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Developmental Change in Children's Understanding of Figurative Language: A Neo-structural Analysis

by

Jeffrey C. Mah

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DEPARTMENT OF EDUCATIONAL PSYCHOLOGY

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The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies for acceptance, a thesis entitled "Developmental Change in Children's Understanding of Figurative Language: A Neo-structural Analysis" submitted by Jeffrey C. Mah in partial fulfillment of the requirements for the degree of Master of Science.

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ABSTRACT

This exploratory study investigated cognitive developmental changes in children's understanding of figurative language. Subjects aged 6-, 8-, and 12-years-old were administered two figurative language tasks, namely, metaphor and riddle interpretation. Statistical analysis of the scores assigned to the task protocols demonstrated a developmental progression between the 3 age groups in (a) their capacity to interpret metaphor, (b) the level of reasoning used to interpret metaphor, and (c) their capacity to explain riddles. Moreover, performance on the two tasks was highly correlated. A neo-structural theoretical framework, which proposes that both domain-specific and domain-general factors contribute to developmental change, was used to interpret the developmental progressions. It is argued that the two tasks share a common set of cognitive operations that involve the differentiation and coordination of alternate encodings of the text and the context that is implied by each.

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Chapter I

INTRODUCTION

Statement of the Problem

Research into language development has presented investigators with an exceptionally complex question. Furthermore, researchers are faced with the issue of treating language as separate from cognition or as intimately linked to it. Attempts to describe what and how language develops has been driven by a variety of theoretical perspectives; for example, Bates (1979) viewed language as a system of meaning driven symbolic representations; Chomsky (1957) proposed that competence with language stems from innate or pre-programmed rule acquisition; and MacWhinney (1987) provided a functionalist account of the structural features of the lexicon and grammar. In addition, many aspects of the language itself have been investigated; for example, deVilliers & deVilliers (1979) described children's first words, sounds and meanings; Kuczaj (1983) observed children's crib speech and language play; Nelson (1985) investigated the acquisition of shared meaning; and Clark and Clark (1977) have discussed a variety of the phonetic, syntactic and semantic dimensions of language. The phonology, grammar, syntax, semantic, and pragmatic aspects represent a number of broad approaches that have dominated the study of language. Although these studies have provided a great deal of insight into the field, approaches have often been in isolation from

each other and at times, in opposition.

With this wealth of descriptive research in hand, it seems a natural progression that researchers have shifted their attention away from the purely linguistic aspects of language development to questions as to what these aspects contribute to the development of meanings; that is, to the relationship between what is said and what is meant. Furthermore, it is often the case that the meanings arrived at by children are different than those derived by adults. Olson (1986) has shown empirically that there is a basic distinction between what is observed in text and language, and what must be inferred or interpreted to arrive at meaning.

This distinction between what is said literally and what must be inferred or interpreted, is apparent in figurative uses of linguistic structures, specifically, in metaphorical statements and riddles. The work of Winner, Engel and Gardner (1980), Winner, Rosenstiel and Gardner (1976), Vosniadou and Ortony (1986), and Vosniadou, Ortony, Reynolds and Wilson (1984) considered together has shown that children's understanding of metaphor follows a developmental progression as to the level of sophistication at which they are interpreted. Similarly, Fowles and Glanz (1977) and Shultz and Horibe (1974) have reported a developmental progression in the child's interpretation of riddles. Like much of the research in language development that acknowledges the interaction between the cognitive and linguistic systems, both

of these groups of researchers eluded to children's cognitive development as a possible explanation for the findings. Despite the theoretical links, there seems to be few efforts directed at investigating this interaction.

Gardner (1983, 1993) proposed a theory that perhaps brings cognition and language closer together. His theory of multiple intelligences allows for a variety of kinds or domains of intelligence. Included among them is a linguistic intelligence, exemplified best by the poet. The poet must exhibit a sensitivity to the interaction of semantics, phonology, and syntax so that he/she may communicate an intended emotion or idea. An understanding of the individual elements is not sufficient but rather, only through an integrated consideration of the linguistic elements does the poet achieve the intended ends. While Gardner contributes the notion of a linguistic intelligence, he does not elaborate on the processes or means that might contribute to the development of such intelligence.

Case's (1985, 1992) theory offers a framework whereby this development can be explored. He proposed that children's knowledge is actively constructed through the consolidation and coordination of qualitatively different knowledge representations (or schemes), resulting in more complex forms of thought. Children's progression in the developmental sequence is constrained by changes in working memory capacity which stem from maturational factors and practice. The

construction of knowledge within similar task domains may result in an internal network of related conceptual representations. Such internal networks of concepts and conceptual relations, which play a central role in permitting children to think about a wide range of situations at a new level, are referred to as central conceptual structures. Case (1992) has cited empirical evidence for this stage-like construction of knowledge related to processing capacity and the presence of central conceptual structures in the domains of logico-mathematical, social, and spatial thought.

Purpose of the Study

The purpose of this study is to explore evidence for a central conceptual language structure. Using the linguistic tasks of metaphor and riddle interpretation, this research is intended to investigate whether there is a developmental progression in the tasks that follow those predicted by Case (1985, 1992) and whether there is an underlying developmental parallel between the two tasks. This study attempted to expand on the research that links mechanisms underlying development with linguistic research in an effort to understand how children derive meaning from language and how these meanings change with age. As such, it represents a first attempt at identifying a central linguistic knowledge structure, within Case's (1985, 1992) general theoretical model of cognitive development.

This chapter is followed by a discussion of the

scientific and theoretical literature that lead to this study's hypotheses. Chapter III details the methodology used in the study, followed by a report of the statistical analyses of the data in Chapter IV. The concluding chapter discusses the findings on a hypothesis-by-hypothesis basis and attempts to account for them within a neo-structural framework.

Chapter II

LITERATURE REVIEW

An exceptional amount of research has been directed toward or related to the study of language and its development. This interest in the domain reflects the important impact and pervasiveness language holds in human culture. As such, the study of language development has been approached from a multiplicity of perspectives on a continuum of levels. The purpose behind using a language is communication, whether it be with other individuals (i.e., socially-situated) or with oneself (i.e., internally-situated). At it's most basic level, language is a tool that enables us to express complex ideas and thoughts, and at the same time, understand those ideas communicated to us. Research into language development then, might be thought of as an examination of that which the multiple dimensions of language contribute to an individual's ability to convey and derive meaning.

This chapter highlights the relevant theoretical and empirical contributions which have shaped the direction of the current research. Particular emphasis will be given to the development of meaning, (specifically, as it is constructed through grammar and semantics), its distinction from figurative language uses (as expressed in the domains of metaphor and riddle interpretation), the relationship between language and cognitive development, and a cognitive-

developmental theory which may provide a framework for understanding how children arrive at meaning.

MEANING DEVELOPMENT

The development of meaning extends beyond a simple one-to-one mapping of linguistic elements to definitional terms. Broadly speaking, not only must the contribution of individual linguistic aspects to meaning be understood, but additionally, attention must be given to how they interact with each other to create it. Meaning development minimally involves many explicitly expressed elements (e.g., grammar) and implicit culturally determined ones (e.g., semantics, pragmatics).

Investigations Into Grammar

The grammatical aspects of language play an important role in the development of meaning, in that changes in linguistic form may result in different meanings or interpretations. That is, on many levels, differences in morphology, phonology, or syntax communicate different things. Grammars involve the lexicon (words), phonology (sounds), and syntax and how they are structurally combined in communication. Within grammar-based approaches to language meaning, listeners are assumed to use the surface features of a sentence or word in coming to its interpretation.

Researchers in this tradition conducted their analyses by reducing the language into its component parts in hopes of discovering patterns, rules and regularities in the way the elements were combined. From these patterns, an

interpretation could be constructed as a result of the relationships between the elements.

We know a great deal about what and when grammatical aspects emerge. For example, deVilliers and deVilliers (1979) described children's phonemic acquisition, deVilliers and deVilliers (1973) and Brown (1973) described the acquisition of a number of grammatical morphemes, deVilliers and deVilliers (1978) investigated children's first words and primitive syntax used to produce two-word utterances, and the rules of syntax which children use has undergone study (e.g., Bever, 1970; Kimball, 1973). By the age of about 5 or 6, the child will have acquired some 13,000 words and the grammatical rules of the language are more or less present, despite any explicit teaching, and exposure to imperfect models and often erroneous speech (deVilliers & deVilliers, 1979).

Although there is no agreed upon theory of grammar development that can account for the mass of observations, several have been formulated. Noteworthy among these, is the work of Chomsky (1957), and Fodor and Crain (1987). Chomsky (1957) proposed that children are innately equipped with some a priori knowledge about the grammatical nature of language, certain universal principles that are needed for all languages. He argued that without the knowledge of universal grammar, children might not learn the grammar of a language until sometime in adolescence. More recently, in an attempt to address the gap between the data and theories of

grammatical development, Fodor and Crain (1987) proposed a theory resting on the assumption that children formulate simpler, more general mental rules compared to their explicitly stated formal equivalents, thereby facilitating grammatical acquisition.

Theories of grammar contribute to our understanding of how meaning emerges and develops from linguistic form. Meaning from grammar plays a major role in language, and advances in developmental accounts of grammar will likely contribute to further understanding in the development of meaning. Additional to the grammatical approaches to meaning, other aspects of language have a potential contribution to a more complete account of meaning development, namely, semantics.

Investigations Into Semantics

Semantics refers to the study of word meanings and how they fit into the processes of comprehension and production. The problem for researchers is to try to determine what makes up children's word meanings and how these meanings develop. Arguably, an investigation into the meaning that is associated with children's first words is very much a question of their knowledge of the world; that is, the representation of their experiences. Much debate has surrounded whether early word meanings contained chiefly functional information (Nelson, 1974) or perceptual attributes (Clark, 1973), and it is unclear whether these early meanings are based on a set of

definable entities, or on the images that it evokes (Paivio, 1971). Other researchers have directed their efforts toward describing the organization of these word meanings or concepts in the mind. For example, Rosch (1975) argued that concepts consist of prototypes; componential approaches emphasized the elements which make up a concept (e.g., Katz, 1972); and in procedural approaches, word meanings are categorized as objects, events, or states based on sequences of procedures or decision rules (e.g., Winograd, 1972). These perspectives points to the close relationship that semantics and cognition share.

Phenomena such as overextensions and underextensions of words reveals that children's terms of reference are not necessarily consistent with those of an adult. Furthermore, it is likely that the term may belong to the context as a whole in which it commonly occurs, as much as the referent itself (Bates, 1979). Word meanings are unlikely to be complete at the initial time they are learned but rather, probably undergo change and refinement as they develop.

In attempts to construct some meaning or arrive at a meaning consistent with an adult's, the overly wide or narrow application of a term might be considered a discovery strategy which allows children to refine a term's usage (deVilliers & deVilliers, 1979); similarly, using terms in different contexts may allow children to determine contexts where a term might be applied (Bates, 1979). Children have often been

observed playing with the language (e.g., Kuczaj, 1983) in manners which imply that the child is experimenting with the structure and meaning in attempts to refine its use. The move toward appropriate meaning is further assisted by corrective feedback which is often based on meaning rather that grammar (deVilliers & deVilliers, 1979).

Clearly, children's semantic development is not an entirely linguistic issue, but has very much to do with conceptual development. The word meanings children have provides some insight into their conceptual representations and the degree to which they are elaborated. Furthermore, the ways in which children go about constructing meanings and refining them may assist us in speculating about the cognitive processes involved.

I have presented to this point what can be considered two of the major veins in language development research and how meaning is impacted by the respective views. Although meaning can be communicated in a number of other ways, for example, through nonverbal gesturing and intonation, and impacted by other factors such as pragmatics, I have chosen to discuss grammar-based and semantic research because of their emphasis on linguistic components. Unfortunately, the two domains have been researched in a seemingly isolated way apart from each other. The key to revealing how meaning develops perhaps lies in finding a synthesis between grammar (form) and semantics (word meanings).

FIGURATIVE MEANING

Research in the area of figurative meaning may provide the link between grammar and semantics. When figurative language is used, the task for a listener or reader is to reconstruct the meaning or interpretation from that which is said. Olson (1986) has shown empirically that what is said does not always correspond to that which is meant. Restated, a number of literal or figurative meanings might be interpreted from the same linguistic form. Olson (1986) reported that younger children have difficulty distinguishing between what is said and meant until around the age of 8 years when it becomes more prevalent, and at the age of 10 years when it is firmly in place; with children younger than 10 years, it is reasonable then to expect that interpretive errors will occur in tasks where this distinction is necessary. Traditionally, language development researchers have focused on the literal meaning that language conveys. However, the ability to understand the non-literal meanings of language is a crucial component of normal language comprehension. Non-literal or figurative language frequently occurs in our conversations and texts. Two figurative uses of language, where what is said and meant are intentionally discrepant, is metaphor and riddles.

Metaphor

Metaphor refers to a figure of speech that illuminates one dimension of a particular object by drawing attention to

its similarity to an object from another realm of experience that is normally viewed as dissimilar. Metaphors can be analyzed into three parts: the topic or what the metaphor is about, the vehicle or term used to comment figuratively, and the ground or similarity between topic and vehicle. The topic and vehicle must be essentially dissimilar; that is, they must belong to different conventional categories. For example, in the metaphor, The skyscraper was a giraffe, the topic is "the skyscraper" and the vehicle is "giraffe". The ground linking them might consist of the feature of height, both being tall.

Some disagreement exists as to when children develop metaphoric competence, and by extension, the ability to interpret or understand non-literal language. Early studies in non-literal language tended to show that children younger than 9- or 10-years-old interpret figurative language literally (Demorest, Silberstein, Gardner, & Winner, 1983; Winner, et al., 1976). The results of these studies allowed the conclusion that children's language acquisition is a process of first learning the literal meaning of words and then moving on to non-literal language (Rumelhart, 1979), a position known as the literal stage hypothesis.

Other researchers believe that the processes underlying the understanding of metaphorical uses of language are fundamentally the same as those involved in the comprehension of literal language (Vosniadou et al., 1984). Vosniadou et al. (1984) showed that there are some circumstances under

which even 4-year-old children appear able to understand metaphorical uses of language. The disagreement among research findings is due perhaps in large part to three factors which are related to the metaphors themselves or the task demands (Vosniadou et al., 1984): the degree of context preceding the metaphors, the response mode, and the type of metaphors used.

Vosniadou et al. (1984) criticised some of the previous research efforts as ecologically invalid since metaphorical utterances were often presented to children in the absence of any reasonable context, a condition that can often lead to comprehension difficulties. Their own work indicated that children can and do draw inferences from the information provided by the linguistic and situational context in which the metaphor occurs. They concluded that in order to provide an adequate test of metaphor comprehension, appropriate contextual information must be included.

The second factor which has been hypothesized to influence the findings on metaphoric competence is the mode of response which is used to measure children's comprehension. Metaphor comprehension is frequently measured in terms of the quality of a paraphrase or explanation (e.g., Winner et al., 1976). Paraphrase and explanation are considered to be poor measures of comprehension because of the linguistic and metacognitive demands that they impose in excess of the ability to comprehend alone (Vosniadou & Ortony, 1986).

Children were found to demonstrate a greater understanding of metaphoric language in multiple choice selection and enactment tasks than in explanation tasks, presumably because the former impose fewer linguistic and metacognitive demands than the latter (Vosniadou & Ortony, 1986; Winner et al., 1980).

Paraphrase and explanation responses theoretically require more sophisticated linguistic and cognitive abilities to state the grounds of a metaphor than does multiple-choice selection which requires only the recognition of it. Similarly, multiple-choice selection require more sophisticated linguistic and cognitive abilities than does the enactment of an interpretation using toys since the latter involves only receptive language abilities and does not entail additional processing and comparisons between possible interpretations. Thus, inadequate paraphrases and explanations cannot be taken as evidence of comprehension failure (Vosniadou et al., 1984) but may be due to linguistic or cognitive limitations. However, it is reasonable then that appropriate paraphrases or explanations suggests the presence of sufficiently well-developed linguistic and cognitive faculties which allow the child to provide such a response. This work indicated that the ability to enact a metaphorical interpretation emerges first, followed by the ability to make a correct multiple-choice selection and finally, the ability to explain the rationale behind a metaphor.

The third condition which appears to affect children's

understanding of metaphor has to do with the kind of conceptual domains which are being compared. Metaphors have been broadly divided according to whether the ground or similarity between the topic and vehicle is based on physical/perceptual domains or psychological/personality domains (e.g., Dent, 1986; Winner et al., 1976). For example, The giraffe is a skyscraper would be considered a physically-based metaphor because of the physical resemblance of height forming the ground between the terms, whereas, She was a sunny person would be considered a psychologically-based metaphor because of the personality trait of being pleasant or nice forming the ground between the terms.

Winner et al. (1976) demonstrated that the capacity to correctly interpret psychological metaphors using explanations or multiple-choice selections does not emerge until age 10 or 11. This conclusion that younger children find physically-based metaphors easier to explain than psychological metaphors is supported by Keil (1986). He reported that metaphors consisting of taste/texture/weather terms combined with person (e.g., he was a stormy person; she was a sour person) were not consistently explained until age 10 while metaphors which involved physical domains (e.g., the wind screamed; the boy tasted the book) were explained earlier. This failure to interpret psychological metaphors has been explained in terms of a lack of background knowledge or conceptual development (Keil, 1986; Vosniadou, 1987; Winner et al., 1976).

These studies into children's metaphoric competence lead to the proposition that the development of such competence is constrained by conceptual knowledge, linguistic skill, and information-processing ability (Vosniadou, 1987). The ability to interpret increasingly complex metaphors implies increasingly sophisticated levels of development in one or all of these abilities. For example, the correct interpretation of metaphors, which are accompanied by minimal context, might imply well-developed linguistic and cognitive faculties. Similarly, the ability to correctly interpret a metaphor in a given response mode (ie. explanation, multiple-choice selection, enactment) might provide an indication of linguistic development. Finally, the ability to interpret psychologically-based metaphors might reflect the child's conceptual or cognitive development. While Vosniadou et al. (1984) viewed these three factors as sources of difficulty in metaphoric comprehension, they can also be seen as indications of children's level of linguistic, conceptual and cognitive development.

Riddle

Riddles also represent a non-literal use of language which is structured in a way that misleads the listener or reader into considering an interpretation of the language different from the one intended. Typically, riddles consist of a question followed by a surprising or incongruous answer. The listener's task is to figure out how the incongruous

answer really does make sense in terms of the original question. The incongruity or surprise is often created through linguistic ambiguity, which may lie in the riddle's question or in some cases, the answer.

Four types of linguistic ambiguity have been identified in riddles: phonological ambiguity, lexical ambiguity, syntactic surface-structure ambiguity, and syntactic deep-structure ambiguity (Shultz & Horibe, 1974). Phonological ambiguity is based on the sound of a word or similar sounding words; for example, the ambiguity in the riddle, Why did the cookie cry? Because its mother had been a wafer so long., is based on the sound of "a wafer" and "away for". Lexical ambiguity is based on the dual-meaning of a key word; for example, the ambiguity in the riddle, Why did the farmer name his hog Ink? Because he kept running out of his pen., is based on the dual-meaning of the word "pen". Next, syntactic surface-structure ambiguity is based on an alternative grouping of words or word segmentation; for example, the ambiguity in the riddle, Tell me how long cows should be milked. The same as short ones., is based on alternative grouping of the words "...(how long) cows..." referring to time, and "...how (long cows)..." referring to size. Finally, syntactic deep-structure ambiguity is based on alternative interpretations of the same surface structure. For example, the ambiguity in the riddle, What animal can jump higher than a house? All animals, houses can't jump., is based on

alternative interpretations of the same question; that is, referring to animals that can jump over the height of a house, and referring to animals that can jump higher off the ground compared to a how high a house can jump off the ground.

Although children have acquired the structure or format of riddles by age 6 or 7 (Shultz, 1974), they may not be able to identify the source of the riddle's humor, ambiguity or incongruity. Shultz and Pilon (cited in Shultz, 1974) reported differential rates of development of each of these four types of ambiguity. The detection of phonological ambiguity emerged first at around 6 years of age, followed by lexical ambiguity across the 6- to 15-year-old age range. The detection of surface- and deep-structure ambiguities did not appear until about age 12. In terms of children's ability to explain the source of humor in the riddle, Shultz and Horibe (1974) reported that 7- to 9-year-olds were most sensitive to play on the phonological structure, while 9- to 12-year-olds were able to understand lexical jokes. The ability to explain surface- and deep-structure jokes did not emerge until around age 12.

Fowles and Glanz (1977) traced a developmental progression in the explanations of riddles by children ages 6 to 9. At the first stage, children's explanations of riddles do not reflect any awareness of what makes a riddle funny. In the next stage, they often find something funny but do not identify the language as the basis of the riddle, rather, they

tend to focus on the context or situation to which the riddle might refer. At the third stage of development, riddles are explained by appealing to the language employed in the riddle, correctly identifying ambiguous words, structures or meanings. Although this sequence of development was observed, these stages in riddle explanation were not found to be related to age.

Although limited, the research suggests that the development of children's appreciation and comprehension of riddles is reflective of their cognitive, linguistic, and metalinguistic abilities (Bernstein, 1986). A child must master the relevant language features utilized in a riddle in order to appreciate and comprehend it. In addition, the child's cognitive development must be sufficiently well-advanced to derive and cope simultaneously with two or more meanings (Fowles & Glanz, 1977). These developmental differences in the ability to comprehend riddles of a particular type may provide an indication of children's level of cognitive and linguistic development.

In summary, several aspects of language that contribute to children's development of meaning have been discussed. Structural elements and the form that language takes conveys subtle changes in meaning. Deriving an interpretation from language also involves the semantic knowledge of terms and the way in which these meanings fit together. Grammatical structure and semantics not only contribute independently to

meaning, but additionally they interact with each other to contribute to its development. This interaction is especially evident in metaphor and riddles where meaning is not entirely literal in nature. Here, the research has demonstrated that the degree of linguistic complexity that can be handled is related to the level of complexity of the conceptual operations. In the next section, this link between linguistic and cognitive development is explored.

LANGUAGE AND COGNITIVE DEVELOPMENT

Gardner (1983, 1993) proposed that the development of linguistic competence is to a significant extent, independent from the development of competence in other domains; that is, a high level of development in one intelligence does not require a similarly high level in another. Gardner's view of the mind as modular is supported by research from several traditions, relying to a large extent on the evidence from neurobiology and socio-cultural studies. For example, damage to a specific area of the brain may result in the inability to put words together grammatically while still understanding their meaning. In this view, although intelligences may be expressed in varying degrees depending on the behavior, each has a different developmental trajectory from the others as well as an identifiable set of operations.

Multiple intelligences theory serves to identify language as one form of intelligence separate from but used in conjunction with other forms. Linguistic intelligence is

ideally exemplified by the poet who must demonstrate mastery of the linguistic elements as well as the ways they are combined. The poet must be sensitive to subtle shades of meaning in the selection of words and phrases, consistent with the image being conveyed, but at the same time retain fluency and the musical nature of the language. The poets sensitivity to and integration of semantic, syntactic, phonological, and pragmatic aspects of language allow him/her to communicate subtleties in experience, ideas, and emotions.

Having identified and described the notion of a separate linguistic intelligence, what is needed is a consideration of the structures and processes which contribute to its development. This is provided by the theoretical framework outlined by Case (1985, 1992).

Cognitive-Developmental Theory

Within Case's (1985, 1992) theory, children are characterized as active constructors of knowledge; rather than simply receiving information from the world, they actively process and transform it. In doing so, they assemble executive control structures which include a representation of the problem state, the goal state, and the procedures that will take the child from the current situation to the goal state. The content of children's control structures is a function of the domain in question but the structure of it has the universal form indicated in Figure 2.1.

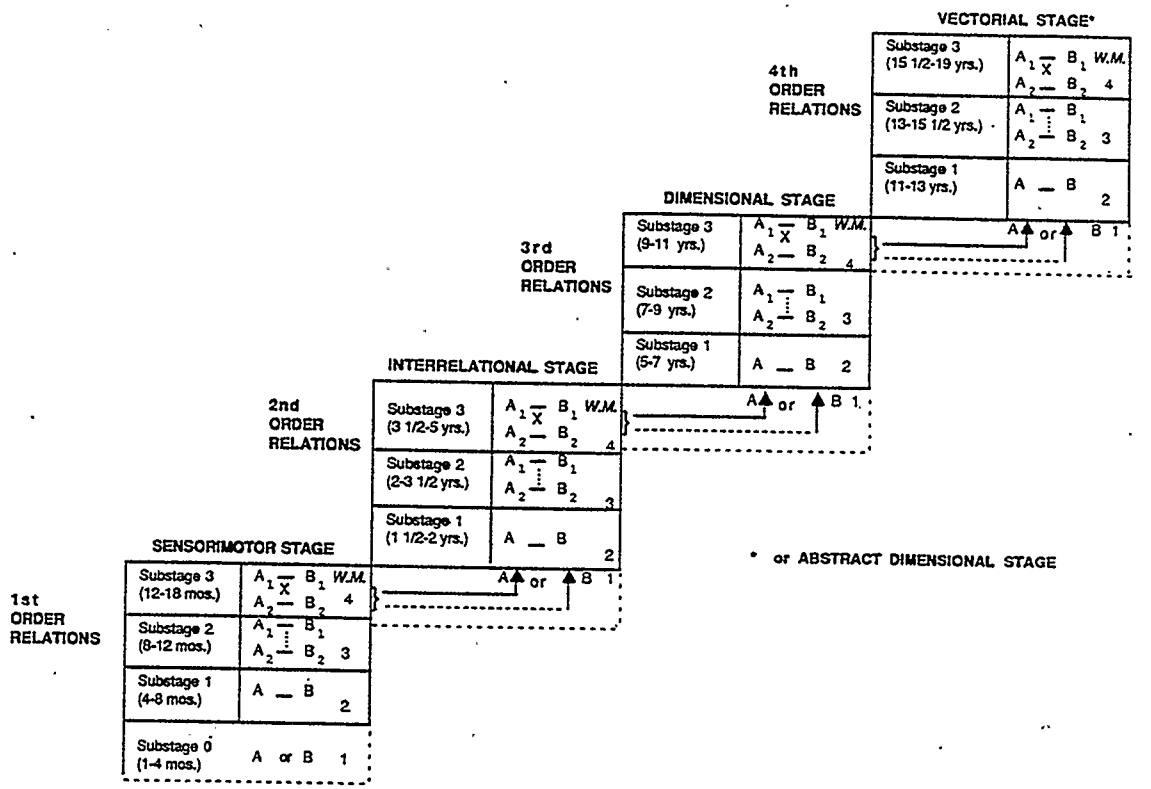


Figure 2.1. Case's model of cognitive development.

As Figure 2.1 shows, progression from one stage of development to the next is considered to take place via the coordination of two qualitatively different structures that are consolidated at the end of the previous stage. The result is a qualitative change in the type of cognitive operations that are characteristic of the stage. Although children's progression through this sequence of development may vary from domain to domain as a consequence of experiential opportunities, there is a limit to how far they can progress in the sequence. This limit is set by the working memory capacity which defines the number of internal units the child

can activate and manipulate simultaneously. Working memory growth is controlled by changes in operational efficiency, which are the result of maturational factors and practice. As a consequence, the characteristic age ranges at which particular structures tend to be acquired can be stipulated as indicated in Figure 2.1.

Evidence for this developmental progression in children's intellectual development has been reported across a variety of task domains; for example, Bruchowsky (1984, 1989) in the development of empathy, Goldberg-Reitman (1984) in the understanding of mothers' motives, Griffin (1985) in the understanding of intentions, and McKeough (1982, 1986) in the development of narrative story-telling. Furthermore, this sequence has been observed in children's sight reading of musical notation (Capodilupo, 1985), their understanding of the balance beam task (Marini, 1992), time-telling, and money-handling (Case & Sandieson, 1988), children's drawing (Dennis, 1987), and their visual-motor coordination (Reid, 1992).

While these findings individually represent relatively narrow task domains, within the theory, the assembly and application of similar control structures leads to the development of general conceptual structures; that is, structures that apply across tasks within a broad conceptual domain. Central conceptual structures are internal networks of concepts and conceptual relations, which form the core of a wide range of more specific concepts. In addition, they

play a crucial role in enabling the child to think about a wide range of situations at a new level and develop a new set of control structures for dealing with them. Notably, the development of empathy, the understanding of mother's motives, the understanding of intentionality, and the development of narrative story-telling have been identified as tasks linked together by a central conceptual structure in the domain social reasoning (Case & McKeough, 1990; Case & Griffin, 1990). Additionally, children's sight reading of musical notation, their understanding of the balance beam, time-telling ability, and money-handling, are tasks that have been linked by a central numerical structure (Case and Sandieson, 1988; Case, Griffin, & Capodilupo, in press). And children's development in drawing, and their visual-motor coordination, represent tasks that are linked by a central spatial structure (Case, 1993).

This notion of a general core of related concepts, which can vary in terms of its specific application, is somewhat similar to Gardner's (1983, 1993) idea of multiple intelligences. It is interesting that included among Gardner's seven intelligences are a logico-mathematical intelligence and an interpersonal intelligence, perhaps corresponding to a central numerical structure and a central social structure, respectively. Case's theory possibly offers a description of the processes by which children assemble these intelligences; that is, with the available processing

capacity, they integrate and consolidate knowledge structures that apply to a broad yet delimited set of tasks.

In the current study, I utilize Case's cognitive-developmental theory to make an initial attempt to identify a central linguistic structure. More specifically, I attempted to map out the development of school-aged children's understanding of metaphor and riddle. The hypotheses were as follows:

HYPOTHESES

Metaphor

1. There will be significant differences in task difficulty between the metaphor item sets (metaphor types) used. Specifically, there will be a hierarchical increase in difficulty as follows: physical metaphors with rich contextual information < physical metaphors with minimal contextual information < psychological metaphors with minimal contextual information.

2. There will be a global developmental progression in metaphor task performance between age groups. Specifically, there will be an increase in the number of items passed across the age groups as follows: 6-year-olds < 8-year-olds < 12-year-olds.

3. There will be a global developmental progression in the level of metaphoric reasoning used between age groups as follows: 6-year-olds < 8-year-olds < 12-year-olds.

4. There will be significant differences in task difficulty between the riddle item sets (riddle types) used. Specifically, there will be a hierarchical increase in difficulty as follows: phonological (based on variation in word sound) < lexical (based on variation in word meaning) < surface structure (based on variation in word grouping) < deep structure (based on variation in sentence interpretation).

5. There will be a global developmental progression in task performance between age groups. Specifically, there will be an increase in the number of items passed across the age groups as follows: 6-year-olds < 8-year-olds < 12-year-olds.

Chapter III

METHODOLOGY

The design and procedures used in this study were aimed at identifying linguistic knowledge structures and mapping out their development. Using two figurative language tasks, namely, metaphor and riddle interpretation, children's ability to correctly interpret increasingly complex items was examined.

GENERAL PROCEDURES

Schools agreeing to participate in the research were contacted and the purpose was explained to teachers and administrators. Professional staff were asked to identify children aged 6, 8, and 12, years of age who they judged to be of average to high average language ability. This ability range was selected because the goal was to map the developmental progression in language of typical individuals at these ages. Letters of permission were sent to parents (see Appendix A) via the classroom teachers. Children who obtained parental consent and agreed to participate in the study were given the age-appropriate vocabulary subtest of the Wechsler Intelligence Scales for Children - III (WISC-III) (Wechsler, 1992), a measure of expressive vocabulary. Children with scaled scores ranging between 9 and 14 were included in the study as these parameters define an average ability sample.

The following description of the tasks was read to those

children who received informed parental consent and were willing to participate:

> Hello, my name is Mr. Jeff Mah and I am a student at the University of Calgary. I am interested in what children about your age know about language and the things that language can mean, and I need some helpers from your class. If you want to be a helper, you will be doing things like acting out stories with pictures (6-year-olds only), telling me what you think a part of the story means, and listening to some riddles. You can quit any time you like. Also, these activities aren't part of your regular school work so you won't be getting marks, you'll just be my helpers. Any questions? Okay, let's get started.

Subjects were seen individually by the experimenter and given two types of figurative language tasks, the first dealing with metaphors, and the second, with riddles. Although the material contained in the individual items was selected on the bases of its familiarity to young children, in order to ensure that children possessed the requisite background information, story books dealing with the topics referred to in the test items were read to the 6-year-olds before the actual experimental sessions began. An additional goal of this activity was to familiarize the children with the experimenter. The completion of both tasks required approximately 45 minutes and involved one or two sessions,

depending on the child's age. All task sessions were audiotaped for later transcription and scoring.

SUBJECTS

Subjects, located in middle socio-economic status areas of a large urban centre in Western Canada were selected from the schools in a publicly-funded Catholic School System. The subject pool consisted of 55 children of average to high-average linguistic ability, with approximately equal numbers of boys and girls at each of three age levels: 6-,8-, and 12-year-olds. The age levels were selected based on the rationale that at these ages, Case (1985, 1992) has theorized that children become capable of increasingly more complex forms of thought. Distribution of gender and age range across the 3 age groups is reported in Table 3.1, along with the mean Vocabulary subtest scaled score of the WISC-III (Wechsler, 1992).

Table 3.1

Mean Age, Age Range, Mean Scaled Vocabulary Scores and Gender Distribution by Age Group

	Age		
	6	8	12
	(n = 15)	(n = 20)	(n = 20)
M Age	6:8	8:4	12:7
Age range	6:1 - 6:11	8:1 - 8:10	12:4 - 12:11
Males	8	10	10
Females	7	10	10
M Vocabulary	10	11	12

TASKS

1. Metaphor Task

Task 1 Description

This task consisted of a number of short stories which ended with a metaphorical concluding sentence, that the experimenter read to the child. Three item sets were used; the first set provided a maximum of contextual information and ended with a physically-based metaphor, the second set provided only a limited amount of context and ended with a physically-based metaphor, and the third set provided a limited amount of context and ended with a psychologically-based metaphor. The item sets were ordered such that the sets were believed to increase in difficulty. Vosniadou et al. (1984) reported that subjects given a greater degree of

context preceding a metaphorical concluding sentence were more likely to correctly interpret them compared to subjects given minimal contextual information. And Keil (1986) and Winner et al. (1976) concluded that the ability to interpret psychologically-based metaphors (e.g., personality characteristics) emerges later than the ability to interpret physically-based metaphors (e.g., similar physical attributes). A more detailed description of each set follows:

Set 1. This item set consisted of six short stories that ended with a physically-based metaphorical concluding sentence that describes a story outcome. Maximum context was provided in this set. A typical item in this set appeared as follows:

> Mary and her friends decided to go tobogganing. She put on her warmest coat and mittens and went out to the garage to get the toboggan. She walked with her mom over to the hill to meet her friends. Mary got onto the toboggan and went racing down the hill. At the bottom of the hill, she got off and climbed back up to the top. Mary got ready to go down again. This time when she went racing down, she hit a bump and fell on her arm. Her mom came over and told Mary that her arm looked broken. Mary was a car being taken to the repair shop.

Set 2. This item set consisted of six three-sentence stories that ended with a physically-based metaphorical concluding sentence. Limited context was provided in this set. A typical item in this set appeared as follows: "Neil

and Ted were having a picnic one afternoon. A butterfly flew by one of the boys. Neil said to Ted, 'A butterfly is a flying rainbow.' What did Neil mean?"

Set 3. This item set consisted of six three-sentence stories that ended with a psychologically-based metaphorical concluding sentence. Again, limited context was provided in this set. A typical item in this set appeared as follows: "Jody and Kelly were playing in the park. Jody saw a boy sitting on one of the park benches. Jody said to Kelly, 'That boy is a bird without a song.' What did Jody mean?". Each of the complete item sets can be found in Appendix B.

Task 1 Administration

The rationale behind the following procedure was to establish both a basal and ceiling level of metaphoric understanding for each subject. The task was terminated if the child clearly experienced discomfort. Three modes of response were used to examine children's understanding of the interpretation of a metaphorical statement: (a) explanation, (b) recognition, and (c) enactment. Previous research indicated that explanation of the rationale of a metaphor places the greatest linguistic demands on the child, followed by recognition (multiple-choice selection) and finally, enactment (using illustrations) (Vosniadou et al., 1984; Winner et al., 1980). Hence, the ability to respond correctly in each mode implies a particular level of linguistic development. That is, the ability to verbally explain a

metaphor implies a higher level of linguistic development than recognition responses. Similarly, the ability to choose a multiple-choice alternative implies a higher level of linguistic development than an enactment response.

In order to familiarize the children with the task demands, all children were administered the practice item and asked to respond using each response mode, first with enactment, then recognition and lastly, explanation. No attempt was made to instruct the children regarding the correctness of their interpretations; only misunderstandings in the task demands were corrected.

Next, each subject was presented with two randomly selected items from Set 1, and asked to respond using explanation. Children were told: "Sometimes stories don't always mean the same thing to different kids. I am going to read you some stories and I want you to listen carefully and tell me what you think the last sentence means. (read story aloud) What does (read concluding sentence) mean?". If the child responded correctly on both items, it was assumed that the level of linguistic development required to interpret all Set 1 items was in place, and the child progressed to Set 2 items. If the child did not meet this criterion (i.e., if s/he failed either item), s/he was administered two additional randomly selected Set 1 items and asked to respond using a linguistically less demanding response mode (i.e., recognition): (read story) "Now, here are two things that

other kids think that (metaphor sentence) might mean. I want you to pick the one that you think it means (read alternatives)". A complete list of the multiple-choice alternatives for all of the test items can be found in Appendix E. If the child responded correctly on both items, s/he progressed to Set 2 items. If the child failed, s/he was administered the remaining two Set 1 items and asked to respond using enactment with the illustrations. This final response mode places minimal linguistic demands on the child: "I am going to read you some more stories and I want you to listen carefully and act them out using these drawings here (show child drawings). I will read slowly so that you can act out the story as I read it. Ready? Let's try one (read story)". If the child responded correctly on both items, s/he progressed to Set 2 items. If the child failed, this constituted an end point and resulted in termination of the task. The possible paths that a subject might follow are presented in Figure 3.1.

Set 2 items were administered in identical fashion as described for Set 1, beginning with the first two items, which required an explanation response, the next two items (if necessary), which required a recognition response, and the final two items (if necessary), which required an enactment response. Similarly, the children advanced to Set 3 items, and failure of all Set 2 items constituted an end point, resulting in termination of the task.

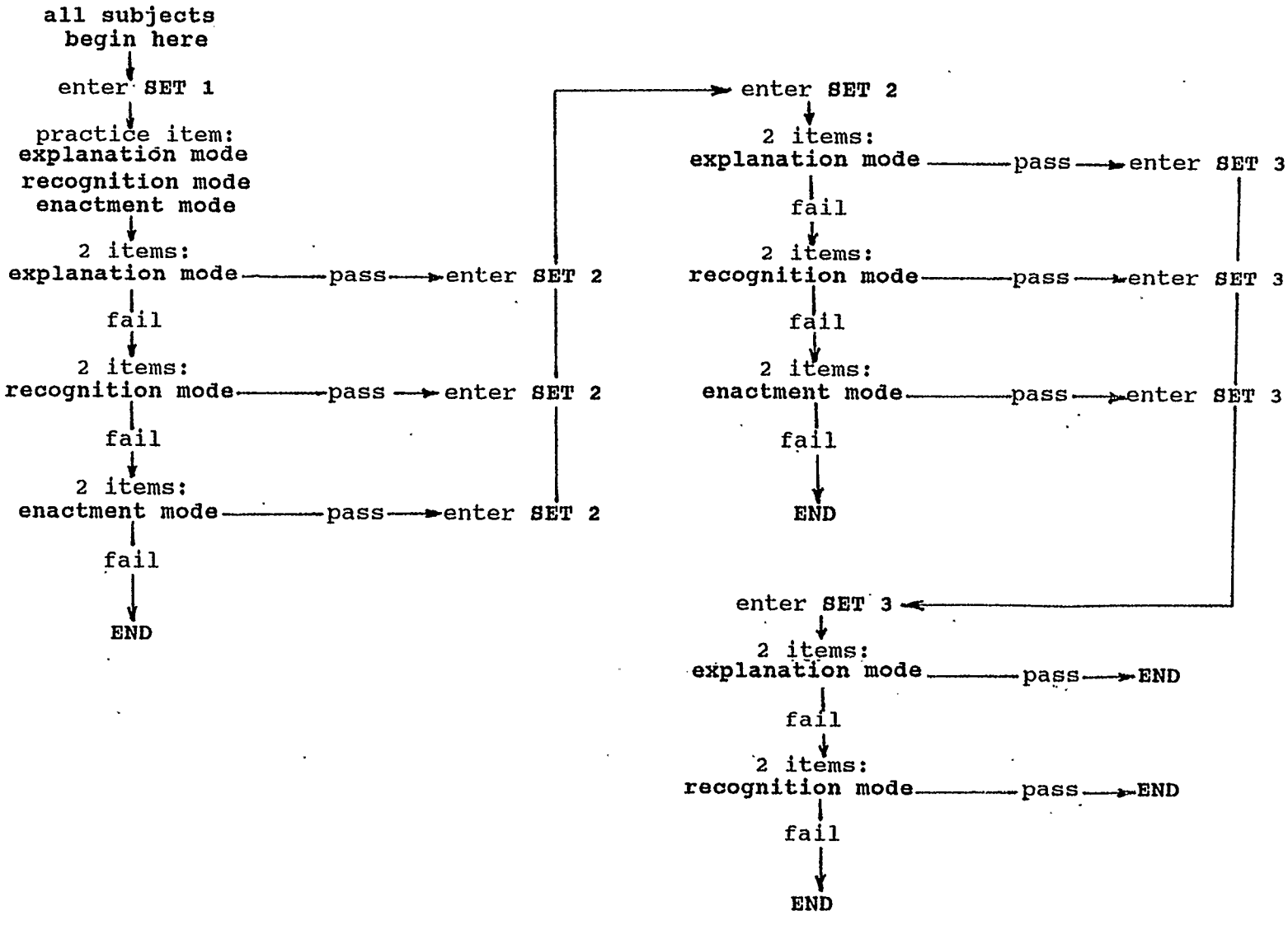


Figure 3.1. Possible metaphor task item administration paths.

Set 3 items were administered in identical fashion as described for Set 1 and Set 2, except that passing both items in a given response mode constituted an end point. Failing all Set 3 items constituted an end point and resulted in termination of the task. Because of the impossibility of enacting psychologically-based metaphors, the enactment phase was not used for Set 3.

Task 1 Scoring

As previously outlined, the child's understanding of the metaphor was assessed in three ways: (a) explanation (verbal explanation), (b) recognition (multiple-choice selection), and (c) enactment (with provided illustrations). Descriptions of each follow.

Responses in the Explanation Mode

Each of the items presented in the explanation mode of response was scored in two ways independently of each other as follows: (a) correctness of metaphoric interpretation, and (b) the level of reasoning or rationale behind the subject's interpretation. That is, for each explanation item, the subject received (a) a pass or fail score and (b) a level of reasoning score. The determination of a passing or failing interpretation was based on whether the response made reference to the figurative meaning implied by the metaphor (a complete list of the item-specific criteria used can be found in Appendix C). For example, the metaphor, the guard is a rock would be scored as correct if the interpretation

minimally involves a reference to the guard being unfriendly, unemotional, unfeeling or cold-hearted. To illustrate, consider the acceptable response given from the following subject:

> Experimenter (E): Rick and Larry worked in a bank. They walked past the security guard and said "hello". Rick said to Larry, "The guard is a rock." What does that mean...The guard is a rock?
>
> Subject (S): He had a heart of stone.
>
> E: What do you mean?
>
> S: Like it means cold, unfeeling...he doesn't care about anyone, only himself...he doesn't have any friends.

Although a subject might provide a correct interpretation of a metaphorical statement, the reasoning employed to arrive at such an interpretation might differ across individuals. Such differences in reasoning suggest that children understand metaphorical language differently; that is, literally, figuratively, or by focusing on particular elements and ignoring others. For example, the subject may appeal to the comparison of characteristics between the topic and vehicle elements which form the ground of the metaphor to arrive at an interpretation, while another subject may provide an explanation of the metaphor by appealing to the natural outcome of contextual clues or story elements preceding the metaphor.

In order to determine the level of reasoning, that is, to classify the rationale behind the subject's given interpretation, a classification system reported by Winner et al. (1976) was adapted to meet our scoring purposes. The scoring system used was as follows, along with examples of subject responses for illustrative purposes.

Level 3. Covert metaphoric refers to an interpretation that is offered based on the comparison between physical characteristics and psychological (characterlogical) domains. For example:

E: Rick and Larry worked in a bank. They walked past the security guard and said "hello". Rick said to Larry, "The guard is a rock." What does that mean...The guard is a rock?

S: That the guard doesn't say "hi" to anyone and he doesn't talk.

E: Tell me more.

S: He always has a solemn expression...like very serious. The guard is sort of cold as a rock...he's unfriendly.

Level 2. Overt metaphoric refers to an interpretation that is offered based on the physical attributes common to both the topic and vehicle; the interpretation is limited to the physical domain. For example:

E: Rick and Larry worked in a bank. They walked past the security guard and said "hello". Rick said to Larry,

"The guard is a rock." What does that mean...The guard is a rock?

S: That the guard is really strong...like rocks are...like if you get hit by the guard, it will hurt...like a rock will.

E: What else might it mean?

S: I...well, he doesn't move very much because rocks just sit there.

Level 1. These include literal forms of interpretation such as: (a) literal meaning is maintained and the figurative statement is rejected on the basis of violations of reality; plausibility may be achieved by inventing magical laws or scenarios; or (b) the sentence may be rephrased so that the two terms on the metaphor can be both interpreted literally without defying realism; plausibility is achieved by relating the two terms through contiguity (situation) rather than identity (meaning). For example:

E: Chris and John were on the same baseball team. The coach walked past them. John said to Chris, "Coach is a tiger." What does that mean...Coach is a tiger?

S: Its a tiger...he's a tiger.

E: What do you mean?

S: He turned into a tiger.

E: What else could it mean?

S: Maybe the team is called the Tigers.

Level 0. Incomplete or inappropriate responses that

involve no interpretation, verbatim repetition or description of a singular term of the metaphor; the explanation may be based on an appeal to contextual reasons rather than elements of the metaphor.

E: Bradley went over to the park to play. He played on the swings, and went down the slide. Bradley saw some monkey-bars he wanted to climb. Up and up over the bars he climbed. He could see all around from up on the bars. Bradley lost his balance and fell off of the monkey-bars. Bradley was a tree with a broken branch. What does that mean...'Bradley was a tree with a broken branch'?

S: He might have broken something...part of his body.

E: How do you know that?

S: Because he fell off the bars.

Because the metaphors comprising Set 1 and Set 2 are physically-based, the level of reasoning score on these items can range from a Level 0 to a maximum of Level 2. The specific criteria used for each Set 1 and Set 2 item to determine whether a Level 2 reasoning was used, can be found in Appendix D and is based on the physical grounds between the topic and vehicle. As the Set 3 items are psychologically-based, the level of reasoning score on these items range from a Level 0 to a maximum of Level 3. Similarly, the specific criteria used for each Set 3 item to determine whether a Level 3 reasoning was used can be found in Appendix D and is based on the psychological grounds between the topic and vehicle.

Responses in the Recognition and Enactment Modes

The responses in the recognition (multiple-choice selection) and enactment modes were scored on a correct(pass)/ incorrect(fail) basis. For the recognition mode, a correct selection from the multiple-choice alternatives was scored as a passing response. Enactments which involved a clear correspondence with the figurative interpretation of the metaphor were scored as a passing response. For example, on the metaphor, The car was a thirsty camel, the figurative enactment of it would include showing the illustration of the car driving to the gas station and filling up with gas, whereas, an incorrect enactment may show the illustration of the camel walking over to a pool of water and drinking from it.

2. Riddle Task

Task 2 Description

The second figurative language task involved the subject's ability to explain the key words or meanings which create humor in a riddle. Four item sets were used: phonological, lexical, surface structure, and deep structure. The item sets were ordered such that the sets were believed to increase in difficulty. Shultz and Horibe (1974) and Fowles and Glanz (1977) described a developmental progression of riddle types that children are able to explain. The authors concluded that children were able to explain phonologically-based riddles first, followed by lexically-based ones; the

ability to explain riddles whose humor was based on the surface structure, emerged in later years and finally, riddles based on a deep structure interpretation could be explained by children in their upper elementary years. A brief description of each item set follows.

Phonological riddles. This item set consisted of three riddles whose humor was based on the phonological structure of a word or similar sounding words. For example, consider the riddle: Why do birds get married? Because they're tweet-hearts. In this example, the humor is based on the similarity of the sound (phonology) and meaning of the terms "tweet-heart" and "sweet-heart".

Lexical riddles. This item set consisted of three riddles whose humor was based on the dual-meaning of a key word. For example, consider the riddle: What has four wheels and flies? A garbage truck. In this riddle, the humor is based on the dual meaning of the word "flies"; that is, "flies" is used to refer to flight in the question but, refers to insects in the answer.

Surface structure. This item set consisted of three riddles whose humor was based on the meanings created by alternative groupings of words. For example, consider the riddle: Tell me how long cows should be milked. The same as short ones, of course. In this riddle, the humor is based on the meaning created by alternative groupings of the words "how long cows". The initial statement leads the listener to

interpret the meaning to be a reference to time - (how long) cows, but the answer reveals that the meaning intended is a reference to size - how (long cows).

Deep structure. This item set consisted of three riddles whose humor was based on alternative interpretations (meanings) of the same surface structure, that is, the riddle question read in the same manner can be interpreted in more than one way. For example, consider the riddle: What animal can jump higher than a house? Any animal, houses can't jump. In this example, the listener is led to believe that the question intended is "What animal can jump higher than the height (over) of a house?", but the answer reveals that the question was "What animal can jump higher than a house can jump?". Each of the complete item sets can be found in Appendix F. The child's understanding of the riddles was assessed based on the explanations they provided.

Task 2 Administration

The rationale behind the following procedure was to establish both a basal and ceiling level of a subject's ability to explain riddles. The task was terminated if the child was clearly experiencing discomfort. Based on Shultz and Horibe (1974), and Fowles and Glanz (1977) findings, the ability to explain a certain type of riddle implies a particular level of linguistic development. For example, the ability to explain a deep-structure riddle implies a higher level of linguistic development than the ability to explain

only phonological riddles.

Each of the subjects received the item sets in the same order, believed to be from easiest to the most difficult. Specifically, phonological riddles were presented first, then lexical riddles, followed by surface structure riddles, and finally, deep structure riddles. Within each set of riddles, the order of presentation was randomly assigned for each subject.

The experimenter read the first phonological riddle to the subject followed by a request to explain what made the riddle funny. Upon completion of the subject's response, the next phonological riddle was presented followed by a request for an explanation of it. Then, the last phonological riddle was read to the subject and the explanation recorded. The subject progressed through the lexical riddles in the same manner, then the surface structure riddles, and lastly, the deep structure riddles. If however, a subject failed to correctly explain any of the items at two successive levels (types), the task was terminated.

Task 2 Scoring

Each of the responses to the riddles presented to a subject was scored on a pass or fail basis. The criteria used to decide whether an appropriate response was given, was developed from a scoring system reported by Fowles and Glanz (1977), and adapted to meet our purposes. The scoring system used was as follows (examples of subject responses are

presented for illustrative purposes).

Pass. An explanation focused on the attributes of the language employed in the riddle. Key words and duality of meanings are cited; references are made that connect dual meanings or key words. For example, Subject 1 responded:

> Experimenter (E): What has four wheels and flies? A garbage truck...What makes that riddle funny?
>
> Subject 1 (S1): Flies go around garbage and dump trucks carry garbage.
>
> E: How does that make it a joke?
>
> S1: Just...you realize its not talking about flying in the air.

And Subject 2 responded:

> Experimenter (E): What animal can jump higher than a house? Any animal, houses can't jump...What makes that riddle funny?
>
> Subject 2 (S2): It makes you think that "What animal can jump higher than the height of a house"...the punch line is "What can jump higher than a house can jump", if it could...it can't.

Fail. Responses that involve (a) an explanation focused on the situation to which the language might refer, references to what is said rather than meant; for example:

> E: How do you keep a fish from smelling? You cut off their noses...How is that riddle funny?
>
> S: Its funny because fishes don't have noses.

E: Why else might it be funny?

S: Because it's funny to cut off a fish's nose.

(b) references to individual meanings without connection to each other; for example:

E: What dog keeps the best time? A watch dog...What makes that riddle funny?

S: Because it's a watch dog...he watches things.

E: What else does watch mean?

S: Like a clock on your wrist.

E: Is that part of what makes it funny?

S: I don't think so.

or (c) confused, tangential comments reflecting no awareness of the workings of riddles and they are seen as incomprehensible; for example:

E: Tell me how long cows should be milked. The same as short ones, of course...What makes that riddle funny?

S: I don't get it.

E: How might it be funny?

S: It's not funny...it's weird.

The specific application of the passing criteria to each individual riddle can be found in Appendix G.

SUMMARY

In the present study, 6-, 8-, and 12-year-old children identified as average to high-average in language ability, were administered two figurative language tasks, namely, metaphor and riddle interpretation. On the metaphor task,

three item sets were used which were considered to be of increasing difficulty. The subjects responded in the metaphor task using three different modes: explanation, recognition, and enactment. All responses were scored on a pass or fail basis; in addition, responses in the explanation mode were scored on the basis of the level of rationale behind the metaphor interpretations. On the riddles task, four item sets (riddle types) were used which were considered to be of increasing difficulty. Subjects responded only with explanations of the riddle and were scored on a pass or fail basis.

It was hypothesized that within each task, there would be significant differences between the item sets in terms of overall level of difficulty. Secondly, within each task, it was hypothesized that there would be global developmental differences between the age groups in terms of their performance. In addition, on the metaphor task, it was hypothesized that there would be developmental differences on the level of rationales used by each age group.

Chapter IV

RESULTS

Statistical analyses were carried out to test the hypotheses. In what follows, the plan of analyses is outlined, followed by a reporting of the statistical results, by hypothesis.

Plan of Analysis

On the metaphor task, only responses in the explanation mode were statistically analyzed. As a consequence of the experimental design, in most cases, the number of responses in the recognition and enactment modes were insufficient to constitute a cell in the analyses. These values are however, important to the findings and are presented for anecdotal support.

A two-way repeated measures ANOVA (1 within subjects, 1 between subjects) was used to analyze the responses in the explanation mode. Performance on the item sets (Set 1, 2, 3) was the dependent variable and age group (6-, 8-, 12-year-olds) was the independent variable. In addition, a between subjects repeated measures ANOVA was used to analyze subjects' level of reasoning in the explanation mode. Level of reasoning (Level 0, 1, 2, 3) was the dependent variable and age group (6-, 8-, 12-year-olds) was the independent variable.

On the riddles task, a two-way repeated measures ANOVA (1 within subjects, 1 between subjects) was used to analyze subjects' responses. Performance on the item sets

(Phonological, Lexical, Surface, Deep) was the dependent variable and age group (6-, 8-, 12-year-olds) was the independent variable.

For both tasks, all of the statistical analyses were performed using BMDP. The alpha level for all of the analyses was set at .05.

Metaphor Task Analysis

Hypothesis 1: Metaphor Item Set Difficulty

In order to examine the first hypothesis that the item sets progressively increased in difficulty, within each item set, the number of items passed in the explanation mode was compiled for all subjects. Inter-rater reliability was examined on 50% of the data at each age. The two raters were in agreement on 100% of the scores. Table 4.1 shows the percentages of items passed in each set. The mean number of items passed and standard deviations is shown in Table 4.2.

Table 4.1

Percentage of Metaphors Passed in the Explanation Mode

	Metaphor item set			
Age	1	2	3	All
6 (n = 15)	53	87	3	48
8 (n = 20)	95	100	50	82
12 (n = 20)	98	100	90	96
All subjects	85	96	52	

Table 4.2

Means and Standard Deviations of Number of Metaphors Passed in the Explanation Mode

	Metaphor item set			
Age	1	2	3	All
6				
M	1.07	1.73	0.07	0.95
SD	0.80	0.59	0.26	0.90
8				
M	1.90	2.00	1.05	1.65
SD	0.31	0.00	0.76	0.63
12				
M	1.95	2.00	1.80	1.92
SD	0.22	0.00	0.41	0.28
All subjects				
M	1.69	1.93	1.05	
SD	0.60	0.33	0.87	

Results of the within subjects repeated measures ANOVA indicated a main effect for set, $F(2, 51) = 70.09$, $p<.001$. Results of the univariate F-tests indicated significant differences between Set 1 and 2, $F(1, 52) = 25.74$, $p<.001$; Set 2 and 3, $F(1, 52) = 127.05$, $p<.001$; and Set 1 and 3, $F(1, 52) = 49.72$, $p<.001$. Although the analyses show significant differences in difficulty between sets, an examination of the means do not support the order of difficulty that was

hypothesized. Recall that the hypothesized order was as follows: Set 1 < Set 2 < Set 3. Although the statistical analysis supported the hypothesis that Set 3 was the most difficult, Set 2 was found to be the easiest with Set 1 occupying the middle position (see Table 4.2). In other words, the results indicate that physical metaphors with minimal contextual information were the easiest to interpret correctly, physical metaphors with rich contextual information more difficult, and psychological metaphors with minimal contextual information, the most difficult to interpret correctly.

Hypothesis 2: Developmental Progression in Metaphor Performance

The second hypothesis was that there is a developmental progression in task performance across age groups. Table 4.1 shows the percentage of items in the explanation mode that were passed by each age group. Similarly, Table 4.2 shows the mean number of items passed and the standard deviations for each age group. Results of the between subjects repeated measures ANOVA indicated a main effect for age group, $F(2, 52) = 45.14$, $p<.001$. Results of the univariate F-tests indicated significant differences in performance between 6- and 8-year-olds, $F(1, 52) = 45.59$, $p<.001$; 8- and 12-year-olds, $F(1, 52) = 7.84$, $p<.05$; and 6- and 12-year-olds, $F(1, 52) = 87.33$, $p<.001$. An examination of the group means across all items (see Table 4.2) indicates that 12-year-olds performed better

than 8-year-olds who performed better than 6-year-olds.

Of critical interest, however, were the results that dealt with the set by age group interactions. Within Set 1, significant differences between the 3 age groups' performance were found $F(2, 52) = 17.94$, $p<.001$; similarly, differences were found between the 3 age groups within Set 2, $F(2, 52) = 4.09$, $p<.05$; and within Set 3, $F(2, 52) = 44.39$, $p<.001$. An examination of the means for each item set compared between the age groups indicates the direction of the effects (see Table 4.2) and is depicted in Figure 4.1.

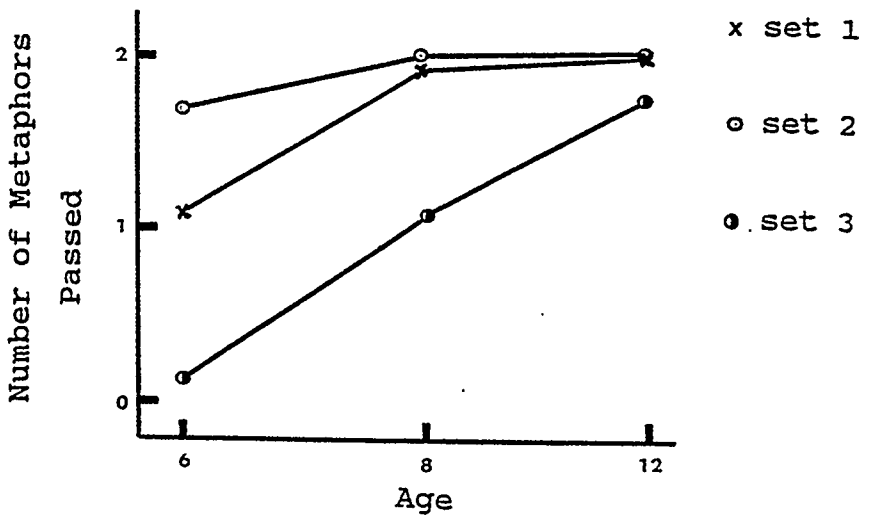


Figure 4.1. Mean number of metaphors passed.

To this point, I have only considered responses in the explanation mode. These results indicated that the performance of the 6-year-olds is considerably lower than the 8-year-olds who, in turn perform well below the 12-year-olds. In order to further explore the level of capability of the

younger children, two additional response modes were used, namely, recognition and enactment. Recall that if a subject did not pass both items in the explanation mode, they were presented with two additional items accompanied by alternatives and asked to identify which one best captured the metaphor. Similarly, if both items in the recognition mode were not passed, they were presented with two additional items and asked to act out their interpretation of the metaphor using illustrations. Table 4.3 shows the percentage of items that were passed in each set using recognition and enactment modes of response, included in brackets are number of items passed (numerator) to number of items presented (denominator).

Table 4.3

Percentage of Items Passed in the Recognition and Enactment Modes

	Metaphor item set		
Age	1	2	3
6			
R	85 (17/20)	50 (2/4)	11 (3/28)
E	75 (3/4)	100 (4/4)	*
8			
R	100 (4/4)	*	64 (18/28)
E	*	*	*
12			
R	100 (2/2)	*	100 (8/8)
E	*	*	*

Note: R = recognition; E = enactment.

* item administration was not necessary

Hypothesis 3: Developmental Progression in Metaphoric Level of Reasoning

In order to examine the third hypothesis that there is a developmental progression as to the level of reasoning between the age groups (i.e., from literal to figurative-physical to figurative-psychological), the mean level of reasoning used was calculated for each item set by age group (see Table 4.4). Inter-rater reliability was examined on 50% of the data at each age. The two raters were in agreement on 96% of the level scores given.

Table 4.4

Means and Standard Deviations of Level of Reasoning Used

	Metaphor item set		
Age	1	2	3
6			
M	1.20	1.40	1.70
SD	0.68	0.74	0.82
8			
M	1.80	1.90	2.30
SD	0.52	0.31	0.86
12			
M	1.90	1.90	2.75
SD	0.31	0.31	0.44

Because the range of potential level of reasoning scores differs between the item sets (recall that Set 1 and 2 required only physical ground whereas items in Set 3 allowed for an expression of psychological ground, as well), it is more informative to examine the set by age group interactions.

Within Set 1, significant differences between the 3 groups' level of reasoning were found $F(2, 52) = 9.14$, $p<.001$; similarly, within Set 2, $F(2, 52) = 6.33$, $p<.05$; and within Set 3, $F(2, 52) = 9.59$, $p<.001$. An examination of the means for each item set compared between the age groups indicates the direction of the effects (see Table 4.4) and is depicted in Figure 4.2.

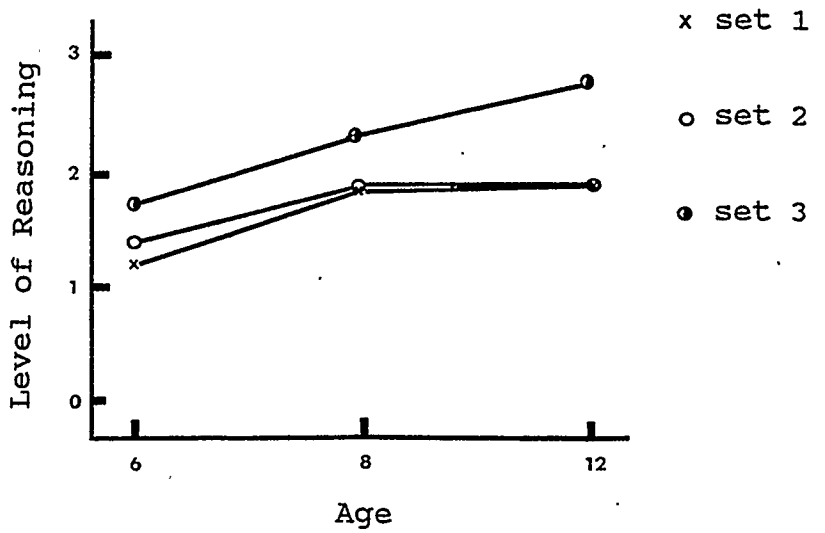


Figure 4.2. Mean level of reasoning in metaphor.

The results support the hypothesis that 12-year-olds used a higher level of reasoning than 8-year-olds who used a higher level of reasoning than 6-year-olds when the item set allowed for it as in Set 3. Furthermore, the differences between 6- and 8-year-olds on the level of reasoning at Set 3, are maintained in Sets 1 and 2; that is, 8-year-olds used a higher level of reasoning than 6-year-olds.

Riddle Task Analysis

Hypothesis 4: Riddle Item Set Difficulty

In order to examine the hypothesis that the item sets progressively increased in difficulty, within each item set (i.e., across riddle type: Phonological, Lexical, Surface, Deep), the number of riddles correctly explained was compiled for all subjects. Inter-rater reliability was examined on 50% of the data at each age group. The two raters were in

agreement on 98% of the scores given. Table 4.5 shows the percentages of items passed in each set. The mean number of items passed and standard deviations in each riddle set is shown in Table 4.6.

Table 4.5

Percentage of Riddles Passed

	Riddle item set				
Age	Phon	Lex	Sur	Deep	All
6 (n = 15)	24	13	4	0	10
8 (n = 20)	60	42	32	0	34
12 (n = 20)	95	85	87	93	90
All subjects	63	50	44	34	

Note: Phon = Phonological; Lex = Lexical; Sur = Surface; Deep = Deep.

Table 4.6

Means and Standard Deviations of Number of Riddles Passed

	Riddle item set				
Age	Phon	Lex	Sur	Deep	All
6					
M	0.73	0.40	0.13	0.00	0.32
SD	0.88	0.63	0.35	0.00	0.62
8					
M	1.80	1.25	0.95	0.00	1.00
SD	1.06	0.79	0.76	0.00	0.99
12					
M	2.85	2.55	2.60	2.80	2.70
SD	0.37	0.60	0.50	0.41	0.49
All subjects					
M	1.89	1.49	1.33	1.01	
SD	1.17	1.10	1.17	1.38	

Note: Phon = Phonological; Lex = Lexical; Sur = Surface; Deep = Deep.

Results of the within subjects repeated measures ANOVA indicated a main effect for set, $F(3, 50) = 20.86$, $p<.001$. Results of the univariate F-tests indicated significant differences between all combinations of item sets: Phonological and Lexical, $F(1, 52) = 9.01$, $p<.05$, Phonological and Surface, $F(1, 52) = 21.52$, $p<.05$, Phonological and Deep, $F(1, 52) = 56.15$, $p<.05$, Lexical and Surface, $F(1, 52) = 3.77$, $p<.057$, Lexical and Deep, $F(1,52) = 22.57$, $p<.05$, and Surface

and Deep, $F(1, 52) = 12.24$, $p<.05$. An examination of the means (see Table 4.6) supports the order of difficulty that was hypothesized; that is, in terms of difficulty, Phonological < Lexical < Surface structure < Deep structure.

Hypothesis 5: Developmental Progression in Riddle Performance

The fifth hypotheses was that there is a developmental progression in task performance across age groups. Table 4.5 shows the percentage of items that were passed by each age group. Table 4.6 shows the mean number of items passed and standard deviations for each age group. Results of the between subjects repeated measures ANOVA indicated a main effect for age group, $F(2, 52) = 185.80$, $p<.001$. Results of the univariate F-tests indicated significant differences in performance between 6- and 8-year-olds, $F(1, 52) = 27.27$, $p<.001$; 8- and 12-year-olds, $F(1, 52) = 196.87$, $p<.001$; and 6- and 12-year-olds, $F(1, 52) = 331.67$, $p<.001$. An examination of the group means across all items (see Table 4.6) indicates that 12-year-olds performed better than 8-year-olds who performed better than 6-year-olds.

As with the metaphor task, of critical interest are the set by age group interactions. Within Set 1 (Phonological), significant differences between the 3 groups' performance were found $F(2, 52) = 28.98$, $p<.001$; similarly, within Set 2 (Lexical), $F(2, 52) = 44.34$, $p<.001$; and within Set 3 (Surface), $F(2, 52) = 84.21$, $p<.001$; and within Set 4 (Deep), $F(2, 52) = 810.73$, $p<.001$. An examination of the means for

each item set compared between the age groups indicates the direction of the effects (see Table 4.6) and is depicted in Figure 4.3.

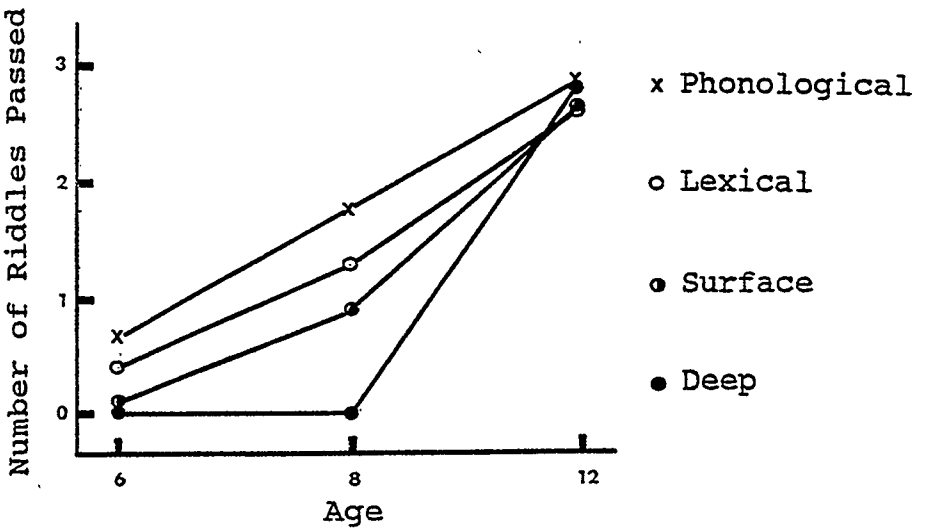


Figure 4.3. Mean number of riddles passed.

It is commonly thought that there exist gender differences on tasks that are related to language abilities or involve a high expressive verbal component (Hyde, 1981). Although it was not explicitly hypothesized, a statistical analysis was performed that examined gender differences on each task. No significant differences resulted from the analysis regarding any of the hypotheses (i.e., metaphor item set difficulty, metaphor task performance, metaphor level of reasoning, riddle item set difficulty, or riddle task performance).

Developmental Parallel Between Tasks

Although an investigation of developmental parallels between the two tasks was not an explicitly stated hypothesis, it was an objective of the study to examine how the two tasks are related. In order to examine the relationship between children's performance in metaphor and their performance in riddle, a post-hoc analysis was conducted. Pearson product moment correlation was calculated using SPSS and the results are presented in Table 4.7. The results of the analysis indicate a significant relationship between children's performance in metaphor interpretation and their performance in riddle interpretation.

Table 4.7

Correlation of Children's Performance in Metaphor and Riddle

	Metaphor	Riddle
Metaphor	1.00	0.68 *
Riddle	0.68 *	1.00

Note: * $p<.001$, one-tailed.

Chapter V

DISCUSSION

The primary purpose of this study was to examine the developmental progression in two figurative language tasks, namely, metaphor and riddle interpretation. Within both tasks, the item sets were examined for differences in difficulty. Children aged 6-, 8-, and 12-years-old of average to high-average expressive language ability were examined for differences in performance on each task; that is, the item complexity that could be successfully interpreted. Additionally, on the metaphor task, differences in the level of reasoning used by each age group was examined.

In this chapter, the results are discussed by hypothesis, dealing first with those pertaining to the metaphor task, and second, with the riddle task. In each section, the study's findings are related to existing work, followed by a theoretical analysis of the cognitive demands of the tasks using Case's (1985, 1992) model of intellectual development. A discussion of the similarities and differences in processing demands of the two tasks is also offered. Finally, the implications for future research and practice are discussed, and the study's limitations and delimitations are identified.

Metaphor Task

Hypothesis 1: Metaphor Item Set Difficulty

It was hypothesized that physical metaphors accompanied by rich contextual information would be easier to interpret

than physical metaphors with minimal contextual information, and in turn, easier than psychological metaphors with minimal context (i.e., Set 1 < Set 2 < Set 3). Although the results clearly demonstrated differences in the difficulty between item sets, they do not support the order of difficulty that was hypothesized. Instead, physical metaphors with minimal context presented the least difficulty, followed by physical metaphors with rich context, and psychological metaphors with minimal context (i.e., Set 2 < Set 1 < Set 3). Closer examination of the results indicated that the difficulty associated with additional context was experienced largely by the 6-year-olds, rather than uniformly across all age groups.

The finding that paraphrasing psychological metaphors is more difficult than physical metaphors is consistent with Winner et al. (1976) and Keil (1986). However, the result that contextually rich physical metaphors were more difficult than those with minimal context is inconsistent with Vosniadou et al. (1984) who reported that additional linguistic and situational context facilitated young children's ability to correctly interpret metaphoric language.

This discrepancy may be due to a combination of factors that acted to impose an additional processing or working memory load on the child. In the present study, children were required to process and retain the contextual information, as well as generate a verbal interpretation, whereas, Vosniadou et al. (1984) utilized enactment with toy figures in a "toy

world" as an indication of metaphoric competence. Utilizing a toy world environment possibly provided a means for the child to retain the contextual information; that is, it provides a concrete representation instead of a mental one. Furthermore, enacting the interpretation of a metaphor does not require the same linguistic or metacognitive demands that explanation does (Vosniadou & Ortony, 1986; Winner et al., 1980).

It is reasonable that the load imposed on children's memory to process and retain the contextual information interfered with their ability to decenter from it, focus on the metaphor, and generate a verbal interpretation. In fact, when much of the contextual information was removed (as in Set 2), the 6-year-olds ability to explain physical metaphors approached that of 8- and 12-year-old children. Similarly, when the linguistic and metacognitive demands of the response mode are reduced, as in the multiple-choice selection, the 6-year-olds did not experience as much difficulty as when generating verbal interpretations, resulting in better performance; this finding is consistent with those of previous research (e.g., Vosniadou & Ortony, 1986; Winner et al., 1980), which showed that children demonstrated a greater understanding of metaphoric language in multiple-choice selection than in explanation tasks.

Hypothesis 2: Developmental Progression in Metaphor Performance

As predicted, the results showed that there is a developmental progression in metaphor interpretation across the 3 age groups. Overall, the 12-year-olds performed better than the 8-year-olds, who performed better than the 6-year-olds. More notably, the differences between the 3 age groups' abilities become clearer as the item sets increase in difficulty.

In terms of the highest level of item complexity that can be successfully handled, 6-year-olds were able to provide correct paraphrases of physical metaphors with minimal contextual information (Set 2 items). As previously discussed, the inclusion of rich contextual information (Set 1 items) caused them greater difficulty, unless the linguistic or metacognitive demands were reduced (i.e., multiple-choice selection). Providing correct paraphrases of the psychological metaphors (Set 3 items) was clearly beyond the 6-year-olds' performance abilities, even when the response involved a multiple-choice selection.

The 8-year-olds had little difficulty paraphrasing the physical metaphors with or without rich contextual information. With the move to psychological metaphors, the 8-year-olds experience some degree of difficulty; however, when multiple-choice selection was used as the response mode, their performance improved. The 12-year-olds clearly demonstrated

that they had little difficulty with any of the item sets; that is, they were able to provide correct paraphrases of psychological, physical, and physical metaphors with rich contextual information. This is in keeping with the findings of Winner et al. (1976) that the ability to correctly paraphrase psychological metaphors does not occur until around 10 or 11 years of age.

Hypothesis 3: Developmental Progression in Metaphoric Level of Reasoning

The prediction here was that there is a developmental progression in the level of reasoning between the 3 age groups (i.e., from literal [Level 1] to figurative-physical [Level 2] to figurative-psychological [Level 3]). The results support an overall developmental trend in the level of reasoning. Of greatest interest are the differences in reasoning as the item sets increase in difficulty.

The results clearly showed that 6-year-olds were able to interpret physical metaphors in Set 2 by stating the common ground between the topic and vehicle elements of it. For example:

> Experimenter: Neil and Ted were having a picnic one afternoon. A butterfly flew by one of the boys.
>
> Neil said to Ted, 'A butterfly is a flying rainbow.' What did Neil mean?
>
> Subject: That it was colorful, full of colors...
>
> E: What was?

S: The butterfly.

E: How do you know?

S: ...because rainbows are full of colors.

With the addition of richer contextual information (Set 1 items), it appears that the 6-year-olds tended to reason at a literal level. For example:

Experimenter: ...Matthew was a snowman in the yard. What does that mean?

Subject: He turned into a snowman...

E: He did? He's not a boy?

S: He's made of snow...a snowman.

Again, it is reasonable to conclude that the additional processing load on children's memory (involving the attention to an elaborated context) interfered with their ability to focus on the metaphor and interpret it on a figurative basis. Further, it may be the case that the extent of the context sets up a literal frame of interpretation that leads the child to interpret the concluding metaphor in a literal way; that is, the child may not be able to decenter from the literal context which has been set up, and recontextualize the metaphor in figurative terms.

Interestingly, it does not appear that the 6-year-olds were able to reason at a figurative-psychological level when presented with psychological metaphors, but provided figurative-physical reasoning and interpretations of them.

For example:

> Experimenter: Rick and Larry worked in a bank. They walked past the security guard and said "hello". Rick said to Larry, "The guard is a rock." What does that mean...The guard is a rock?
>
> Subject: That the guard is really strong...like rocks are...like if you get hit by the guard, it will hurt...like a rock will.
>
> E: What else might it mean?
>
> S: I...well, he doesn't move very much because rocks just sit there.

Keil (1986), Vosniadou (1987), and Winner et al. (1976) have argued that the failure to interpret psychological metaphors can be explained by a lack of background knowledge or conceptual development relating to psychological domains and personality characteristics. However, Astington, Harris and Olson (1988) have shown that children as young as 4-years-old have knowledge of psychological verbs as they apply to people. Rather than lacking the knowledge or scheme for psychological traits, I am proposing that, although young children have the concepts or schemes necessary for interpreting psychological states, they may not be able to coordinate them cognitively in a way that enables them to interpret psychological metaphor. I will expand on this proposition in the following section dealing with the task processing demands.

Turning now to the 8-year-olds, the results showed that

they reasoned at a figurative-physical level even when it involved an elaborated context. On the psychological metaphors, the 8-year-olds demonstrated some ability to reason on a figurative-psychological basis; that is, they began to transfer physical attributes to psychological domains. For example:

> Experimenter: Rick and Larry worked in a bank. They walked past the security guard and said "hello". Rick said to Larry, "The guard is a rock." What does that mean...The guard is a rock?
>
> Subject: That the guard doesn't say "hi" to anyone and he doesn't talk.
>
> E: Tell me more.
>
> S: He always has a solemn expression...like very serious. The guard is sort of cold as a rock...he's unfriendly.

Although the 8-year-olds demonstrated this ability, they do not do so as consistently or as easily, it appears, as the 12-year-olds.

The 12-year-olds were able to consistently reason at a figurative-psychological level when the task required them to do so. It is likely that both 8- and 12-year-olds were not able to demonstrate their ability to reason at higher levels except on the Set 3 items, which allowed for the widest range of potential reasoning levels (i.e., Level 0 to 3). On both the Set 1 and Set 2 items, the range of potential reasoning

levels extended to a maximum of Level 2 (figurative-physical); therefore, it appears that the 8- and 12-year-olds reached a ceiling in terms of the reasoning level allowed by these items. Further, because a large percentage of the 12-year-olds passed the psychological metaphors, it might well be that the task did not test the limits of their capability.

In sum, the 6-year-olds were able to reason on a figurative-physical basis, but experienced difficulty when rich contextual information was included, and appeared unable to reason at a figurative-psychological level. However, the 8-year-olds demonstrated the ability to reason on a figurative-psychological level but did not do so consistently; that is, the majority of the 8-year-olds were able to utilize figurative-psychological reasoning on one, but not both of the items presented. Finally, the 12-year-olds were able to consistently reason at a figurative-psychological level when the task demanded it, and showed little difficulty with items that required figurative-physical reasoning. Rather than a particular level of reasoning being typical of each age group independent of the task items, it seems that the task difficulty plays a significant role in determining the level of reasoning used.

In order to further explain the phenomenon of task difficulty and reasoning level, it is necessary to examine the cognitive demands of each type of metaphor. In the following section, Case's (1985, 1992) theory of cognitive development

will be used to analyze each item type in terms of working memory load.

Neo-structural Analysis of Metaphor

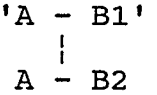
Recall that Case (1985, 1992) proposed that children's intellectual development takes place via the coordination and consolidation of control structures (schemes) for dealing with problem situations. The number of schemes that can be represented and remembered depends on the child's working memory capacity.

According to the theory, 6-year-olds should be able to hold two schemes in working memory and use them in a means-end fashion along a single dimension (unifocal coordination) (see Figure 2.1). In order to correctly interpret physical metaphor, children must have a scheme that involves encoding the text base or what is said about the topic and vehicle, as well as a scheme for deriving the ground (i.e., the feature that the two elements have in common). When the two schemes are used in a coordinated fashion, figurative-physical meaning can be derived. Graphically depicted, the scheme for encoding the text base may be represented as 'A' and the scheme for establishing the common physical ground may be represented as 'B'. Thus, the 6-year-old child can be seen as having the capacity to use these two schemes in a coordinated fashion as follows: 'A and B' or 'A - B'

This structure is thought to allow for the interpretation of physical metaphors. As previously argued, the imposition of

additional loads on working memory interferes with the 6-year-olds ability to use these two schemes in a coordinated fashion, unless the load is reduced. This perhaps can help account for the 6-year-olds tendency to reason at a literal level on Set 1 items; that is, they can only hold a single scheme in mind instead of using it in a means-end fashion.

The 8-year-olds, with their hypothesized increased working memory capacity, should be able to hold three schemes in mind. Accordingly, this enables them to assume a dual focus (bifocal coordination). Depicting the scheme for interpreting physical metaphors as 'A - B1' (where A represents the encoded text base and B1 represents the derived physical ground) and the scheme for deriving the psychological ground as 'A - B2' (where A represents the encoded text base and B2 represents the derived psychological ground) then, the structure for interpreting psychological metaphor can be represented as:



Thus, according to the theory, the 8-year-old has the capacity to focus on the figurative-physical meaning along with the figurative-psychological meaning, which enables them to transfer the physical ground to psychological domains. Furthermore, because this structure requires that three schemes be held in working memory, it may be that for this reason, one would not expect 6-year-olds to have the capacity to interpret psychological metaphor. That is, limitations in

the 6-year-olds working memory does not allow them to retain and use the necessary schemes in a coordinated fashion. The data supported this assumption.

Although 50% of the 8-year-old group was able to correctly interpret psychological metaphor, the children typically required questioning to arrive at a psychological interpretation. It may be that because of the sequential nature of their thought at this stage, the questioning and probes were necessary in that they acted as a cognitive scaffold. That is, the 8-year-olds were able to derive the physical grounds of the metaphor but transferred them to psychological domains only when questioned for other meanings.

Theoretically, a different encoding of the text base (A2) that possibly involved psychological attributes, depicted as 'A2 - B2' (where A2 represents a psychological encoding of the text base and B2 represents the derived psychological ground) is needed to consistently interpret psychological metaphor. When this scheme is coordinated with the scheme for deriving figurative-physical interpretations 'A1 - B1' (where A1 represents the encoded text base and B1 represents the derived physical ground), the result is an elaborated bifocal structure:

'A1 - B1'
X
A2 - B2

This structure is thought to allow for a more direct and consistent psychological interpretation of the metaphors. This is typical of 10-year-old cognition according to the

theory. Of course, without data from a 10-year-old group, this is highly speculative, but nevertheless theoretically reasonable.

Because of a possible task ceiling effect (due to the fact that 10-year-olds can, in theory, correctly interpret psychological metaphor), it is difficult to analyze the performance of the 12-year-olds beyond saying that the results of the study clearly show that 12-year-olds easily accomplished the metaphor task. If the structural analysis of the figurative psychological metaphor is accurate, then it stands to reason that 12-year-olds would have little problem with the task since their increased working memory would allow them to easily achieve this kind of dual focus. Presently, it is difficult to identify an additional scheme that must be coordinated with the hypothesized 10-year-old structure that can account for the 12-year-olds performance. Perhaps a task that involved the interpretation of a system of metaphors, as with allegorical novels, would better identify the limits of 12-year-olds' performance.

Although the results indicate a developmental progression, this analysis of the structures underlying children's performance should be considered tentative. Rather than formulate an absolute model of metaphor performance, the above analysis was intended to articulate a possible connection between children's cognitive operations and their performance, in this case, indicated by their level of

reasoning and ability to interpret metaphor.

Riddle Task

Hypothesis 4: Riddle Item Set Difficulty

As with the metaphor task, it was hypothesized that there is a difference in the difficulty of the item sets, specifically, that phonological riddles are the easiest to explain, followed by lexical, surface structure, and deep structure riddles. Overall, the results support the prediction in terms of the order of item set difficulty. These results are consistent with Shultz and Pilon (cited in Shultz, 1974), and Shultz and Horibe (1974) who reported that the detection of and ability to explain these types of riddles, emerged in this sequence.

Hypothesis 5: Developmental Progression in Riddle Performance

The results support the hypothesis that there is a developmental progression in riddle task performance across the 3 age groups. Overall, the 12-year-olds performed better than the 8-year-olds, who performed better than the 6-year-olds. As with the metaphor task, it is of critical interest to examine the differences between the 3 age groups as the item sets increase in difficulty.

In the present study, 6-year-olds experienced difficulty explaining the source of humor over all the item sets, showing only the emergence of the ability to explain phonological riddles. The 8-year-olds demonstrated a stronger grasp of the phonological and lexical riddles, but were unable to explain

surface structure riddles with any consistency. Finally, the 12-year-olds appeared to have little difficulty with even the most difficult item set, demonstrating the capability to consistently explain phonological, lexical, surface structure, and deep structure riddles. The results appear to be consistent with Shultz and Horibe (1974) who reported that 7- and 9-year-olds were able to explain phonological riddles, 9- to 12-year-olds were able to explain lexical riddles, and 12-year-olds were able to explain surface structure and deep structure riddles.

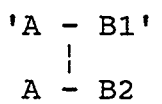
According to Fowles and Glanz (1977), in order to appreciate and comprehend riddles, children's cognitive development must be sufficiently well-advanced to derive and cope simultaneously with two or more meanings. Examining the cognitive demands of each type of riddle and hence, the complexity of the meanings that must be handled, can assist in explaining the differential performance of the 3 age groups, as the items increase in difficulty. As with the analysis of metaphor, perhaps Case's (1985, 1992) theory can provide a framework for understanding children's capacity to interpret riddles.

Neo-structural Analysis of Riddle

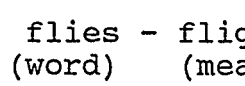
Recall that Case proposed that the structure underlying the 6-year-olds representations are made up of two schemes in working memory (see Figure 2.1). Like metaphor, in the domain of riddle, 6-year-olds may be utilizing a figurative meaning

scheme comprised of two coordinated schemes, scheme A for the encoded text base and scheme B for establishing the linking ground between the elements in the riddle. Thus, although the 6-year-olds may be able to assemble a figurative meaning (i.e., 'A and B'), they may have difficulty with coping simultaneously with two or more such meanings. It is possible that for this reason, they perform poorly on all riddle sets which, by virtue of their design, intentionally mislead the listener toward one interpretation while referring to another.

However, according to the theory, 8-year-olds should be able to assemble and cope simultaneously with two meanings (a dual focus) and comprehend certain types of riddles, namely, phonological and lexical. The comprehension of lexical riddles demands that children derive one meaning from the text 'A - B1' and consider it in a coordinated way with a second meaning 'A - B2'. The resulting 8-year-old structure:



should allow them to comprehend lexical riddles, as they have been observed to do. An example will assist in clarifying the discussion. In order to comprehend the riddle, What has four wheels and flies? (an airplane) A garbage truck., the child must derive one meaning associated with the word "flies" (A - B1), as referring to flight:



(where the word to be interpreted is represented as 'A' and

the first meaning ascribed to it as 'B1') and consider it in conjunction with a second meaning associated with the same word (A - B2), as referring to insects:

flies - insect
(word) (meaning 2)

(where the second meaning is represented as 'B2').

The assembly of the structure:

'A - B1'
|
A - B2

enables the 8-year-olds to explain the riddle's humor.

In much the same way, phonological riddles require a dual focus. For example, in order to comprehend the riddle, What's a bee's favorite vegetable? Sting-beans., the child must interpret the answer, first as an ambiguous utterance wherein "sting" refers to bees and "beans" refers to vegetables (assembly of a figurative meaning A1 - B); and consider it in conjunction with a second word "string-beans" that refers solely to vegetables (i.e., A2 - B). The assembly of the structure:

'A1 - B'
|
A2 - B

enables the child to explain the riddle.

It may be that with lexical riddles, the derivation and simultaneous consideration of two meanings from the same word demands greater cognitive effort, compared to the simultaneous consideration of two different words that have the same essential meaning. This perhaps may explain why the 8-year-olds passed the phonological riddles more regularly than the

lexical riddles.

Surface structure riddles, which are based on an alternative grouping of the same words to create ambiguity, requires the listener to derive the meaning from one grouping of the words and consider it in conjunction with the meaning from a second grouping of the words. For example, the riddle, Tell me how long cows should be milked. The same as short ones., requires the listener to encode the text and derive the meaning from the word grouping "(how long) cows", depicted as:

'A1 - B1'
(how long) cows - meaning 1

(where A1 represents the scheme to encode the text base of the first word grouping and B1 represents the derived meaning) and consider it in conjunction with the meaning derived from a second word grouping "how (long cows)", depicted as:

'A2 - B2'
how (long cows) - meaning 2

(where A2 represents the scheme to encode the text base of the second word grouping and B2 represents the derived meaning). The assembly of an elaborated bifocal structure:

'A1 - B1'
X
A2 - B2

enables the child to derive and consider these two meanings in conjunction and thus, explain surface structure riddles. The assembly of an elaborated bifocal structure theoretically requires that four schemes be held in working memory, a capacity thought to be available at 10 years of age. Although

this analysis of surface structure riddles is theoretically reasonable, it is nonetheless purely speculative without accompanying data from 10-year-olds. As might be expected from this analysis, the data showed that the 12-year-olds were consistently able to explain surface structure riddles.

Within the framework of Case's theory, the ability to comprehend and explain deep structure riddles may represent a major qualitative stage shift in children's representation of riddle. By 12 years of age, the structures assembled in the previous substages should be consolidated into a new control structure (see Figure 2.1): 'A'
and can be used in a means-end (coordinated) fashion:

'A and B'

The ability to explain deep structure riddles depends on deriving an explicit meaning and considering it simultaneously with an implicit meaning; that is, meaning derived from elsewhere other than contained in the text. It might be argued that the implicit meaning results from the addition of text originating from the child, not the riddle itself. What is not stated in the riddle, must be generated by the listener. In the case of phonological, lexical, and surface structure riddles, the information is explicitly contained in the text of the riddle: that is, it is not necessary to provide additions of text by the listener to create ambiguity, only identification of the meanings associated with the words (as in phonological and lexical riddles) or grouping of them

(as in surface structure riddles). For example, in order to comprehend the deep structure riddle, What animal can jump higher than a house? Any animal, houses can't jump., an explicit meaning, a reference to animals that can jump higher than the height of a house: 'A'
and an implicit meaning, a reference to animals that can jump higher compared to a house can jump:
'B'
must be considered in conjunction ('A and B') to explain the riddle.

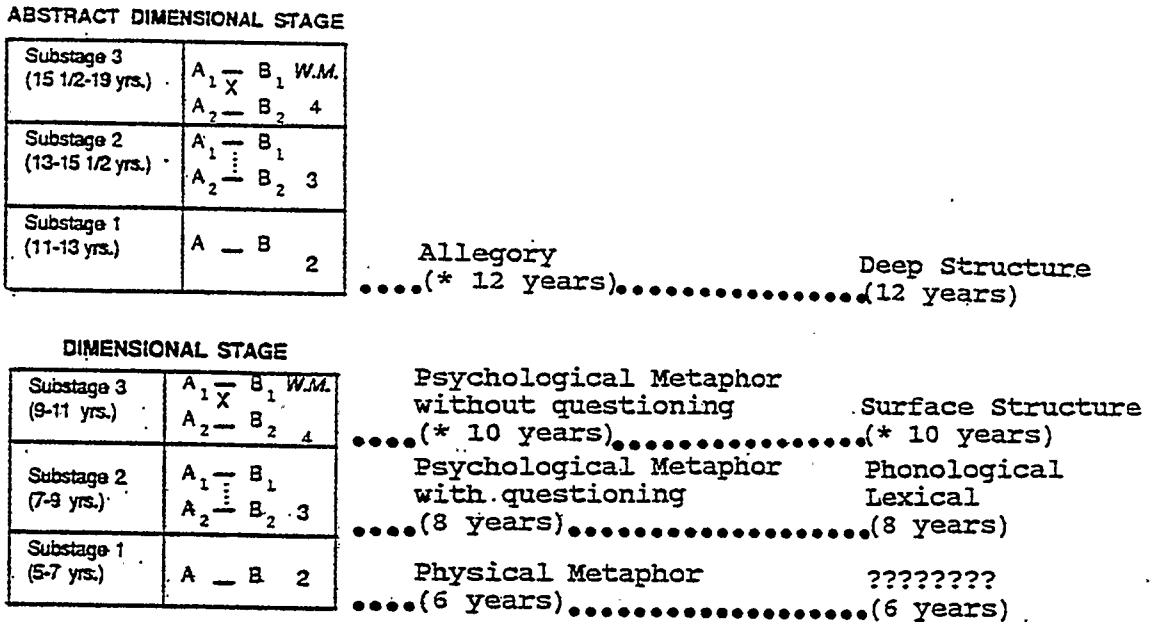
Like the analysis of metaphor, this analysis of the riddle performance should be considered tentatively. Again, rather than proposing an absolute model of riddle performance, it is seen as a first attempt at articulating a connection between the structures underlying children's representation of riddle and their capacity to interpret them.

GENERAL DISCUSSION

This study of children's understanding of figurative language, specifically, metaphor and riddle interpretation, found that there was a developmental progression in their ability to explain increasingly complex items. Children's performance on both tasks was analyzed using Case's (1985, 1992) neo-structural framework. The resulting theoretical analyses were considered as first attempts at articulating the underlying cognitive structures that might account for children's performance on the two tasks. Rather than

explaining the developmental differences in performance as the result of knowledge deficits (e.g., Keil, 1986; Vosniadou, 1987; Winner et al., 1976), I proposed (following Case, 1885, 1992), that processing capacity limitations play an essential role. That is, although children might have the available schemes, they may not be able to use them in a coordinated fashion.

This study begs the question: "How are the two tasks related; that is, what are the developmental parallels between the two tasks ?" When the performance of the 3 age groups is compared between the two tasks, the developmental progressions are asynchronous. That is, it appears that the metaphor task was insufficient in the range of item difficulty to examine the cognitive operations of the 12-year-olds (resulting in a ceiling effect), and the riddle task was too difficult for the 6-year-olds to examine their understanding (resulting in a floor effect). The developmental progressions found in this study are shown in Figure 5.1 along with the theorized structures underlying children's representations (the schemes specific to each task and stage of development are discussed in previous text).



Note: W.M. = Number of schemes required in working memory.

* = Analysis done on the basis of theory.

Figure 5.1. Neo-structural analysis of children's performance in metaphor and riddle interpretation.

The general observation that riddle interpretation presents a more difficult task for young children compared to metaphor interpretation may be the result of the intentionally misleading nature of riddles. That is, whereas metaphors tend to lead the listener toward a particular interpretation, riddles lead the listener astray. As such, riddles may require a more complex set of cognitive operations.

Although the two tasks are different in terms difficulty, they likely share a common set of cognitive operations as the correlation showed. Correctly interpreting figurative

language requires the differentiation and coordination of alternate encodings of the text base and the context that is implied by each. A consideration of the meanings generated by the text and the context in which they are used allows for the assembly of a figurative interpretation.

The findings from this study do, however, point out that although metaphors and riddles are prevalent in children's everyday experience, the capacity to interpret them may not emerge as early as literal uses of language. It might be the case that young children are simply unfamiliar with this type of conceptual trickery. This is not to say that literal interpretations are learned first followed by figurative interpretations, but rather that they may involve a different set of cognitive operations that receive less attention or explicit teaching.

Implications for Future Research and Practice

As this study represents a theoretical analysis, the implications for future research are of greater relevance than practical issues at this point. Future studies in figurative language development most certainly will require a broader age range to more accurately map out the developmental progression in a task domain. That is, for a study such as this, perhaps 4- and 10-year-olds should be included in addition to the 6-, 8-, and 12-year-olds.

Secondly, the tasks in future studies should incorporate items that are sufficient to explore the range of abilities of

the age groups; that is, in order to protect against potential ceiling and floor effects. Furthermore, the items within a particular level of difficulty should be carefully constructed to ensure equal difficulty.

Thirdly, future researchers may wish to explore other figurative uses of language, such as poetry. Alternatively, they may wish to expand the range of complexity of the tasks used in this study; for example, in metaphor, investigating how "systems of metaphors" are understood by children, as in the allegorical novels, Animal Farm (Orwell, 1946) and Lord of the Flies (Golding, 1963).

In terms of implications for practice, this study draws attention to an under taught aspect of language and its development. An awareness of how children understand figurative uses of language and derive meaning from it, has the potential to help educators to better tailor instruction in the classroom. Elementary children may require explicit instruction in figurative language uses to facilitate their understanding of stories.

Limitations and Delimitations

The primary delimitation of the study was there was no way to control the amount of prior experience that children had with metaphoric language and riddles. This perhaps could be addressed by providing "warm-up" activities such as using analogies or similes, prior to test situations. A second related delimitation was that there was no way to control for

the conceptual knowledge or schemes that children had. Future researchers might consider providing visual or verbal descriptions of the topics used in the test items in order to establish some baseline level of knowledge. A third delimitation was that subjects may have invested different amounts of effort on the tasks. Providing external rewards or recompensation for the child's efforts may address this delimitation.

The primary limitation of this study was the emphasis placed on cognitive factors in the analysis while overlooking linguistic factors. A second limitation of the study was that on the metaphor task, each subject potentially was presented with different items to be interpreted. Therefore, the equivalency of the task across subjects is uncertain. Thirdly, a limitation was that there was no control over the number of the items administered on the metaphor task. Some subjects may have therefore, benefitted from practice effects in receiving additional items.

Additional limitations of the study relate to the generalizability of the findings. The results and conclusions are not readily generalizable to other children because of the small number of subjects involved, the narrow socioeconomic status range, the range of expressive language ability, and the ethnic make-up of the subject pool.

SUMMARY

In the current study, school-aged children were asked to explain metaphors and riddles. Their capacity to explain increasingly more difficult items was explored. The results of the statistical analysis demonstrated that their capacity to interpret metaphors and riddles follows a developmental progression. Statistical differences in performance (additionally, in the case of metaphors, level of reasoning) on the two tasks were found, specifically, that 12-year-olds performed better than 8-year-olds, who in turn, performed better than 6-year-olds.

The results of this study suggest that cognitive developmental changes may be evaluated by examining children's ability to interpret increasingly more complex items in the task domains of metaphor and riddle. Furthermore, the results suggested that there may be an underlying set of cognitive operations shared by both tasks. Continuing research in this field may provide new information and insights into developmental changes in cognitive abilities.

Figurative meaning represents an important dimension in the capacity to understand and use language. As the following statement shows, exploring children's meaning is an important part of their experience with language:

"It's neat, but it's kind of hard. Our teacher just doesn't ask us what things mean...or how we got the meaning...I wish we could do more of that."

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APPENDIX A

Parental Consent - Cover Letter

Dear parent/guardian:

I am a graduate student at the University of Calgary in the Department of Educational Psychology. As part of my degree requirement, I am currently doing research for my thesis under the supervision of Dr. A. McKeough. To complete my research, I require the participation of a number of 6, 8 and 12 year old children. The research will enable me to explore the way language develops and how the interpretation of language changes as children get older.

Participants will meet with me on an individual basis for approximately 45 minutes in one or two sessions, depending on the child's age. The children will be explaining what metaphors (e.g. "David was a car out of gas") mean (and in the case of younger children, acting out stories with illustrations), and listening to riddles and explaining why they're funny.

All sessions will be audiotaped. As with all research, precautions will be taken to ensure that the results are confidential and anonymous and participation on your child's part will not affect his/her academic standing in any way.

If you agree to your child's participation in this study, please read and sign the attached form and return it to the classroom teacher. I appreciate your taking time to consider your child's participation. Thank you.

Sincerely,

Jeffrey C. Mah

Consent for Research Participation

I hereby consent to allow my child,_____, to participate in the research project at ___(school name) entitled, "Children's Understanding of Figurative Language" conducted by Jeffrey C. Mah under the supervision of Dr. A. McKeough of the Department of Educational Psychology at the University of Calgary.

I understand that the study will involve the following general procedures: At a time during the school day agreed upon by the principal and teacher, my child will: a) be explaining what metaphors (e.g. "David was a car out of gas") mean (and in the case of younger children, acting out stories with illustrations); and b) listening to riddles and explaining why they're funny. The research is expected to help identify how children's understanding of language changes as they get older.

I understand that my child's participation is completely voluntary, and that if I should decide against his/her participation, this will not result in any penalty for myself or my child. Furthermore, should permission be given, my child is still free to withdraw from the study at any time, without penalty for myself or my child.

I understand that the results of this research may be published or reported to funding agencies, or scientific groups, but my child's name will not be associated in any way with any published results or attached to the final product of this work.

Finally, I understand that my child's responses will be kept in a locked file, accessible only to the researcher.

I understand that if at any time I have any questions, I can contact the experimenter, Jeffrey Mah at 220-3670 or his supervisor, Dr. A. McKeough at 220-5723.

_____ _____

Date Signature - Parent/Guardian

_____

Child's Signature

APPENDIX B

Metaphor Task Items

Practice item

Billy invited some of his friends to his house, so his mother baked some cookies. She told Billy not to eat the cookies before his friends arrived and sent him to his room to play. Then she put the cookies up in the cupboard and went out to the backyard. After his mother left, Billy came down. He opened the cupboard and found the cookies. He was ready to eat the first cookie when he heard his mother coming back in. Billy was a squirrel hiding the nuts.

Set 1

1. Mary and her friends decided to go tobogganing. She put on her warmest coat and mittens and went out to the garage to get the toboggan. She walked with her mom over to the hill to meet her friends. Mary got onto the toboggan and went racing down the hill. At the bottom of the hill, she got off and climbed back up to the top. Mary got ready to go down again. This time when she went racing down, she hit a bump and fell on her arm. Her mom came over and told Mary that her arm looked broken. Mary was a car being taken to the repair shop.

2. Kenny and Andy were brothers. Their mom told them to get ready to go to the grocery store with her. Kenny and Andy and their mom got into the car and drove to the grocery store. When they got there, it was very busy. There were people and shopping carts going in all directions. There were lots and lots and lots of people in the store. Kenny and Andy did not want to get lost. Kenny and Andy were puppies following their master.

3. Bradley went over to the park to play. He played on the swings, and went down the slide. Bradley saw some monkey-bars he wanted to climb. Up and up over the bars he climbed. He could see all around from up on the bars. Bradley lost his balance and fell off of the monkey-bars. Bradley was a tree with a broken branch.

4. John was at the library with his mom. John told his mom he was going to look for a book he liked. He walked around the library looking for books, but could not find one he liked. He asked his mom to help him find a book. Mom came back with a book for John. John sat down with the book at a table. John was a shark gobbling up his meal.

5. Sally was going to the store with her dad today. They walked over to the grocery store. Sally helped out by getting things on the shopping list. Sally went here and there to get what was on the list. After paying for the groceries, they

began to carry them home. Sally had her arms full of heavy groceries. When they got home, she helped put the groceries away. Her brother asked her if she wanted to play. Sally was a burnt out light bulb.

6. Matthew went outside to play with his friends in the park. There was lots of snow from the night before. Matthew and his friends went sledding, then had a snowball fight. When that was done, they built a snow fort. But soon it was time to go home. Matthew began walking home. Matthew was a snowman in the yard.

Set 2

7. Neil and Ted were having a picnic one afternoon. A butterfly flew by one of the boys. Neil said to Ted, "A butterfly is a flying rainbow." What did Neil mean?

8. Jeff and Susan were lying in the park one afternoon. They were watching the clouds go by. Jeff said to Susan, "Clouds are floating scoops of ice cream." What did Jeff mean?

9. Jill and Wendy were playing upstairs at Wendy's house. Jill was brushing Wendy's hair. Jill said to Wendy, "Hair is spaghetti." What did Jill mean?

10. John and Steve were riding in the back of their dad's car. They were driving down a mountain road. John said to Steve, "A road is a snake." What did John mean?

11. Lori and Cheryl were walking downtown. They passed by a building crane. Lori said to Cheryl, "A crane is a giraffe." What did Lori mean?

12. Bill and Heather got into the car. Bill and Heather went for a long drive in the car. Bill said to Heather, "The car is a thirsty camel." What did Bill mean?

Set 3

13. Rick and Larry worked in a bank. They walked past the security guard and said "hello". Rick said to Larry, "The guard is a rock." What did Rick mean?

14. Sally and Brenda were walking through school. They walked past a new teacher. Sally said to Brenda, "That teacher is sunny." What did Sally mean?

15. Neil and Joe were eating lunch in a restaurant. Neil saw his boss sitting at another table. Neil said to Joe, "My boss is a lamb." What did Neil mean?

16. Jody and Kelly were playing in the park. Jody saw a boy sitting on one of the park benches. Jody said to Kelly, "That

boy is a bird without a song" What did Jody mean?

17. Rick and Al were visiting the library. They sat down at a table. Al said to Rick, "The librarian is an encyclopedia." What did Al mean?

18. Chris and John were on the same baseball team. The coach walked past them. John said to Chris, "Coach is a tiger." What did John mean?

APPENDIX C

Scoring Metaphor Task Items - Passing Criteria of Responses in the Explanation Mode

Set 1

1. Mary was a car being taken to the repair shop.
   -reference to Mary being taken/going to a hospital/doctor to receive help for an injury

2. Kenny and Andy were puppies following their master.
   -reference to Kenny and Andy following close behind their mother

3. Bradley was a tree with a broken branch.
   -reference to Bradley having a broken/injured arm/leg/limb

4. John was a shark gobbling up his meal.
   -reference to John reading a book; reading the book quickly

5. Sally was a burnt out light bulb.
   -reference to Sally being tired or out of energy; needing rest

6. Matthew was a snowman in the yard.
   -reference to Matthew being cold and snowy; snow covered

Set 2

7. A butterfly is a flying rainbow.
   -reference to butterflies being colorful; having lots of colors

8. Clouds are floating scoops of ice cream.
   -reference to shape (scoops, puffy, bumpy) or color of the clouds

9. Hair is spaghetti.
   -reference to hair being long, straight, similar in color (blonde, yellow), tangled, wavy, made of strings

10. A road is a snake.
   -reference to roads having curves, being curvy, having numerous turns

11. A crane is a giraffe.
   -reference to cranes being tall, having long necks

12. The car is a thirsty camel.
   -reference to the car needing gas, oil; having to go to

a gas station

Set 3

13. The guard is a rock.
  -reference to the guard being unfriendly, cold-hearted, solemn, unemotional, unfeeling

14. That teacher is sunny.
  -reference to the teacher being happy, friendly, nice, cheerful

15. My boss is a lamb.
  -reference to the boss being quiet, gentle, meek, timid, easily scared

16. That boy is a bird without a song.
  -reference to the boy being sad, lonely

17. The librarian is an encyclopedia.
  -reference to the librarian being smart, knowledgeable, having lots of answers

18. Coach is a tiger.
  -reference to the coach being mean, aggressive, outgoing, tough

APPENDIX D

Scoring Metaphor Task Items - Level of Reasoning Criteria of Responses in the Explanation Mode

Set 1 - Level 2 reasons

1. Mary was a car being taken to the repair shop.
   -reference to Mary having an injury and needing to go to a hospital/doctor because cars go to the repair shop when broken

2. Kenny and Andy were puppies following their master.
   -reference to the boys following close behind their mother because puppies follow closely behind their master

3. Bradley was a tree with a broken branch.
   -reference to Bradley having a broken/injured arm/leg/limb because it is like trees that have broken branches (limbs)

4. John was a shark gobbling up his meal.
   -reference to John reading a book quickly because sharks gobble or eat meals quickly

5. Sally was a burnt out light bulb.
   -reference to Sally being tired because burnt out light bulbs are out of energy or unable to work anymore

6. Matthew was a snowman in the yard.
   -reference to Matthew being cold and snowy because snowmen are cold and made of snow

Set 2 - Level 2 reasons

7. A butterfly is a flying rainbow.
   -reference to butterflies being colorful, having lots of colors because rainbows are colorful

8. Clouds are floating scoops of ice cream.
   -reference to shape (scoops, puffy, bumpy) or color of the clouds because scoops of ice cream have similar shape, color, texture

9. Hair is spaghetti.
   -reference to hair being long, straight, similar in color (blonde, yellow), tangled, wavy, made of strings because spaghetti possesses similar characteristics

10. A road is a snake.
   -reference to roads having curves, being curvy, having numerous turns because snakes are shaped or move in a similar manner

11. A crane is a giraffe.
-reference to cranes being tall, having long necks because a giraffe is tall and has a long neck

12. The car is a thirsty camel.
-reference to the car needing gas, fuel, oil to keep running because camels need to drink water to keep moving

Set 3 - Level 3 reasons

13. The guard is a rock.
-reference to the guard being unfriendly, cold-hearted, solemn, unemotional, unfeeling because a) rocks are unable to feel emotions, don't display outward signs of emotions or b) an appeal to a colloquial meaning (e.g., heart of stone, stone-hearted)

14. That teacher is sunny.
-reference to the teacher being happy, friendly, nice, cheerful because sunny days make people happy

15. My boss is a lamb.
-reference to the boss being quiet, gentle, meek, timid, easily scared because lambs are associated with similar characteristics

16. That boy is a bird without a song.
-reference to the boy being sad, lonely because birds who are not singing are considered sad and singing birds are considered happy

17. The librarian is an encyclopedia.
-reference to the librarian being smart, knowledgeable, having lots of answers because encyclopedias possess a great deal of information regarding a wide range of topics

18. Coach is a tiger.
-reference to the coach being mean, aggressive, outgoing, tough because tigers are associated with similar characteristics

APPENDIX E

Metaphor Task Items - Multiple-Choice Alternatives

practice item: Billy was a squirrel hiding the nuts.
a) Billy was hiding the cookies like a squirrel hides nuts.
b) Billy saw a squirrel out in the yard.

Set 1

1. Mary was a car being taken to the repair shop.
a) Mary was getting a ride with her mom in the car.
b) Mary was being taken to a hospital or doctor where she could be made better.

2. Kenny and Andy were puppies following their master.
a) Kenny and Andy followed close behind their mom.
b) Kenny and Andy were taking their puppies for a walk.

3. Bradley was a tree with a broken branch.
a) There was a tree in the park with a broken branch.
b) Bradley had a broken arm.

4. John was a shark gobbling up his meal.
a) John read all of the book quickly.
b) The book was about sharks and their food.

5. Sally was a burnt out light bulb.
a) Sally forgot to buy light bulbs.
b) Sally was tired and out of energy.

6. Matthew was a snowman in the yard.
a) Matthew was cold and covered in snow like a snowman.
b) Matthew and his friends wanted to build a snowman.

Set 2

7. A butterfly is a flying rainbow.
a) Butterflies have lots of colors like rainbows.
b) Butterflies fly through the air.

8. Clouds are floating scoops of ice cream.
a) Clouds and ice cream are both cold.
b) Clouds are round and white like scoops of ice cream.

9. Hair is spaghetti.
a) Hair is long and stringy like spaghetti.
b) Her hair had a piece of spaghetti stuck in it.

10. A road is a snake.

a) He saw a snake on the road.
b) The road is curvy and windy like a snake.

11. A crane is a giraffe.
a) Cranes are tall like giraffes are tall.
b) They are walking to the zoo and are going to see the giraffes.

12. The car is a thirsty camel.
a) They drove by the zoo and saw the camels from the car.
b) The car needs to be filled with gasoline.

Set 3

13. The guard is a rock.
a) The guard was cold and unfriendly.
b) The guard had muscles like hard rocks.

14. That teacher is sunny.
a) The teacher was wearing bright, yellow clothes.
b) The teacher was friendly, happy and nice to the kids.

15. My boss is a lamb.
a) His boss was quiet and gentle.
b) His boss had white curly hair.

16. That boy is a bird without a song.
a) The boy has a quiet voice like a bird.
b) The boy was sad and lonely.

17. The librarian is an encyclopedia.
a) The librarian is smart and knows about a lot of different things.
b) The librarian knows how to use the encyclopedias very well.

18. Coach is a tiger.
a) The coach is outgoing, tough and aggressive.
b) The coach yells loudly like a tiger roars loudly.

APPENDIX F

Riddle Task Items

Phonological riddles: based on the phonological structure of a word or similar sounding words or sequences

1. Why do birds get married?
   Because they're tweet-hearts.
2. What does a man with no hair write with?
   A bald point pen.
3. What's a bee's favorite vegetable?
   Sting-beans.

Lexical riddles: based on multiple-meaning words

4. What has 4 wheels and flies?
   A garbage truck.
5. How do you keep fish from smelling?
   You cut off their noses.
6. What dog keeps the best time?
   A watch dog.

Surface structure: based on an alternative grouping of words

7. Tell me how long cows should be milked.
   The same as short ones, of course.
8. Why did the dog go out in the sun?
   He wanted to be a hot dog.
9. What kind of skates wear out fast?
   Cheap-skates.

Deep structure: based on alternative interpretations of the same surface structure

10. What animal can jump higher than a house?
    Any animal, houses can't jump.
11. What do elephants have that no other animal has?
    Baby elephants.
12. Why do postmen carry letters?
    Because letters can't go anywhere by themselves.

APPENDIX G

Scoring Criteria for Riddle Task Items

Pass - an explanation focused on the attributes of the language employed in the riddle; key words and duality of meanings are cited; references connecting dual meanings or key words

Fail - an explanation focused on the situation to which the language might refer, references to what is said rather than meant
- references to individual meanings without connection to each other
-confused, tangential comments reflecting no awareness of the workings of riddles; seen as incomprehensible

Passing criteria for riddles task items

1. Why do birds get married?
   Because they're tweet-hearts.
-reference to the substitution of sweet-heart with tweet-heart
-reference to the connection between sweet-heart and tweet-heart in meaning

2. What does a man with no hair write with?
   A bald point pen.
-reference to the substitution of ball-point with bald-point
-reference to the connection between ball-point pen and bald-point pen in meaning

3. What's a bee's favorite vegetable?
   Sting-beans.
-reference to substitution of string-beans with sting-beans
-reference to the connection between string-beans and sting-beans in meaning

4. What has 4 wheels and flies?
   A garbage truck.
-reference to the dual meanings implied by the word 'flies'
a) as an insect
b) flight; to be airborne

5. How do you keep fish from smelling?
   You cut off their noses.
-reference to the dual meanings implied by the word 'smelling'
a) having an odor; stinking
b) as a sensation

6. What dog keeps the best time?
   A watch dog.
-reference to the dual meanings implied by the word 'watch'

a) looking at; looking for
b) a timepiece

7. Tell me how long cows should be milked.
   The same as short ones, of course.
-reference to the meanings conveyed by alternative grouping of words 'how long cows'
a) (how long) cows - measure of time
b) how (long cows) - reference to size

8. Why did the dog go out in the sun?
   He wanted to be a hot dog.
-reference to the meanings conveyed by alternative grouping of words 'hot dog'
a) (hot-dog) - a foodstuff; wieners
b) (hot) (dog) - bodily temperature of a canine

9. What kind of skates wear out fast?
   Cheap-skates.
-reference to the meanings conveyed by alternative grouping of words 'cheap skates'
a) (cheap-skates) - individuals who are overconscious re: money
b) (cheap) (skates) - inexpensive skates

10 What animal can jump higher than a house?
   Any animal, houses can't jump.
-reference to dual meanings implied by the question
a) an animal jumping higher than the height of a house; over the house
b) the height a house jumping off the ground compared to the height off the ground an animal jumps

11. What do elephants have that no other animal has?
   Baby elephants.
-reference to dual meanings implied by the question
a) what physical attribute/characteristic do elephants possess
b) what do elephants give birth to

12. Why do postmen carry letters?
   Because letters can't go anywhere by themselves.
-reference to dual meanings implied by the question
a) definition of a mailman's occupation; job description
b) a reason letters are carried from point to point