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COGNITIVE STYLE AND OVERGENERALIZATION IN THE ACQUISITION OF THE ENGLISH IRREGULAR PAST TENSE VERBS

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ABSTRACT

The present study was designed to see to what extent variations in children's knowledge of the English irregular past tense verbs may be associated with differences in other areas of cognitive functioning. Three aspects of cognitive functioning were examined. These included two dimensions of cognitive style, psychological differentiation and divergent thinking, and metalinguistic awareness for language. Thirty-eight children, ages 7;4 to 8, were tested. The measures employed included the Children's Embedded Figures test, a modified version of Wallach and Kogan's test for divergent thinking, a scale for assessing metalinguistic development and four linguistic tasks assessing children's knowledge of the irregular verbs. Additionally, a control for intelligence was employed using the WISC-R. Each cognitive factor was examined in relation to children's performance on the linguistic tasks. The results indicated that there was no significant relation between children's knowledge of the irregular verbs and cognitive style. A significant relation was observed between metalinguistic segmenting skills and knowledge of these verbs assessed by one judgment task. It was concluded that cognitive style dimensions do not seem to be factors associated with children's acquired knowledge of the English irregular past tense. The results relating segmenting skills with linguistic performance on the judgment task were interpreted with caution, as no similar relation was observed for performance on the other linguistic measures.

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Curriculum Studiorum

Stephanie B. Sawyer was born in Far Rockaway, New York, on May 7, 1948. She received the Bachelor of Fine Arts (Broadcasting and Cinema) degree from New York University in 1970, and the Master of Arts (Psychology) degree from the New School for Social Research in 1976.

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Introduction

Cognitive Style and Overgeneralization in the Acquisition of English Irregular Past Tense Verbs

There are many ways in which children differ in the process of acquiring their first language. They vary in their rates of acquisition and in the time they begin to utilize their knowledge of language in speech. Differences have also been observed with respect to the size of children's early vocabularies, and, recently, in terms of the kinds of strategies they employ when pursuing the task of learning language.

The major concern which motivated the present study was whether or not we can attribute any particular psychological significance to differences children display in the process of acquiring language. More specifically, we observed that within a restricted age range children show wide variation in their linguistic knowledge, as evidenced in patterns of overgeneralization of certain linguistic rules. While the pervasiveness and significance of the overgeneralization process in language learning has been well documented, little attention has been given to how we are to understand such differences. The

broad questions underlying the present study were: Can we legitimately separate the process of language learning from other psychological factors? If not, do individual differences in children's acquired linguistic knowledge reflect differences in other aspects of cognitive functioning?

It is only within the last few years that the problem of individual differences in language learning has come into sharp focus. Previously, for most researchers, even more striking than the differences had been the similarities among children in the course of acquiring their native language. Consequently, during this time researchers have had to contend with gaps in the literature which both describe and account for the differences children display during the acquisition process. More and more, research activity is being directed at resolving these issues. Yet, at present, it is clear that we still know very little about the ways in which children differ in the process of acquiring their first language. Even less understood are the factors which may help account for these differences.

Alternatively, the relation between language and cognitive functioning has long intrigued psychologists.

Over the years empirical investigations have continued to specify the nature of this relationship. These studies have covered a wide range of topics. For example, in the area of child development language has been considered in association with concept formation (Bruner, Olver, and Greenfield, 1967; Nelson, 1973; Razran, 1961, cited in Baker and Cantwell, 1978), problem solving (Luria, 1961) and the ability to discriminate perceptual stimuli (Blank, 1974). There is also much evidence indicating that the acquisition of various semantic and syntactic forms parallels or is precipitated by the achievement of certain levels of cognitive development (e.g., Beilin, 1975; Carni and French, 1984; Gathercole, 1985; Tremaine, 1975). As well, in recent years, a trend may be distinguished in which psycholinguists have adopted a more dynamic model of the processes of language learning and language functioning which presupposes the role of at least some cognitive abilities when accounting for language processing (Berman, 1982; Bybee, 1985; MacWhinney, 1978; Stemmer, 1985).

The present study was based upon the observation that the task of organizing certain linguistic data, evidenced in both the onset and relinquishing of

certain overgeneralization errors, reflects processes similar to those described in theories of cognitive styles. This similarity is especially apparent when language acquisition is viewed as a process of analysis, abstraction and classification. The major question we addressed is whether stylistic differences in children's cognitive functioning may help account for observed differences among children in the process of acquiring linguistic knowledge. Since it is clear that all children go through periods of overgeneralization of linguistic rules, then it may be possible to understand differences in the extent of overgeneralization in terms of stylistic variation in conducting these processes. Concomitantly, overgeneralization is intimately connected with the child's implicit or explicit awareness of other related aspects of the language system. Thus variations in children's overgeneralization patterns may reflect differences in their acquired linguistic knowledge. Consequently, the aim of this study was to examine the interrelations among children's knowledge of certain aspects of language, cognitive style and patterns of overgeneralization.

The method we adopted was to take a meticulous look at a particular area in language learning, the acquisition of English irregular past tense verbs. Assessments were made using a variety of linguistic tasks designed to examine different aspects of the child's developing system of knowledge of these verbs. Cognitive style was assessed in terms of two factors: (1) measures of divergent thinking; and (2) examination of psychological differentiation. Extensions to previous research included analysis of differences in divergent thinking in relation to patterns of overgeneralization. Prior research on semantic development indicates an association between aspects of children's overgeneralization patterns in learning novel concepts and measures of divergent thinking. This would suggest that the underlying processes operating in overgeneralization during initial learning in one area of language development may be similar to the processes reflected in performance on tasks measuring divergent thinking. However, it was not clear whether this relationship extends to other areas of language learning. As well, research in the area of psychological differentiation has suggested that differentiation is associated with

at least some aspects of language functioning. However, this construct has not, to our knowledge, been examined in relation to chidren's acquisition of linguistic knowledge. As such, arguments are presented suggesting that, in general, the intellectual operations described in theories of cognitive style are similar to some of the operations children employ in the process of acquiring the irregular past tense verbs. In addition, it was suggested that the development of certain more general language competencies and, specifically, certain metalinguistic skills, believed to represent a by-product of both language and cognitive skills, reflected abilities likewise necessary in the acquisition of the irregular past tense verbs.

It is believed that this project addresses issues relevant to conceptualizations of children's language learning ability, as well as the relation between language and cognitive functioning.

Review of the Literature

Background to the Problem

This project derives from a theoretical perspective of children's language learning ability which is slowly emerging in developmental psycholinguistics. The literature which will be discussed was selected so that we might first clarify this theoretical approach and then examine one possibility it offers for research. In the first section we will examine the problem of individual differences in research in first language acquisition. Included is a brief discussion of recent studies which have attempted to account for these differences. The review then turns to a different area in the literature where we examine both theoretical and empirical perspectives concerning how individual differences in cognitive functioning may be associated with differences in language functioning. This section is concluded by examining research which has extended the study of this relationship to the problem of individual differences in language acquisition. Before presenting arguments extending this approach, the processes involved in the acquisition of the English irregular past tense as well as further background to the cognitive factors focused upon in this study are

considered. Finally, a brief summary of research on children's acquisition of the English irregular past tense verbs is presented.

1. Individual Differences in First Language Acquisition

Until recently most researchers of children's language learning have worked with a model of language development which precluded serious analysis of individual differences in the learning process. This model derived from the nativist position, initially described in the writings of Noam Chomsky (e.g., 1965). Central to this position was the view that the child was predisposed to learning language, and that innate, language specific mechanisms could explain this accomplishment. This led to the assumption that the course of language development would be similar for all children both within and across language communities. Apropos to this was the assumption that the outcome of the acquisition process would be the same for the adult members of a given language community.

It followed that the predominant focus of research had been to identify the ways in which children were alike in learning language. If differences were considered, it was with the understanding that these were only quantitative differences. That is, that children varied only with respect to the size of their vocabularies or speed of acquisition. In particular,

it had been widely accepted that females progressed more rapidly than males. Such differences in language acquisition were usually assumed to reflect individual differences in physiological maturation. However, the findings in these areas of research are controversial in many respects. Macaulay (1978) noted the results of studies directed at examining female superiority were frequently contradictory or not validated through cross cultural studies. As well, when language skills or level of language development had been assessed, traditionally it was in terms of children's productive skills, e.g., frequency of talking, requests for information, mimicry of nonsense terms (Macaulay, 1978), or mean length of utterance (Horgan, 1981). Such measures are inadequate in fully determining knowledge of language.

More recently, a shift has occurred suggesting that language acquisition cannot be sufficiently understood within the restrictive framework of innatist theories (Fillmore, Kempler, and Wang, 1979; Nelson, 1981). Evidence has accumulated that raises serious doubts about some central assumptions of the generativist position. Recent studies on child language learning indicate there may be more than one path to successful

language acquisition (e.g., Bloom, 1970; Bloom, Lightbown, and Hood, 1975; Bretherton, McNew, Snyder, and Bates, 1984; Nelson, 1973; Nelson and Bonvillian, 1978; Peters, 1977). These different paths represent differences in the degree to which children emphasize the use of certain linguistic forms in their early language behavior. Two major approaches have been distinguished, though these are not mutually exclusive. In an often cited study, Nelson (1973) observed that the early vocabularies of some children consisted of a large proportion of nominals. In contrast, the vocabularies of a smaller group of children were more diverse, with fewer nouns but more pronominals and personal-social expressions. Nelson referred to these groups as referential and expressive speakers, respectively.

Since Nelson's study, other researchers have identified similar distinctions among children (e.g., Bloom, Lightbown, and Hood, 1975), as well as elaborated upon these differences. For example, Dore (1974 in Schwartz, 1982) and Peters (1977) noted a style in which some children early on appeared to produce few words, instead mastering units of language larger than words including intonation patterns, or unsegmented

phrases or sentences. Peters observed that such vocalizations, while communicatively appropriate and meaningful, were frequently unintelligible, which may account for them having previously been ignored by researchers. It is worth noting that except for the problem of intelligibility, we know of no evidence suggesting one approach to be more advantageous over another either with respect to knowledge of language or subsequent rates of acquisition (Horgan, 1981; Schwartz, 1982).

Additional differences in children's approaches to language learning have been observed in phonological acquisition and in the tendency to imitate adult utterances (Schwartz, 1982) or overgeneralize concepts both in production and comprehension (Nelson and Bonvillian, 1978). Although a more thorough review of this literature might be interesting, it is beyond the scope of this paper. Partial reviews can be found in Nelson (1981), Schwartz (1982) and Bretherton et al. (1984). More relevant to the present study is the problem of accounting for these differences.

Without criticizing the view that there is a biological basis for language (e.g., Studdert-Kennedy, 1983), for some researchers the findings on individual

differences in language acquisition have led to serious reconsideration of how we conceptualize children's language learning ability. As indicated in the older paradigm individual, social, cultural or situational factors could play no part influencing the acquisition process as it was assumed learning proceeded under universal, genetically given principles. Now, however, it would appear that individual differences may be accounted for through their association with non-linguistic factors. For example, there is some empirical evidence suggesting that children who tend to employ mostly nouns or words utilize these forms to make statements about objects or the environment. Children who use phrases do so under conditions which appear more directed towards social-interaction (Nelson, 1981; Schwartz, 1983). Reflecting on sociolinguistic and linguistic studies, Nelson noted that the context in which language is used is frequently related to the form of language employed. For children acquiring their first language, differential exposure to different contexts may then determine the forms of language first used. However, it is also possible that individual preference for

different contexts may similarly determine the forms children employ.

In the same article, Nelson cited an unpublished study by Ross, Nelson, Wetstone and Tanouye that provides some support for this hypothesis. In an experiment designed to teach children nonsense labels for objects, children classified as pronominal continued to use more personal and interactional expressions than children classified as nominal. Nelson concluded the tendency to continue to employ more social/interaction expressions in situations designed to elicit nominals may be associated with individual preference.

Additional support for the role of individual factors in language learning derives from research on overgeneralization as well as the acquisition of phonology. Nelson and Bonvillian (1978) found a significant positive relation between overgeneralization of concepts and measures of divergent thinking. This research is discussed in greater detail in the next section of this paper. Schwartz (1978, cited in Schwartz, 1982) observed in experimental situations over a 3-month period, children, ages 1;0 to 1;3 at the outset, were more

likely to acquire novel concepts with phonological characteristics that were already within their own phonology system than concepts with phonological characteristics that were not in their own system.

Several writers have proposed that individual differences in styles of processing information may be associated with different approaches in language learning. This material will be discussed in the next section of this paper.

Regarding the relation of environmental factors on language learning, there is some evidence that birth order and family educational status are associated with approach differences in children's early language behavior (Nelson, 1981). Furthermore, there is some evidence suggesting that the manner in which mothers respond may help determine the strategies children acquire. Lieven (1978), analyzing the speech of two mothers whose children had different speech styles, found the mothers differed in the manner they responded to their children. The mother of the referential child responded 86% of the time to her daughter's statements and employed more questions. Their conversation appeared to contain more turn-taking. The mother of the expressive child, however, responded only 46% of

the time. The content of her remarks included a ready-made word or phrase, corrections or comments that seemed to ignore the child's statements.

In summary, it is becoming increasingly clear that understanding human language learning cannot be restricted by strictly innatist explanations. In an attempt to account for observed differences in children's language acquisition, researchers are beginning to ask entirely new questions concerning the impact of non-linguistic factors on children's language development. Thus far, this approach has received support from empirical investigations which indicate a range of factors may be associated with different aspects of language development. However, the number of studies in this area is small and focused on limited aspects of children's early language behavior. It is, therefore, evident more research is needed if we are to develop a more realistic view of language learning.

2. Individual Differences in Language and Cognitive Functioning

As we indicated, several researchers in the area of language development have speculated that differences in early language learning strategies may be partially due to differences in cognitive functioning. One suggestion is that different types of strategies may be associated with variations in information processing factors (Bates, 1979; Horgan, 1981; Peters, 1977). Bates' model contained three components -- analytic, gestalt and communicative intent -- all of which the child must master during language development. Bates then observed similarities between the different approaches in language learning and styles in children's approach to symbolic play identified by researchers in that area. Briefly, some children appear interested in breaking down patterns and transforming the input information. Other children seem more inclined towards preserving themes and approximating reality. Bates suggested these differences represent differences in the use of analyzed versus arbitrary or more gestalt-like learning. The reader will recall that referential speakers seem to abstract more words from their

language environment, whereas expressive speakers have incorporated more unsegmented phrases and intonation patterns. Consequently, the two types of learning observed in children's play are respectively similar to the language styles observed in children's speech. Furthermore, Bates noted parallels between these bipolar approaches and recent evidence on hemispheric specialization where the left hemisphere is implicated in analytic processing and the right hemisphere is associated with gestalt processing. Bates concluded since both types of processing are essential for learning, stylistic differences may reflect nothing more than differential weighting of these processes during development.

Similar information processing proposals to explain differences in language learning approaches have been made by Peters (1977) and Horgan (1981). Although these suggestions may be interesting, thus far we know of no studies that have explored these suggestions. However, one area in the empirical literature which has received some attention concerns differential hemispheric processing of different linguistic tasks.

Das, Kirby, and Jarman (1979) examined children's performance on a number of linguistic tasks in relation

to performance on tasks purported to measure simultaneous and sequential cognitive processing skills. The concepts of simultaneous and sequential processing were derived from Luria's observations of cases with brain lesions. Briefly, the theory proposes an information processing view of intelligence which incorporates the idea that different types of processing have a neurological basis and may be localized in different regions of the brain. Linguistic processes have the same physiological bases as other non-linguistic processes, and, therefore, are not viewed as "discrete functions" (Jarman, 1980). Simultaneous and successive synthesis reflect different information coding processes. Simultaneous processes deal primarily with spatial relations between elements. Successive processing refers to the processing of information in serial order (Das et al., 1979). Based upon Luria's research on aphasia, contextual grammatical structures are believed associated with successive synthesis, whereas quasi-spatial conceptual relations or "communication of relationships" (e.g., "above" and "taller than", respectively) were believed to reflect simultaneous processes. A more complete

discussion of these issues may be found in Das, Kirby and Jarman's (1979) book.

Das et al. tested children, with an average age of 9 years, on a number of tasks. These included a story recall and three ambiguities tests. In the ambiguities tests subjects had to match sentences with pictures depicting the message in each sentence. Each sentence had one ambiguity of three possible types: (a) lexical - "The boy picked up the bat" (baseball bat, flying bat); (b) surface structure - "He told her baby stories" (he told HER baby stories, he told her BABY stories); and, (c) underlying structure - "The eating of the chicken was sloppy" (chicken eating sloppily, girl and boy eating chicken sloppily) (pp. 178-179). Scoring for story recall was based on Hunt's research (Hunt, 1970, cited in Das et al., 1979). The ambiguities tests were scored according to the number of correct meanings and justifications.

Das et al. predicted that the ability to recall speech in the story recall and grasp the grammatical surface and underlying structure ambiguities would relate significantly to successive processing as measured by Digit Span Forward and Serial Recall tests. Lexical ambiguities, because the ambiguity resides in

one phrase rather than the entire sentence, would be related to simultaneous processing, measured by Raven's Coloured Progressive Matrices and Figure Copying tests (Das et al., 1979). In general, these predictions were confirmed. In addition, the authors noted an association between the number of words per second in story recall and simultaneous processing. They suggested that this phenomenon may be indicative of a planning function in speech production which entails a "unifying Gestalt between different parts of the story" (p. 184).

Das et al.'s research did not directly address the question of the processes involved in children's acquiring language. The authors have pointed out that in the process of learning in general, the relation between cognitive factors and that which is being learned may shift due to differentiation and integration. Nonetheless, their research suggests that different cognitive factors may be involved in different aspects of language functioning.

Another area of cognitive functioning that has received some attention with respect to individual differences in language functioning concerns the construct "cognitive style". Although various

definitions have been proposed (e.g., see Kogan, 1971), in general, the term cognitive style refers to the consistent patterns within the individual for perceiving, organizing, processing and remembering information (Kogan, 1971; Poole, 1975).

Several researchers in the area of language development have speculated that differences in approaches to early language learning may be partially due to differences in cognitive style (Bates, 1979; Bloom and Lahey, 1978). For example, Bates observed that bipolar cognitive styles frequently distinguish between the degree of internal versus external control which individuals exercise in pursuing cognitive tasks. She suggested that referential speakers in their capacity for analysis and extraction, display characteristics similar to those associated with styles manifesting internal control. Expressive speakers, however, in acquiring more unanalyzed wholes and means-end relations appear to display characteristics associated with styles manifesting greater external control.

Nelson (1973), analyzing the first 50 words of children's vocabularies, suggested that early differences in emphasizing nouns versus personal-social

interaction terms, may reflect differences in children's conceptual organization. Conceptual differences of this sort would then interact with family and environmental patterns in producing subsequent learning strategies.

In the empirical literature, most inquiries into the relation between language and cognitive style have derived from Witkin's research on psychological differentiation (Witkin, Dyk, Faterson, Goodenough, and Karp, 1962). Witkin and his co-workers viewed psychological differentiation as both a developmental and enduring characteristic of cognitive and personality functioning. This is to say that while differentiation increased during development, children's level of differentiation tended to remain stable relative to their peers (Witkin, Oltman, Raskin, and Karp, 1971). Psychological differentiation can be viewed as a continuum of undifferentiated versus highly differentiated functioning and provides a means for conceptualizing the ways in which individuals tend to perceive and direct themselves in relation to their environment and experience. Less differentiated individuals are described as having low self-esteem and self awareness, exhibit poor impulse control, anxiety,

passivity and a low need to achieve. Highly differentiated individuals tend to have a well developed sense of self and their own separateness, and an ability to deal effectively with vague or ambiguous stimuli (Alterman, 1977; DeFazio, 1973). Psychological differentiation is operationally defined by performance on one of a number of tasks, including the Embedded Figures Test and rod-and-frame test (DeFazio, 1973). A more complete discussion of this construct is presented in a subsequent section of this paper.

Psychological differentiation was developed as an extremely broad construct having bearing on many aspects of psychological functioning. To the extent that this was true, it was assumed that variations in differentiation would be related to variations in language functioning. Elaborating on this association, DeFazio (1973) noted that differentiation purportedly influences the individual's capacity to internalize and utilize "stable sets of rules". He further observed since language learning refers to the internalization of linguistic rules which then are employed in production and comprehension, then individual differences in differentiation would be associated with differences in performance on linguistic tasks.

Similar types of arguments can be found in studies relating Bernstein's social-cultural theory of elaborated and restricted code users with Witkin's descriptions of field independent and field dependent individuals (e.g., Alterman, 1977).

The results of research have not consistently supported the view that language and cognitive style functioning are related. For example, examining essays written by male and/or female college students, differences in differentiation have been found to be associated with (a) verbal fluency, and cognitive clarity and thoroughness (Shapiro, 1967); (b) verbosity, the use of noun qualifiers, pronouns, adverbs and verbs indicating action, internal reaction and possession (Doob, 1963); and, (c) the number of self-referrents and verbal productivity (Jennings, 1967). In addition, using a variety of linguistic tasks, DeFazio (1973) found more differentiated subjects performed better on tests of verbal comprehension, fluency, prediction and some aspects of speech perception.

Contrary to these findings, a few writers found little or no association between measures of differentiation and language functioning. Chapman

(1967), using a cloze technique, found levels of differentiation positively associated with the ability to decode but not encode messages. Similarly, Alterman (1977) examined high school students' use in speech of subordinate clauses, infinitive phrases, and participle and gerund phrases in response to ambiguous and non-ambiguous questions. No significant differences were found to be associated with level of differentiation, except for the use of subordinate clauses in the ambiguous situation.

These inconsistencies relating Witkin's construct to language skills can not be accounted for by the theory from which the construct of differentiation is derived. Witkin et al. (1962) commenting on their own lack of success, had suggested that "the development of at least some verbal skills may follow a different pathway than the mode of field approach and other characteristics of developed differentiation" (p. 198). It appears this suggestion is congruent with theoretical suggestions and empirical evidence noted at the beginning of this section indicating that aspects of language functioning may be differentially associated with different approaches to information processing.

More recently, a number of studies examining the association between other areas of cognitive style and language functioning have provided support for this suggestion. In a series of studies, Poole (1977, 1978a, 1978b, 1978c) examined how various cognitive as well as linguistic variables might be associated. Working within the framework of Bernstein's social-cultural theory of language functioning, Poole considered how males and females of different socioeconomic backgrounds performed on various linguistic and cognitive tasks. Using canonical correlation and principal components analysis she examined the relation among the domains in order to see whether some underlying structure might be suggested. Summarizing her results, Poole (1978b) observed,

> Although exploratory, the specific interdomain analysis between "cognitive style" and "linguistic code" has yielded results congruent with theoretical perspectives which consider that language shapes cognitive style...that language is a mediating, amplifying, or focusing mechanism for the solution of cognitive tasks...and with researchers who report...an elaborated code facilitates the manifestation of cognitive

processes such as specificity, differentiation, analysis, and the weighing of alternatives... (p. 1163).

Thus far, the research we have discussed has dealt with individual differences in cognitive styles as they relate to the application of linguistic knowledge in production and comprehension. The results of this research are, at best, equivocal, although they do indicate some of the methodological problems also noted elsewhere in the literature when a univariate interpretation of the construct cognitive style is adopted (Block, Buss, Block, and Gjerde, 1981; Wachtel, 1968). However, this research has not directly addressed the question of the processes which may be involved in children's acquiring language.

Recently, researchers have become interested in this problem. Nelson and Bonvillian (1978) examined how variations in concept learning were associated with differences in divergent thinking. The term divergent thinking, often used interchangeably with 'creativity' and 'ideational fluency', refers to the ability to produce 'cognitive associates' both typical and unique (Wallach and Kogan, 1966). A more complete discussion

of this construct is presented in a subsequent section of this paper.

In an experiment designed to teach children new concepts, Nelson and Bonvillian noted that children of approximately age two-and-a-half varied in the extent to which they overgeneralized concepts. In a follow-up study of most of these children at age approximately four-and-a-half, these early patterns predicted performance on reduced versions of Wallach and Kogan's 'alternative uses' and 'instances' tasks.

Interpreting their findings, Nelson and Bonvillian suggested that these two related patterns may reflect the same processes. Elaborating on this discussion, Nelson and Nelson (1978) observed that overgeneralization may be viewed as a type of conceptual breadth. Conceptual breadth refers to the number of exemplars individuals include in a category. Research in cognitive styles indicates that individuals tend to be consistent in whether they are broad or narrow categorizers in their performance on various tasks measuring category breadth (Block et al., 1981). Similarly, Nelson and Bonvillian found a significant relation between early and later patterns of overgeneralization in their sample. In addition,

divergent thinking has been found to be positively associated with some measures of breadth of categorization. This finding, and Nelson and Bonvillian's results on the relation between divergent thinking and overgeneralization, suggest that overgeneralization patterns may entail a stylistic component which is closely associated to the cognitive styles conceptual breadth and divergent thinking.

Nelson and Bonvillian's research is noteworthy in that it is the first empirical study to find early precursors in children of later stylistic differences in cognitive functioning. Conversely stated, this is the first study to examine how such stylistic differences might be associated with differences children display in the process of acquiring language. In the present study, these findings are extended by examining how stylistic differences in divergent thinking might be associated with overgeneralization in a different area of language learning, the acquisition of the English irregular past tense verbs. However, as noted in the introduction and as will be discussed shortly, overgeneralization patterns are intimately associated with children's knowledge of other aspects of the language system. Consequently, it will be

suggested that individual differences in divergent thinking may indeed be associated with differences in children's knowledge of the English past tense.

3. Overgeneralization, Deregularization and the English Past Tense

The major obstacle in doing research relating language acquisition to cognitive processes is in defining those processes associated with acquisition which, in the case of the present study, may explain children's learning of the irregular verbs. Specifically, our interest is in the period of deregularization, during which children relinquish the tendency to overgeneralize the -ed suffix and develop a more adult-like system of knowledge for these verbs. In these sections, therefore, papers will be reviewed which bear upon our ability to understand deregularization. We begin with a brief summary of overgeneralization, which is considered background to the problem of understanding the period of deregularization. The review then turns to a discussion of descriptions of the linguistic knowledge which is acquired for these verbs and the implications which follow for understanding deregularization. Additionally, theoretical discussions are presented which further clarify the processes purportedly involved in the child's acquisition of this knowledge.

3.1 Overgeneralization and the Acquisition of Irregular Past Tense Verbs.

Observations and interpretations of overgeneralization in child language learning are well documented in the literature (e.g., Bowerman, 1982; Cruttenden, 1981). As well, overgeneralization may be observed in various aspects of language learning, for example, in the acquisition of the English inflections, in semantics and in lexical learning. Bowerman suggests that overgeneralization errors typify the child's disposition to seek out rules and discover the regularities and structure of language.

A familiar description of overgeneralization derives from studies of English inflectional morphology, involving the child's learning of the rules for inflecting nouns and verbs to form the plural and past tense respectively. Very generally, it can be said that overgeneralization occupies a midpoint in the child's learning of these linguistic forms. Prior to this point, children often use the various irregular forms correctly, for example, feet, broke. However, after acquiring a number of regular forms, errors such as 'feets' or 'breaked' begin to appear in their speech. Later on in development, overgeneralized

errors become increasingly infrequent and eventually disappear.

The common interpretation of this process is that at first terms are learned individually, in specific relation to their referents (Bowerman, 1982; Cruttenden, 1981). The onset of overgeneralization errors indicates that the child has systematized the regularities within each system, and abstracted and analyzed certain components, for example, cup/s, walk/ed, such that the components are now "conceptually freed from the forms with which they were originally learned" (Bowerman, p. 105). Thus, it appears the child has formulated rules reflecting the regularities of a system and can handle any known or newly acquired exemplars in accordance with these rules. The later re-emergence of appropriate use of the regular and irregular forms indicates the child has integrated these forms into one system.

In the acquisition of the English past tense much attention has been given to children's overgeneralization of the -ed suffix as this is certainly the most frequent type of error observed. However, during the period when the tendency to overgeneralize predominates, correct irregular forms

are frequently found in conjunction with overgeneralizations in children's speech and recognized as equally correct in testing situations (see Kuczaj, 1977, 1978). The reader will recall that the child initially learns the correct forms in specific relation to their referents. Consequently, these correct forms are already part of the child's lexicon. In switching to different forms, it appears children display their having acquired alternative means for expressing pastness. That is, their resources include items acquired in the lexicon as well as the capacity to derive the past tense from a present-base form using the -ed suffix (Kuczaj, 1977, 1978; Pinker, 1985). Kuczaj suggested that children may still have to learn that a present and irregular past tense form are paired, and that the irregular past tense form is used to the exclusion of the overgeneralized form. One question in the present study, therefore, is how this learning is accomplished.

In addition to the problem of switching forms, there is also some evidence that children recognize the potential for systematizing irregular past tense verbs. Bybee noted an instance where a four-year-old boy stated the word 'foyt' as the past tense for 'fight' (Bybee,

personal communication, 1985). She suggested the possibility that the child compared the present base 'fight' with 'write', thus trying out 'foyt' (as in wrote) as a reasonable term (Hooper, 1979). Similarly, children may frequently be observed using the terms 'brung' and 'brang' as past tense for bring (Pinker, 1985).

Reports and discussions of this type of data from young children are clearly lacking in the literature on the acquisition of the English past tense. While this lack of attention may indicate the infrequency of such errors (Kuczaj, 1977), nonetheless, these data bring to light some intriguing and as yet unexamined questions regarding children's learning of the irregular verbs. For example, do early productions such as 'foyt' represent only fleeting insights into the potential for grouping at least some of these verbs? Insightful moments reflecting more advanced levels of knowledge have previously been noted in other areas of U-shaped behavioral growth (Strauss, 1982). Consequently, it would not be particularly unusual to observe isolated instances as that described in children's language behavior.

Alternatively, however, it seems reasonable to wonder how much preschool and early school age children understand about the behavior of the various subgroups and concomitant rules for deriving the past tense of these verbs. In the context of this paper, these issues are significant in that they bear upon our understanding of deregularization, when the tendency to overgeneralize the -ed suffix is relinquished. One point is that the process of deregularization may, in part, be facilitated by children's awareness that the -ed suffix added to the present-base of a verb is an incorrect form. Furthermore, such awareness may come about in a context where the child is uncertain about what to do next if he/she wishes to express pastness using a particular verb. Second, examples of this sort lead us to question what point, if any, in development do errors such as 'foyt' and 'brung' represent more advanced levels of learning of these verbs. Stated another way, it appears that it is unclear how to weight or what value to give this type of error in relation to overgeneralization errors using the -ed suffix.

Nevertheless, it is suggested that deregularization is a multi-faceted process during which children learn

to recognize the inappropriateness of the -ed suffix being added to certain verbs, where they learn to match a present base with its appropriate past tense form and where they may also learn to systematize the regularities within the subgroups of the irregular verbs.

In the next section we further discuss the problem of matching and its relation to knowledge of the regularities within the subgroups of the irregular verbs. The problem of recognizing irregularity is considered last.

3.2 Deregularization and the Acquisition of the English Past Tense - Rote and Rule Learning.

Before beginning our discussion of deregularization, the reader should note that in these sections we will not be emphasizing the specific rules or acquired knowledge for particular verbs. Rather, these discussions are focused on the general nature of children's acquired knowledge of the irregular past tense. A more complete presentation of the actual content of this knowledge is presented later in our discussion of the acquisition of the irregular verbs.

Rote learning:

Kuczaj (1977) suggested that the irregular verb pairs are learned by rote and stored in the lexicon. Overgeneralization errors would be eliminated as each pair is memorized. Examining preschoolers' spontaneous speech samples, Kuczaj found no errors such as 'foyt' in his data. In addition, mean length of utterance (MLU) was a better predictor of success with regular verbs than chronological age, while chronological age was as good a predictor as MLU in success on the irregular forms. Interpreting these results, Kuczaj argued that MLU reflects children's level of sophistication with language rules. Chronological age, however, is associated with the amount of exposure to the language. Consequently, it would be more than or as likely as MLU to predict success on forms which are rote learned.

Similarly, it has been suggested that frequency of exposure to and usage of an irregular past tense verb may facilitate the role learning of that verb by strengthening its presence in the child's language system (Bybee, 1985; Bybee and Slobin, 1982; MacWhinney, 1978; Pinker, 1985). Support for this suggestion may be derived from recent observations of

the relation between frequency of word usage and the extent of overgeneralizations. Bybee and Slobin (1982), examining children's knowledge of irregular past tense verbs, noted a significant negative correlation between estimates of frequency of word usage (Kucera and Francis, 1967, cited in Bybee and Slobin, 1982) and the percent of regularizations in some subgroups of the irregular verbs. However, it is apparent that attributing deregularization to rote learning bypasses explaining errors such as 'foyt' and 'brung'. As well, while memorization may ultimately resolve the matching problem, it does not explain how children learn to recognize the inappropriateness of the -ed suffix added to irregular past tense verbs. Finally, as we discuss in the next section, there is evidence indicating the relations between many of the present and past tense forms are principled (Bybee and Moder, 1983; Bybee and Slobin, 1982; MacKay, 1976) and that recognizing these principles may enhance the child's ability to find the appropriate match for a verb and/or avoid overgeneralization of the -ed suffix.

Rule learning:

Although various classification systems for the irregular verbs have been proposed (for example, Hoard

and Sloat, 1973; Jesperson, 1942), it is only recently that the psychological reality of these classes for speakers has become the focus of research (Bybee and Moder, 1983; Bybee and Slobin, 1982; MacKay, 1976). For example, examining adults' response latencies and errors in forming the past tense from a base form, MacKay found that reaction times increased in relation to the complexity of phonological changes hypothesized for deriving the past tense forms. MacKay observed that such differences would not be predicted by the hypothesis that these forms are stored independently in the lexicon. In addition, these differences, as well as some of the error patterns, suggested that speakers, at least some of the time, may employ derivational rules when forming the past tense of irregular verbs.

While MacKay's research did not address the problem of understand deregularization, it helped to elaborate on the nature of some of the linguistic knowledge that children eventually acquire for the irregular verbs. More recently, Bybee and Slobin (1982) have suggested that children acquire similar knowledge of the irregular verbs and that this knowledge may be associated with deregularization.

Bybee and Slobin examined preschoolers' spontaneous speech samples as well as performance on an elicitation task. Data from third graders were also collected using an elicitation task. They found that the phonological structure of various subgroups of the irregular verbs was associated with the number of overgeneralizations children produced using the -ed suffix. Four factors were noted:

1. the shape of the verb in its past form, and specifically verbs that undergo an internal vowel change and whose past forms end in t/d, for example, feel/felt;
2. the degree of phonological similarity in the consonantal structure between the present base and past tense forms, for example, break/broke, blow/blew;
3. generalizations reflecting similarities in the phonological shape of the irregular verbs in their past tense forms, for example, fly/flew; blow/blew. Bybee and Slobin called these generalizations 'schemas' (see discussion on the acquisition of these verbs); and

4. holding constant the consonantal structure of the present base while changing the internal vowel when forming the past tense.

Bybee and Slobin cited the work of Slobin (1971) in considering the first factor. Slobin found that irregular verbs whose past tense forms end in t/d were regularized less frequently than other irregular verbs by preschoolers ages one-and-a-half through four years. Data from Bybee and Slobin's preschoolers confirmed this finding. Interpreting these results, Bybee and Slobin suggested that in order for children to match a present-base with the correct past tense form, they must first make the analysis that a form expresses pastness. For some irregular verbs, this task may be aided by the resemblance between the t/d ending and suffixation rule. For other irregular verbs, the only clue to indicate pastness is context. Only after this analysis has been made can children begin to approach the problem of matching present and past forms. In other words, it seems that the t/d ending on the past tense form of these verbs gives the child a 'head start' in the learning process (p. 277).

Regarding the second factor, Bybee and Slobin hypothesized that the matching task would be easier for

verb pairs matching in both initial and final consonants or consonant clusters than for pairs matched in only initial consonants or consonant clusters. Data from preschoolers verified these predictions. The percent of regularizations for verb classes whose member pairs match in both initial and final consonants or clusters ranged from 32% to 55%. Verb pairs which matched in only initial consonants or clusters were regularized 80% of the time.

Bybee and Slobin also found some evidence that phonological distance remains a problem even after common irregular past tense forms have been acquired. Anecdotal data from third graders indicated the difficulty some subjects had accepting the correct past tense forms for 'go' and 'make', even when the correct responses were suggested by the examiner. Additionally, when adults were asked to produce a past tense form from a present-base stimulus as quickly as possible, this problem was further reflected in the high percentage of regularizations for verbs like 'catch' and 'think'. Both these verbs require a vowel and consonant change to form the past tense. This suggests that matching may be enhanced by the

phonological similarity between a present-base and its past tense form (Bybee, 1985; Bybee and Slobin, 1982).

The third factor considered generalizations about the various subgroups of the irregular verbs which Bybee and Slobin called "schemas'. These schema represent the shared morphophonemic alternations of irregular past tense verbs (Bybee and Moder, 1983; Bybee and Slobin, 1982).

Evidence for the existence of schema derives mainly from observations of the systematicity in children's and adults' errors when forming the past tense of irregular verbs (Bybee and Slobin, 1982), and from adults' responses when forming the past tense for nonsense terms (Bybee and Moder, 1983). For example, Bybee and Slobin observed that over half the innovations made by third-graders and adults occurred using the schema describing the class of verbs in which a vowel change occurs changing /i/ to /ae/ or to /ʌ/, for example, begin/began or dig/dug. In some instances subjects provided the past participle form for verbs, for example, ring/rung, drink/drunk. However, in other instances the errors reflected innovations that were non-words or dialectical variations, for example,

bring/brung, think/thunk, or other existing words, for example, clink/clank or clunk.

Examining third-graders' performance on the elicitation task, Bybee and Slobin observed that many present-base stimuli were treated as irregular verbs even though children did not respond with the appropriate past tense form. Examples included eat/ut, think/thunk, blow/blow. These data indicate that children may recognize the inappropriateness of regularizing a particular verb without having learned the association between a present base and its past tense form. Furthermore, it appears children may utilize their understanding of schema to avoid overgeneralizing the -ed suffix with an irregular past tense verb.

The last factor indicated that the consonantal structure of a verb base may be held constant while the internal vowel is changed. Bybee and Slobin noted that many of the adults' innovations reflected an approach in which the vowel was changed to form a past tense from a present-base, for example, raise/rose. Bybee and Slobin suggested that speakers of English acquire this strategy. Similarly, many of the third-graders' errors revealed the same approach, for example,

ride/rid or red, fight/fit. This suggests that the process of deregularization may be further enhanced by children's knowledge of this strategy.

It is worth noting that Bybee and Slobin did not advocate that the irregular past tense verbs were rule learned. Rather, they suggested these verbs were rote learned and stored in the lexicon but that speakers also acquire generalizations about the subgroups of these verbs. In the same study (Bybee and Slobin, 1982) they hypothesized that if the irregular verbs were solely rule governed, then the errors produced by adults under pressure would result in innovations of novel, non-English words, for example, heap/hept. However, if the irregular past tense forms are stored in the lexicon, errors would be caused by selection of incorrect, but pre-existing words. The results for the most part supported the latter hypothesis. However, it was also noted that other factors played a role in selection, including syntactic and semantic categories, morphological category and phonological shape of the stimulus and past tense words. Furthermore, Bybee and Slobin observed that these errors usually reflected some conformity to the 'schema' which define the various generalizations about the irregular verbs.

They suggested these factors may interact when speakers are accessing irregular verbs.

Thus far we have examined evidence which helps to elaborate upon the processes involved in deregularization and matching between pairs of the irregular past tense verbs. Apart from rote learning, we have observed that both deregularization and matching may be facilitated by attention to various phonological aspects of these verbs. Furthermore, it appears that children may derive principles about the kinds of phonological changes which occur when forming the past tense for the irregular verbs. Before discussing the problem of children's recognition of the necessity for deregularization, however, we still need to explain how children may learn these facts about the irregular past tense verbs.

In theoretical psycholinguistics a number of writers, for example, MacWhinney (1978) and Pinker (1985), have ascribed the process of learning the irregularities within a language system to abilities likewise employed during the acquisition of the system's regularities. However, during acquisition it is suggested that these abilities may interact with other factors that represent children's inherent

knowledge or disposition for language. It is this interaction that determines the child's eventual acquisition of the adult's language system.

For example, MacWhinney (1978) proposed language learning is predicated upon three central abilities: rote memorization, productive combination and analogical formation. Rote learning is characterized by the absence of analysis. Productive combination refers to the putting together of language units to build larger units, for example, building words out of morphemes, or sentences out of words. MacWhinney suggested that analogical formation depended upon a number of skills such as processes capable of locating analogous items within the acquired system and comparing items. A complete list of these skills may be found in MacWhinney (1978, p. 2).

MacWhinney then made certain claims about the ways in which children should learn morphophonology. For example, he suggested that the first productive uses and overgeneralizations in language learning would make use of the most frequent form (p. 12). Although a complete review of MacWhinney's model might be interesting, it is beyond the scope of this paper. What is significant to our present discussion of

deregularization is his discussion of correction which he suggests enables children to monitor language data.

Briefly, MacWhinney noted that monitoring of discrepancies in the language system may facilitate children's unlearning of errors, for example, overgeneralizing the -ed suffix. In his claims he suggests that unlearning, in turn, may be facilitated by a disposition to attend to the various phonological characteristics of forms. It is at this point that combination and analogy would enable the child to seek out alternative means for an expression. In the process of finding alternatives, monitoring would continue to function until discrepancies were eliminated. Finally, repetition of this cycle with various forms would eventually lead to productivity of other morphophonological patterns.

In Pinker's model (Pinker, 1985) children formulate word-specific paradigms from which they abstract patterns of inflection to formulate general paradigms specifying the regularities within the system. Pinker suggests that in accessing an inflected form, the child will also access the general paradigm. If features are missing in the word-specific paradigm, the general paradigm enables the child to fill in

missing features. In this way Pinker may account for overgeneralization.

A similar procedure is proposed in the child's learning of the irregularities within the system. However, like MacWhinney, Pinker suggests that children's attention would be specifically directed at examining shared phonological features among the items. As we have seen in our discussion of deregularization, this is, in fact, the case.

In summarizing, it appears then that the processes underlying deregularization may be similar to processes associated with more general language learning. MacWhinney observed that apart from rote learning, the acquisition of the irregular verbs may be accounted for by analogy and combination whereby children eventually abstract the principles regarding these verbs. Similarly, Pinker noted the necessity for comparison and abstraction in formulating the rules for inflections. Additionally, both writers suggested that it is attention to the phonological structure of these verbs which enables children to derive the principles associated with their irregularity. Finally, we would suggest that this represents a shift in children's attention during development from the final t/d ending

to alternative content as well as other segments of these verbs.

In the present study we suggest that the ability to conduct analyses of the kind discussed above are not unique to the language learning process, but may be observed in other areas of cognitive functioning. If this is the case, then it is suggested that the maturation of the skills required in the acquisition of the irregular past tense verbs and manifested in children's increased knowledge of these verbs would be correlated with the manifestation of these skills on certain other cognitive tasks. A view of cognition which emphasizes these skills seems to be embodied in Witkin's theory of psychological differentiation. This theory takes into account that individuals vary in the rate at which they acquire these skills as well as the degree of proficiency eventually obtained. In addition, the constructs divergent thinking and metalinguistic awareness for language are defined in terms of children's capacities to conduct at least some of the operations we have discussed.

However, before we discuss these other areas of cognitive functioning and their relation to language

learning, we still are left with the problem of accounting for children's recognition of irregularity.

3.3 Deregularization and the Acquisition of the English Past Tense - Identifying Irregular Verbs

Bybee and Slobin (1982) suggested that when accessing a verb to express pastness there must be some way for the speaker to recognize whether or not a verb is irregular. They suggested this is done through 'marking'. Verbs that are not marked are regular verbs and may be selected in their present base form and regularized. If a verb is marked, selection of the base form will be inhibited and the accessing search will continue. In the case of no-change verbs, for example, hit/hit, marking would merely prevent the application of the suffixation rule.

One frequent suggestion as to the processes underlying marking is based upon the strength of an item in the child's language system (Bybee, 1985; Bybee and Slobin, 1982; MacWhinney, 1978). Bybee (1985) defined strength metaphorically. If an item could be written into the lexicon, then each time it is processed the representation in the lexicon is etched over so that the lines become deeper and darker.

It follows that in acquisition increased exposure to an item would strengthen its marking. This suggestion is consistent with Kuczaj's (1977) observation noted earlier that chronological age was as good as MLU in predicting children's success in forming the correct past tense of irregular verbs, since age was associated with exposure to language.

Similarly, MacWhinney (1978) suggested that infrequent irregular forms would be regularized more often than common irregular forms due to their weakness within the language system. In support of this, Bybee and Slobin (1982) observed a positive correlation between correct responses and frequency of word usage for the no-change category of the irregular verbs for third-graders and adults in their study. As well, they found a significant negative correlation between frequency of adult input and preschoolers' regularizations in spontaneous speech.

Conversely, it may also be suggested that infrequently processed forms may become weaker and eventually fade from the lexicon (Bybee, 1985). Bybee observed that some English verbs previously had irregular past tense forms but had become regularized over time, for example, bide/bode/bided. She points

out that verbs that have regularized are low frequency verbs. This suggests that overgeneralization errors would also eventually fade since the strength of the error would only be enhanced by children's errors. The strength of the correct forms would be increased by adult input as well as children's correct usage.

With this in mind, consider Pinker's (1985) recent proposal that underlying the resolution of alternative expressions for pastness for the same base form is a linguistic principle of 'unique entry'. Pinker suggests that in forming paradigms for specific words, where a paradigm is a matrix representation encoding the grammatical features of words in their various conjugational or declensional forms, only one entry may fill each cell. In development, therefore, the child necessarily is motivated to eliminate any extra forms for a particular word for a specific grammatical expression. Which form is eliminated or retained would be determined by its strength. Consequently, the acquisition of recognizable irregularity could be understood in terms of the interaction between the strength of an item and Pinker's 'unique entry principle'.

Also, at this point, it seems essential to reconsider MacWhinney's (1978) discussion of the process of correction. The reader will recall that MacWhinney postulated a monitoring process which enables the child to detect discrepancies. He further suggested when the child uses a form which is weak within the language system he can detect the discrepancy and then move into a process of correction. This explanation may serve to account not only for why overgeneralized forms are eliminated and the relations between present bases and their correct past tense forms strengthened, but also why some previously infrequent irregular forms have become regularized (Bybee, 1985). Bybee and Slobin (1982) and Bybee further suggested that phonological similarity between a present base and its past form make this process easier. However, we have discussed this in the previous section.

We suggest that the outcome of the processes described is the elimination of overgeneralized forms in the child's lexicon. The matching process described earlier would then facilitate finding the appropriate past tense form, also in the lexicon. If we are correct, then monitoring appears to contribute to the

child's learning of irregularity. However, this process is not viewed as exclusive from the processes described earlier. Rather, they appear to be dynamically linked together.

In these sections we have examined literature which bears upon our understanding of children's acquisition of knowledge for the irregular past tense verbs and concomitant deregularization of these verbs. Suggestions were also made regarding the processes which would appear to be involved in this area of language learning. In the next sections we discuss some other cognitive constructs which appear to be representative of processes similar to those outlined here.

4. Psychological Differentiation

The construct psychological differentiation derived from research on perceptual processes which indicated that individuals vary in the amount of difficulty they have in perceiving parts of a field as separate from the surrounding context (Witkin and Asch, 1948; Witkin et al., 1971). Assessments of differentiation were based upon the individual's ability to determine uprightness under conditions of conflicting proprioceptive information, or subjects locating a simple figure within a larger, more complex visual field. The larger field was designed to obscure the simple figure. The measures developed to assess these skills included the tilting-room-tilting-chair test, the rod-and-frame test (RFT) and the Embedded Figures Test (EFT).

Observing both children's and adults' performance on these tasks, Witkin found he could place individuals on a continuum in terms of their success (Alterman, 1977). Test-retest reliabilities for the EFT further indicated a subject's performance tended to remain consistent even over extended periods of time. In addition, comparisons between EFT performance and other

perceptual 'disembedding' tasks yielded significant correlations (Witkin et al., 1971).

Witkin suggested that individuals manifest an approach in their perceptual activities which they apply in a variety of situations of a particular structure (pp. 3-4). Highly differentiated subjects demonstrate greater ability to isolate a percept from the surrounding field. Less differentiated subjects tend to perceive the parts of a field as fused.

Witkin and Goodenough (1977) explained that in the RFT and tilting-room test highly differentiated subjects were better able to use their own bodies as a frame of reference for determining uprightness. They, therefore, appeared to rely more on internal cues. Conversely, the judgments of other subjects appeared to be more affected by the surrounding field or external cues. According to Witkin, such performance differences could be understood in terms of the degree of self-nonself segregation, which represents the extent to which the self is articulated and boundaries have been formed to denote inner and outer. As such, the well articulated or differentiated person is better able to distinguish attributes which belong to the self and are distinct from the outside. Additionally, the

well articulated person may be more autonomous in his/her relations with the environment and do well on tasks requiring restructuring. Restructuring, in turn, may be viewed as three distinct but related operations: breaking up a stimulus organization into elements; providing new structure for a stimulus complex; and imposing structure for a stimulus which is ambiguous (Davis and Frank, 1979; Witkin and Goodenough, 1977).

As indicated earlier, psychological differentiation was considered an extremely broad construct believed associated with many aspects of psychological functioning. Witkin observed that historically, psychology has long recognized the significance an individual's perceptual processes may have for other aspects of personality and cognitive functioning. Consequently, theoretical and empirical interests in psychological differentiation shifted from a strict emphasis on perceptual processes towards a wide range of psychological factors which may be associated with these processes. These included personality, defense mechanisms, learning ability and problem solving ability, to name a few. In fact, the amount of research generated by this construct was extraordinary. As such, a review of this literature is beyond the

scope of this paper. The interested reader is referred to Kogan (1984) for a most recent review with key references. In this section we will attend to those issues relevant to our discussion.

Witkin noted the concept of autonomy has implications for both interpersonal and cognitive functioning. For example, reliance on external cues is hypothesized to be associated with interpersonal competence. In addition to the characteristics observed earlier, there is, in fact, much evidence showing less differentiated subjects tend to be more attentive to and rely more upon social referents. Highly differentiated subjects are more inclined to be inattentive to such information and use social isolation as a defense (Alterman, 1977 ; Davis and Frank, 1979; Witkin and Goodenough, 1977). We will return to the issue of cognition shortly.

Psychological differentiation was also conceived of as a developmental construct. The infant necessarily starts out in an undifferentiated state. In development, there is a move towards increased differentiation which is reflected in increased analysis and structuring of experience.

It is noteworthy that this interpretation of development is in no way novel to psychology. It has been developed in relation to most theories of cognitive as well as language development (see, for example, Piaget and Inhelder, 1969; Strauss, 1982). Consequently, the possible overlap between stylistic differences in differentiation and general progress towards increased differentiation discussed in more traditional 'stage theories' has led some researchers to turn towards theories of cognitive style as a potential source for understanding the variation among children in their progress and approach in various areas of cognitive development (e.g., Finley, Solla, and Cowan, 1977; Hill, 1980; Liben, 1978). In the present study, we too are interested in analytic and structuring abilities as they relate to children acquiring knowledge of the irregular verbs. However, this association is discussed in a subsequent section of this paper. Presently, we are restricting the discussion to research which has extended our understanding of these abilities by their association to other areas of cognitive development and cognitive functioning.

Using a variety of measures to assess differentiation, research on the association between degree of differentiation and cognitive development has proved rather fruitful. In general, it appears that individuals low in differentiation are at a distinct disadvantage in the development of some formal operational and conservation skills, as defined in Piagetian theory (Lawson, 1976; Neimark, 1975; Stone and Day, 1980). However, as Kogan points out, this relationship is not "across the board". For example, Hill (1980) found the association between differentiation and conservation skills decreases with age. Similarly, Case (1977) observed this relation decreases when less differentiated children are taught conservation skills. Consequently, it would appear the relation between the stylistic component and the development of some cognitive structures is most evident during periods of transition in the development of these structures when a more methodical, analytic approach would facilitate learning. As well, the strength of this relation tends to increase when the tasks for both domains share more common features (Kogan, 1984).

Recently, a number of researchers have questioned whether psychological differentiation reflects a 'cognitive style' or skill. McKenna (1983) observed that the results of research on the relation between differentiation and personality have been inconsistent. However McKenna, as well as Weisz, O'Neill, and O'Neill (1975) noted that the correlation between differentiation and measures of ability are fairly consistent. Furthermore, it has been suggested that these correlations may result from a common underlying relation among the measures employed (Weisz et al., 1975).

Similarly, Davis and Frank (1979) have suggested that the difference between more or less differentiated subjects may not be in the processes employed but, rather, in the developmental efficiency of memory processes and/or the ability to conduct combinatorial analysis. These authors noted that studies on concept learning indicated there was an interaction between structuring and recall. For example, in one problem solving task less differentiated subjects tended to need more trials and more time in determining a solution. However, it was also observed that these subjects were more inclined to repeat their errors

(Laughlin, 1966, cited in Davis and Frank, 1979). In addition, these authors noted that less differentiated subjects had more difficulty testing hypotheses under conditions of negative feedback. Davis and Frank concluded that less differentiated individuals experience more problems in remembering information. Memory processes, in turn, may be affected by information load, subjective organization and interfering factors.

Apart from these difficulties in interpretation, the construct psychological differentiation has proved worthwhile to researchers in many areas of psychology. Of interest to us here are studies indicating that the abilities associated with stylistic variation in differentiation appear to be related to abilities in other areas of cognitive functioning. In particular, it is suggested that the analytic and structuring skills tapped in testing differentiation are the same skills facilitating the development of certain cognitive structures as these structures are assessed by certain cognitive tasks.

While the child's acquisition of linguistic knowledge may also be viewed in terms of increased differentiation and integration, presently we know of

no studies which have attempted to explore the possible relation between differences in psychological differentiation and variations in linguistic knowledge.

5. Divergent Thinking

Divergent thinking refers to a mode of thinking which can be labeled creativity, and is considered distinct from convergent thinking or intelligence (Kogan, 1984; Wallach and Kogan, 1966). Operationally defined, divergent thinking may be characterized by the number of ideas or associations generated in response to a particular stimulus, for example, "Tell me the ways that a shoe can be used".

Harrington, Block, and Block (1983) observed that the processes underlying a profusion of ideas and associations relevant to a specific task have long been viewed as essential in creative thinking. However, Kogan (1984) warned the term creativity as it is used to described performance on tasks measuring divergent thinking should not be confused with the more popular notion of creativity associated with creative geniuses and their creative productions. It merely represents ideational fluency elicited in a particular testing situation.

Using Wallach and Kogan's (1966) test battery, there is much evidence indicating the separation between divergent and convergent thinking (Kogan, 1973). These results, however, appear to be contingent

performance on these tasks. The more divergent thinking performers reported attending to the environment and exhausting a category. These subjects were also better able to verbalize their own strategies than their less divergent thinking peers. LaGreca reported the latter group seemed to wait passively for ideas to emerge.

Pepler and Ross (1981) observed that divergent play enhanced children's unique responses on divergent thinking tests and was also related to children's abandoning ineffective strategies when seeking a solution to a problem on a problem solving task. Convergent play and no-controlled play had no association to performance on divergent-thinking tasks. As well, convergent play seemed only to enhance performance on convergent tasks resembling those employed during the play period. It appears, then, that divergent play may be beneficial to problem solving skills.

However, efforts to relate problem solving skills to divergent thinking have not consistently supported the view that these two areas of performance are related (Houtz and Speedie, 1978; Houtz, Montgomery, and Kirkpatrick, 1979). Houtz and Speedie, observed that

different problem solving tasks may require different sets of skills. Furthermore, the principles underlying divergent thinking are that it represents the production of many ideas and not necessarily the abstraction of one idea to hypothesize a solution to a problem.

Nonetheless, several writers have suggested that creativity as it is defined in theories of divergent thinking may be linked with the development of cognitive structures (Kogan, 1984). The argument seems to be that cognitive development may proceed through the interaction of various dynamic cognitiive processes. When these processes present the child with conflicting information the resolution of the conflict facilitates the development of higher order structures. Kogan noted that writers in this area have suggested that creativity may facilitate the developing awareness of these contradictions or may be partially defined by the acceptance of contradictions.

Interesting as these suggestions may be the relation between divergent thinking and the development of cognitive skills remains largely unexamined. The reader will recall, however, that divergent thinking has been viewed as a type of conceptual breadth and has

been found to be associated with some measures of this construct. In the present study it is suggested, therefore, that the inclination to categorize information into a group under the rubric of a specific idea as evidenced in divergent thinking task performance reflects processes similar to those children must apply when acquiring knowledge of the irregular verbs.

6. Cognitive Style and the Acquisition of English Irregular Past Tense Verbs

The present paper is intended to examine the possible relation between cognitive style and individual differences in children's acquisition of the English irregular past tense verbs. More specifically, it is suggested that differences in differentiation and divergent thinking may help us understand observed differences in children's knowledge of these verbs.

In previous sections we outlined a number of issues in the acquisition process which appeared to be associated with deregularization and, concomitantly, reflected on the child's movement towards developing a system of knowledge more closely resembling the adult's language system for these verbs. Also, in reviewing the literature relevant to these topics, we indicated those processes which appeared to be implicated in the child's discovery of this knowledge. Below is a brief summary of these issues and the suggested associated processes.

a. Marking: the child recognizes a verb as irregular and that the -ed suffix tagged on to the present-base of a verb is incorrect.

b. Matching and rote learning: the child's recognition of the association between a present-base and past tense form is acquired by memorizing verb pairs.

c. Matching and rule learning: principles regarding the phonological structure and alternations of these verbs are acquired through processes similar to those employed in more general language learning including analogy, combination, monitoring, abstraction; application of these principles to other irregular verbs.

We further suggested that attention to phonological structure reflected a shift in children's attention from the t/d ending towards alternative content as well as other segments of these verbs.

Table 1 represents a summary of our efforts to conceptualize the interface between these processes and traits associated with psychological differentiation and divergent thinking. The format is intended to highlight those traits which might facilitate as well as inhibit deregularization and the acquisition of the irregular past tense verbs. The reader will note, however, that highly differentiated individuals have

Table 1

Deregularization and Cognitive Style

	Psychological Differentiation			
	High		Low	
	enhance	inhibit	enhance	inhibit
Marking	distinguish self/non-self; analytic; efficient memory	socially isolated	attends to external cues	less efficient memory
Rote Learning	efficient memory	autonomous; socially isolated	attends to external cues	perceives globally; less efficient memory

(table continues)

Psychological Differentiation

	High		Low	
	enhance	inhibit	enhance	inhibit
Phono-logical Prin-ciples	breaking up experience; analytic; restructur-turing experience; combina-torial analysis; efficient memory			perceives globally/ fused field; repeats errors

	Divergent Thinking			
	High		Low	
	enhance	inhibit	enhance	inhibit
Marking	relating instances	avoids solution	convergent thinking	
Rote Learning	use of external cues	broad categorization style	convergent thinking	less attention to comparisons
Phonological Principles	relating instances; broad categorization style; use of external cues; abandoning ineffective strategies			less attention to comparisons

been found to be more flexible in their ability to switch to less differentiated modes when necessary. Less differentiated subjects do not manifest traits associated with higher levels of differentiation (Santostefano, 1974, cited in Hill, 1980).

If this representation is correct, then it appears that both high and low levels of differentiation may be advantageous in aspects of the learning process for these verbs. High differentiation would additionally facilitate attention to, and abstraction and organization of the structural aspects of these verbs described earlier. However, given the greater flexibility associated with higher levels of differentiation as well as Bybee and Slobin's (1982) observation of the association between phonological structure and deregularization, we would expect children higher in differentiation to progress faster in the process of deregularization and the acquisition of the irregular verbs. It is, therefore, suggested that more highly differentiated subjects would demonstrate having acquired greater knowledge of these verbs as evidenced in their making fewer overgeneralization errors using the -ed suffix.

With respect to divergent thinking, we also find different advantages for both the high and low categories. Non-divergent thinkers would appear to be more inclined to seek out a single correct past form for a particular verb. However, given the observed association between the structural components and acquisition of these verbs it seems reasonable to suggest that children who are inclined to make comparisons as opposed to rote learn would progress faster through the process of deregularizing and acquiring knowledge of the irregular verbs. Consequently, it is suggested that divergent thinkers would make fewer overgeneralization errors with the -ed suffix than their less divergent peers.

7. Metalinguistic Awareness

Metalinguistic awareness refers to the awareness one is capable of applying to language. Explaining this phenomenon, Scholl and Ryan (1975) cite Vygotsky's description of two stages of developing knowledge - the first is unconscious or automatic; the second is characterized by increasing conscious awareness and control. Gleitman, Gleitman, and Shipley (1972) suggested that the ability to contemplate the structure of language is the central meaning of language knowledge in generative transformational theory.

Metalinguistic awareness is considered to be a by-product of children's developing language and cognitive competencies. As such, this meta-knowledge appears after children have acquired systematic knowledge of linguistic rules, as reflected in their speech patterns and ability to comprehend the speech of others. Bohannon, Warren-Leubecker, and Hepler (1984) point out that as language skills become more automatic, cognitive resources become more available to children to consciously attend to the meanings and forms of the language. Such awareness may then be utilized in, as well as influence, further language learning (Saywitz and Wilkinson, 1982).

Until recently, empirical investigations of the development of metalinguistic awareness have typically focused upon only one dimension of linguistic development, for example, phonology, morphology, syntax or semantics. Although a complete review of this material might be interesting, it is beyond the scope of this paper. Partial reviews may be found in Saywitz and Wilkinson (1982) and Bohannon et al. (1984). In this section we will attend to recent studies which have attempted to integrate this research and elaborate upon issues relevant to our discussion.

Assessments of metalinguistic awareness are based upon children's (or adults') judgments of language. However, School and Ryan (1975) observed that these judgments are insufficient unless a correction is solicited. Thus, a child may be asked to judge whether a statement is silly or correct, and then, if necessary, provide a correction. Or a child may be asked to correct a sentence by determining what is missing or not correct, for example, "The dog is eat___." Recently, Saywitz and Wilkinson (1982) observed that while such judgments frequently may be found in preschoolers' performance, the major issue for assessing the development of metalinguistic awareness

is whether or not children are capable of repeatedly demonstrating such skill in making these assessments across a variety of similar questions. These authors noted further that this ability does not appear until approximately ages 7 to 8 years (we will return to a discussion of their research shortly).

It is not surprising that metalinguistic performance has been associated with Piagetian 'decentering' abilities, since such abilities mark the beginning of the onset of the development of operational logic. It is during this period when children become more consistently able to represent mentally that which had previously been absorbed at the level of action and assume a more objective relation between the self and the objects or events in the world (Piaget and Inhellder, 1969).

Saywitz and Wilkinson (1982) examined children's performance on 11 different tasks measuring different aspects of metalinguistic awareness. These included illogicality, word order, morpheme omission, lexical segmentation, syllable segmentation, phoneme segmentation, the non-physical nature of words, meanings and references, rhyming, ambiguity, and arbitrariness. Their subjects ranged in age from 2;5 to

8;10 years. The purpose of their research was to integrate the diversity in previous studies and explore the possibility that metalinguistic awareness reflects the ability to apply awareness to a "variety of linguistic activities simultaneously" (p. 246). The results indicated that these subtests tapped different aspects of the same phenomenon and that metalinguistic awareness increases with age, regardless of the particular feature examined. As well, a significant correlation was observed between metalinguistic awareness and language comprehension. This relation remained significant even after partialling out the effects due to age or intelligence. Saywitz and Wilkinson concluded that metalinguistic awareness reflects a multifaceted construct which is highly related to language comprehension. As well, and as noted earlier, they observed that complete awareness, as measured by the tasks employed, does not develop until approximately ages 7 to 8 years.

Saywitz and Wilkinson's research was significant in that it attempted to bring together previous studies that individually examined different aspects of the construct metalinguistic awareness. In addition to providing a more comprehensive operational definition

for this term, to this writer's knowledge, this study was the first to incorporate some control measures of intelligence and general language development in the study of this construct. Furthermore, although delays or difficulties in the development of metalinguistic awareness have been linked with learning disabilities in the area of reading and, consequently, language development, thus far, this is the only study we have found to associate the development of this ability with general language learning. The present study, therefore, will attempt to extend these results and explore how the development of metalinguistic awareness might be associated with a particular aspect of language learning. In the next section, it is suggested that skills associated with metalinguistic awareness may facilitate the child's acquisition of knowledge for the irregular past tense verbs.

8. Metalinguistic Awareness and the Acquisition of the English Irregular Past Tense Verbs

One of the vexing problems in the child's acquisition of the irregular verbs is the fact that they are acquired relatively late in general language learning. This may be due to any number of reasons. For example, each subset is made up of only a few verbs when compared to the total number of verbs which may exist in English. Dealing with so little information may be difficult for the preschooler, especially given the productivity of the suffixation process for regular verbs. MacWhinney (1978), examining children's acquisition of morphophonology across a number of languages, suggested that children first focus on learning that rule which is most common within a system. Thereafter, children attend to rules in the order of their frequency within the same system. In addition, in the case of the English past tense, no meaning is lost in communication when the suffixation rule is applied to these verbs. Thus, the motivation in learning the irregularities may be generally delayed.

Although we cannot hope in the present study to resolve the problem of the reasons for this delay, it

is suggested that the older child has acquired certain skills beyond those of the preschooler which may be associated with the acquisition of these verbs. These skills would include the general development of a conscious awareness of the behavior of certain aspects of language, as well as the ability to perform segmenting operations on the units of language. Such skills represent different aspects in the child's acquisition of metalinguistic knowledge. That such skills might be useful to language learners is indicated when we examine the nature of the adult's system of knowledge and the processes involved in the acquisition of these verbs.

In our discussion of deregularization we observed how the process of acquiring the irregular verbs appeared to require a shift in children's attention from the ending toward the beginning, middle and/or end segments and content of these verbs. Bybee and Moder (1983), examining adults' knowledge of the class of verbs exemplified by string/strung, further noted a hierarchy in the defining attributes of this class. These included, firstly, the final consonant cluster; secondly, the initial consonant cluster; and, finally, the internal vowel of the verb base. This would

suggest that the nature of the rules learned, as well as the processes involved in children's determining these rules reflect a segmenting strategy. If this is so, then the ability to perform these operations on language in general, reflected in the development of metalinguistic awareness, may be associated with the ability to perform these operations with the irregular verbs and, consequently acquire more correct knowledge of these verbs. Partial support for this hypothesis may be derived from research on reading disabilities and their relation to language learning.

There is much evidence indicating that the ability to make judgments about differences between certain units of language, for example, phonological units, observed around the age of 5 to 6 years, predicts reading ability. Furthermore, delays in the development of these and other metalinguistic skills have frequently been observed among reading disabled and slow reader groups (Gleitman and Gleitman, 1979). In addition, studies have shown that such populations, when compared to their normal peers, are often delayed in general language acquisition, including the acquisition of irregular past tense verbs (e.g., Wiig, Semel, and Crouse, 1973). This suggests that the

development of metalinguistic skills may be associated with the child's improved ability to acquire increased knowledge of these verbs.

In our discussion of deregularization we also observed that the process of acquiring the irregular verbs may entail a growing awareness on the part of the child of the inappropriateness of overgeneralized forms. Kuczaj (1977) suggested that children must learn that the overgeneralized and correct forms express the same meaning, and that the correct past tense verb is used to the exclusion of the overgeneralized form. We further suggested that children may become increasingly aware that overgeneralized forms are not present in the adult's language system for these verbs. If these suggestions are correct, then it is possible that the development of an increased awareness of language in general may facilitate or be associated with the awareness necessary in recognizing that -ed is incorrect when added to an irregular verb.

It was suggested, therefore, that in addition to children's cognitive styles, we also examine the development of metalinguistic awareness. It was hypothesized that differences in the development of

metalinguistic skills would help account for variations in children's patterns of overgeneralization and concomitant increased knowledge of the irregular verbs.

9. The Acquisition of English Irregular Past Tense Verbs

As we have indicated, beyond a simple rote learning of individual items, the acquisition of irregular past tense verbs into an organized system characterized by certain rules takes place at a fairly late age in child language learning. For this reason, children's progress in acquiring these forms has been more easily accessible to researchers and, consequently, fairly well documented.

In our own observations and in examining the literature it is evident that children vary in the time it takes to acquire correct knowledge of these forms. For example, in a recent re-examination of Bybee and Slobin's (1982) data from third-graders we have observed variations not only in the total number but also in the kinds of errors children make when forming the past tense for these verbs. Such errors included:

1. overgeneralization of the suffix -ed when forming the past tense, for example, eated, bended, and,
2. overgeneralization or misapplication of the rules of the various subgroups of these verbs, for example, no-change.

This suggests that this area of language learning is a reasonable one to examine when studying individual differences in language development.

Another reason for studying this area, as we noted above, is that the acquisition of these verbs has recently been fairly well documented. By studying adults' use of irregular verbs on linguistic tasks, researchers have achieved greater specificity in identifying the nature of the linguistic knowledge implicit in the adult's language system. Studies with children have revealed many of the changes which take place in the child's use and knowledge of these verbs as he/she moves closer towards having a system of knowledge resembling that of the adult. In addition, these studies provide good examples of effective testing procedures for examining this issue in language learning.

The rest of this section will be devoted to describing this research and what is known about the child's acquisition of these verbs. Included in this discussion will be observations of some of the methodological problems inherent in studying this aspect of language learning.

Research on the acquisition of irregular past tense verbs indicates that progressive changes occur in the child's knowledge and subsequent use of these verbs. As noted earlier, very generally it can be said that this knowledge moves from a simple rote learning of individual verbs to a progressively more elaborate system characterized by knowledge of the relation between a base and its past form, and hypotheses or rules which reflect an understanding of the structure or behavior of various subsets of these verbs. Additionally, at least one class of these verbs is organized around a prototype (string/strung), while other individual verb pairs appear to be rote learned, belonging to no particular class, for example, go/went.

As we observed, one of the interesting points about the child's acquisition of these verbs is the tendency to overgeneralize the use of the suffix -ed to these verbs when forming the past tense. Thus one will often find errors such as 'goed', 'wented' or 'eated' in children's speech. Kuczaj (1977, 1978) has observed that these errors can occur in two distinct patterns. First, the child can attach the -ed suffix to the 'generic' base of the verb, producing errors like 'sleeped' or 'eated'. Second, the child might affix

the -ed to the past tense form of an irregular verb, for example, 'ated' or 'wented'.

Using spontaneous speech samples, Kuczaj (1977) noted that the tendency to overgeneralize to the past form of irregular verbs increases between the ages of 3 and 5;6. This is to say that children under 4 produced proportionally more errors like 'eated' and 'goed' than 'ated' or 'wented'. The tendency for 5 year olds, however, was exactly the opposite. Similar results were obtained in a later study (Kuczaj, 1978) using children's judgments of grammatical correctness. Kuczaj concluded it would appear the child's inclination to avoid redundancy in forming the past tense diminished in favor of syntactic regularity. However, he also observed that these were only tendencies.

It is worthwhile noting that we can often distinguish through testing between children's language use and comprehension. Comparisons can then be made to see if the child's understanding resembles or is dissimilar from his or her use of language. As noted earlier, previous research on the use of judgment tasks indicates the feasibility of these procedures for tapping the child's metalinguistic knowledge of

language. However, this applies only when a correction is solicited. Corrections can be in a number of forms, for example, distinguishing between adult and child speech, or correcting something that sounds wrong (DeVilliers and DeVilliers, 1974).

Although Kuczaj (1978) included this type of task in his test battery, no conclusion could be given regarding the development of this aspect of children's knowledge of the past tense. The procedure was designed such that a child's own judgments of a single verb directly preceded questions about what an adult would say about that verb. Kuczaj found that children rarely contradicted their own responses. It would seem this may have resulted from the order of presentation. Early studies employing judgment tasks revealed innumerable difficulties in getting children to provide corrections. Scholl and Ryan (1975) suggest the "potentially aversive" situation of a positive followed by a negative experience in various procedures might influence a child's performance.

The results of Kuczaj's study did indicate quite clearly that children usually accepted the use of the correct form of these verbs in their past form. However, in light of their tendency to accept incorrect

forms as well, it is still not clear when children develop the ability to recognize which form is more correct.

Another distinction which can be made regarding irregular past tense verbs concerns the types of changes which occur in each verb when forming the past tense. Although several category systems have been proposed, for example, Jesperson (1942), the one that has been employed most regularly for research, in its most revised form, was developed by Bybee and Slobin (1982). This category system is presented below.

I. Verbs that do not change at all to form the past tense, for example, hit;

II. Verbs that change a final 'd' to 't' to form the past tense, for example, send;

III. Verbs that undergo an internal vowel change, and also add a final 't' or 'd', for example, feel, lose, say, tell;

IV. Verbs that undergo a vowel change, delete a final consonant, and add a final 't', for example, bring, catch;

V. Verbs that undergo an internal vowel change and whose stems end in a dental, for example, bite, find, ride;

VI. Verbs that undergo a vowel change of /t/ to /œ/ or to /ʌ/, for example, sing/sang, sting/stung;

VII. All other verbs that undergo an internal vowel change, for example, give, break; and,

VIII. All verbs that undergo a vowel change and that end in diphthongal sequence, for example, blow, fly (pp. 268-269).

The advantages of categorizing irregular past tense verbs in research are twofold. First, it allows for greater precision in examining the kinds of errors individuals make. Second, based on these errors, we can make inferences as to the rules individuals have or have not formulated about these verbs. For example, using elicitation tasks, a number of writers have examined the developmental patterns for various subcategories of these verbs. Using both nonsense (Berko, 1958; Derwing and Baker, 1974) and real terms (Bybee and Slobin, 1982; Kuczaj, 1978), it has been observed that between ages 3 and 9 the percent of regularizations (i.e., overgeneralization of -ed) for the no-change verbs tends to remain stable. This is contrasted with the general tendency for

regularizations decreasing during this period of time. In both the Berko, and Derwing and Baker studies, it was found that younger children tended to handle nonsense verbs ending in t/d as no-change verbs. Similarly, using real terms, Bybee and Slobin found a tendency among preschoolers to treat verbs ending in t/d as no-change verbs, whether they were regular verbs, for example, melt, or irregular verbs requiring some change, for example, shoot.

The conclusions which were drawn from these findings were that at an early age speakers develop the following schema: "A past tense verb ends in 't' or 'd'," (Bybee and Slobin, p. 269). Sometime before ages 8 or 9 (in grade 3) the suffixation process gains strength over the tendency to avoid the phonological redundancy of adding -ed to verbs ending in t/d. However, the schema is retained since it is necessary when handling verbs of the no-change class which have yet to be learned (Bybee and Slobin, 1982).

Bybee and Slobin noted other 'schemas' in the adult's language system for irregular past tense verbs for /æy/, /ow/, /uw/ and /ɛ/. Summarizing the characteristics of schemas, they noted the following:

1. Their defining properties are phonological and can range over more than one segment...
2. Classes of items covered by schemas are defined in sets of family resemblances, not by sets of strictly shared properties...
3. Though schemas do not in themselves change features they are used in lexical selection; and they may serve as the basis of new formation occasionally, either in speech errors...or in so-called analogical formations, such as past 'snuck' for earlier sneaked. (p. 285).

Bybee and Slobin also observed that not all irregular verbs are covered by schema. Examining errors made by adults under pressure when transforming verbs in the novel vowel change category to past tense, they found that many incorrect past tense forms selected reflected choices based on synonymity (e.g., search/sought) or membership in a transitive-intransitive pair (e.g., set/sat). These findings were interpreted as suggesting that these verbs are "stored in the lexicon" (p. 282).

Another issue which needs to be considered in the child's acquisition of these verbs is the learning of

the connections between a present-base and its past form, for example, go/went. Based upon preschoolers' performance on an elicitation task (Kuczaj, 1978), this process appears to take place throughout language learning. Data from Bybee and Slobin's subjects indicate that the process of learning these connections is not fully complete, even with common verbs, for example, make/made, by the third grade. This is to say that when confronted with the task of providing the connection on an elicitation task, not all children displayed certainty in their knowledge of these connections. Earlier we observed an example of a subject who could not accept the word "made" as the past form of "make", even when it was suggested by the examiner.

Finally, as we indicated, in general, the tendency to overgeneralize decreases as children get older. This decrease becomes quite marked sometime between ages 7 and 9 years (Bybee and Slobin, 1982; Kuczaj, 1978). Kuczaj observed that by age 7 a sharp decrease occurs in the child' tendency to accept or produce overgeneralization errors on judgment and elicitation tasks, respectively. Beilin (1975) has suggested that the ability for children to relinquish the tendency to

overgeneralize may be associated with the development of the "reflective function" in language (pp. 372-373), which he associated with the development of operational logic. In his own studies and those of other researchers, Beilin noted at this age children also show noticeable improvement in their ability to judge and, if necessary, correct sentences, and to imitate without correcting ungrammatical sentences. He attributed these skills to the development of the ability to treat sentences as if they were objects. Thus far, however, we know of no studies which have tested his hypothesis as it applies to children's acquisition of irregular past tense verbs.

In summary, the acquisition of irregular past tense verbs is a multi-faceted task throughout which progressive changes appear to take place in the child's use and knowledge of these verbs. It appears to begin with a rote acquisition of present and past forms and end with a system of rules where present and past forms are linked and hypotheses exist regarding the nature of many of the changes in these verbs in their past form. In the present study, it was suggested that we examine differences in children's knowledge of these verbs in

relation to individual differences in cognitive and metalinguistic functioning.

10. Synopsis and Hypotheses

Efforts to account for children's language learning ability have typically been shadowed by explanations which stress the biological basis of this uniquely human capacity. However, without disputing man's predisposition for language, it has become clear that strictly innatist explanations are inadequate in accounting for observed differences among children in the process of acquiring linguistic knowledge. By adopting an interdisciplinary approach, researchers have sought to avoid these pitfalls and develop a more integrated view of how it is children come to acquire their first language.

Recently, it has been suggested that stylistic differences in children's cognitive functioning would likewise be reflected in their learning language (Bates, 1979; Bloom and Lahey, 1978; Nelson, 1973; Nelson and Bonvillian, 1978; Peters, 1977). Most research relating cognitive style differences to language has focused on the issue of language use (Alterman, 1977; Chapman, 1967; DeFazio, 1973; Doob, 1963; Jennings, 1967; Shapiro, 1967). The results of this research have not consistently supported the view that there is a relation between language and cognitive

style. Yet, it seems possible that these inconsistencies may be accounted for when cognitive style is viewed as a multi-faceted construct. This perspective is supported by recent investigations examining the interrelations of various dimensions of this construct (Block et al., 1981).

Thus far, only a few studies have adopted this approach to the study of the relation between language and cognitive style (Poole, 1977, 1978a, 1978b, 1978c). Only one of these, however, has focused on the issue of children learning language (Nelson and Bonvillian, 1978). These studies support the view that aspects of style are related to aspects of language functioning. Of particular interest was Nelson and Bonvillian's research on children's acquisition of noun concepts, indicating the fruitfulness of this approach in studying some of the processes involved in children's acquiring language. Additional support is evident when we contrast descriptions of the processes of language learning with theories of psychological differentiation and divergent thinking.

It was decided, therefore, to examine a particular area of children's language learning together with performance on two measures of the construct cognitive

style in order to further explore the relation between language and cognitive functioning in development, and possibly, elaborate upon our understanding of the processes involved in language learning. A well researched area of language acquisition was selected in which individual differences among children had been previously noted. That area is the acquisition of English irregular past tense verbs.

As mentioned in the review of the literature, research indicates that between the ages of 7 and 9 years children relinquish the tendency to overgeneralize the suffix -ed when forming the past tense of irregular verbs. As well, they appear to recognize and utilize many of the correct forms of these verbs in their past tense, and show some understanding of the rules related to the various subgroups of these verbs. Therefore, in order to explore these changes we have decided to use subjects between the ages of approximately 7;6 and 8 years.

Nelson and Bonvillian's findings on the association between patterns of overgeneralization of novel noun concepts and divergent thinking suggest that similar processes may underscore both patterns of behavior. Although their study was designed to test

overgeneralization as manifested in the early acquisition of novel noun concepts in an experimental situation, it was significant in that it showed that stylistic differences in cognitive functioning may be reflected in the language learning process. Presently, it is not clear if this relation extends to other areas of language learning. However, in our discussion we presented arguments suggesting that the processes underlying performance on Wallach and Kogan's 'alternative uses' and 'instances' tasks measuring aspects of divergent thinking may be of significance in children's deregularization and concomitant acquisition of irregular past tense verbs. Therefore, it was proposed that individual differences in divergent thinking would be significantly related to differences in children's patterns of overgeneralization and concomitant acquired knowledge of the English irregular past tense verbs.

In our discussion we also observed certain traits associated with differentiation which might facilitate or inhibit children in the process of acquiring the irregular past tense verbs. We further observed that highly differentiated individuals were more flexible in shifting to less differentiated modes of functioning.

The reverse, however, could not be said for less differentiated subjects. If our assumptions were correct, then we would expect higher levels of differentiation to facilitate children's acquisition of the irregular verbs. Therefore, it was suggested that we examine the relationship between psychological differentiation and children's patterns of overgeneralization for forming the past tense for the irregular verbs. It was hypothesized that levels of differentiation would be significantly related to children's deregularization of the English irregular past tense verbs.

Finally, we observed that the task of acquiring knowledge of the irregular verbs may be significantly facilitated by or associated with the development of certain metalinguistic skills. In addition, we suggested that the development of this awareness may further be associated with children's ability to recognize the inappropriateness of the suffixation process for these verbs. Therefore, we examined this more general aspect of language development. It was hypothesized that metalinguistic skills would be significantly related to differences in children's

patterns of overgeneralization and concomitant acquired knowledge of the irregular verbs.

Hypotheses:

The two central hypotheses underlying the present study were:

A. That a significant, positive relation exists between individual differences in primary school age children's cognitive styles, and children's acquired knowledge of the English irregular past tense verbs; and,

B. That a significant positive correlation exists between children's metalinguistic knowledge and acquired knowledge of the irregular past tense verbs.

Specific hypotheses are stated in terms of the individual independent variables.

1. That a significant, positive relation exists between psychological differentiation and children's knowledge of English irregular past tense verbs, as measured by total number of errors and total number of -ed errors children produce.
2. That a significant, positive relation exists between divergent thinking, reflected in the quantity of associations to a stimulus, and

children's knowledge of the English irregular past tense verbs, evidenced in the total number of errors and total number of -ed errors children produce on various linguistic tasks.

3. That a significant positive correlation exists between children's metalinguistic skills, reflected in the consistency in their ability to make appropriate judgments about language, and their knowledge of the irregular past tense verbs.

4. That a significant, positive correlation exists between children's metalinguistic segmenting skills, measured by the consistency in their ability to make appropriate judgments about the units of language, and their knowledge of the English irregular past tense verbs.

11. Areas of Special Concern

Investigations of the present type are susceptible to the influence of a number of factors regarding subject selection. Three areas of concern in the present study were: (1) socioeconomic status; (2) children's linguistic background; and, (3) intelligence factors. Each of these concerns will be discussed briefly.

Socioeconomic status. Socio-linguistic research indicates that the quality of the linguistic environment for children often varies with families' socioeconomic position. Such environmental differences in turn affect the linguistic input and consequent language learning for the child. For example, economic status has been found to be related to differences in syntactic form, as well as performance on linguistic tasks (Alterman, 1977).

Similarly, in the area of cognitive style research, Poole (1976) observed differences between male and female lower and middle class groups when the construct of 'style' was viewed as a system of different processes operating together, adduced from a variety of cognitive tasks.

Therefore, subjects were screened for socioeconomic status and selected on the basis of achieving homogeneity for this variable in the sample.

Linguistic background. Subjects were monolingual, English-speaking. As well, except in one case, both parents were English-speaking where English was their first language. For the one exception, the primary language for the parent was English since childhood.

Screening subjects for dialect background was also necessary. Reflecting on earlier observations by Jesperson (1942), Bybee and Slobin (1982) noted a tendency in American English to regularize (i.e., add the suffix -ed to a present-base of a verb when forming the past tense) a certain class of irregular verbs ending in 'n' or 'l', for example, burn, dwell, spoil. In order to avoid the possible influence of such subtle differences on children's acquisition of these verbs, this screening was included when obtaining subjects for this study.

Intelligence factors. There is a tendency among some researchers studying both language ability and cognitive style to include analysis of the contribution of intelligence to differences in subjects' performance (Alterman, 1977; Bigelow, 1971; DeFazio,

1973; Nelson and Bonvillian, 1978). Although intelligence has not been consistently related to language skills, there is evidence suggesting that it is related to at least some skills as well as performance on certain tasks measuring cognitive styles. Alterman (1977), for example, using 9th grade Kuhlman Anderson tests, found IQ was not related to linguistic performance but significantly related to scores on the Group Embedded Figures Test. Nelson and Bonvillian (1978), however, found that children's IQ scores, as measured by the Stanford-Binet, were significantly related to the quality of children's overgeneralization errors (i.e., good or fair versus poor exemplars). Therefore, a measure of intelligence was included in the testing.

Method

Subjects

Forty subjects were tested ranging in age from 7;4 to 8;0 years. All subjects were in the second or third grade at school. They were obtained through contact with parents, and through the Ottawa Board of Education. We received no refusals in our contacting parents. The subjects obtained through the Board of Education were informed of the study by the school system. Only those subjects whose families responded to this request for subjects were contacted. Parental permission was a prerequisite to testing (see Appendix A). The sample included 20 males and 20 females.

Subjects were screened for linguistic and socioeconomic background. All subjects were monolingual, English-speaking, with English as their first language. All but one subject had been raised in within a 250 mile radius of Ottawa in English-speaking environments. One subject had lived in French-speaking Quebec during infancy, but had not been taught the French language. However, all subjects had received no more than 40 minutes of French per day, which is part

of the curriculum for all students in the English program of the Ottawa Board of Education.

The linguistic environments for all children revealed both parents to be English-speaking, primarily from English-speaking areas of Canada. For two subjects, however, only one parent was from Canada. However, in both families the parents were English-speaking, one where English was his first language, the other English-speaking since childhood.

All subjects came from middle-class backgrounds. Blishen's revised socioeconomic index (Blishen and McRoberts, 1976) was used to screen subjects (see Appendix B). Subjects were selected for homogeneity of socioeconomic status, defined in this study by no more than 2 class intervals within the middle class range. Of the 40 subjects selected, 36 were within the 60th to 70th percentile while 4 were within the 50th to 60th percentile. Given this homogeneity, there was no further control for socioeconomic status.

A number of subjects had to be excluded from the final analysis of this study. Two were dropped from the study completely because they appeared to adopt specific testing strategies to the linguistic testing. As will be indicated later, check questions were

incorporated to make sure children were attending to the task. For one subject, it was apparent that she surmised the topic of study and blanketly avoided using the -ed ending. Another subject responded to a multiple choice test of 31 questions by accepting all responses. Three subjects, two from a pilot study and one from the final data collection, were withdrawn from the study by the parents before the last two tests (in this instance the CEFT and WISC-R) had been administered. One subject could not be administered the WISC-R because he had been scheduled for professional testing after our data collection began. This testing was to include the WISC-R. Two subjects from the pilot study could not be reached for the final administration of the WISC-R and CEFT. Finally, two subjects responded quite negatively to the testing. One became quite upset at the difficulty she was having with the CEFT and started to cry. Consequently, testing was discontinued. The other refused to participate during the administration of the WISC-R.

The final sample included 38 subjects for the linguistic and divergent thinking testing, 31 on all but the WISC-R, and 30 on all tests.

Intelligence. Assessments of intelligence were made using the WISC-R. As suggested in the manual, the Mazes and Digit Span subtests were deleted to reduce testing time (Wechsler, 1974). Total testing time was one to one-and-a-half hours. Further description of this test is found in Appendix C.

Linguistic Testing

Our review of the literature indicated that there are four major methods for collecting data on the acquisition of irregular past tense verbs. Each type of task is designed to examine a different aspect of children's developing understanding and treatment of these verbs. The tasks include:

1. Elicitation tasks using real terms (Bybee and Slobin, 1982);
2. Elicitation tasks using nonsense terms (Berko, 1958);
3. Judgment tasks (Kuczaj, 1978); and,
4. Judgment tasks from the adult's point of view (Kuczaj, 1978).

A detailed description of the procedures employed can be found in Appendices D and E.

Elicitation task using real terms. An elicitation task adopted from Bybee and Slobin (1982) was employed

to test whether children make the connection between a present-base and its past form. In addition, based upon the errors children make, some assessment could be made of the rules children have formulated about these verbs.

Scoring was based upon the total number of errors, number of overgeneralizations using the -ed suffix, as well as number of incorrect responses categorized by the number of schema or no-change rules which were applied. Kuczaj noted that elicitation tasks obscure the problem of children's overgeneralizing the -ed suffix with the past form of a verb, for example, ated. Therefore, no distinction was made between the two types of overgeneralization errors using the -ed suffix. Instructions and questions for this test are listed in Appendix E. Six additional regular verbs were added as a check for testing strategies. Total testing time was approximately one-half hour.

Elicitation task using nonsense terms. This task was adopted from procedures employed by Berko (1958), Derwing and Baker (1974), and Bybee and Moder (1983). The nonsense terms on this task varied in the extent to which they resemble real terms. These variations were based upon phonological similarities with real terms

along three dimensions: initial consonants, the vowel and final consonants. A modification to Berko's procedure was that puppets instead of pictures were employed to depict the meanings of terms.

Scoring was based upon the total number of errors, total number of regularizations, as well as the number of no-change responses and number reflecting the use of the rules for forming the past tense of irregular verbs. Instructions and questions are listed in Appendix E. Testing time was approximately five to ten minutes.

Judgment task. This task was adopted from Kuczaj's (1978) study in which children were asked to accept or reject correct and incorrect formations of the past tense of the irregular verbs. Kuczaj designed this task to test children's comprehension and, more specifically, to assess the types of overgeneralization errors children accept. As indicated in our review, Kuczaj was interested in children's overgeneralizing the suffix -ed. Accordingly, the alternatives included only errors of this type in addition to the correct past tense forms of these verbs.

In our own study, our interest extended to overgeneralizations or misapplications of the rules

governing the various subgroups of these verbs. Therefore, a modification to Kuczaj's design was incorporated into some of the questions by adding alternative responses of common errors noted in Bybee and Slobin (1982), for example, bring/brung. As well, questions were added to lengthen the task and increase the amount of data collected for each subject on this task.

Scoring was based upon the total number of errors and number of errors accepted by the subject in each category of possible answers, that is, (1) no-change, (2) the use of schema and (3) type of -ed overgeneralizations. Appendix E lists the instructions and questions for this task. Testing time was 15 to 20 minutes.

Judgment task from the adult's point of view. This task was adopted from Kuczaj's (1978) research in which the subject is asked to select the response his or her mother would use. While it was designed to assess children's metalinguistic knowledge of irregular past tense verbs, as indicated, its utility to this end is not yet clear. Therefore, we included this procedure and attempted to avoid the methodological problems noted in the review of the literature by administering

it separately from the other linguistic tasks, using real terms, testing for the past tense.

Modifications and scoring were the same as described for the judgment task.

Metalinguistic development. The development of metalinguistic awareness was assessed using a battery of tests adopted from Saywitz and Wilkinson's (1982) protocol of 10 short subtests. Each subtest is designed to tap a different aspect of the child's developing metalinguistic skills, including rhyming, recognition and correction of illogicality, lexical ambiguity, lexical segmentation, syllable segmentation, phoneme segmentation, recognition and correction of word order and of morpheme omission, non-physical nature of words, and meanings and reference (pp. 242-243).

As indicated by their research, successful performance on many of the subscales for this test is developed by age six-and-a-half. Consequently, two of these subtests were dropped from the battery to help reduce the total testing time. These included the rhyming and arbitrariness of language subtests. As well, the meanings and reference subtest was dropped as

the objectivity subscale was represented by the non-physical nature of words subtest.

Scoring was based upon the total mean score. As well, a mean score for the segmenting subscale was calculated incorporating three subtests. These included the lexical, syllable and phoneme segmentation subtests. Appendices F and G present further description, instructions and questions for this battery. Total testing time was 15 to 25 minutes.

Cognitive Testing

Psychological Differentiation. The Children's Embedded Figures Test (CEFT) (Witkin, Oltman, Raskin, and Karp, 1971) was used to assess psychological differentiation. In this task the subject is presented with a series of designs. Embedded in each design is a figure which the subject must find. Scoring was based upon the number of figures correctly identified. Total testing time equaled 20 to 45 minutes. This test is further described in Appendix H.

Divergent Thinking. The tests used to assess divergent thinking were adopted from Wallach and Kogan (1966). Two subtests were included, including 'alternate uses' and 'instances' subtests, both verbal techniques. Three questions from each subtest were

included. For the instances task these were the 'round', 'noise' and 'wheels' questions. The alternative uses questions were 'newspaper', 'knife', and 'shoe'. Scoring was based upon the mean number of responses across the three questions for each subtest. A more complete discussion of this test is presented in Appendix I.

Due to the total amount of testing conducted for this study with each subject, it was decided to limit the amount of time to five minutes for each question. Subjects were told after the sample question for each subtest, 'We could probably go on all day or keep coming back to thinking about this. So, because that would be a lot to ask, I'm limiting the time to five minutes for each question. Okay?'

Procedure

All linguistic tests were administered within a 10-day period. The longest time between the first and last meeting was 45 days. Testing was divided into four and five sessions. Except for the intelligence testing, each session lasted no less than one-half hour and no longer than one hour, during which time each child was administered two to three tests. Total testing time ranged from two-and-a-half to four-and-a-

half hours. The total length of time varied, as six children had already been administered the WISC-R by the school board. For most children, however, testing ranged from three-and-a-half to four-and-a-half hours. For their participation, subjects were paid ten dollars.

Due to the total length of time necessary to administer all the tests, permission obtained from the Ottawa Board of Education to test during school time and on school property was limited to one-and-a-half hours. Consequently, much of the testing was conducted after school hours and on weekends in the children's homes.

All divergent thinking tasks were administered in children's homes, in well furnished rooms. The three linguistic tasks using real terms were administered over three meetings. The order of tests was counterbalanced.

Intelligence testing was conducted by four experienced testers. Two were students trained in administering the WISC-R by the University of Ottawa. Two were trained in administering the WISC-R, with samples of their work for the present study positively evaluated by a psychologist with the Board of

Education. All other tests were administered by the present writer.

Before beginning any testing, the writer met with each subject and at least one parent at the family's home, to make sure both parent and child agreed to the child's participation in the study. At these meetings children were told who the examiner was and that the project she was asking they participate in was something the examiner had to complete in order for her to finish school. Also they were informed that we were mainly looking at what children their age knew or believed about some things in language. Children were asked if they knew what language was - all said yes. Children were told how long the testing would take, where, how often and for how long we would meet. As well, they were assured that most of the testing was not like school, we just wanted to know what they knew or believed. They were also informed that we would be working some of the time with puppets. Children were, therefore, familiar with the examiner and some of the process prior to beginning testing. Children were also aware that someone else would be administering one of the tasks and were informed a day or a few days prior to this.

After a child agreed to participate, parents were met with separately. They were informed that the WISC-R was to be part of the testing and the issue of confidentiality was explained. Parents were then given the permission form where the issue of confidentiality is outlined. After this explanation, a release of information for children previously tested on the WISC-R was obtained when appropriate.

Children were tested individually. In the case of testing in the home, the privacy necessary for testing was respected. Testing at the schools was conducted in empty offices or classrooms.

Results

Each hypothesis was examined separately using correlational analyses. Given the lack of research or theory indicating what cognitive variables would be most critical in helping us better understand children's acquisition of the irregular verbs, evidenced in their linguistic task performance, the present study was exploratory. Correlational analysis allowed us to look at the degree of the relationship between each dependent and independent measure (Moore, 1970). Because increased scores on the linguistic tasks represented the number of errors children produced, support for the hypotheses was suggested when significant negative correlations between the independent and dependent measures were obtained.

The relation between age and all other variables was examined using correlational analysis. Differences between males and females were assessed using analysis of variance. While it could be argued that t-tests would have been more appropriate as there were only two groups in this analysis, the results of analysis of variance with two groups are the same as those with t-tests where $F = t^2$ (McCall, 1970).

Upon examining the data, it was observed that the total number of schema errors for each schema were too few to analyze separately for each schema. Consequently, these errors were grouped into one score. In addition, the number of errors adding the -ed suffix to the past tense form of an irregular verb on the judgment tasks was zero for almost all the subjects. Therefore, this variable was dropped from the analysis.

Given the dilemma noted in the review of the literature on determining the value given to schema errors versus -ed errors it was decided to calculate a total error score for each task as an assessment of knowledge for the irregular past tense verbs. Total -ed score was used to assess deregularization. The number of no-change as well as schema errors were also examined. However, the examination of schema errors was considered exploratory.

An exploratory question to this study had been to examine the interrelations among the independent and dependent variables. The method we chose was a multiple regression analysis. However, due to the number of subjects tested on all the measures, these analyses were not conducted. An underlying assumption in regression is that the variables be normally

distributed. As such, it is necessary to have at least 10 subjects for each independent measure to avoid obtaining a misleading distribution which could result in spurious relations (Cohen and Cohen, 1983).

Linguistic Measures

Before presenting the results regarding the hypotheses of this study, some comments are warranted regarding the utility of the measures employed to assess children's knowledge of the irregular verbs. This seems essential given the limitations of previous research in this area and, especially, in terms of the convergent and discriminant validity of these measures with respect to assessing the dependent variables.

Descriptive statistics for the 38 subjects included in the study tested on the three linguistic tasks using real terms are presented in Table 2. It can be seen that the distribution of scores for no change errors on the elicitation task as well as the distribution of scores for schema errors on the judgment task are asymmetrical and exceedingly distant from a normal curve. Examination of the frequency distribution for no-change errors on the elicitation task indicated the majority of subjects, 24 out of 38, had no errors in this category, with the number of subjects decreasing

Table 2

Descriptive Statistics for Linguistic Task Performance Using Real Terms

Task		Range	Mean	SD	Skewness	Kurtosis
Elicitation	1	2-44	19.763	11.269	0.409	-0.609
	2	1-43	16.514	10.953	0.587	-0.246
	3	0- 6	0.684	1.188	2.802	10.221
	4	0-10	2.184	2.288	1.976	3.992
Judgment - Adult	1	0-14	4.026	3.089	1.351	2.450
	2	0-12	2.105	2.957	1.904	3.816
	3	0- 3	0.526	0.797	1.434	1.369
	4	0- 3	1.342	1.021	0.373	-0.906
Judgment	1	0-30	12.526	7.392	0.326	-0.578
	2	0-19	5.921	5.410	0.803	-0.338
	3	0- 5	1.026	1.174	1.534	2.864
	4	0-18	3.500	3.073	2.830	12.829

Note.

1 = total number of errors

2 = total -ed errors

3 = total no-change errors

4 = total schema errors

as errors increased. Looking at the range of no-change errors on the two judgment tasks, it appears that enough words were not selected in the design of these tests to get a wide range of this type of error. Consequently, the results of subsequent correlation analyses for this type of error need be interpreted with caution since correlations are predicated on the assumption of a normal distribution.

Examining the frequency distribution for schema error scores on the judgment task revealed a bimodal distribution with peaks at 1 and 5 errors. It would appear, therefore, we are observing two underlying distributions which were not elicited by the other linguistic tasks. Again, this suggests caution in interpreting the results of subsequent correlations.

To examine the relationships among the three dependent measures using real terms, the intercorrelations for the three tasks were calculated for total number of errors, total number of -ed errors, total number of no-change errors and total number of errors reflecting the use of the rules or schemas for deriving the past tense for all but no-change verbs

(throughout the rest of this discussion this last group of errors will be referred to as schema errors). Tables 3 to 6 present the intercorrelations for each category of error. The correlations indicate the consistency of these tasks in measuring children's tendencies to make errors and utilize the -ed suffix in forming the past tense for irregular verbs. However, the correlation coefficients are far from 1.0, demonstrating that while there is significant overlap among the skills tapped by these tests, there remains a good deal of unique variance. That is, that each test appears to tap some unique portion of children's knowledge of the irregular verbs left untapped by the other tests.

To further examine this problem, an item analysis was conducted to determine the nature of this variance. Twenty-four items were included that appeared on all three tests. It was possible for the total sample to perform consistently across tests 913 times. However, the entire sample was consistent only 463 times, a little more than half the time. Interestingly, in only 7 instances was this consistency associated with errors in performance. In other words, more than 98% of the time, consistency in performance was obtained when

Table 3

Intercorrelation Analyses of Linguistic Tasks Using Real Terms

	Total Number of Errors		
	1	2	3
1	1.0000	0.4707**	0.5213**
2		1.0000	0.4694**
3			1.0000

Note. 1 = elicitation task

2 = judgment task - adults' point of view

3 = simple judgment task

* $p < .05$

** $p < .01$

Table 4

Intercorrelation Analyses of Linguistic Tasks Using Real Terms

	Total -ed Errors		
	1	2	3
1	1.0000	0.4824**	0.6043**
2		1.0000	0.5614**
3			1.0000

Note. 1 = elicitation task

2 = judgment task - adults' point of view

3 = simple judgment task

* p <.05

** p <.01

Table 5

Intercorrelation Analyses of Linguistic Tasks Using Real Terms

	Total No-Change Errors		
	1	2	3
1	1.0000	0.2375	0.4132**
2		1.0000	-0.0152
3			1.0000

Note. 1 = elicitation task

2 = judgment task - adults' point of view

3 = simple judgment task

* $p < .05$

** $p < .01$

Table 6

Intercorrelation Analyses of Linguistic Tasks Using Real Terms

	Total Errors Using Schemas		
	1	2	3
1	1.0000	0.3310*	-0.1557
2		1.0000	-0.0905
3			1.0000

Note. 1 = elicitation task

2 = judgment task - adults' point of view

3 = simple judgment task

* $p < .05$

** $p < .01$

children knew the correct past tense forms. As a consequence of the variance among these tests, therefore, it appeared necessary to look at each test separately.

Split-half reliabilities were used to assess the homogeneity among items in terms of their usefulness in assessing children's knowledge of the irregular verbs. The reliability coefficients for the different types of errors on each task are presented in Table 7. It can be seen that all three tasks have some degree of consistency in eliciting errors in general, although the coefficients are lower than we would like. However, it appears that this consistency is largely due to the number of -ed errors on each of the tests. Again, an item analysis helped to elaborate on this problem.

Examining those items appearing on all three tests, it is apparent that items varied in their degree of difficulty. Consistently correct responses across subjects ranged from 3 to 28. However, looking at

Table 7

Split-Half Reliability Correlation Coefficients for Linguistic Tasks Using Real Terms

Task	Errors			
	Total	-Ed	No-Change	Schema
Elicitation	0.7477	0.75453	0.3092	0.1987
Judgment - Adult	0.6632	0.7613	0.5574	0.1639
Judgment	0.7183	0.7207	0.2512	0.0605

children's total performance it is also evident that items varied in terms of their consistency in eliciting the different types of errors. For example, 'bring' and 'ring' elicited an -ed response only 2 times each. All the other errors for these words reflected an incorrect use of a schema. It is further worth noting that only 3 children responded correctly to the word bring on all three tests. The word 'shake', however, elicited 11 responses of 'shuck' and 22 responses of 'shaked' across the three tests. The lack of reliability may, therefore, reflect the unequal weighting of items.

The intercorrelations for responses given on the nonsense terms task in relation to errors made on the real terms task were, generally, non-significant ($p > .05$). One exception was the observed significant correlation between -ed errors on the elicitation task and no-change responses on the nonsense terms task. However, this is congruent with previous research discussed earlier, which found that the tendency to apply the no-change rule is manifested at a later age in studies using nonsense terms than in studies using real terms (see Bybee and Slobin, 1982).

Statistical Analyses

Table 8 shows the range, means and standard deviations for males' and females' performance on the linguistic tasks. Initial analysis of variance indicated a significant effect due to sex on two dependent measure scores. These included: (1) total number of errors across the three linguistic tasks using real terms, F [1, 36] = 4.374, $p < .05$; and, (2) total number of errors on the elicitation tasks, F [1, 36] = 6.454, $p < .02$. In both instances, females performed significantly better than males, that is, making fewer errors. Consequently, collapsing the two groups was not warranted for all analyses in testing the hypotheses for these scores without transforming the data. It was therefore decided to examine the groups separately for these scores when testing the hypotheses for tasks using real terms. As well, this decision was supported by previous research indicating differences between males and females with respect to both measures of psychological differentiation and divergent thinking (Kogan, 1984).

Chronological age was not significantly related ($p < .05$) to performance on the independent or dependent measures using real terms. A significant positive

Table 8

Descriptive Statistics for Males and Females Performance On Linguistic Tasks

Task			Range	Mean	SD
Elicitation	1	M	3-44	24.3	13.4
		F	2-27	15.3	7.1
	2	M	2-43	21.0	12.8
		F	1-26	12.3	6.9
	3	M	0-6	0.8	1.5
		F	0-3	0.5	0.8
	4	M	0-10	2.1	2.4
		F	0-8	2.3	2.3
Judgment - Adult	1	M	0-12	4.0	3.1
		F	0-14	4.2	3.2
	2	M	0-11	2.2	3.0
		F	0-12	2.1	3.1
	3	M	0-2	0.6	0.7
		F	0-3	0.5	0.9
	4	M	0-3	1.2	1.0
		F	0-3	1.5	1.0

(table continues)

Task			Range	Mean	SD
Judgment	1	M	2-30	14.2	7.7
		F	0-25	10.6	6.9
	2	M	0-19	6.6	5.2
		F	0-18	4.9	5.5
	3	M	0-5	1.3	1.4
		F	0-3	0.8	0.9
	4	M	1-18	3.9	3.9
		F	0-6	3.0	2.1
Nonsense	2	M	0-17	13.2	4.5
		F	0-17	11.2	6.3
	3	M	0-4	1.0	1.2
		F	0-5	0.8	1.4
	4	M	0-4	0.7	1.3
		F	0-6	1.3	2.0

Note.

1 = total number of errors

2 = total -ed errors

3 = total no-change errors

4 = total schema errors

correlation between age and number of -ed responses in the nonsense term task (r = .31, p < .05) was observed. As well, significant negative correlations between age and full scale IQ (r = -.36, p < .05), and between age and verbal IQ (r = -.37, p < .05) were obtained. Due to the number of correlations conducted for age, 23 in all, it was possible these observed relationships resulted from chance. Therefore, correction for alpha level was employed for the number of correlations following Kepple's (1982) formula .05/# of significance tests. Accordingly, significance for age would be obtained with p < .0021. Consequently, the relationships noted were considered spurious and age was dropped as a variable from subsequent analyses.

The relation between intelligence and linguistic performance was assessed using correlations. Table 9 lists the results of these analyses. It can be seen there is a significant negative correlation between intelligence test performance and performance on the elicitation test as well as no-change errors on the adult judgment task. However, when alpha level correction was employed (p < .0033), no significant relationships were observed.

Table 9

Correlation Between Intelligence Scores and Linguistic Performance

Task		r	p
Elicitation	1	-0.47	.004
	2	-0.37	.021
	3	-0.42	.011
	4	-0.34	.032
Judgment -	1	-0.16	.192
Adult	2	-0.07	.352
	3	-0.37	.022
	4	-0.11	.280
Judgment	1	-0.28	.068
	2	-0.25	.095
	3	-0.18	.185
	4	-0.06	.371
Nonsense	2	99.00	.***
	3	99.00	.***
	4	99.00	.***

(table continues)

Note. 1 = total number of errors

2 = total -ed errors

3 = total no-change errors

4 = total schema errors

df = 26

Psychological Differentiation

Hypothesis 1 stated that psychological differentiation would be significantly and positively associated with children's deregularization and concomitant level of knowledge of the irregular verbs. Therefore we would expect scores on the CEFT to be negatively correlated with performance on the linguistic tasks using real terms indicating that increased differentiation is related to increased knowledge of the irregular verbs.

Before discussing the results as they pertain to this prediction, some comments seem warranted regarding the reliability of the present data in relation to previous research and particularly to previously observed differences between males and females, as well as the association between differentiation and intelligence.

For the sample of 31 subjects tested for psychological differentiation, scores ranged from 6 to 20 points out of a possible score of 25 points. The mean score was 13.3871, with a standard deviation equal to 3.871. Skewness was -0.140, and kurtosis equaled -0.749, approximating a normal distribution. The data

obtained from the present sample, therefore, are quite similar to the data in Witkins (1971) study.

One way analysis of variance indicated no significant differences between males and females. Although collapsing across the two groups was therefore appropriate when testing the hypothesis, males and females were examined separately due to the linguistic performance differences noted earlier. Table 10 shows the ranges, means and standard deviations for the two groups on CEFT performance.

The relation between CEFT performance and intelligence scores was examined using a correlation. The results of this analysis proved non-significant (r = .19, p > .05). Therefore, in testing the hypothesis a correlation design was employed.

Table 11 presents the results of the correlational analyses for the three linguistic tasks using real terms. When a correction for alpha-level was employed, no significant relation was found between CEFT and linguistic performance. Therefore, support for the first hypothesis was not obtained.

With respect to children's performance on the nonsense terms task, no significant relationship was

Table 10

Range, Means and Standard Deviations for Males and Females on CEFT

	Range	Mean	SD
Males	8-20	13.6	3.7
Females	6-20	14.1	4.1

Table 11

Correlation Analysis for Psychological Differentiation with Linguistic Dependent Measures Using Real Terms

Task		Males (n = 15)		Females (n = 16)	
		r	p	r	p
Elicitation	1	0.1446	.304	-0.1382	.305
	2	0.0872	.379	-0.1588	.278
	3	0.0903	.374	0.1231	.325
	4	0.3007	.138	-0.0355	.448
Judgment - Adult	1	-0.0801	.388	-0.2239	.202
	2	-0.1288	.324	-0.1512	.288
	3	0.4468	.047	0.1989	.230
	4	-0.1196	.336	-0.3377	.100
Judgment	1	0.2169	.219	0.0553	.419
	2	0.1930	.245	-0.2464	.179
	3	-0.1741	.267	0.4427	.043
	4	0.1047	.355	0.1375	.306

(table continues)

Note.

1 = total number of errors

2 = total -ed errors

3 = no-change errors

4 = schema errors

found between psychological differentiation and types of responses to nonsense terms.

Divergent Thinking

The second hypothesis stated that divergent thinking would be positively and significantly associated with children's knowledge of the irregular past tense verbs. Consequently, we would expect a signficant, negative correlation between performance on the divergent thinking tests and performance on the linguistic tasks.

Before testing the hypothesis the data distribution and the relation between divergent thinking performance and the control variables were assessed. Table 12 presents the ranges, means and standard deviations for the sample of 38 subjects included in the study for both divergent thinking subtests. Skewness and Kurtosis for the two subtests were: alternative uses, skewness = 0.366, kurtosis = 0.030; and instances, skewness = -0.036, kurtosis = 0.035 indicating an approximate normal distribution for each subtest.

One way analysis of variance revealed no significant differences between males and females on each divergent thinking subtest: for the

Table 12

Range, Means and Standard Deviations of Performance on Divergent Thinking Tasks

	Range	Mean	SD
Alternate Uses	0.3-32.0	13.868	6.876
Instances	7.7-35.0	22.716	6.180

alternative uses test, F (1, 36) = 0.254, p = .6176; for instances test, F (1, 36) = 0.157, p = .6944. Descriptive data for the two groups are shown in Table 13.

Correlational analysis assessing the relation between divergent thinking test performance and intelligence scores indicated a significant positive relation between these two variables, r = .32 with $p < .05$. In view of Wallach and Kogan's findings of no relation between divergent thinking and certain subscales of the WISC, additional correlations were calculated to determine the relation between divergent thinking and the WISC-R subscales. The alternative uses subtest was found to be significantly correlated with picture completion (r = 0.5102, p = .002) and object assembly (r = 0.3467, p = .03). The instances task correlated with similarities (r = 0.3587, p = .026), comprehension (r = 0.3497, p = .029), picture completion (r = 0.4610, p = .005) and picture arrangement (r = 0.3413, p = .032).

Wallach and Kogan's initial research in the development of the divergent thinking tasks employed only the vocabulary, block design and picture arrangement subscales of the WISC. Thus, with respect to the results regarding the instances task, it is

Table 13

Range, Means and Standard Deviations for Males and Females on Divergent Thinking Tests

		Range	Mean	SD
Alternative	M	0.3-23	14.5	6.3
Uses	F	3.7-32	13.3	7.4
Instances	M	7.7-35	23.1	6.8
	F	11.3-35	22.3	5.8

possible to consider the present findings congruent with their research. However, the same can not be said for the alternative uses task because of the relation in the present study between performance on this task and picture arrangement. This may have been due to the departure in the present study from an unlimited time allowance for responding to the divergent thinking test, initially proposed by Wallach and Kogan. Nevertheless, a control for intelligence was incorporated in subsequent analyses for divergent thinking.

In testing the second hypothesis, therefore, a partial correlation analysis controlling for intelligence was used. Table 14 presents the correlation coefficients and probability values for both males and females on each linguistic task using real terms. It can be seen from the table that the only significant relationship between divergent thinking and linguistic performance using real terms was for males' schema errors on the judgment task from the adult's point of view with the instances subtest. Given the noted reservations for interpreting schema errors with respect to level of knowledge, the present results do not lend support to the prediction.

Table 14

Partial Correlation Analyses for Divergent Thinking With Linguistic Performance Using Real Terms Controlling for IQ

		Alternative Uses			
		Males**		Females***	
Task		r	p	r	p
Elicitation	1	-0.0326	.458	0.0368	.446
	2	-0.0526	.432	-0.0065	.491
	3	0.3516	.119	-0.2353	.199
	4	0.0269	.465	0.2795	.157
Judgment -	1	0.4262	.073	0.3808	.081
Adult	2	0.3309	.135	0.2967	.141
	3	-0.1793	.279	-0.1088	.350
	4	0.3733	.105	0.2543	.180
Judgment	1	0.2365	.218	0.0603	.416
	2	0.0428	.445	-0.0440	.438
	3	0.1997	.256	0.0470	.434
	4	0.2016	.254	-0.0058	.492

(table continues)

Task		Instances			
		Males**		Females***	
		r	p	r	p
Elicitation	1	-0.1319	.334	0.0382	.446
	2	-0.1277	.339	0.0505	.429
	3	0.2146	.241	-0.1003	.361
	4	0.1260	.484	0.0752	.395
Judgment - Adult	1	0.2116	.239	0.0132	.481
	2	0.0462	.440	0.0023	.497
	3	0.0202	.474	0.0980	.364
	4	0.5178	.035*	-0.1886	.250
Judgment	1	0.2253	.230	0.3142	.127
	2	0.0300	.461	0.0995	.362
	3	0.0588	.424	0.2533	.181
	4	0.1057	.366	0.3996	.070

Note.

1 = total number of errors

2 = total -ed errors

3 = no-change errors

4 = schema errors

** df = 11

***df = 13

Additionally, when alpha correction is employed for the number of correlations, no significant relation is observed.

The results relating divergent thinking with performance on the nonsense terms task are somewhat more interesting than the foregoing. Using partial correlations controlling for intelligence, both the alternate uses and instances subtest scores for divergent thinking were significantly and positively related to children's application of schemas in responding to nonsense terms, $p = .009$ ($r = 0.4331$) and $p = .004$ ($r = 0.4805$), respectively.

As there were three correlations, one for each category of response to this task, when alpha level correction was employed $p < .05$ became $p < .017$. These relationships, therefore, remained significant.

In separate analyses for males and females, these relationships were maintained at the .05 level of significance. Table 15 presents the results of partial correlations for both males and females. When alpha level correction was employed for the number of correlations, however, only the association between males' performance on the instances test with schema errors remained significant.

Table 15

Partial Correlation Analyses for Divergent Thinking and the Use of Schema Responses on Nonsense Terms Task Controlling for Intelligence

	Males			Females		
	r	df	p	r	df	p
Alternative Uses	0.5011	11	.041	0.4942	13	.031
Instances	0.6082	11	.014	0.4867	13	.033

Metalinguistic Skill

The third hypothesis stated that there would be a significant positive relation between metalinguistic skill and children's knowledge of the irregular verbs. Therefore we would expect metalinguistic scores to be negatively correlated with linguistic task performance on tasks using real terms.

In order to examine this hypotheses it was first necessary to assess whether any differences in performance were evident between males and females, as well as the relation between metalinguistic performance and intelligence.

The range of mean scores for metalinguistic performance was 65-96%, with a mean of 81.2 and standard deviation of 7.5. Skewness and kurtosis were -0.032 and -0.728, respectively, indicating a normal distribution.

Table 16 presents descriptive data for males' and females' performance on these tasks. One way analysis of variance revealed no significant difference between males and females on metalinguistic score, F (1, 36) = 1.623, p = .21.

Table 16

Range, Means and Standard Deviations for Males and Females on Metalinguistic Tasks

	Range	Mean	SD
Males	65-96%	79.6%	8.07
Females	71-92%	82.7%	6.88

The correlation between metalinguistic performance and intelligence was positive and significant with $r = .54$, $p < .01$. Consequently, further analyses used a partial correlation controlling for intelligence.

A summary of the partial correlational analyses testing the third hypothesis is presented in Table 17. When alpha level correction was employed for the number of correlations all results were non-significant. Since no significant differences were initially observed between males and females, and as the only score on the linguistic measures showing a difference between the two groups was total elicitation task errors, partial correlations were also calculated for the combined sample. No significant relation was found.

Additionally, the results correlating metalinguistic performance with performance on the nonsense-term task controlling for intelligence were not significant, $p < .05$. Consequently, the third hypothesis was not supported.

Table 17

Partial Correlation Analyses for Metalinguistic with Linguistic Performance Controlling for IQ

Task		Males*		Females**	
		r	p	r	p
Elicitation	1	-0.1354	.330	-0.0030	.496
	2	-0.1587	.302	0.1403	.309
	3	0.0584	.425	-0.0318	.455
	4	0.1745	.284	-0.4773	.036
Judgment - Adult	1	-0.2074	.248	-0.1562	.289
	2	-0.2326	.222	-0.2022	.235
	3	0.0572	.426	-0.1121	.345
	4	-0.0406	.447	-0.1246	.329
Judgment	1	-0.2815	.176	0.4255	.057
	2	-0.2460	.209	0.4292	.055
	3	-0.0470	.439	0.4132	.063
	4	-0.3234	.141	0.1280	.325

Note. 1 = total number of errors * df = 11

2 = total -ed errors ** df = 13

3 = no-change errors

4 = schema errors

The fourth hypothesis stated that there would be a significant, positive association between metalinguistic segmenting skills and knowledge of the irregular verbs. Therefore, we would expect segmenting subtest performance to be negatively correlated with performance on the linguistic tasks using real terms. Before examining this hypothesis, the difference between males and females in addition to the relation between segmenting skill performance and intelligence were examined.

The range of mean scores on segmenting skill performance for the combined sample was 63-98%, with a mean of 82.9% and standard deviation equal to 9.7. Skewness was 0.386, while kurtosis equaled -0.735, indicating a close approximation to a normal distribution.

Table 18 shows the range, means and standard deviations for males and females on segmenting task performance. One way analysis of variance revealed no significant difference between males and females, $F(1, 36) = 1.892$, $p = 0.18$.

A significant positive relationship between intelligence test and segmenting skills performance was observed with $r = .39$ and $p < .05$. Therefore, in

Table 18

Range, Means and Standard Deviation for Males and Females for Performance on Segmenting Skills Subtests

	Range	Mean	SD
Males	63-98%	81%	10.3
Females	67-98%	85%	8.9

further analyses partial correlations were used controlling for intelligence.

A summary of the partial correlation analysis testing the fourth hypothesis for males and females is shown in Table 19. When alpha level correction was employed for the number of correlations the results were all non-significant.

For reasons noted before, dividing the sample into two groups - males and females - was not warranted in examining this hypothesis except with respect to the total number of errors on the elicitation task. Therefore, additional correlations controlling for intelligence for the combined groups were conducted. These results are presented in Table 20. When alpha level correction was employed for the number of correlations, significance could be obtained with $p < .0045$. It can be seen a significant negative relationship was found between the number of -ed errors in the judgment task and metalinguistic segmenting skills. This indicates that for the combined group segmenting skills are positively associated with children's knowledge of the irregular verbs as this knowledge is assessed by performance on the judgment task and, therefore, offers partial support for the fourth hypothesis.

Table 19

Partial Correlation Analyses for Metalinguistic Segmenting with Linguistic Performance Controlling for IQ

Task		Males*		Females**	
		r	p	r	p
Elicitation	1	-0.4623	.056	-0.3151	.126
	2	-0.4440	.064	-0.3455	.104
	3	-0.1769	.282	0.5701	.013
	4	0.0280	.464	-0.2496	.185
Judgment - Adult	1	-0.4029	.086	-0.3122	.129
	2	-0.3881	.095	-0.5415	.019
	3	0.5570	.428	0.3483	.102
	4	-0.480	.436	-0.0077	.489
Judgment	1	-0.3765	.102	-0.2695	.166
	2	-0.4033	.086	-0.3665	.090
	3	-0.2823	.175	-0.1132	.344
	4	-0.0696	.411	-0.0409	.442

(table continues)

Note. 1 = total number of errors

2 = total -ed errors

3 = no-change errors

4 = schema errors

* df = 11

** df = 13

Table 20

Partial Correlation Analyses of Segmenting Skills with Linguistic Performance on Tasks Using Real Terms for Both Males and Females Controlling for Intelligence

Task		r	df	p
Elicitation	1	not applicable		
	2	-0.4155	27	.012
	3	0.0292	27	.440
	4	0.1210	27	.266
Judgment - Adult	1	-0.2957	27	.060
	2	-0.3220	27	.044
	3	0.0566	27	.385
	4	0.0067	27	.486
Judgment	1	-0.4071	27	.014
	2	-0.4445	27	.008
	3	-0.1645	27	.197
	4	-0.1090	27	.287

Note. 1 = total number of errors

2 = total -ed errors

3 = total no-change errors

4 = total errors using schemas

The results correlating segmenting skills scores with performance on the nonsense terms tasks controlling for intelligence were all not significant, $p < .05$.

In conclusion, although marginal support for the last hypothesis was noted, the general pattern of correlations did not support the original predictions in this study.

Discussion

This study was an attempt to demonstrate that individual differences in children's knowledge of the English irregular past tense verbs would be associated with individual differences in other cognitive domains. Before discussing the results regarding the major hypotheses, some clarification is needed regarding the design and limits of the present study and particularly with respect to the tests employed to assess children's knowledge of the irregular verbs.

Previous research has been directed at elaborating upon the specific nature of children's knowledge of the irregular verbs with the assumption that the measures employed were valid in their ability to tap this knowledge. In the present study we observed that on tasks using real terms the relations among these tests for total number and -ed errors were significant but also sufficiently different to suggest that these tests were each tapping a different portion of children's knowledge of these verbs. When we consider that consistency in performance was almost always achieved when children offered correct responses for a term across the three tests, this variability among the tests makes sense. The reader will recall that in the

review of the literature we observed that during development children's knowledge of these verbs may be characterized by their having acquired alternative means for expressing pastness for a word. This was further observed in Kuczaj's (1978) study using the judgment task, when children frequently accepted more than one answer as correct. Consequently, the variability obtained in the present study may be a reflection of the underlying variability in children's knowledge of these verbs.

It may be argued, then, that a judgment task is the best measure for tapping children's knowledge of these verbs, since both the elicitation and judgment from the adults point of view tasks obscure this variability. However, in re-examining our own data we have observed that children's responses across the three tests did not always parallel their responses on the judgment test. For example, many children alternated between 'brung' and 'brang' as past tense for 'bring'. A few children were able to select out appropriate responses on many of the items on both judgment tasks but failed to provide a correct response for these items on the elicitation task. For a few other children the reverse was true. As such, it is suggested that these tasks

may be making different cognitive demands on the child and that when the demands of the situation are varied, only then do we get a full picture of children's knowledge of these verbs.

The general lack of correlation between performance on the nonsense term task and the other linguistic measures warrants some explanation. It has been observed that children generalize their knowledge of the irregular verbs to performance on a nonsense term task at a slightly later age than they display this knowledge on tasks using real terms (Bybee and Slobin, 1982). Bybee and Slobin suggested that this may be due to the differences between the tasks. Consequently, it is not surprising that children's performance on the nonsense task in the present study was not associated with performance on the other linguistic tasks.

The lack of correlation between performance on the two judgment tasks for no-change errors would suggest that these tests are not interchangeable in terms of their ability to assess children's tendencies to make these kinds of errors. However, we also observed that the range for the no-change errors was quite restricted on all three tasks. As such, it may be that in designing these tests we failed to include enough items

that would elicit this type of error from children and provide us with the necessary range and distribution of scores warranted in correlation analysis.

Regarding schema errors on the three linguistic tasks using real terms, we observed that the correlation between the elicitation and judgment task was significant but that all other correlations between the three tasks were not. Given the bimodal distribution for performance on the elicitation task for schema errors as well as the low value of the coefficient (.3310) for the correlation between the elicitation and judgment tasks, we would forego interpreting the relation between the elicitation and both judgment tasks. Nor can we presently account for the finding that we observe two discrete groups based on schema errors on the elicitation task but not on the two judgment tasks. Again this may be an artifact due to the different cognitive demands of these tasks. The elicitation task appears to require greater spontaneity and recall than the judgment tasks. The judgment tasks, however, appear to be more solely based on the child's ability to recognize and evaluate items. It would appear that more experimental work needs to be done, however, to explore these proposals. Perhaps

employing a larger sample to increase the number of subjects in each group and examining their cognitive skills in a variety of areas, in a design similar to Poole's (1978a, 1978b, 1978c), would shed some light on the cognitive demands of this task in contrast to the demands of the judgment tests.

The problems we observed in assessing the reliabiity of the linguistic measures point to a number of problems in the design of this study. In our item analysis we observed that words varied both in terms of their degree of difficulty and extent to which they elicited different types of errors. Although we might have predicted that some words would be more difficult, we would not have known, based on previous research, what kinds of errors specific words elicit. For example, based upon our review, we would not have predicted the extent to which 'brung', 'brang' and 'snuck' would be evidenced in children's productions in lieu of either the correct or regularized past tense form. Also, as we noted in the review, we do not yet know whether errors such as 'brang' represent more advanced levels of knowledge than errors such as 'bringed' or whether 'brang' and 'bringed' are both acquired during the preschool years. If this is so,

then which form is relinquished first may reflect stylistic differences in children's performance with the irregular verbs and not necessarily differences on a continuum of greater or lesser knowledge.

However, it is clear to us that the items on these tests were not of equal difficulty or equal value in terms of their potential to elicit the different types of errors. Consequently, in expecting to assess differences in the kinds of errors children make, future research would profit from designing linguistic tasks with some measure of control for both the difficulty of words and expectancy of type of error.

Bybee and Slobin (1982) noted that they were uncertain to what extent perseveration might have effected performance in the testing situations in their study. Although it is clear that in order for subjects to have intentionally handled stimulus bases as irregular verbs they must recognize irregularity within the verb system, we did find evidence to suggest that at least some children realized the nature of the testing we were conducting or issues related to the material in our tests. As we indicated, one subject was dropped from the study as she admitted to knowing what the tests were about. Even when the examiner

questioned her using regular verbs, she proceeded to handle these as irregular past tense verbs. Another subject, after accepting many alternative past tense forms on the judgment task stated, "There's really only one for a word, isn't there?" Additionally, looking at individual records of responses on the elicitation tasks it appears that a few children would shift in their approach to responding. For example, one subject produced many -ed errors in the first third of the test, then produced almost all schema errors for the next third and finally shifted to alternating. Finally, a number of subjects responded to the word 'weave' by stating they didn't know "that one" rather than give a response overgeneralizing the -ed suffix or guessing.

Although these appear to be isolated instances, taken as a whole they suggest an awareness of the nature of or issues related to the testing which could obscure what children do in reality. The results from the present study do not enable us to examine this problem. However, it seems that future research would profit from designing tasks in which a variety of areas of language were considered and questions about these other areas intermixed with the questions upon which

the study was focused in order to avoid this possibility.

The theoretical underpinings for this study were to draw parallels between suggested processes which children appear to carry out in the acquisition of the irregular past tense verbs and the processes purported to be associated with psychological differentiation and divergent thinking. As well, it was suggested that metalinguistic skills, and specifically, the ability to perform segmenting operations on language reflected abilities likewise necessary in the acquisition of the irregular past tense verbs. Consequently, it was hypothesized that increased competence in performance on the three independent measures would be associated with improved performance on tasks measuring children's knowledge of the English irregular past tense verbs.

The rest of this discussion of the results is organized around the hypotheses and the independent variables with which each hypothesis was concerned. Further comments about the instruments and methodology are included when relevant. A discussion of supplemental findings follows.

Psychological Differentiation:

The first hypothesis stated that increases in psychological differentiation would be significantly and positively associated with children's increased knowledge of the English irregular past tense verbs. This hypothesis derived from an examination of the literature describing children's acquisition of these verbs which suggested that apart from rote learning, children utilize the structural components of these verbs to facilitate learning the association between present tense and past form pairs. In addition, analysis and comparison of the structural components appeared necessary in order to abstract the rules and/or schemas associated with the irregular past tense forms. It was reasoned that children at higher levels of differentiation would be more skillful in performing these analyses and, therefore, would demonstrate greater knowledge of irregular verbs.

The findings in the present study did not support this hypothesis.

As noted in the review of the literature, efforts to find an association between psychological differentiation and verbal behavior have not been consistently successful. As such, it has been

suggested that psychological differentiation, primarily represented in these studies by performance on visual perception tasks, does not necessarily generalize to verbal functioning. Similarly, the lack of significance in the present study may indicate further the relative separation between language functioning and differentiation.

However, we also noted in the review, that several researchers have adopted a more integrated approach to understanding the construct cognitive style (Block et al., 1981; Wachtel, 1968) and its relation to language behavior (Poole, 1978a, 1978b, 1978c). One point here is that different cognitive factors may be interdependent in their relation to other areas of functioning. Similarly, as we discussed at some length in the sections on deregularization, recent descriptions of the processes which appear to be associated with language learning, and particularly the acquisition of the English past tense, stress the interaction and interrelatedness among these processes in order for knowledge of language to be acquired (Bybee, 1985; Bybee and Slobin, 1982; MacWhinney, 1978; Pinker, 1985). Consequently, a more appropriate design would have been to examine the interrelations among the

variables of psychological differentiation, divergent thinking, metalinguistic performance and intelligence with respect to performance on each linguistic task. Unfortunately, as noted in the results section, the number of subjects in this study precluded this type of analysis.

In our discussion of psychological differentiation, we noted that the relation between differentiation and the development of certain cognitive structures is best observed during the initial stages in the development of such structures. We suggested it was at this point, during the initial stages of learning, that a more methodical, analytic approach, which is associated with higher levels of differentiation, would facilitate learning. As such, it is possible that a relation between differentiation and language learning would be observed when children are first beginning to acquire knowledge of the irregularities for the past tense. As mentioned in our review, research indicates that the tendency to overgeneralize is relinquished between ages 7 and 9. However, MacWhinney (1978) observed that when children first acquire affixes, they use them with only a limited set of roots. Generalization to new roots is not observed until later (p. 11). It is possible,

therefore, a more appropriate period in development to examine would have been during the time when children are still well inclined to overgeneralize the -ed suffix.

It would appear, therfore, that we would be premature in further accepting the idea of a relative separation between differentiation and language functioning. And, it is evident more research is needed in both areas if we are to clarify our understanding of children's acquisition of the irregular past tense verbs, as well as the relation between acquisition and cognitive functioning.

Divergent Thinking:

The second hypothesis stated that a significant positive relation would exist between divergent thinking and children's knowledge of English irregular past tense verbs. It was observed that divergent thinkers tended to be broad categorizers and utilize external cues in making associations. There is also some evidence to suggest that more highly divergent thinkers may abandon ineffective strategies in problem solving more easily than their less divergent peers. It was hypothesized that these inclinations would

facilitate children's deregularization and concomitant acquisition of knowledge of the irregular verbs.

The results indicated that differences in divergent thinking were not associated with differences in children's knowledge of these verbs, when knowledge was defined by the total number of and total -ed errors on language tasks using real terms. Therefore, support for the second hypothesis was not found.

However, a significant positive relation was noted between divergent thinking and schema responses to the nonsense term task for the combined sample. When examining males and females separately, this relation was maintained for males, but not for females.

Based upon the arguments we presented in our review, we would not have expected that divergent thinking, as it was assessed in the present study, would be differentially associated with performance on the nonsense terms task versus performance on real word tasks. Consequently, the incongruity we have observed warrants explanation. The reader will recall that Nelson and Bonvillian (1978) also observed a relation between divergent thinking and overgeneralization when examining children's acquisition of novel noun concepts. A comparison of the designs in the two

studies, our own and Nelson and Bonvillian's, helps to elucidate upon the present results.

In Nelson and Bonvillian's design, the objects which were employed as referrents for the novel concept names had been constructed by the researchers to insure that children had not been previously exposed to the objects. Overgeneralizations included extensions of novel concept names acquired during the study to the wrong novel object, as well as extensions of non-experimental words or real words to these objects.

The similarity in design between our own research using the nonsense term task, and in Nelson and Bonvillian's experiments was that in both studies the stimuli to which children were responding were all novel. This suggests there may be a stylistic component to the way more highly divergent thinking children classify novel stimuli through language. On tasks using novel objects and novel terms, more highly divergent thinkers will use overgeneralizations to identify these objects and terms. On nonsense term tasks, children of the ages we tested in this study will apply principles reflecting the phonological changes associated with the irregular past tense verbs

more frequently than their less divergent thinking peers.

Since no significant differences in the use of the -ed suffix or no-change rule on the nonsense term task were observed in relation to performance on the divergent thinking tasks, it appears that the more highly divergent thinkers in this study also employed more variety in the manner they chose to form the past tense for a nonsense term. This may be congruent with recent research that indicates a component of divergent thinking is spontaneous flexibility (Houtz and Speedie, 1978).

Kogan described spontaneous flexibility as the number of categories of response. Houtz and Speedie administered a battery of problem solving and divergent thinking tests to fifth graders. Using factor analyses they observed that spontaneous flexibility and divergent thinking consistently loaded on the same factor and were distinct from measures associated with school performance and intellectual ability.

Another way, then, of explaining the association between nonsense term and divergent thinking task performance is that more highly divergent thinking children reveal their spontaneous flexibility by their

choosing a wider set of ways of responding. However, one problem we cannot account for is why we can discriminate between more highly divergent thinking children and their less divergent thinking peers on the nonsense term task by their use of schema, as we defined this in our own scoring of children's linguistic performance in this study, and in lieu of their use of the -ed suffix and no-change rule.

The findings discussed above also necessitate a re-evaluation of the use of nonsense terms tasks in assessing children's knowledge of the irregular verbs. The major question here is whether less divergent thinking children do not respond with as many schema due to a lack of knowledge or because they handle nonsense terms differently as a result of some issue which reflects back to their being less divergent in their thinking. Since the inclination to respond using schema on the nonsense term task was not related to responding using schema on the linguistic tasks with real terms, and since divergent thinking was not associated with children's performance on these other linguistic tasks, we suspect the answer is the latter. Future studies employing nonsense tasks with children would seem to profit from knowing whether their results

were a true representation of children's knowledge of language or an artifact due to cognitive style differences. This is especially true if the goal of such studies is to describe children's knowledge of language.

Metalinguistic Awareness:

Hypothesis 3 stated that there would be a significant positive correlation between metalinguistic awareness and children's knowledge of the irregular past tense verbs. It was argued that cognitive skills reflected in the development of metalinguistic awareness might likewise be reflected in the child's acquisition of the irregular past tense verbs. More specifically, it was suggested that segmenting skills might be more directly related to the acquisition of these verbs, since the nature of the knowledge which is acquired seemed to involve segmenting the components of these verbs. Hence, Hypothesis 4 stated that a significant, positive correlation would exist between metalinguistic segmenting skills and knowledge of the irregular past tense verbs.

The results of the present study did not support Hypothesis 3.

As we observed in our discussion of the acquisition of the irregular past tense verbs, Beilin (1975) suggested that the noticeable improvement in children's ability to make judgments about language, and correct sentences at approximatley age 7, may be associated with relinquishing the tendency to overgeneralize. He further explained that the above skills reflected children's ability to treat sentences as if they were objects. Although Beilin did not label this ability metalinguistic awareness for language, the subtests examining metalinguistic awareness, employed in the present study, do appear to tap this ability. Consequently, based upon the present results we also found no support for Beilin's suggestion.

Many discussions of metalinguistic awareness, for example, Bohannon et al., (1984), Saywitz and Wilkinson (1982), and Scholl and Ryan (1975), have reflected upon the child's acquisition of specific linguistic knowledge as a prerequisite to the development of metalinguistic awareness for that knowledge. Saywitz and Wilkinson suggested that this construct may, therefore, be multidimensional, where different aspects are associated with specific areas of linguistic knowledge. The data from their own study supported

this view. These researchers observed that different groups of subtests in their battery could be discriminated from each other statistically in that they were differentially difficult for children within each of the age groups they tested. As well, children's skills appeared to increase at a similar rate across the age groups and across the different subtests.[9] Saywitz and Wilkinson concluded that children are simultaneously involved in a variety of "metalinguistic activities" (p. 248).

Given this conceptualization of the metalinguistic construct, it would appear that our suggestion of a relation between general metalinguistic awareness and children's knowledge of the irregular past tense verbs was short-sighted and weakly founded. A better approach to suggesting an association between these two areas, metalinguistic awareness and children's knowledge of the irregular verbs, was in our fourth hypothesis, where we specified the nature of the linguistic knowledge children acquire. In our review, it was suggested that the integration of information regarding the changes in the irregular verbs when forming the past tense is partially predicated upon attention to the different segments of these verbs in

both their present and past tense forms. As such, we suggested that the ability to segment units of language may facilitate the acquisition of knowledge of these verbs.

The results of this study provided partial support for the fourth hypothesis, in that performance on the segmenting skills tasks was positively and significantly correlated with performance on the judgment task. Again, however, as we observed in our discussion of the differential distribution of scores on the linguistic tasks, we have to wonder why this relation would be observed with the judgment task and not with the other linguistic tasks.

In examining the validity of the linguistic tasks we noted that, while these tests appear to overlap in terms of the skills they each assess, they also appear to tap some unique portion of children's knowledge of the irregular past tense verbs. Subsequently, in discussing the reliability of these tasks we also suggested that differences in performance for each subject across the different tasks may be affected by the different cognitive demands of each task. It is possible, therefore, that the differential association between performance on the various linguistic tasks

using real words and performance on the segmenting skills tasks reflects some inherent difference between the judgment task and the two other linguistic measures. And, we suggest that the nature of this difference is being highlighted by the present findings. Regretfullly, the data from the present study do not enable us to explain this difference. Therefore, it is obvious more experimental research is needed if we are to increase our understanding of what these linguistic tasks are measuring.

One problem in this area of the study was that when males and females were examined separately, the relationship between metalinguistic segmenting skills and linguistic performance was not maintained. However, this may have been due to the small sample size. Thus, dividing subjects into groups might have obscured the full range in performance we observed in the whole sample.

Up to this point in our discussion we have observed that the predictions in this study were not substantiated. In an attempt to explain these results we have, whenever possible, continued to elaborate on the methodological problems we retrospectively observed in our design. These included the small

sample size which prohibited analysis of the interrelations among the independent and control variables in relation to our dependent variables, the design of the linguistic tasks in terms of the items on these tasks and our lack of knowledge of how children respond to different items, the effects of the testing procedure on children's performance, our lack of understanding the different linguistic task demands as they might effect children's performance and the possible effect on the statistical results when dividing our already small sample into two groups by sex. The few significant findings we observed, though we explained them, seemed to shed even more light on the problems in the design of this study and our previous lack of understanding of some of the measures we employed.

It seems essential at this point to comment about the theoretical understanding we developed regarding children's acquisition of the English irregular past tense verbs, and how the present results might have bearing on that understanding. As we have stated, this study was an attempt to examine whether individual differences in children's knowledge of the irregular verbs would parallel differences observed in other

areas of cognitive functioning. We were hopeful that finding relationships would enhance our knowledge of children's language learning ability.

However, at the outset, we did not perceive a causal relationship between differences in cognitive skills as they are assessed by various cognitive tasks, and differences in language ability, as we were interested in assessing it here. Rather, we suspected that performance in both areas sprang from some common ability, as has been suggested by researchers examining the relation between the development of linguistic and cognitive structures (Beilin, 1975; Tremaine, 1975).

Consequently, we believe with very few exceptions, the theoretical views and interpretations of empirical evidence we examined reflecting on the processes involved in children's acquisition of linguistic knowledge have not been challenged by the lack of any significant findings in the present study. One exception is regarding Beilin's (1975) suggestion of children's ability to judge sentences. However, we have discussed this in our discussion of the results concerning metalinguistic awareness.

Recently, Bybee (1985) proposed that the mechanism underlying the operations involved in the acquisition

and/or processing of linguistic knowledge in morphology is not unique to language functioning but reflects more general cognitive abilities. Based upon the results in our study we would hesitate to accept this idea. However, due to the array of problems we observed in the present methodology, it seems premature to draw any conclusions regarding Bybee's proposal.

Supplemental Findings:

As noted in our review, historically it had been widely accepted that children vary in their rates of acquisition in general but that efforts to assess these differences had been based on measures which were inadequate in assessing knowledge of language. Nevertheless, at the beginning of our study we made the assumption that children do indeed vary in the amount of knowledge they have acquired for the English past tense. Data from Bybee and Slobin's (1982) study supported our assumption. However, their study included only 15 third graders. The difference in ages between some subjects was more than one year. As such, we did not know how much variability we would find within a restricted age group.

The descriptive statistics for linguistic task performance presented in the results (see Table 2)

indicate children show wide variability in their overgeneralizing the -ed suffix and total errors. However, the same cannot be said for children's inappropriate use of schema and the no-change rules.

Throughout our discussion we have observed a variety of problems in the present study. Most of these concerned the instruments we employed. However, the descriptive statistics for the present sample reveal yet another problem. Moore (1975) noted that the size of the correlation coefficient is related to the range, variability or sample size. Thus, if any of these factors are reduced, the correlation coefficient will also be reduced, thereby limiting the generalizations we can make about the results. As we have seen, each of these factors were problems in the present study. Consequently, the results of this research should be considered only exploratory.

Although the aim of this study was to examine individual differences, it seems worthwhile to make a few comments regarding the linguistic data we have collected as it compares to previous research. Many of the errors children in our sample produced on the elicitation task were congruent with those reported by Bybee and Slobin (1982). For example, we too noted a

strategy where children held the consonantal structure of a verb constant while changing the internal vowel, for example, write/writ; fight/fit; think/thank, suggesting that children have already acquired this strategy before age 8. That children in our study have acquired knowledge of specific schema we observed earlier in our commments in the results. The reader will recall that almost every child we tested used the expressions 'brung' or 'brang' at least once during the testing as past tense for brought. Another productive schema for this group appears to be from the class exemplified by 'bite' and 'hide'. Many of the errors for words ending in 'ite' were reflections on this class, for example, write/writ; drive/driv; stride/strid.

Alternatively, we have also observed evidence in this age group for selecting incorrect past tense forms from the lexicon, for example, pat/pet, sat/set.

Although a more thorough analysis of our own data would be interesting, it is beyond the scope of this project. The evidence we have observed suggests that by age approximatley 8;0 children have already acquired a substantial knowledge base for handling the irregular verbs. This knowledge may be in the form of specific

content of schema or reflecting the structural changes in these verbs when forming the past tense. When the process of acquiring this knowledge begins remains a question for future research.

To conclude, the present study was designed to examine the relation between a number of cognitive factors which would reflect individual differences in children's cognitive functioning and knowledge of the English irregular past tense verbs. Children between 7;4 and 8;0 were tested on the Children's Embedded Figures test, a modified version of Wallach and Kogan's test for divergent thinking, a battery assessing metalinguistic development and a variety of linguistic tasks designed to assess children's knowledge of the irregular verbs. A control for IQ was incorporated using the WISC-R. No significant relationship was found between cognitive style and knowledge of the irregular verbs. However, a significant relation was observed between knowledge of these verbs assessed by performance on one linguistic task, a judgment task, and metalinguistic segmenting skills.

References

Alterman, R.N. (1978). The relations between psychological differentiation, situational context and linguistic code in tenth-grade students. (Doctoral dissertation, New York University, 1977). Dissertation Abstracts International, 38, 7219A.

Asch, S.E. & Witkin, H.A. (1948). Studies in space orientation: Perception of the upright with displaced visual field. Journal of Experimental Psychology, 38, 325-337.

Baker, L. & Cantwell, D.P. (1978). Language acquisition, cognitive development and emotional disorders in childhood. In K.E. Nelson (Ed.), Children's language, 3. Hillside, New Jersey: Lawrence Erlbaum Associates.

Bates, E. (1979). The emergence of symbols, cognition and communication in infancy. New York: Academic Press.

Beilin, H. (1975). Studies in the cognitive basis of language development. New York: Academic Press.

Berko, J. (1958). The child's use of English morphology. Word, 14, 150-177.

Berman, R. (1982, August). Cognitive principles and language acquisition. Paper presented at the Second European-North American Workshop on Cross-Linguistic Second Language Acquisition Research, Gohrde, Germany.

Blank, M. (1974). The cognitive functions of language in the preschool years. Developmental Psychology, 10, 225-245.

Blishen, B.R. & McRoberts, H.A. (1976). A revised socioeconomic index for occupations in Canada. Canadian Review of Sociology and Anthropology, 13(1), 71-79.

Block, J., Buss, D.M., Block, J.H., & Gjerde, P.F. (1981). The cognitive style of breadth of categorization: Longitudinal consistency of personality correlates. Journal of Personality and Social Psychology, 40, (4), 770-779.

Bloom, L. (1970). Language Development. Cambridge, Mass.: MIT Press.

Bloom, L. & Lahey, M. (1978). Language development and language disorders, New York: John Wiley and Sons, Inc.

Bloom, L., Lightbown, P., & Hood, L. (1975). Structure and variation in child language. Monographs for the Society for Research in Child Development, 40, (2, serial no. 160).

Bohannon, J.N., Warren-Leubecker, A., & Hepler, N. (1984). Word order awareness and early reading. Child Development, 55, 1541-1548.

Bowerman, M. (1982). Starting to talk worse: Clues to language acquisition from children's late speech errors. In S. Strauss (Ed.), U-Shaped behavioral growth (pp. 101-145). New York: Academic Press.

Bretherton, I., McNew, S., Snyder, L., & Bates, E. (1984). Individual differences at 20 months: Analytic and holistic strategies in language acquisition. Journal of Child Language.

Brown, R. (1973). A first language. Cambridge, Mass: Harvard University Press.

Bruner, J.S., Olver, R.R. and Greenfield, P.M. (1967). Studies in cognitive growth. New York: Wiley.

Bybee, J.L. (1985). Morphology: A study of the relation between meaning and form. Philadelphia: John Benjamin's Publishing Co.

Bybee, J.L. & Moder, C.L. (1983). Morphological classes as natural categories. Language, 59(2), 251-270.

Bybee, J.L. & Slobin, D.I. (1982). Rules and schemas in the development and use of the English past tense. Language, 58(2), 265-289.

Carni, E. & French, L.A. (1984). The acquisition of before and after reconsidered: What develops? Journal of Experimental Child Psychology, 37, 394-403.

Case, R. (1977). Responsiveness to conservation training as a function of induced subjective uncertainty, M-space, and cognitive style. Canadian Journal of Behavioral Science, 9, 12-25.

Chapman, H.H. (1967). Field dependence and communication effectiveness (Doctoral dissertation, University of Oklahoma, 1967). Dissertation Abstracts, 28, 1692B.

Chomsky, N. (1957). Syntactic Structures. The Hague: Mouton.

Chomsky, N. (1965). Aspects of a theory of syntax. Cambridge, Mass: MIT Press.

Cohen, J., & Cohen, P. (1983). Applied multiple regression/correlation analyses for the behavioral sciences (2nd ed.). Hillsdale, N.J.: Erlbaum.

Cruttenden, A. (1981). Item-learning and system-learning. Journal of Psycholinguistic Research, 10(1), 79-88.

Das, J.P., Kirby, J.R., & Jarman, R.F. (1979). Simultaneous and successive cognitive processes. New York: Academic Press.

Davis, J.K. & Frank, B.M. (1979). Learning and memory of field independent-dependent individuals. Journal of Research in Personality, 13, 469-479.

DeFazio, W. (1973). Field articulation differences in language abilities. Journal of Personality and Social Psychology, 25, 351-356.

Derwing, B.L. (1980). English pluralization: A testing ground for rule evaluation. In G.D. Prideaux (Ed.), Experimental linguistics. Ghent: Scientific Publishers.

Derwing, B.L. & Baker, W.J. (1974). Rule learning and the English inflections. Final Report to the Canada Council.

DeVilliers, J.G. & DeVilliers, P.A. (1974). Competence and performance in child language: Are children really competent to judge? Journal of Child Language, 1, 11-22.

Doob, L.W. (1968). Behavior and grammatical style. Journal of Abnormal and Social Psychology, 56, 398-451.

Fillmore, C.J. (1979). On fluency. In C.J. Fillmore, D. Kempler, and W. S-Y Wang (Eds.). Individual differences in language ability and language behavior (pp. 85-101). New York: Academic Press.

Fillmore, C.J., Kempler, D., & Wang, W. S-Y. (Eds.). (1979). Individual differences in language ability and language behavior. New York: Academic Press.

Finley, G.E., Solla, J., & Cowan, P.A. (1977). Field dependence-independence, egocentrism and conservation in young children. Journal of Genetic Psychology, 131, 155-156.

Flavell, J.H. (1963). The developmental psychology of Jean Piaget. Princeton, N.J.: Van Nostrand.

Gathercole, V.C. (1985). More and more and more about more. Journal of Experimental Child Psychology, 40, 73-104.

Gleitman, H. & Gleitman, L. (1979). Language use and language judgment. In C.J. Fillmore et al. (Eds.), Individual differences in language ability and language behavior (pp. 103-126). New York: Academic Press.

Gleitman, L.R. & Gleitman, H. (1970). Phrase and paraphrase. New York: W.W. Norton and Co.

Gleitman, L.R., Gleitman, H., & Shipley, E. (1972). The emergence of the child as grammarian. Cognition, 1, 137-164.

Goodenough, D.R. (1976). The role of individual differences in field dependence as a factor in learning and memory. Psychological Bulletin, 83, 675-694.

Harrington, D.M., Block, J., & Block, J.H. (1983). Predicting creativity in preadolescence from divergent thinking in early childhood. Journal of Personality and Social Psychology, 45, (3), 609-623.

Hill, D. (1980). Relation of field independence to development of conservation. Perceptual and Motor Skills, 50, 1247-1250.

Hooper, J.B. (1979). Child morphology and morphophonemic change. Linguistics, 17, 21-50.

Horgan, D. (1981). Rate of language acquisition and noun emphasis. Journal of Psycholinguistic Research, 10, 629-640.

Houtz, J.C. & Speedie, S.M. (1978). Processes underlying divergent thinking and problem solving. Journal of Educational Psychology, 70(5), 848-854.

Houtz, J.C., Montgomery, C., Kirkpatrick, L., & Feldhusen, J.F. (1970). Relationship among measures of evaluation ability (problem solving), creative thinking and intelligence. Contemporary Educational Psychology, 4, 47-54.

Houtz, J.D., Denmark, R., Rosenfield, S., & Tetenbaum, T.J. (1980). Problem solving and personality characteristics related to differing levels of intelligence and ideational fluency. Contemporary Educational Psychology, 5, 118-123.

Jarman, R.F. (1980). Cognitive Processes and syntactical structures: Analysis of paradigmatic and syntagmatic associations. Psychological Research, 41, 153-167.

Jennings, B.S. (1968). Some cognitive control variables and psycholinguistic dimensions (Doctoral dissertation, University of Florida, 1967). Dissertation Abstracts, 29, 1172B-1173B.

Jesperson, O. (1942). A modern English grammar on historical principles. Morphology VI. Copenhagen: Munksgaard.

Kagan, J., Moss, H.A. & Sigel, I.E. (1976). Psychological significance of styles of conceptualization. In J.C. Wright and J. Kagan (Eds.), Basic cognitive processes in children. Monographs for the Society for Research in Child Development, 28 (2, serial no. 86), 73-124.

Kepple, G. (1982). Design and analysis: A researchers handbook (2nd ed.). Englewood Cliffs, N.J.: Prentice Hall.

Kogan, N. (1971). Educational implications of cognitive styles. In G.S. Lesser (Ed.), Psychology and educational practice. Glenview, Ill.: Scotts, Foresman.

Kogan, N. (1973). Creativity and cognitive style: A life-span perspective. In P.B. Baltes and K.W. Schaie (Eds.), Life-span developmental psychology: personality and socialization. New York: Academic Press.

Kogan, N. (1984). Stylistic differences in childhood and adolescence: Creativity, metaphor and cognitive styles. In P. Mussen (Ed.) Carmichaels manual of child psychology (pp.603-706). New York: John Wiley and Sons, Inc.

Kuczaj, S.A. (1977). The acquisition of regular and irregular past tense forms. Journal of Verbal Learning and Verbal Behaviour, 16, 589-600.

Kuczaj, S.A. (1978). Children's judgments of grammatical and ungrammatical irregular past tense verbs. Child Development, 49, 319-326.

LaGreca, A.M. (1980). Can children remember to be creative? An interview study of children's thinking processes. Child Development, 51, pp. 572-575.

Lawson, A.E. (1976). Formal operations and field independence in a heterogeneous sample. Perceptual and Motor Skills, 42, 981-982.

Liben, L. (1978). Performance on Piagetian spatial tasks as a function of sex, field dependence and training. Merrill-Palmer Quarterly, 24, 97-110.

Linn, M.C. & Kyllonen, P. (1981). The field dependence-independence construct: Some, one or none. Journal of Educational Psychology, 73, 261-273.

Mackay, D.G. (1976). On the retrieval and lexical structure of verbs. Journal of Verbal Learning and Verbal Behavior, 15, 169-182.

MacWhinney, B. (1978). The acquisition of morphophonology. Monographs of the Society for Research in Child Development, 43 (1 & 2, Serial No. 174).

McCall, R.B. (1970). Fundamental statistics for psychology. New York: Harcourt, Brace and World, Inc.

McKenna, F.P. (1983). Field dependence and personality: A re-examination. Social Behavior and Personality, 11(2), 51-55.

McKinney, J.D. & Forman, S.G. (1977). Factor structure of the Wallach-Kogan tests of creativity and measures of intelligence and achievement. Psychology in the Schools, 14, 41-44.

Neimark, E.D. (1975). Individual differences and the role of cognitive style in cognitive development. Genetic Psychology Monographs, 91, 171-225.

Nelson, K. (1973). Structure and strategy in learning to talk. Monographs of the Society for Research in Child Development, 38 (1 & 2, serial no. 149).

Nelson, K. (1981). Individual differences in language development: Implications for development and language. Developmental Psychology, 17(2), 170-181.

Nelson, K.E. (1977). Aspects of language acquisition and use from age 2 to age 20. Journal of the American Academy of Child Psychiatry, 16(4), 584-607.

Nelson, K.E. & Bonvillian, J.D. (1978). Early language developmment: Conceptual growth and related processes between 2 and 4 1/2 years of age. Children's Language, 467-550.

Nelson, K.E. & Nelson, K. (1978). Cognitive pendulums and their linguistic realizations. In K.E. Nelson (Ed.) Children's language: Vol. 1 (pp. 223-287). New York: Gardner Press.

Pepler, D.J. & Ross, H.S. (1981). The effects of play on convergent and divergent problem solving. Child Development, 52, 1202-1210.

Peters, A.M. (1977). Language learning strategies: Does the whole equal the sum of the parts? Language, 53, 560-573.

Piaget, J. & Inhelder, B. (1969). The psychology of the child. New York: Basic Books, Inc.

Pineo, P. & Porter, J. (1967). Occupational prestige in Canada. Canadian Review of Sociology and Anthropology, 4, 24-40.

Pinker, S. (1985). Language acquisition and learnability. Cambridge, Mass: Harvard University Press.

Poole, M. (1975). Understanding cognitive style as a basis for curriculum immplementation in inner suburban schools. In D.E. Edgar (Ed.), Sociology of Australian education (pp. 169-185). Sydney: McGraw Hill Book Company.

Poole, M. (1976). Social class constraints in linguistic, cognitive and verbal domains. Education Research and Perspectives, 2, 17-36.

Poole, M. (1977). Social Class-sex contrasts in patterns of cognitive style. Australian Journal of Education, 21, 233-256.

Poole, M. (1978a). Cognitive style and verbal processing strategies: Interdomain analysis. Journal of Psychology, 98, 215-223.

Poole, M. (1978b). Linguistic code and cognitive style: Interdomain analysis. Perceptual and Motor Skills, 46, 1159-1164.

Poole, M. (1978c). Exploration of relationship inherent in linguistic, cognitive and verbal processing domains. Psychological Reports, 43, 639-647.

Saywitz, K. & Wilkinson, L.C. (1982). Age related differences in metalinguistic awareness. In S. Kuczaj (Ed.), Language development: Vol. 2, Language, thought and culture (pp. 229-250). New York: Lawrence Erlbaum Associates.

Scholl, D.M. & Ryan, E.B. (1975). Child judgments of sentences varying in grammatical complexity. Journal of Experimental Psychology, 20, 274-285.

Schwartz, R. (1982). Lexical styles in early language acquisition. In R.N. St.Clair and W. vonRaffler-Engel (Eds.) Language and cognitive styles (pp. 197-221). Lisse: Swets and Zeitlinger.

Shapiro, J.W. (1967). A study of behavioral styles in essay examinations. (Doctoral dissertation, Western Reserve University). Dissertation Abstracts, 28, 1210B-1211B.

Slobin, D.I. (1971). On the learning of morphological rules: A reply to Palermo and Eberhart. In D.I. Slobin (Ed.), The ontogenesis of grammar (pp. 215-223). New York: Academic Press.

Snyder, L., Bates, J.E., & Bretherton, I. (1981). Content and context in early lexical development. Journal of Child Language, 8, 565-582.

Stone, C.A. & Day, M.C. (1980). Competence and performance models and the characterization of formal operational skills. Human Development, 23, pp. 323-353.

Strauss, J.S. (1982). U-Shaped behavioral growth. New York: Academic Press.

Studdert-Kennedy, M. (1983). Perceptual processing links to the motor system. In, M. Studdert-Kennedy (Ed.) Psychology of language (pp. 29-39). Cambridge, Mass.

Swyter, L.J. & Michael, W.B. (1982). The interrelationships of four measures hypothesized to represent the field dependence-field independence construct. Educational and Psychological Measurement, 42(3), 877-888.

Tremaine, R.V. (1975). Syntax and Piagetian operational thought. Washington, D.C.: Georgetown University Press.

Vernon, P.E. (1972). The distinctiveness of field independence. Journal of Personality, 40, 366-391.

Wallach, M.A. & Kogan, N. (1966). Modes of thinking in young children. New York: Bolt, Rinehart and Winston.

Ward, W.C. (1969). Rate and uniqueness in children's creative responding. Child Development, 40, pp. 869-878.

Wechsler, D. (1974). Wechsler intelligence scale for children. New York: Psychological Corporation.

Weisz, J.R., O'Neill, P., & O'Neill, P.C. (1975). Field dependence-independence on children's embedded figures test: Cognitive style or cognitive level? Developmental Psychology, 11(4), 539-540.

Wells, G. (1980). Apprenticeship in meaning. In K.E. Nelson (Ed.), Child language: Vol. 2 (pp. 45-126). New York: Gardner Press.

Wiig, E.H., Semel, E.M., & Crouse, M.A.B. (1973). The use of English morphology by high risk and learning disabled children. Journal of Learning Disabilities, 6(7), 59-66.

Witkin, H.A., Dyk, R.B., Faterson, H.F., Goodenough, D.R., & Karp, S.A. (1962). Psychological differentiation. New York: John Wiley and Sons, Inc.

Witkin, H.A. & Goodenough, H. (1977). Field dependence and interpersonal behavior. Psychological Bulletin, 84, 661-689.

Witkin, H.A., Oltman, P.K., Raskin, E., & Karp, S.A. (1971). A manual for the embedded figures test. California: Consulting Psychologists Press.

Appendix A

PARENTAL PERMISSION FORM

Having been explained and understanding the procedure to be followed in the study to be carried out by Ms. Stephanie Sawyer regarding the children's acquisition of language, I hereby grant permission for my son/daughter to participate as a subject in this study as part of the requirements for completion of the doctoral degree in psychology at the University of Ottawa. It is, however, understood that my son/daughter is free to withdraw from participation should he/she so choose.

I further understand that any information learned from the results of this study about my son/daughter in particular is confidential. Consequently, these results may not be identified or associated with my child and may not be made known to anyone but Stephanie Sawyer or those directly participating in the testing situation, unless I so request. I also understand, however, that a notation must be made in the school record by the Ottawa Board of Education, Psychology Department, of the date of administration of the WISC-R, although the results or information from the test itself may not be revealed without my permission. Finally, I understand that this information is being collected for purposes of research only.

_____

Child's Name

_____

Date of Birth

_____

Relationship to parent or guardian

_____

Signature of parent or guardian

_____

Date

Appendix B

Blishen and McRoberts' Index for Socioeconomic Status

This index was developed as a research tool for determining social class position in Canada (Blishen and McRoberts, 1976). It is a revised version of Blishen's earlier scale and is based upon 1971 Canadian statistics for the male labor force.

To calculate the index, statistics included three factors. First, total income received by laborers for the year 1970, including wages and salaries, and net income from business including professional practice and/or farm income was determined. An education variable was determined by the percentage of males in a particular occupation in 1970 who had attended either grades 12 or 11, depending upon the province in which school was attended. As well, a prestige variable was determined for 85 occupations from the Pineo-Porter prestige scale (Pineo and Porter, 1966), which matched occupation titles in Blishen's earlier scale. Data were based on males working in 1970, with occupation determined by the job held in the week prior to enumerations, or job held longest since January 1, 1970 if unemployed that week.

To calculate socioeconomic status a regression formula was determined resulting in regression coefficients for income and education, where prestige is the dependent variable. Class intervals were divided into 6 categories ranging from below 30.0 to 70+, with four ten-point intervals between the high and low scores.

Appendix C

WISC-R

The Wechsler Intelligence Scale for Children - Revised was developed by Wechsler (1974) as a means for assessing children through the ages of 6 and 16 years with respect to intelligence. Wechsler defined intelligence as a multifaceted construct reflecting an individual's general capacity to comprehend and cope in the world. Wechsler emphasized that there is a need in assessing general intelligence to avoid singling out any particular ability as too important. Rather, it is a global construct (p. 5). Furthermore, he acknowledged the role of non-intellective factors in intelligent behavior which may provide the drive, impetus and attitude in performing intelligent behavior. Examples of non-intellection would include impulse control, zest and awareness (p. 6). However, these are assumed as factors influencing or utilized in test performance and performance in the real world, and are not basic cognitive abilities.

The WISC-R consists of ten subtests and two optional subtests. The subtests are divided into verbal and performance scales. Intelligence scores are calculated for each scale as well as the full scale, a

combination of both verbal and performance scores. Each subtest is designed to tap different abilities or knowledge.

The WISC-R was standardized on 2200 normal children. That is, the sample included those not institutionalized or manifesting severe emotional disturbances. The sample was divided into 200 subjects for each of the 11 age groups. Subjects were selected from both urban and non-urban communities and careful consideration was given to stratification variables of the 1970 United States Census of Population. Suffice it to say that composition of the sample closely approximated census statistics for geographic region, race, occupation of household head, and area of residence.

Reliability was determined using split-half reliability tests usually for odd versus even items with the Spearman-Brown formula for correction. Verbal, Performance and Full Scale IQ reliability were determined using Guilford's formula for reliability of a composite group of tests. For the age group in the present study these were .91, .91 and .95, respectively.

Validity issues were examined in terms of the WISC-R relations with other measures of intelligence, as well as the relations among the various subtests of the WISC-R. The analyses with other measures of intelligence were based upon comparisons of scores for both a group of oldest and youngest subjects for the WISC-R in relation to scores of tests designed for adults (WAIS), and preschoolers and early school-age children (WPPSI), respectively. As well, a group of children in the upper primary school grades were tested on the Stanford-Binet. The results of these studies were all positive and significant.

Administration of the WISC-R is highly standardized, warranting experienced testers. This consideration was respected in the present study.

Appendix D

Linguistic Testing

Chomsky observed the necessity for employing "devious and clever ways" to assess language competence through performance factors (deVilliers and deVilliers, 1974). The major point of this comment was that speech production may be influenced by various non-grammatical or non-linguistic factors, for example, memory and random errors, thus rendering the speech corpus almost useless in determining the true grammars which children possess. Consequently, psycholinguists have adopted methods which enable them to probe beyond the limitations of a corpus of speech and explore children's language systems.

These methods are not without problems. Of particular interest to us here is determining the validity and reliability of the different assessment procedures. These issues have often been overlooked in discussions of the results of research, and, as such, have to be inferred from the degree to which the results confirm or disconfirm previous research.

Despite these drawbacks, the procedures we will describe have appeared to be effective in adding to our knowledge of children's language systems in the

acquisition of the English irregular past tense verbs. They were selected as they are designed to assess, in part, different aspects of the child's system of knowledge of these verbs.

Elicitation task using real terms. This task was adopted from Bybee and Slobin (1982). The elicitation task is a sentence completion task. The subject is first presented with the verb in its base form and then a sentence is read using the verb in its present tense form. Following this the child is asked to complete a sentence with the verb in its past form where the sentence begins with putting the action in the past. An example would be: Blow: When I get a balloon I blow it up. Yesterday, I...(p. 268).

Bybee and Slobin included 90 irregular verbs in their testing of third-graders ranging in age from 8;6 to 10;1 years. However, a similar, but shorter procedure was employed with preschoolers. This suggests that this task is appropriate for the age group we will study.

In the list given to the third-graders, no regular verbs were included. However, Bybee and Slobin observed other subjects treating some regular verbs as irregular, for example, no-change. Therefore, in the

present study we included regular verbs in the list of verbs given to our subjects. The verbs we employed were adopted from the lists given to both the preschoolers and third-graders in Bybee and Slobin. A total of 96 verbs were used representing the different categories, including 6 regular verbs as check questions against testing strategies.

Bybee and Slobin made no assessment of the reliability of their procedure. Furthermore, they noted that some of the responses might have been due to children's perseverating. This presents somewhat of a problem as, they added, it is not known how recent an item would need to be to cause children to perseverate. Consequently, the order of presentation of items was randomized.

Judgment task. In Kuczaj's (1978) original design the child was shown three puppets. He was then told that the puppets "like to talk silly and they sometimes might say something which is not correct" (p. 320). The aim was to have the child take part in deciding if anything any of the puppets said was incorrect or silly. To establish subjects' comprehension of the instructions a pretest was given consisting of at least four sentence pairs, with one grammatical, for example,

"I like to eat beans", and one ungrammatical, for example, " believe green eat daisy bear", sentence in each pair. Subjects were required to respond correctly to at least four pairs in succession to be included in the study.

During the testing, sentences were presented in pairs or triplets, each puppet speaking only one sentence. The only difference between sentences in each set was the form of the past tense verb. For example, one set consisted of the first puppet stating, "I gived the dog a bone." The second and third puppets, respectively, said "I gaved the dog a bone," and, "I gave the dog a bone." In the case of no-change verbs, only two alternatives were possible, for example, hit and hitted.

As we noted, Kuczaj examined children's patterns of overgeneralization using the suffix -ed. Subjects ranged in age from 3;4 to 9 years. He included 14 verb pairs or triplets. Regretfully, he did not note the average time for administering this task. Nor was any estimate of the reliability of this task examined. However, the order of the sentences and sets of answers were randomized.

Some evidence for the validity of this task may be observed when it is compared to other studies examining children's acquisition of these verbs. We have already noted in the review of the literature that the developmental pattern for the suffixation process gaining prominence over the schema t/d had been observed in Kuczaj's study as well as in studies using both real and nonsense terms on elicitation tasks. In addition, in a second experiment, using a slightly different approach, Kuczaj (1978) found similar results to his first study in the patterns of overgeneralization for the no-change verbs, as well as for base +ed and past +ed errors for the various age groups. Finally, the observed patterns of overgeneralization of the -ed suffix confirmed earlier observations of children's speech errors (Kuczaj, 1977). This suggests that this judgment task is a valid means for assessing the kinds of overgeneralizations children find acceptable for the irregular verbs.

Summarizing, the judgment task appears to be a valid means for examining the kinds of overgeneralizations in children's system of knowledge of the irregular past tense verbs. In the present

study we included most of the verb sets from Kuczaj's original design. However, as we were also interested in children's overgeneralizations of the various schemas for this group of verbs, we added to the list a set of verbs which we suspected may have elicited these other types of errors. The list of test questions is presented in Appendix E. Two regular verbs, listed as check questions, were introduced individually during the administration as checks against testing strategies.

Judgment task from adult's point of view. This task is a revision of Kuczaj's (1978) procedures in which children were asked to judge what their mothers would say when choosing between the correct versus incorrect forms. As we noted in the method section, this task was designed to assess children's metalinguistic awareness of these verbs.

The design we selected was similar to the first judgment task except at the start the child was told, "Sometimes these puppets liked to say something silly and they might say something incorrect. Which form would your mother say?" After the three forms were given by the puppets the examiner repeated the choices,

for example, drinked, drank, dranked, and the child was again asked which his or her mother would choose.

The verbs which were included on this task are the same as those for the regular judgment task.

Appendix E

Elicitation task

Here is what we are going to do now. First I will tell you a word I am interested in. Next I am going to read you a sentence with that word in it, and finally I am going to begin a sentence and ask you to finish it using the particular word I mentioned. For example, I'll say the word "walk". Then I'll read a sentence, "Every day after school I walk home." Next I'll start a sentence, "Yesterday, I ____" and you'll say "Yesterday I walked home from school." Let's try a few examples, okay?

Talk: Before going to sleep at night, I talk with my mother. Yesterday I _____. (If subject gets it right say 'good'.)

Watch: After dinner each night I watch a little TV. Yesterday I _____.

If subject says ...I didn't..., suggest, 'okay, let's say you did, yesterday, I _____'. If subject says, yesterday I did ____, suggest 'okay, now I just want you to use the word, so yesterday I _____.'

After examples, say 'good, now we'll do some more.'

(Regular verbs should be introduced intermittently throughout testing.)

Nonsense term task

Instructions are the same as for elicitation task, except the examples include at least two irregular verbs until the child gives two correct past forms without -ed ending (blow, come).

Elicitation task

blow: When I get a balloon, I always blow it up! Yesterday I...

begin: School always begins at 8:45. Yesterday it...

bend: I always bend my knees when I sit down. Yesterday I...

beat: Our team usually beats the Cardinals, but yesterday the Cardinals...

break: My little brother always breaks my toys. Yesterday he...

bind: We bind up our old newspapers. Last Saturday I...

bite: The dog sometimes bites the mailman. Yesterday the dog...

bleed: The mailman bleeds when the dog bites him. Yesterday he...

bring: I sometimes bring my lunch to school. Yesterday I...

build: I always build models on Saturday. Last Saturday I...

buy: I save up my money and buy candy. Yesterday I...

cast: When we go fishing, I cast with my rod and reel. Last time I...

catch: We usually catch lots of fish. Last time we...

cut: Sometimes I cut pictures out of magazines. Yesterday I...

deal: When we play cards, I sometimes deal. Yesterday I...

drink: I always drink milk at lunch. Yesterday I...

drive: My mother drives the car. On Sunday last week, she...

feed: I always feed my fish in the morning. This morning I...

feel: Today I really feel good. Yesterday I...

find: Sometimes I find coins on the street.. Yesterday, I...

fight: I know a dog that always fights with other dogs. Yesterday he...

fit: This shirt doesn't fit me anymore. Last year it...

forget: I sometimes forget my library book. This morning I...

get: I always get up at 7:30. But this morning I...

grow: I grow an inch a month. Last month I...

hide: I always hide from my friends. Yesterday I...

hit: In baseball, I always hit a homerun. Yesterday I...

hurt: When I fall down I hurt my knee. Yesterday I...

keep: I always keep a secret. Once, I...

kneel: Sometimes I kneel down to play marbles.. Yesterday I...

tear: Sometimes I tear my jeans. Last week I...

tell: Sometimes I tell my mother about school. Yesterday I....

think: Sometimes I think I don't know the spelling words. Last week I...

throw: Usually the pitcher throws the ball very well. But yesterday he...

wake: I always wake up at 7:30. Yesterday I...

wear: I always wear jeans to school. But yesterday I...

weave: I weave hotpads sometimes. Last week I...

weep: The little girl sits and weeps. Yesterday she...

wet: To clean up the counter I wet the sponge. Yesterday I...

win: I always win at tic tac to. But last night my mother...

write: At school I write. Yesterday I...

come: I come home from school at 3 o'clock. Last Wednesday I...

do: I always do my best. Yesterday I...

draw: I draw pictures of airplanes in art. Last week I...

eat: I always eat lunch with my friends. Yesterday I...

fall: I almost never fall down. But yesterday I....

fly: I sometimes fly on an airplane. Once, last year I...

give: I always give my brother some candy. Yesterday I...

go: I always go to the drug store on Saturday. Last Saturday I...

hang: I sometimes hang posters on my wall. Last week I...

have: I always have ice cream after dinner. Last night I...

hold: I hold onto my balloon. Last time I had a balloon, I...

hear: I always hear the bell. Yesterday I was the only one who...

lose: Sometimes I lose my sweater. Yesterday I...

make: I always make my brother do what I say. Yesterday I....

run: I always run home after school. Yesterday I...

say: I always say good morning to my teacher. Yesterday He...

see: I always see Mr. Harris at school. This morning, first thing, I...

shoot: When I play army, I always shoot the enemy. Yesterday I...

stand: I always stand in line at lunch. Yesterday I...

know: In reading, I usually know the answer. Yesterday, I...

leave: I always leave school at 2 o'clock. But yesterday I...

lend: Sometimes I lend my toys to my friends. Yesterday I...

let: I always let the cat out in the morning. This morning I...

meet: I usually meet my friend before school. Yesterday I...

put: I always put my toys and clothes away at night. Last night I....

read: I usually read some on the weekend. Last weekend I...

ride: I usually ride in the backseat of the car. But yesterday I...

ring: The bell rings at 10 till 2. Yesterday it...

sell: I never sell any of my things. Except once I...

send: I sometimes send a letter to my grandmother. Last week she...

set: My mother usually sets the table. Only last night I...

shake: If you shake a coke, it will fizz and spew. Yesterday I...

shrink: Every time I wash this shirt it shrinks. Last time I washed it, it...

shut: I always shut the door when I go out. Yesterday I...

sit: I always sit at the front of the class. Last year I...

sleep: On Saturdays, I sleep late. Last Saturday, I...

slide: I always slide down the slide. Yesterday, I...

speak: I always speak to the teacher when I go into the classroom. Yesterday, I...

spit: My cats sometimes spits at me. Yesterday she...

spread: When I make a peanut butter sandwich, I spread peanut butter. Yesterday, I...

stick: When I sew, I stick the needle into the cloth. Yesterday I missed the cloth, and I...

sting: Sometimes a bee stings me. Last Sunday, a bee...

stride: The man strides across the field. Yesterday he...

string: The woman usually strings beads. Yesterday she...

swear: I never swear. Except once, last week, I...

sweep: I sometimes sweep the driveway. Last Saturday I...

swim: I always swim on Wednesdays. Last summer I...

take: I never take a nap anymore. Except once, last week, I was tired, and I...

teach: My father teaches me how to play baseball. Last Saturday he...

Check questions

climb: When I want to go up to my bedroom, I climb the stairs. Yesterday, I____

pat: When I am with a really nice dog, I always pat him on the head. Yesterday, I____

smile: When I am with someone I like a lot, I smile at them. Yesterday, I_____

melt: If ice cubes are left on the kitchen counter, they melt. Yesterday, they_____

smoke: John smokes. Yesterday, he_____

Nonsense terms (Puppet was changed at * questions)

1. (with puppet clapping hands behind head)

Rick: This (name puppet) knows how to rick/rik. He is ricking. Yesterday he did the same thing. Yesterday he____

2. (alternating left and right taps across waist)

Mot: This ___knows how to mot. He is motting. Yesterday he did the same thing. Yesterday he__

3. (moving left hand behind head to waist and head again, etc.)

   Gling: This____knows how to gling. He is glinging. Yesterday he did the same thing. Yesterday he____

4. (tapping pencil in 2 hands against paper on table)

   Bing: This ____knows how to bing. He is binging. Yesterday he did the same thing. Yesterday he___

5. (throwing plastic cup and picking it up to throw again)

   Bod/bad: This ____knows how to bod. He is bodding. Yesterday he did the same thing. Yesterday he____

6. (flipping paper on a pad)

   Spow: This____knows how to spow. He is spowing. Yesterday he did the same thing. Yesterday he__

7. (with pencil, pushing paper pad on table)

   Dit: This____knows how to dit. He is ditting. Yesterday he did the same thing. Yesterday he___

8. (with hands on neck turning head side to side)

   Glim: This____knows how to glim. He is glimming. Yesterday he did the same thing. Yesterday he__

9. (spreading hands in and out on table)

   Teep: This____knows how to teep. He is teeping. Yesterday he did the same thing. Yesterday he___

10. (turning over on back to front to back, etc.)

    Leem: This____knows how to leem. He is leeming. Yesterday he did the same thing. Yesterday he___

11. (from hand to hand)

    Brink: This____knows how to brink. He is brinking. Yesterday he did the same thing. Yesterday he____

12. (sit ups)

    Bide: This____knows how to bide. He is biding. Yesterday he did the same thing. Yesterday he__

13. (crossing hands and swaying)

    Speel: This____knows how to speel. He is speeling. Yesterday he did the same thing. Yesterday he____

14. (scrunching up head and hands)

Reeve: This____knows how to reeve. He is reeving. Yesterday he did the same thing. Yesterday he____

15. (clapping hands)

Nake: This____knows how to nake. He is naking. Yesterday he did the same thing. Yesterday he__

16. (lying on back and knocking head)

Mide: This____knows how to mide. He is miding. Yesterday he did the same thing. Yesterday he__

17. (creeping along table)

Brow (Bro): This____knows how to brow. He is browing. Yesterday he did the same thing. Yesterday he___

Judgment task - instructions

"Here we have a number of puppets and one doll. Sometimes the puppets like to talk silly and they might sometimes say something which is not correct. I want you to help me decide if any of these puppets say something silly or not correct."

(Examples) I like to eat beans.
Believe green eat daisy bear.
Cat the chased by was boy.
The dog barks when the bell rings.
Water she sign motor jump.
We drove to the lake yesterday.
We are having weiners tonight for dinner.
Cold he car down slow.

If subject gets the above correct, the examiner then says, "Now, she (the doll) will say a sentence which is correct, and each puppet will then speak. You tell me if what each puppet says is silly or not correct. Okay?"

Judgment task (from adult's point of view)

The instructions are the same except that the subject is told "I want you to decide which puppet is saying something the way your mother (father) or I would say

it. Let's try an example." Examples are then given in pairs. After the examples, the subject is told that the doll will say something which is correct. Then each puppet will say something, and you decide which puppet is saying something that your mother (father) or I would say. (The examiner goes through all the responses for each present-base, then repeats the key word pointing to the appropriate puppet and asks, "which one would your mother (father) or I say?"

Judgment Tasks

1. I am going to hit this ball.

   I already hit the ball.

   hitted

2. Later on, I will catch the ball.

   I already catched the ball.

   catch

   caughted

   caught

3. I never break a promise.

   Well, yesterday, I broked a promise.

   broke

   breaked

4. Now I will melt the butter.

   I already melt the butter.

   melted

5. I will spend my money on groceries.

   Well, last week I spent my money.

   spend

   spended

6. I will feel the bump on his head now.

   I already feeled it.

   felted

   felt

7. I am going to drink my milk.

I already dranked mine.

drinked

drank

drunk

8. I will eat lunch later.

I already eated it.

ate

ated

9. I will throw the paper away.

I already threwed it away.

threw

throwed

10. I will think about it later.

I already thunk about it.

thought

thinked

11. I will fight with my brother about this.

Well, yesterday, I fighted with him.

fight

fought

12. I will build a sandcastle today.

I already build one.

builded

built

13. I will beat him in getting home first from school.

I already bet him.

beat

beated

14. I will fall off this bicycle easily.

I already ~~falled~~ off.

fell

felled

15. My sweater will shrink in hot water.

Mine already shrank.

shrinked

shrunk

16. I will write the letter now.

I already writed one.

write

wrote

17. I will take my toys to my room.

I already took mine.

tooked

taked

18. I will cut the meat first.

I already cutted it.

cut

19. I will sleep at Jane's house tonight.

I already slepted there.

slept

sleeped

20. I will hurt myself if I ride the bike too fast.

I already hurted myself.

hurt

21. I will bring my report back to school today.

I already brought mine back.

bringed

brang

22. It's my turn to leap over the barrels.

I already lept over them.

leaped (leapt)

23. I don't remember where I put my books.

I putted mine in my room.

put

24. I will ring the school bell today.

I ringed it before.

rung

rang

25. I will pat the neighbor's dog when I visit today.

When I was there I patted him.

pat

26. This water will seep into my shoes.

It already seeped into mine.

sept

27. I will send these Christmas cards to my friends.

I already sent mine.

sended

send

28. I will shake the table cloth out later.

I already shaked it.

shuck

shook

29. He will come in when he finishes.

He already came in.

comed

camed

Check Questions

a. I am going to climb the stairs to the attic.

Last night I climb the stairs.

climbed

clumb

b. I am going to wash my hair.

Last night I washed my hair.

wash

Appendix F

Metalinguistic Awareness

The development of this battery of 11 short subtests was part of an experiment designed to examine the trend in development of discrete aspects of metalinguistic awareness (Saywitz & Wilkinson, 1982). Thirty subjects were tested ranging in age from 2;5 to 8;10. The relation between metalinguistic awareness and intelligence, as well as general language development was also examined.

Standardized T scores (M = 50, sd = 10) were computed for each subtest. A mean total T score was calculated for 10 of the subtests. (One subtest was deleted from the analyses as it was not a reliable measure.) Reliability based on Kuder and Richardson (1937) estimates was significant at $p < .01$ level. As well, the subtests were divided into five scales according to the area of metalinguistic skill examined. Heterogeneity of the five subscales was determined using repeated-measures analysis of variance.

Intelligence was assessed using the Peabody Picture Vocabulary Test. General language development was examined using the Receptive subtest of the Northwestern Syntax Screening test. After controlling

for the effects of age, the correlation between metalinguistic awareness and general language development was .53 ($p < .01$). Therefore, Saywitz and Wilkinson suggested that the two assessments measured different but related aspects of language development.

The relation between age and metalinguistic awareness, as measured by each subtest, was highly significant. This relation remained significant for each of the five subscales. This suggests that metalinguistic awareness develops gradually with children only reaching full awareness by age 8;10 on some subtests. When considered in relation to the previously observed relation with general language development, it is indicated that this battery will serve as a good means for assessing individual differences in children's general rate of acquiring language.

Appendix G

Metalinguistic Awareness

1. Recognition and correction of illogicality

"We are going to play a game with two puppets. Now you choose one. (Subject selects a puppet then experimenter selects one.) This puppet (experimenter's) often says things all the wrong way round, and what you have to do is help it to talk properly. So first you have to decide whether what he says is right or wrong. Then, if he is wrong, tell him how to fix it up or the right way to say it. Okay?"

"Let's try an example." (Sunny days are dark)

1. When it rains, the ground gets dry.
2. Mud makes me clean.
3. Drink the chair.
4. Brush your milk.
5. I ate dinner, now you eat them.
6. Golf plays my brother.
7. Lights make a room dark.
8. Bring the ball.
9. I am eating dinner.
10. George frightens the color green.

2. Recognition and correction of word order

Instructions same as for test number 1. (Sample: Cake the eat.)

1. Pat the dog.
2. Up it fix.
3. Door the shut.
4. Box the open..
5. Find the cup.
6. Bed the make.
7. Juice your drink.
8. Ball the throw.
9. Set the table.
10. Down it put.

3. Recognition and correction of morpheme omission

Instructions are same as for test number 1. (Sample: The phone is ring.)

1. The big dog is eat.
2. Two and two four.
3. Boy is at the door.
4. I am eat dinner.
5. I threw ball hard.
6. The girl reading upstairs.
7. Set table.
8. We are read books.
9. The lady's dog eating.
10. Little boy is washing.

4. Lexical Segmentation

"This is a talking and tapping game. (Show the subject eight pennies in a horizontal line.) Here is how we do it. (Point to one penny after each word.) 'Elephants live in the zoo.' Now you try and I'll help you."

a. I like to read books.

b. We don't go to school on Sundays.

c. I play in the yard on sunny days.

(If subject divides one word into two, ask if word is one or two words and repeat example until correct.)

"Now I'll say a sentence and first you'll repeat it. Then you'll say the sentence again, tapping one penny for each word."

1. The book is in the desk.
2. You have to go home.
3. The dog wanted to eat.
4. Is snow cold?
5. Bill is drinking soda.
6. The houses were built by men.
7. The dog wanted bones.
8. Is bill drinking milk?
9. Cats can jump on tables.
10. Flowers grow in the yard.

5. Syllable segmentation

Instructions same as for test number 4. (Sample word is "banana".)

"Now you try and I'll help."

a. radio

b. apples

c. basketball

"Now I'll say a word and first you'll repeat it. Then you'll say it again pointing to one penny for each segment.

1. Brother (2)
2. Oranges (3)
3. Computer (3)
4. Television (4)
5. Table (2)
6. Dictionary (4)
7. Elementary (5)
8. Encyclopedia (6)
9. Refrigerator (5)
10. Revolutionary (6)

6. Phoneme segmentation

"In this game you're to say what word would be left if you take off the first sound in the word. For example, 'part', the first sound is 'puh' and the rest is 'art'. So if I take away the 'p' I have the word 'art'. Now let's first try a few."

a. fair

b. chart

c. sweep

d. spy

(If subject says "eep", help sound out. If cannot surmise "weep" go over each sound - s,w,eep and show child that "weep" is what is left. Proceed the same way for spy if subject has trouble.)

"Okay, now try these."

1. Jam
2. Frock
3. Nice
4. Stop
5. Spin
6. Cold
7. Near
8. Pate
9. Bring
10. Hill
11. Dit
12. Taid
13. Proom
14. Skeep
15. Mowl
16. Brode
17. Kydle
18. Slehm
19. Gling
20. Swug

7. Non-physical nature of words.

"I am going to ask you some questions and you are to tell me if the answer is 'yes' or 'no' or you don't know. Okay?"

1. Is the word 'nickel' worth 5 pennies?
2. Is the word 'book' made out of paper?
3. Does the word 'bird' have feathers?
4. Can you buy bubble gum with the word 'twenty-five cents'?

Appendix B

The Children's Embedded Figures Test

The Children's Embedded Figures Test (CEFT), developed by Witkin, Oltman, Raskin and Karp (1971) was derived from the Embedded Figures Test (EFT). Both tests were designed to require a subject to separate a figure obscured in a larger field. These tests were designed to test psychological differentiation and have been found to correlate well with other measures of differentiation (see, for example, Swyter and Michael, 1982).

The CEFT contains two solid figure forms, a tent and house, 25 test cards, 11 for the tent and 14 for the house, 4 practice cards for each figure and 3 preliminary test cards, for the age group tested in this study. The task is divided into sections. In the first part the child is shown the figure of a tent and required to find the picture of the figure hidden in the designs. The second is the same as the first, only concerning the figure of the house. No time limit is given for each card.

The CEFT was standardized on a group of 160 children ranging in age from 5 to 12 years, from the New York City public schools. Forty children were in

each age group, 5 to 6, 7 to 8, 9 to 10, and 11 to 12 years, with an equal number of males and females in each group. Analysis of variance indicated no significant effect due to sex. The mean score for subjects of a similar age to those tested in the present study was 10.6 for the total group, with a standard deviation of 5.6. For males and females respectively, the means were 11.4 and 9.8, with standard deviations of 6.2 and 4.8, respectively.

Reliability was determined using Spearman Brown split half odd even formula. The internal consistency reliability coefficients were .87 for the total group, .90 for males and .83 for females.

Validity was assessed for the age groups from the entire sample for which both the CEFT and EFT were appropriate measures of differentiation. For 9 to 10 year olds the correlation coefficients were .71 for the entire group, .73 for males and .71 for females. For the 11 to 12 year old group the coefficients were .85 for the entire sample, .86 for males, and .83 for females. Validity estimates for younger subjects were attempted by examining the correlations between CEFT performance and performance on other tasks purported to assess psychological differentiation. For boys,

significant correlations were found between CEFT and articulation-of-body-concept scores (r = .40) (Corah, 1965, in Witkin et al., 1971). However, no significant correlation was observed for girls (r = .02).

Nevertheless, the CEFT has been found to correlate with other tasks purported to measure differentiation, including the WISC Block Design, and has been used frequently in research on psychological differentiation in children. However, Witkin cautioned against a strong relation between socioeconomic status and CEFT performance. The point here is that lower economic groups have been found to score lower than the standardization group of the same age. In the present study, this was not considered a problem since the sample was selected from the middle and upper-middle class ranges for socioeconomic status.

Appendix I

Divergent Thinking

Alternative uses and instances: These tasks were designed by Wallach and Kogan (1966) as part of a battery of tasks measuring divergent thinking. The battery was developed on the premise that there is a mode of thinking which can be labeled creativity and which may be independent from intelligence. The failure of earlier researchers to isolate these aspects of cognition led Wallach and Kogan to propose that the cognitive behavior of creativity might best be revealed in the production of associations which are abundant as well as unique. The results of research using this battery have been fairly consistent in finding a separation between divergent thinking and intelligence (Kogan, 1984). Moreover, Kogan observes that little doubt remains of the separation between divergent and convergent thinking when the method of administering these tests under gamelike conditions is maintained.

The Wallach and Kogan battery was standardized on 151 white fifth grade children with an average age of 10;7.6 years and standard deviation of 5.42 months. The sample included 70 boys and 81 girls coming primarily from Protestant families with professional

and managerial backgrounds. Six percent were from upper blue collar families. The original battery consists of 5 subtests: 3 verbal and 2 pictorial. In administering each task precaution was taken to establish the gamelike nature of the task and the subjects were given as much time as desired to answer each question, for example, name all of the round things you can think of. Scoring was based upon the total number of responses for each task and the number of unique responses for each task where a unique response is given only once taking into consideration the response of the entire sample group.

Reliability was determined in two ways. A split-half reliability coefficient was calculated for each measure. On the 'alternative uses' and 'instances' tasks, coefficients for the total number of responses equaled .93 and .75, respectively. For the uniqueness score they were .87 and .51. An additional item analysis for each task was conducted to assess the contribution of each item to the total score. The reliability coefficients for each item on these two tasks were high.

Since its development, a great deal of research has been conducted with this battery across a range of

populations varying in age and economic status. Of significance are studies concerning the validity, scoring and interrelations among the subtests of this battery. Briefly, factor analytic studies (e.g., McKinney and Forman, 1977) indicate two main factors: verbal and figural. The verbal is identified by performance on the 'alternative uses' and 'instances' tasks, while the figural factor is defined by performance on 'pattern' and 'line' meanings tasks, and secondarily by the 'similarities' subtest. McKinney and Forman suggest that the verbal factor reflects the use of association processes in divergent thinking, while the figural factor represents conceptual organization.

In addition, a number of studies point to the differential association of these subtests to other variables, confirming factor analytic results (Kogan, 1984).

Efforts to assess the validity of this battery have been relatively successful in terms of construct and concurrent validity (Kogan, 1984). However, Kogan observes the ability to predict later accomplishments from performance on these measures is, at best, equivocal. Recently, however, it has been suggested

that the type of scoring methods employed may reveal the predictive validity of these tasks.

As indicated, Wallach and Kogan derived two different scores for subjects on each task. The total number of responses was believed to reflect 'ideational fluency' or the flow of associations. The uniqueness dimension was taken literally. Since the battery's development two other scoring categories have been introduced. They include spontaneous flexibility, indicating the number of different categories of response, and a quality measure, where judges assess the quality of the different responses. Kogan has observed the negative and positive side to these methods of scoring. Of significance is the research by Harrington, Block, and Block (1983) which indicates a significant correlation between quality of response in early childhood and teacher ratings of creativity in preadolescence. Therefore, it is indicated that quality of response may help in establishing the predictive validity of these tasks.

Finally, it is worth noting that research on the relation between task performance and other variables has frequently revealed sex-patterning differences (Kogan, 1984). Such results are difficult to interpret

and may have strong implications for the social influences on behavior (see Kogan, 1984).

In summary, the Wallach and Kogan test battery is a fairly valid and reliable measure of divergent thinking. In the present study modified versions of the 'alternative uses' and 'instances' subtests were employed as an extension to earlier research examining the relation between divergent thinking and overgeneralization patterns, discussed in the review of the literature. The correlations between uniqueness and fluency scores frequently noted in the literature (see Kogan, 1984), however, suggested a fluency score was sufficient in assessing divergent thinking.