the total sample combined, by locus of control, by grade level, and by the combination of grade level and locus of control. Significant correlations occurred only between the spontaneous verbalizations on the two sequential tasks, i.e., the pounding-board and serial-recall tasks. One of these significant correlations (r = 0.64, $p < .01$) which occurred for nursery school external Ss did account for 41 per cent of the variance in spontaneous verbalizations between the pounding-board task and the serial-recall task. For first grade external Ss, the correlation was significant .37 ($p < .05$), yet it accounted for only 14 per cent of the variance. The correlation for third grade external Ss (r = 0.06, $p > .05$) was not significant. The results showed little evidence that Ss are consistent across tasks in the degree of spontaneous verbalizations.

Relation to Hypotheses and Speculation About Results

The results tended to confirm hypothesis (a_1). The performance on each of the verbal control tasks increased with the children's ages or grade levels. The results showed that the number of spontaneous verbalizations did not necessarily increase with increasing grade level, but depended on the type of task being performed and the degree of difficulty. On a speed task such as the push-button, spontaneous verbalizations were virtually non-existent. However, on the sequential types of tasks as the pounding-board and serial-recall tasks, spontaneous verbalizations tended to increase as grade level increased and difficulty increased. This was consistent with the finding that forced verbalization was more facilitating for the two sequential tasks. However, it was indicated by post-experimental interviews that spontaneous verbalizations appeared to become more covert on the pounding-board task as grade level increased and difficulty decreased. The increase in covert speech would be in agreement with such researchers as Luria (1961), Conrad (1971, 1972), Kendler and Kendler (1959), and Vygotsky (1962), and Kohlberg, Yaeger, and Hjertholm (1968). Meichenbaum (1973) stated that the procession from overt to covert self-verbalizations was not related to the child's chronological age per se, but rather was more closely related to the child's proficiency or competence at a

particular task. Meichenbaum suggested that a child seemed to verbalize aloud when confronted by a new task or when he encountered difficulty and/or frustration on an old task. As the child becomes more proficient at the task, the child's self-verbalizations become more abrupt, incomplete, and then covert. The results on spontaneous verbalizations for the more difficult serial-recall task were also in agreement with Meichenbaum (1973), as well as, Flavell, Beach, and Chinsky (1966).

The results also showed that verbalization aided the performance on different types of tasks at different grade levels. Verbalization paralleled successful performance on the sequential types of tasks such as the pounding-board and serial-recall tasks. However, verbalization hindered performance on the push-button task which was a speed task. The latter result with verbalizations was in line with the findings of Jarvis (1964) using a push--don't push button device. Jarvis found that overt speech had no significant effect on performance. Jakovleva (1959) also found that very young children had difficulty coordinating his verbal commands with the signal and that their entire energy was soon diverted to the utterance of "press" or "now" and not to the task. In this study, some of the nursery school children shook their whole bodies while verbalizing rather than just pushing the button.

In hypothesis (b_1), it was stated that children with internal locus of control showed higher levels of overt task performance than same age children with external locus of control. This hypothesis gained limited support in this study, given the sample size and instrument used. At no grade level did internals show significant superior performance over externals, but internal Ss tended to perform better than external Ss on both sequential types of tasks. In fact, first grade internal male Ss under the no verbalization condition did perform significantly better than first grade external males on the pounding-board task. These results would give support to such researchers as Baron (1967), Bartner (1964), and Gale (1970).

In hypothesis (b_2), it was stated that under forced verbalization, the performance by external locus of control children on different verbal control tasks was equivalent to the performance of internal locus of control children. This hypothesis received minimal support.

In hypothesis (b_3), it was stated that the more internal a child's locus of control within any grade level, the greater the overt task performance. This hypothesis was not examined, since locus of control was not a significant main effect.

In hypothesis (c_1), it was stated that children with an internal locus of control show a higher degree of spontaneous verbalization behavior than same grade level children

with external locus of control. This hypothesis was not supported since differences in degree of spontaneous verbalization for main effects between internal and external were not significant for any of the verbal control tasks. On the push-button task, there were virtually no spontaneous verbalizations by any individual at any grade level or locus of control. Evidently this speed controlled task was not of the type of difficulty where Ss would spontaneously verbalize to control behavior. In fact, third grade external Ss on the pounding-board task gave significantly more spontaneous verbalizations than third grade internal Ss, which was in contradiction to hypothesis (c_1). Possibly the third grade internal Ss were using covert speech rather than overt speech.

In hypothesis (c_2), it was stated that both internal and external locus of control Ss increase their task performance by the degree to which they employed verbal mediators. This hypothesis had some support due to the fact that there is a tendency for performance to improve under forced verbalization on the two sequential types of tasks. However, performance did not improve under forced verbalization on the push-button task.

In hypothesis (c_3), it was stated that the more internal a child's locus of control, the more effective would be his utilization of verbal mediators on different verbal control tasks. This hypothesis was not supported

since there were no significant main effects for locus of control in the analysis of the verbalization data, nor in the performance data.

In hypothesis (d_1), it was stated that the use or absence of verbal mediating behavior by children is consistent across different verbal control tasks. This hypothesis had little support. There were some small significant correlations and one significant medium size correlation across the sequential tasks. Most of the significant correlations accounted for only a small percentage of the variance between the spontaneous verbalizations across these sequential tasks. As for the higher correlation, the researcher has difficulty in its interpretation. More study in this area is needed before any generalizations can be made.

CHAPTER VI

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

The development of the functional interaction between self-regulation and overt behavior has received a great deal of scrutiny in recent years (Kohlberg, Yaeger, & Hjertholm, 1968; Reese, 1962; Wozniak, 1972). There is now sufficient evidence of a developmental transition in the character of children's learning processes between the ages of five and eight. That is, prior to age five, the child appears to lack the ability to regulate his overt behavior through symbolic or verbal means. There is also evidence of wide individual differences in the age at which children make this shift. This study focused upon the nature of young children's deficiencies in different learning tasks, i.e., the degree to which young children either failed to produce or failed to utilize previously learned verbal mediating responses to more effectively perform certain tasks. The E examined the possibility of one's locus of control being a factor in whether or not an individual used verbal mediators in the self-regulation of one's overt behavior. The principal question was whether or not external locus of control children were those most delayed in their production of symbolic mediators in relation to peers of the same grade

level with an internal locus of control status. This study also focused on the degree to which individual children were consistent in the production of verbal mediating behaviors across a variety of different types of cognitive task settings. The study concentrated upon a broad range of grade levels so as to maximize the detection of developmental differences in the performance of different verbal control tasks.

The study consisted of 120 white children, 40 children from each of three grade levels--nursery school (three and one half to four and one half years old), first grade, and third grade. The children were of average intellectual ability and represented families of middle class socioeconomic status as ascertained from cumulative records. At each grade level, half of the children were pre-categorized to have an internal locus of control and half to have an external locus of control. Of those individuals with internal and external locus of control, half were males and half were females.

The design consisted of a split-plot (Kirk, 1968) ANOVA model with repeated measures on one variable. The variables included three grade levels (nursery school, first grade, and third grade), a sex variable (males and females), a locus of control variable (internal and external), and three instructional conditions (NI, NV, FV) intended to examine the effects of children's verbalization behaviors.

This design was used for three different verbal control tasks (PB, ST, SR).

It was hypothesized that (a) the performance on each of the verbal control tasks increases with the children's ages or grade level; (b) children with internal locus of control show higher levels of overt task performance and verbalization behaviors during the tasks than same age children with external locus of control; (c) under forced verbalization, the performance on different verbal control tasks by external locus of control children is equivalent to the performance of internal locus of control children; (d) both internal and external locus of control children increase their overt task performance by the degree to which they employ verbal mediating behaviors (i.e., spontaneous verbalizations); and (e) the use or absence of verbal mediating behaviors by children is consistent across different verbal control tasks.

The results indicated that on the push-button task under the free condition and under the no verbalization condition, performance increased significantly with increasing grade level. Under the forced verbalization condition, first graders performed significantly better than nursery school children, and third graders performed better, but not significantly better, than first graders.

On the pounding-board task under the free condition, first graders performed significantly better than nursery

school children, and third graders performed better, but not significantly better, than first graders. Under the no verbalization condition, performance increased significantly with increasing grade level. Under the forced condition, first graders performed significantly better than nursery school children and third graders performed better, but not significantly better, than first graders.

On the serial-recall task under the free condition, performance increased significantly with grade level. Under the no verbalization condition, first graders performed better, but not significantly better, than nursery school children. Third graders under the no verbalization condition did, however, perform significantly better than first graders. Under the forced verbalization condition, performance increased significantly with increasing grade level.

With regard to the premise that verbalization aids performance on different types of tasks at different grade levels, it was found that this is true for tasks requiring sequences of steps or operations, such as in the pounding-board and in the serial-recall tasks. Forced verbalization tended to hinder performance on the push-button task.

On the push-button task, nursery school children and first graders performed significantly better under the free condition and under the no verbalization condition. Third grade Ss performed the push-button task significantly better

as the S went from the forced verbalization condition to the no verbalization condition to the free condition.

On the pounding-board task, nursery school children performed significantly better as the Ss went from the no verbalization condition to the free condition to the forced verbalization condition. For first graders, Ss performed significantly better under the free condition than under the no verbalization condition. But, performance was better under the forced verbalization condition, but not significantly better, than under the free condition. Third graders performed significantly better under the forced verbalization condition than under the no verbalization condition. Performance was also better, but not significantly better, under the forced verbalization condition than under the free condition, and better under the free condition, but not significantly better, than under the forced verbalization condition.

On the serial-recall task, nursery school children and first graders performed significantly better under the forced verbalization condition than under the free condition or under the no verbalization condition. For nursery school children, the difference between the free condition and the no verbalization condition was not significant. First graders performed better under the free condition, but not significantly better, than under the no verbalization condition. Third graders performed significantly better as one

went from the no verbalization condition to the free condition, to the forced verbalization condition.

As a result, performance on the push-button task increased as the Ss went from the forced verbalization condition, to the no verbalization condition, to the free condition. On the pounding-board and serial-recall tasks, performance increased as the Ss went from no verbalization condition, to the free condition, to the forced verbalization condition. This is consistent with the findings by such researchers as Flavell, Beach, and Chinsky (1966); Kendler, Kendler, and Carrich (1966); and Kohlberg, Yaeger, and Hjertholm (1968). Evidently, having the Ss verbalize on the push-button task made the task more difficult; (a) saying the word "push" and (b) pushing the button. Verbalizing on the pounding-board or serial-recall task also made their respective task more difficult. On the push-button task, however, it was observed that some Ss would concentrate on just vocalizing and not pushing the button. Some of the nursery school children, when given the task to perform with forced verbalization, would shake their whole bodies instead of just pushing the button. These same children could do the task with ease when not forced to verbalize. This type of performance did not take place under the sequential types of tasks.

It may be that under a sequential type of task using verbalization, the S somehow makes cognitive use of these

verbal mediators which outweigh the added complexity of the task. Furthermore, the push-button task was a high-speed task since it was time controlled; the sequential tasks were not time controlled. Since verbalizations make any task more complex, the use of verbalization on the push-button task would take up additional time which could have been directed to just pushing. Verbalization did improve performance on the sequential types of tasks and, as a result, verbalization appeared to be functioning as an error reducer, not as a time saver.

The mediation deficiency hypothesis put forth by Reese (1962), suggesting that there is a stage in development during which the child cannot regulate his overt behavior via symbolic mediators even when such skills are understood and available for use, was not supported in this study. Since the Ss' performance on the two sequential tasks improved at all grade levels when subjects were forced to verbalize, the mediation deficiency hypothesis was not supported. That is, the notion that young children within the five to eight year age period cannot mediate their verbal learning performance through symbolic mediators gained no support here. Furthermore, the results indicate that even the oldest Ss in this study (i.e. eight year olds) do not spontaneously utilize to the maximum degree their verbal abilities to enhance performance. This is shown by

the superior performance under forced verbalization on the sequential type of task at all grade levels.

The production deficiency hypothesis appeared to be more consistent with the results of this study. This hypothesis, put forth by Flavell, Beach, and Chinsky (1966), suggests that there is a stage in children's development during which symbolic-conceptual skills are not brought into play spontaneously as a means of coping with complex learning tasks, even when such skills are clearly a part of the child's cognitive repertoire. This was shown by the fact that performance at all grade levels improved on the sequential types of tasks when the Ss were forced to verbalize.

The results also found that there is a higher degree of spontaneous verbalizing behavior with increasing age on the sequential types of tasks--pounding-board and serial-recall, but not on the easier push-button task. First graders and third graders spontaneously verbalized significantly more than nursery school children on the pounding-board and third graders spontaneously verbalized significantly more than nursery school children on the serial-recall task.

On the pounding-board task, first graders spontaneously verbalized more, but not significantly more, than third graders. It is felt that the reason for this may be due to the fact that third graders are beginning to use

covert speech rather than overt speech in the controlling of their behavior. This is partly suggested by the fact that when forced to verbalize overtly, third graders verbalized significantly more than first graders on the pounding-board task. The fact that third graders verbalized more, but not significantly more, than first graders on the serial-recall task may be due to the fact that the serial-recall task is a more difficult operation to perform and that individuals are more likely to overtly verbalize on a more difficult problem.

There was very little support for locus of control being a factor in whether or not an individual uses verbal mediators in the self-regulation of one's overt behavior. There was no significant main effect on the locus of control variable on any of the three different verbal control tasks. However, internals tended to perform better than externals at all age levels, but not significantly better, on the pounding-board task and the serial-recall task. On the push-button task, externals tended to perform better than internals in nursery school. Internal first graders tended to perform better than external first graders, and third graders tended to perform about the same except under the forced verbalization, where externals tended to perform better than internals. The reason for this may be that internal third graders are more accustomed to covert speech and when forced to verbalize overtly, the task became more

difficult for the internals than third grade externals. On the pounding-board task, however, first grade male internals performed significantly better than first grade male externals under the no verbalization condition.

In regard to the number of verbalizations made by Ss with different locus of control on different verbal control tasks, it was found that on the push-button task, there was almost no spontaneous verbalization by any individual at any age level or locus of control. On the pounding-board task, there was also virtually no difference between the number of spontaneous verbalizations for nursery school internals and externals. Internal first graders tended to verbalize spontaneously more, but not significantly more, than external first graders. However, third grade externals gave significantly more spontaneous verbalizations than third grade internals. The reason for this may be that third grade internals were using covert verbalization rather than overt verbalization under the free condition, because when forced to verbalize, the internal third graders verbalized more than the external third graders while performing the pounding-board task. On the serial-recall task, external nursery school children tended to give more spontaneous verbalizations, but not significantly more, than internal nursery school children. Internal first graders and third graders on the serial-recall task tended to give, however,

more spontaneous verbalizations, but not significantly more, than external first graders and third graders.

It may be that locus of control would have played a more significant role in the production deficiency shown above at the different grade levels if the sequential tasks being performed had had a wider range of scores. Furthermore, significance may have been reached if the locus of control scores had been more diverse, or if the sample had been larger. Sex was not found to be significant in any main effects or interactions.

As for examining the consistency in spontaneous verbalizations across tasks, Pearson correlations were performed on the number of spontaneous verbalizations across the different verbal control tasks by the total sample combined, by locus of control, by grade level, and by the combination of grade level and locus of control. The only significant correlation was between the spontaneous verbalizations on the two sequential tasks--the pounding-board and serial-recall tasks. However, all but one of the significant correlations accounted for only small percentages of the variance found between spontaneous verbalizations for the pounding-board and serial-recall tasks. There was one significant correlation for nursery school externals which accounted for 41 per cent of the variance in spontaneous verbalizations between the pounding-board task and

serial-recall task. Further research needs to be done before any substantial generalizations can be made.

Suggestions for Future Research

The results of this investigation suggest that additional research approaches should be explored in new studies. In future studies concerning locus of control, the differences between internal and external locus of control groups should be wider than that used in this study. Such an approach would better differentiate any real differences in performance which would result from differences on the locus of control factor. It is suggested that Ss who score at least one and a half to two standard deviations above or below the mean on a locus of control scale should be compared--especially at the younger age levels. It is also suggested that a variety of types of verbal control tasks should be used. The data suggests that a task which would allow for a greater range of scores would lead to more significant results. Moreover, additional studies are suggested which call for other types of overt tasks in order to clarify how locus of control and verbalization affect performance. It is also suggested that some type of sensitive throat microphone be used, especially with older children, in order to detect covert speech. Hopefully, future studies should also attempt to study the deficiencies and changes which occur during the observed five to eight year

shift. The explanation of the effects of verbalization on different types of tasks during this transitional period needs much additional study.

The present study examined the consistency in the amount of spontaneous verbalization across different tasks. An examination of the observed results tended to show that one must be very careful when one draws general conclusions. The present study revealed inconsistency in the spontaneous verbalization across certain types of tasks. Consistency as a construct needs to be further examined using many types of tasks.

The present study suggests that in dealing with the cognitive development of individuals that the serial-recall tasks needs further exploratory study. The picture serial-recall tasks when performed by nursery school children resulted in some children pointing to the former location of the pictures rather than specifically indicating the actual pictures. Research of this kind could also investigate various memory strategies which are employed by different age levels in performing a specified serial-recall task.

Although the experimenter has made a determined effort to select a random sample, other samples of internals and externals should be drawn in order to enable generalizations of the significant results to wider populations than were attempted in the present study. Finally, it is suggested that the present study should be replicated with

specific attention to differences and similarities between the internals and externals of varying cultures and in so doing be able to provide many new insights on the effectiveness of verbal mediation as an aid to more efficient learning procedures.

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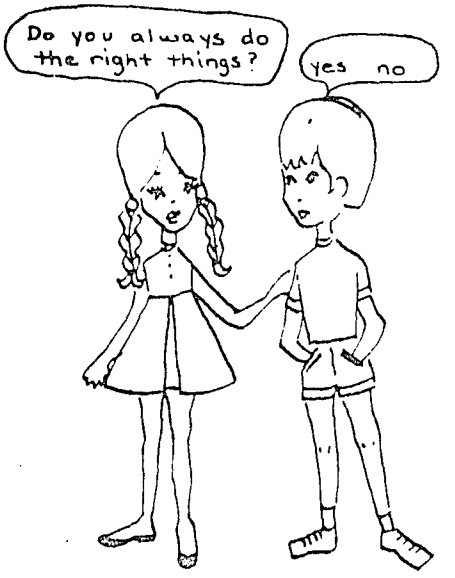
APPENDIX A

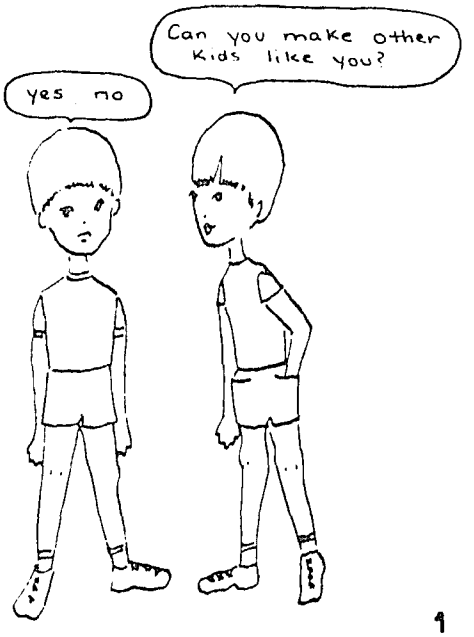
NOWICKI-DUKE'S EXTERNAL LOCUS OF CONTROL SCALE

PPNSIE

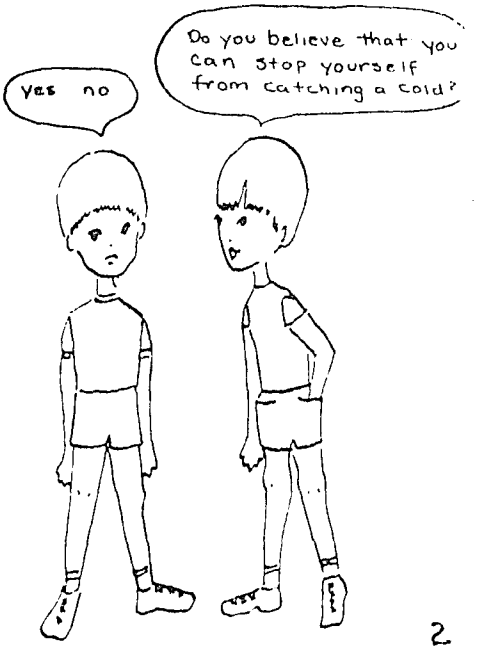
for boys

Example





1



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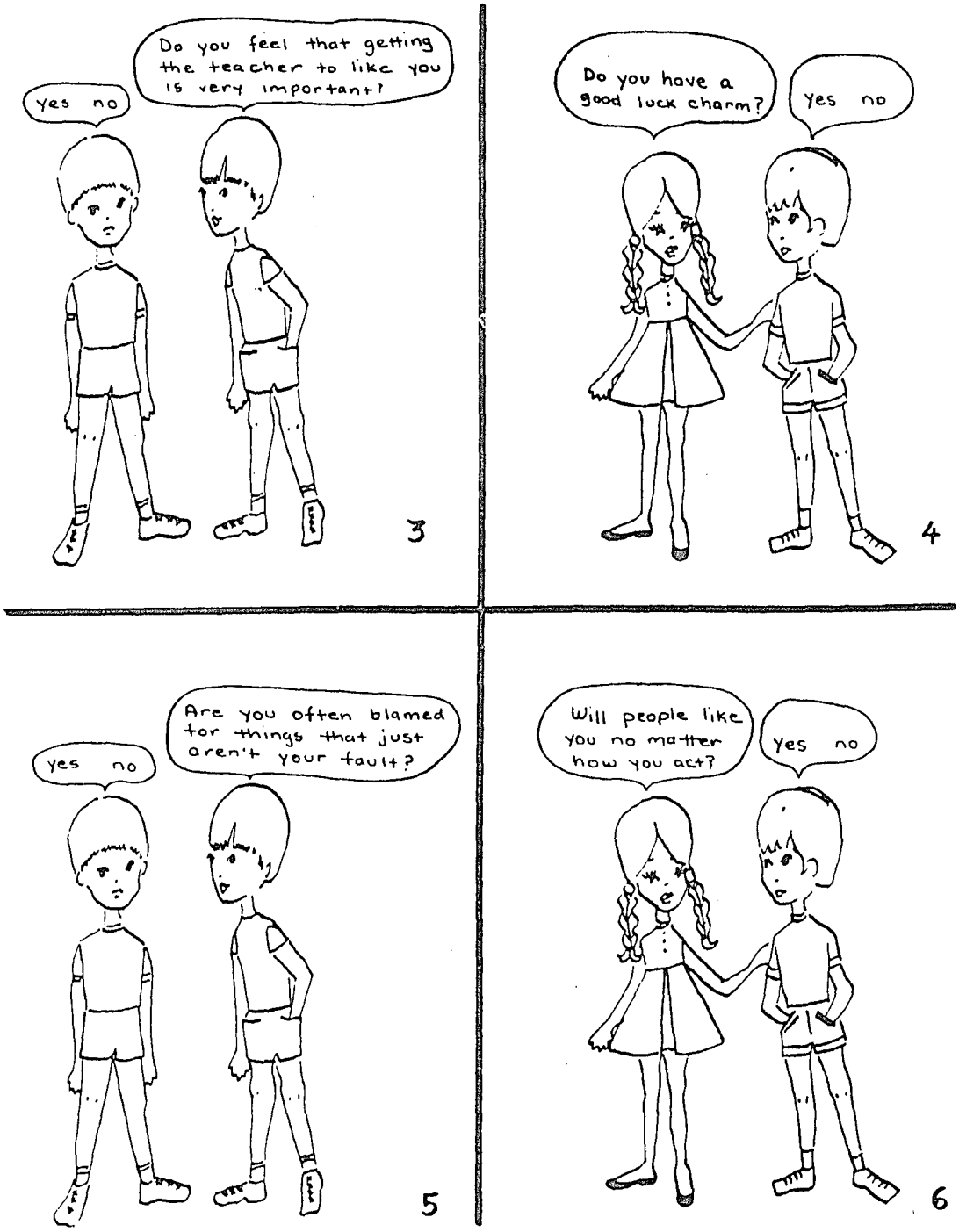
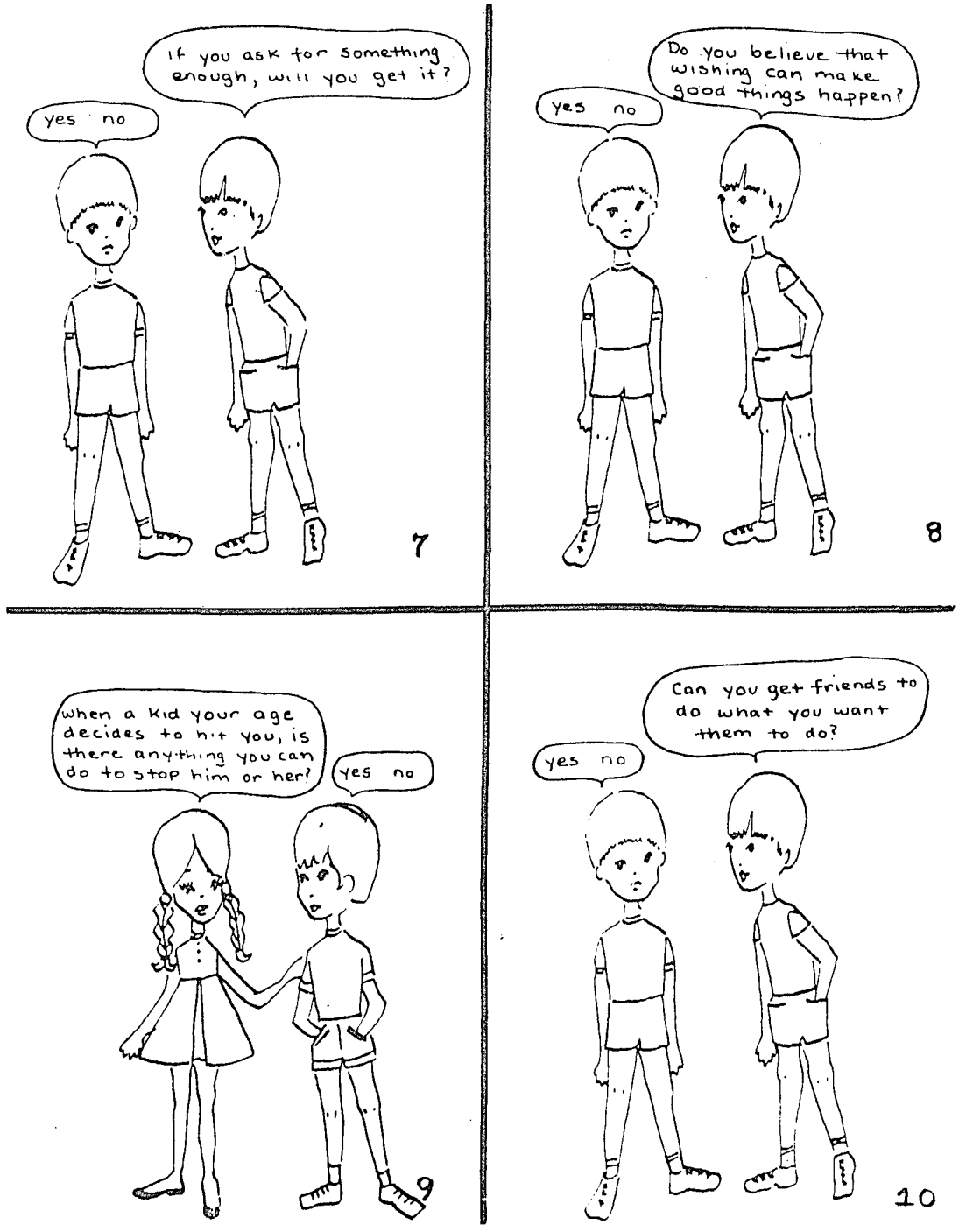
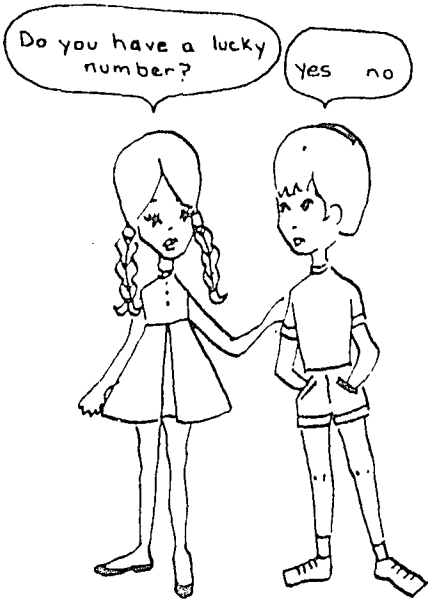

Do you feel that getting the teacher to like you is very important?
yes no
3
Do you have a good luck charm?
yes no
4
Are you often blamed for things that just aren't your fault?
yes no
5
Will people like you no matter how you act?
yes no
6

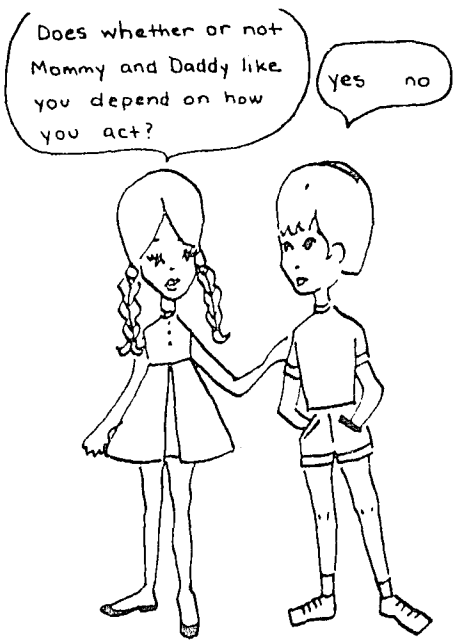

If you ask for something enough, will you get it?
yes no
7
Do you believe that wishing can make good things happen?
yes no
8
When a kid your age decides to hit you, is there anything you can do to stop him or her?
yes no
9
Can you get friends to do what you want them to do?
yes no
10


Do you have a lucky number?
yes no

11


Can you get your Mommy and Daddy to do what you want to do instead of what they want to do?
yes no

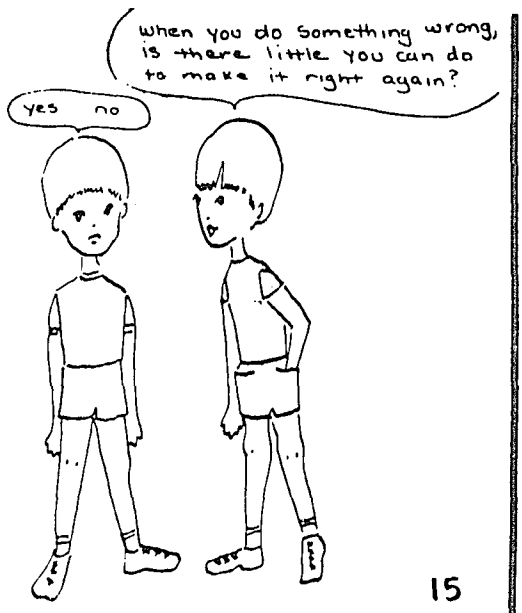
12


Does whether or not Mommy and Daddy like you depend on how you act?
yes no

13


When people were mean to you, was it usually for no reason at all?
yes no

14


When you do something wrong, is there little you can do to make it right again?
yes no

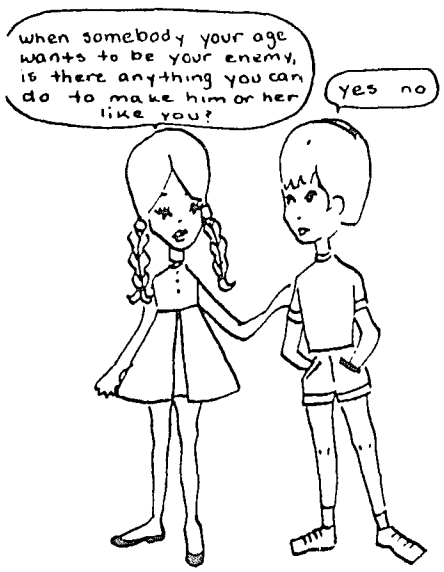
15


Most of the time do you find it easy to get your own way at home?
yes no

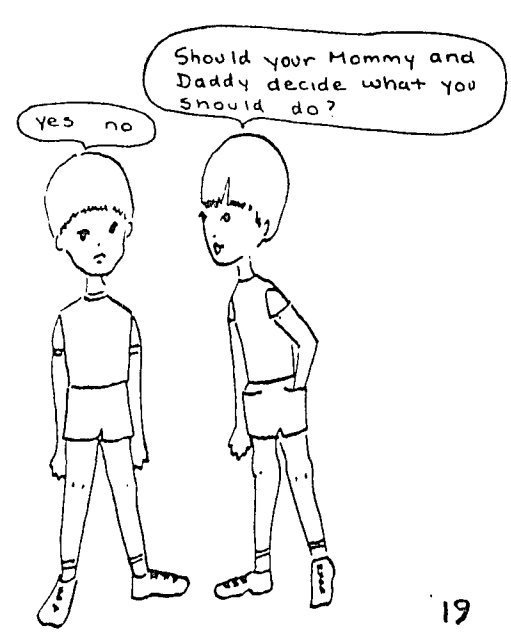
16


Are most kids just born good at running races?
yes no

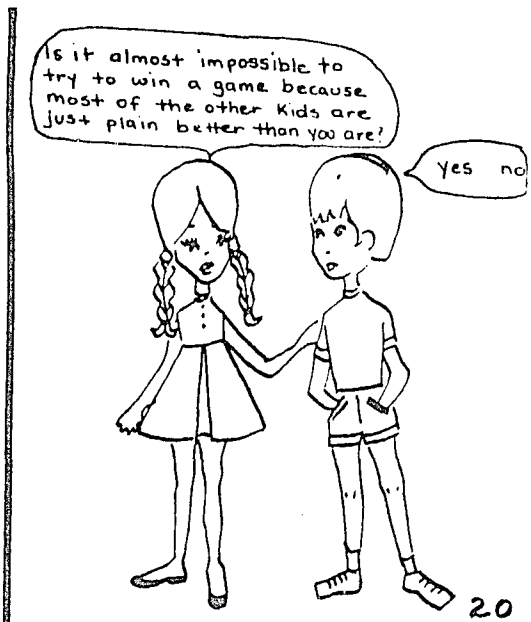
17


When somebody your age wants to be your enemy, is there anything you can do to make him or her like you?
yes no

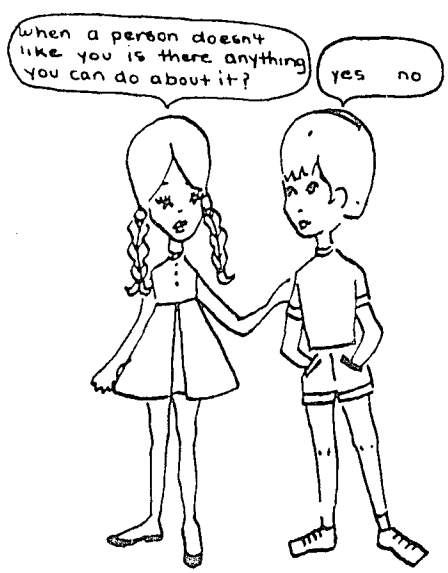
18


Should your Mommy and Daddy decide what you should do?
yes no

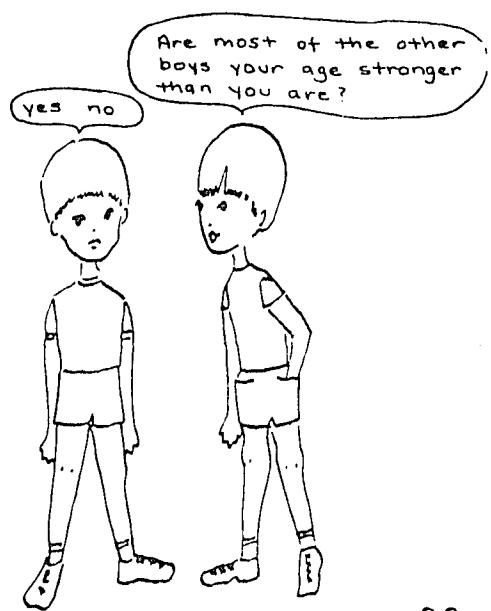
19


Is it almost impossible to try to win a game because most of the other kids are just plain better than you are?
yes no

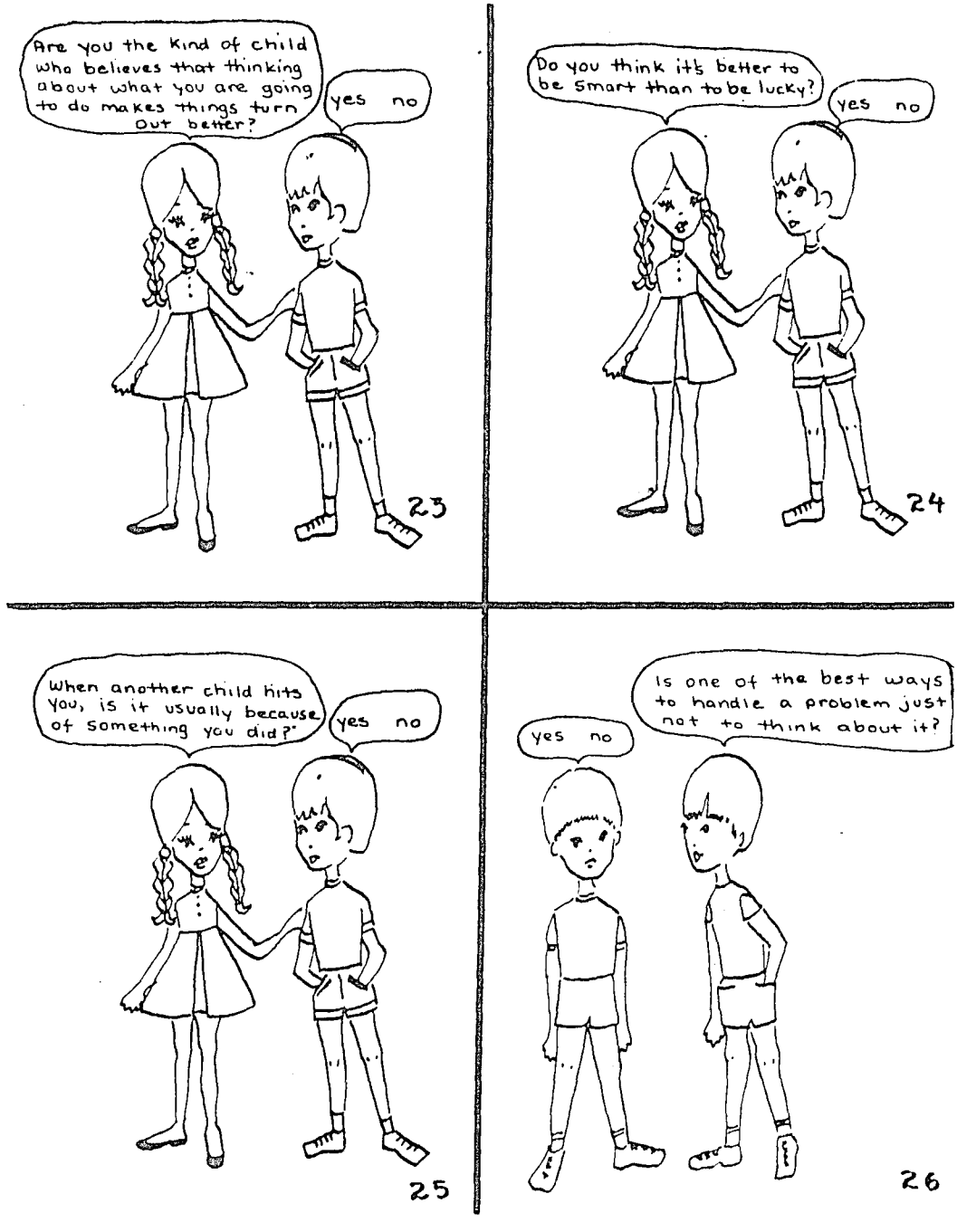
20


When a person doesn't like you is there anything you can do about it?
yes no

21


Are most of the other boys your age stronger than you are?
yes no

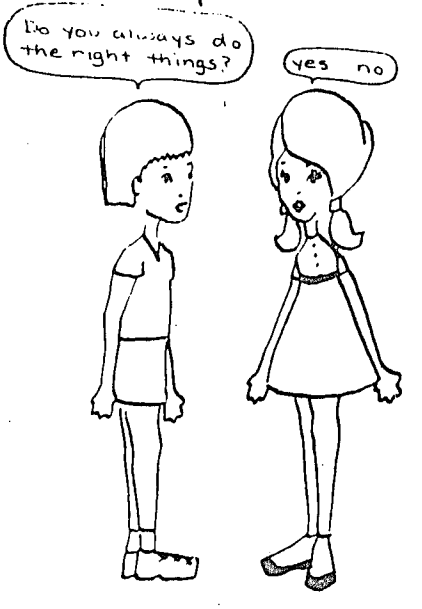
22.

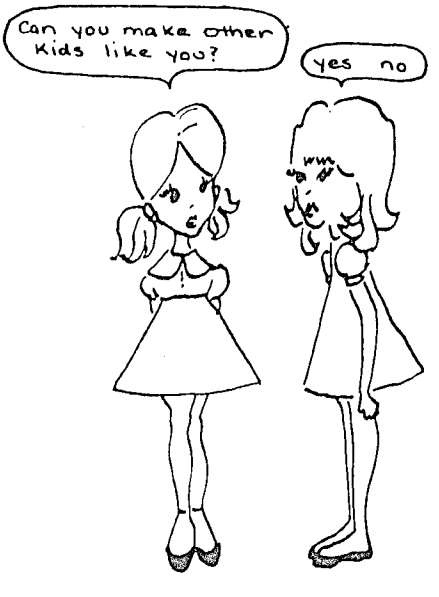

Are you the kind of child who believes that thinking about what you are going to do makes things turn out better?
yes no
23
Do you think it's better to be smart than to be lucky?
yes no
24
When another child hits you, is it usually because of something you did?
yes no
25
Is one of the best ways to handle a problem just not to think about it?
yes no
26

PPNSIE

for girls

Example





1

2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3
Do you have a good luck charm?
yes no
4
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yes no
5
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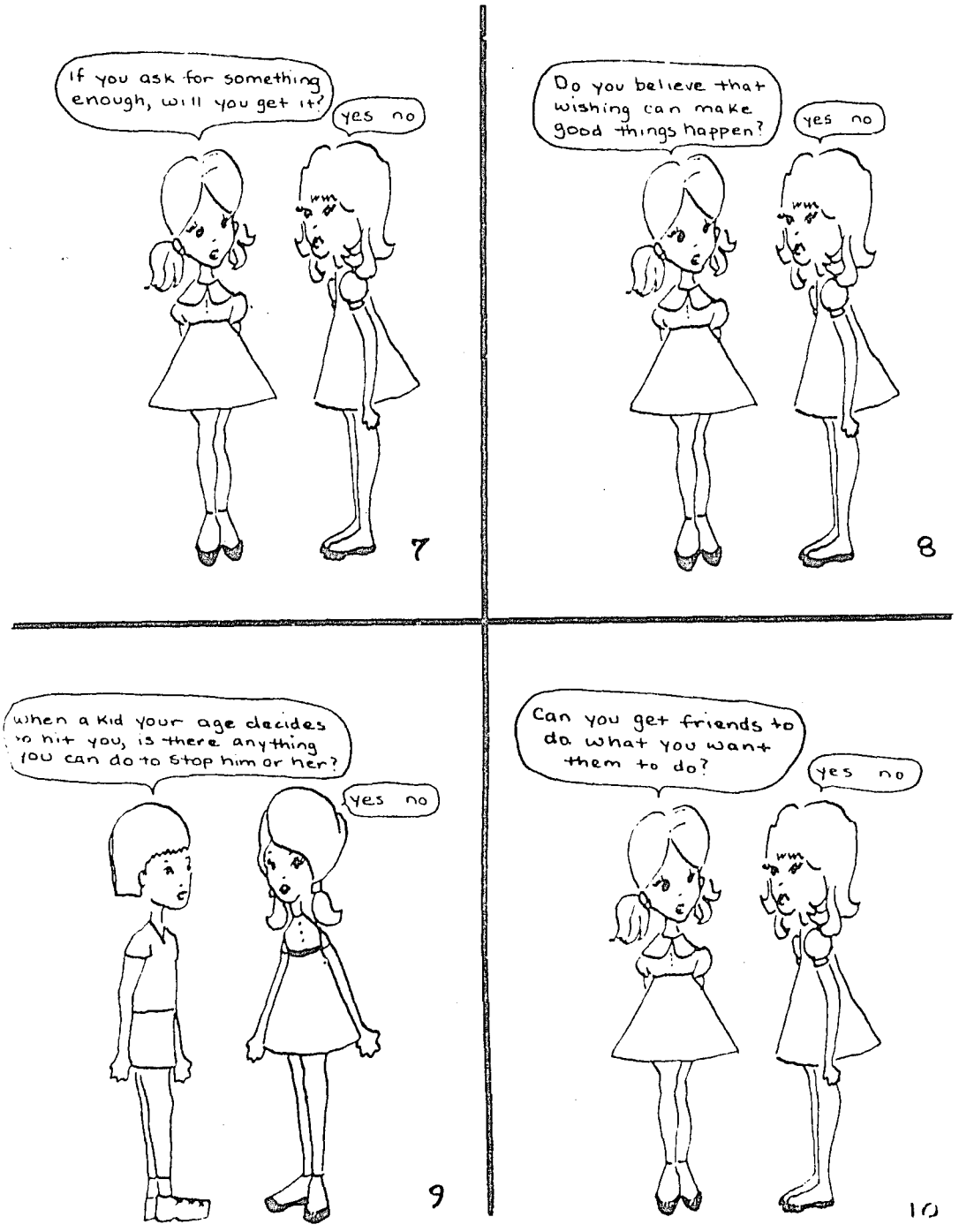
6


If you ask for something enough, will you get it?
yes no
7
Do you believe that wishing can make good things happen?
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8
When a kid your age decides to hit you, is there anything you can do to stop him or her?
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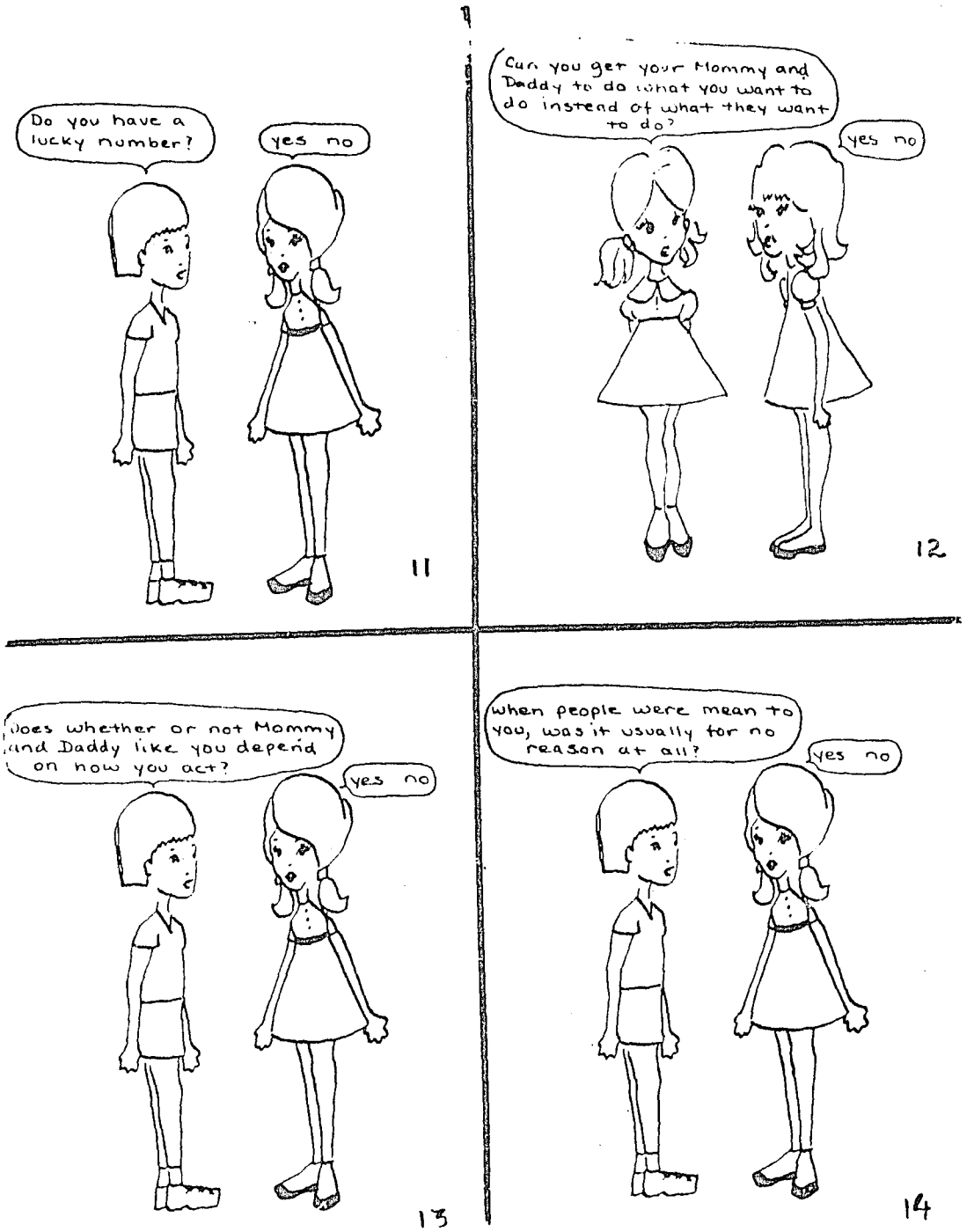
Do you have a lucky number?
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11
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Does whether or not Mommy and Daddy like you depend on how you act?
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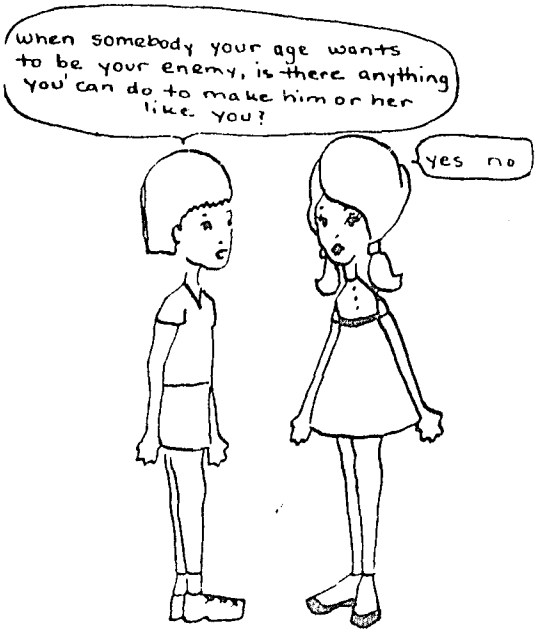
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18


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19


Is it almost impossible to try to win a game because most of the other kids are just plain better than you are?
yes no

20


When a person doesn't like you, is there anything you can do about it?
yes no

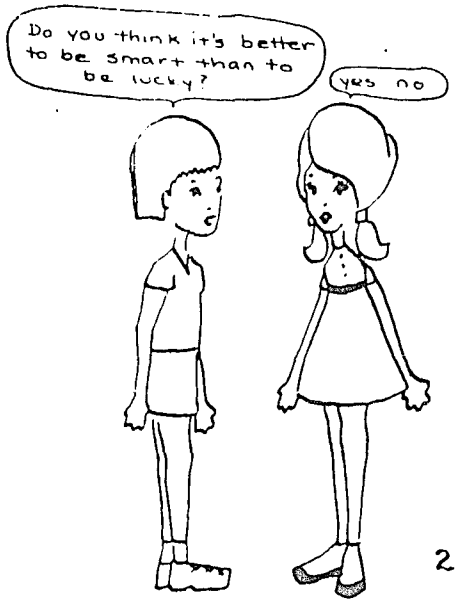
21


Are most of the other girls your age stronger than you are?
yes no

22


Are you the kind of child who believes that thinking about what you are going to do makes things turn out better?
yes no

23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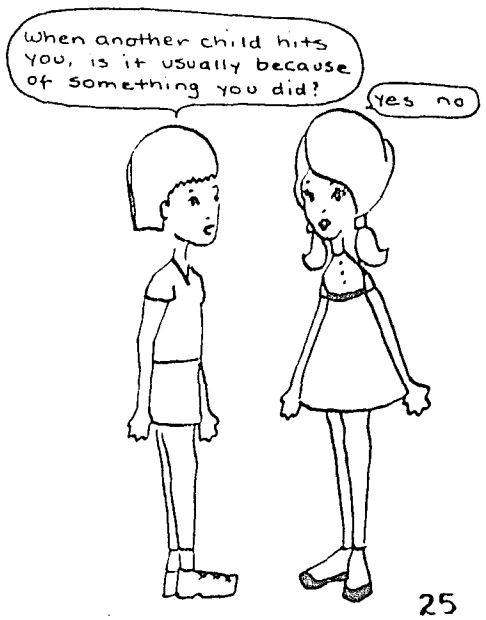
24


When another child hits you, is it usually because of something you did?
yes no

25


Is one of the best ways to handle a problem just not to think about it?
yes no

26

Preschool and Primary Form of Nowicki-Duke's

LOCUS OF CONTROL SCALE FOR CHILDREN

KEY

Locus of control items = 26 items:

LOC - Keyed for Externality:

1.	NO	11.	YES	21.	NO
2.	NO	12.	NO	22.	YES
3.	NO	13.	NO	23.	NO
4.	YES	14.	YES	24.	NO
5.	YES	15.	YES	25.	NO
6.	YES	16.	NO	26.	YES
7.	NO	17.	YES		
8.	YES	18.	NO		
9.	NO	19.	YES		
10.	NO	20.	YES		

APPENDIX B

NON-RELATED SERIAL-RECALL PICTURES