AGE-RELATED DIFFERENCES IN CHILDREN'S

PARTICIPATION IN COGNITIVE ACTIVITIES

Leslie Jacob Moro

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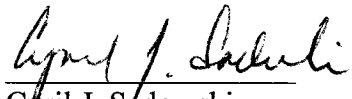

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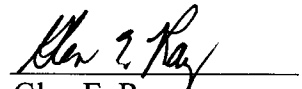

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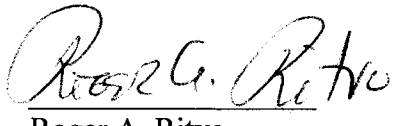

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AGE-RELATED DIFFERENCES IN CHILDREN'S PARTICIPATION IN COGNITIVE ACTIVITIES

Leslie Jacob Moro

A Thesis

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Vita

Leslie Jacob Moro, daughter of Mr. and Mrs. Richard Waugh Jacob, was born November 14, 1974, in San Jose, California. She attended the United States Air Force Academy in 1993-1995 and the University of Memphis from 1995 to 1996. She graduated from the University of Memphis with a Bachelor of Arts degree in psychology in August 1996. She entered Graduate School at Auburn University Montgomery in March 1998. She is married to U.S. Air Force Captain John R. Moro and has a 3-year-old daughter Caitlyn Marie Moro, and is expecting another daughter in May 2000.

THESIS ABSTRACT

AGE-RELATED DIFFERENCES IN CHILDREN'S

PARTICIPATION IN COGNITIVE ACTIVITIES

Leslie Jacob Moro

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The present study examined age-related and gender-related differences in children's participation in cognitive activities. Children in first through sixth grades (N = 261) were interviewed about the activities they enjoyed that made them think. The activities from these interviews were incorporated into questionnaires which were completed by elementary school teachers (N = 21). Ten teachers rated these activities according to gender and grade levels they believed best matched the activities. Eleven teachers rated the activities according to their prototypicality of membership in the category of "Activities children enjoy that make them think." The teachers' gender and grade level ratings were analyzed with respect to the actual gender and grade levels of the respondents. The prototypicality ratings were used to identify those highly prototypical thinking activities for each grade level.

Findings are discussed in terms of the validity of the prototypicality ratings, the developmental trends evident in the children's cognitive activities, and gender differences in the cognitive activities children report participating in. The prototypicality ratings

were shown to have validity, as indicated by their positive relationship with thinking dispositions, the accuracy of the raters' grade level identification for highly prototypical activities, and the accuracy of the raters' gender identification for highly prototypical activities. Developmental trends were examined through investigating the prototypicality ratings of the various activities for each grade level, examining the levels of thinking associated with the activities for each grade level, and identifying and analyzing the grade-common activities. Overall, developmental trends were not as evident as anticipated. Gender differences were examined by identifying those gender-prototype activities but noted that most of the activities, which the children mentioned in the interviews, were shown to be gender-neutral. This paper discusses how the current study extends previous research on need for cognition. Finally, implications for future research into children's need for cognition are considered.

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Age-Related Differences in Children's

Participation in Cognitive Activities

Need for cognition refers to one's cognitive motivation, or one's "tendency to engage in and enjoy thinking" (Cacioppo & Petty, 1982, p. 116). There is extensive research cited in over 100 empirical published studies which has focused on individual differences in need for cognition (Cacioppo, Petty, Feinstein, & Jarvis, 1996). Yet as extensive as the research is, little is known about individual differences in children's need for cognition. The development and validation of a Need for Cognition Scale for children are necessary to fill the knowledge gap surrounding this concept. This study will provide research on age-related activities, which will facilitate the future development of a measure of children's need for cognition.

Purpose of the Study

The purpose of this study was to facilitate discovery and description of children's individual differences in need for cognition or intrinsic motivation to think. A qualitative design is most suited to answer the primary research question: Do children participate in particular cognitive activities depending on their age and gender?

Need for the Study

A thorough review of the literature indicates that need for cognition has been extensively studied, but the existing Need for Cognition Scale was not designed to assess need for cognition in children. Cacioppo et al. (1996) acknowledge that, while the range of ages in most need for cognition studies exceeds 50 years, "college students typically served as the 'young' participants" (p. 217). The Need for Cognition Scale reliably

assesses individual differences in cognitive motivation in college-age students and older adults (i.e., Cronbach alphas typically $\geq$ .85; e.g., Cacioppo & Petty, 1996). However, without research on differences in children's cognitive motivation, one cannot generalize any of these findings across the age spectrum. Cacioppo et al. (1996) acknowledge the need for research on need for cognition with children. Their review states that nine studies have examined the relationship between age and need for cognition in adults. They note that research with children would help complete the "picture" (p. 217). The present study used the child's age as a participant variable allowing for investigation of the relationship between age and activities reflecting need for cognition.

Need for cognition research has been beneficial to the description and understanding of individual differences. Cacioppo et al.'s (1996) review discusses research which relates need for cognition to other personality and individual-difference variables. These findings would be useful in understanding children's differences in intrinsic motivation and other individual differences if they are found applicable to younger populations. The results of this study may enable researchers to answer important questions concerning the basis for individual differences in children's intrinsic motivation, academic achievement goals, and creativity.

Review of the Literature

The literature reviewed for this study addressed the following concepts: need for cognition, intrinsic motivation, cognitive development, and act prototypicality.

Need for Cognition

The literature indicates that the Need for Cognition Scale has been shown to assess need for cognition reliably (Cacioppo & Petty, 1982; Cacioppo et al., 1996). Need

for cognition was found to be a "stable individual difference in people's tendency to engage in and enjoy effortful cognitive activity" (Cacioppo et al., 1996, p. 197).

In regard to gender differences, considerable research indicates that need for cognition is gender neutral. Cacioppo et al. (1996) indicate that the reliability of the Need for Cognition Scale was found to be similar for men and women (e.g., Cronbach alpha = .86 for men and women).

Need for cognition has been related to a multitude of individual differences variables, such as intrinsic motivation, dogmatism, need for structure, preference for order, and curiosity. Cacioppo et al. (1996) acknowledge that need for cognition reflects a cognitive motivation rather than an intellectual ability. Individuals high in need for cognition are intrinsically motivated to engage in cognition. Cacioppo et al. (1996) refer to individuals with low intrinsic motivation to engage in effortful cognitive endeavors as "chronic cognitive misers" (p.197). They label those with high intrinsic motivation to exercise their mental faculties as "chronic cognizers" (Cacioppo et al., 1996, p.197). The Cacioppo et al. (1996) review indicates that individuals high in need for cognition "enjoy effortful reasoning and problem solving more [than individuals low in need for cognition] and are less stressed by cognitively effortful problems, complex life circumstances, or cognitively demanding tasks" (p. 215).

Intrinsic Motivation

While there has been extensive research on children's intrinsic motivation in general (Dev, 1997; Guthrie et al., 1997; Shapiro & Whitney, 1997; Wigfield & Guthrie, 1997; Wild, Enzle, Nix, & Deci, 1997), there has been little on children's intrinsic motivation to think. The need for cognition literature indicates a positive relationship

between intrinsic motivation and need for cognition, with individuals high in need for cognition having greater intrinsic motivation to think than individuals low in need for cognition (Cacioppo et al., 1996). There is a need for a reliable measure of children's need for cognition so that researchers may determine if this relationship can be generalized to younger populations.

The purpose of reviewing the literature on intrinsic motivation, in addition to the literature on need for cognition, lies in the attempt to search for the relationship between intrinsic motivation and children's need for cognition. The rate in which children engage in cognitively demanding tasks reflects individuals' intrinsic motivation to engage in effortful thinking. Wigfield and Guthrie (1997) define intrinsic motivation as "choosing to do and then doing an activity for its own sake, rather than for 'extrinsic' reasons such as receiving recognition or grades (p. 421). They further acknowledge that an individual who is intrinsically motivated to perform a task tends to become "totally involved in the activity" (p.421).

Dev (1997) notes that an intrinsically motivated individual is "excited by the challenging nature of an activity" (p.13). Similarly, Shapiro and Whitney (1997) define children's academic intrinsic motivation as involving "the enjoyment of school learning characterized by an orientation toward mastery, curiosity, preference, and the learning of challenging, difficult and novel tasks" (p.352). There are common themes in these researchers' definitions of motivation. Both definitions refer to an individual's excitement or enjoyment in challenging activities or tasks. In addition, research indicates that labeling an activity as "work" actually increases intrinsic motivation for children who view work in a positive manner (Wild et al., 1997). It is evident, from these

definitions of intrinsic motivation, that need for cognition is related to intrinsic motivation, since these concepts both reflect an individual's engagement and enjoyment of challenging or effortful tasks.

In addition, research on intrinsic motivation reveals that "interpersonal cues" concerning the motivation of others who are involved in a task can also affect a child's interest and enjoyment during the task (Wild et al., 1997). In other words, merely observing another person displaying enjoyment and persistence while participating in the activity results in enhanced intrinsic motivation in "perceiver-subjects" when they later engaged in the activity (Wild et al., 1997). In a similar study, Wild, Enzle, and Hawkins (1992) found that those children, who perceived the target person as intrinsically motivated, were more interested in further learning and displayed greater exploratory activity during their leisure time. These results allow researchers to conclude that children's intrinsic motivation is influenced by their perceptions of others' motivation to engage in an activity (Wild et al., 1997).

Intrinsic motivation and leisure reading. In looking at intrinsic motivation for reading, one might ask whether the tendency to engage in leisure reading is related to need for cognition. In the current study, one might ask whether book reading is a task that requires effortful thinking. If the reading is regarded as a task involving effortful thinking, the child's rate of participation in leisure book reading may reveal his or her level of need for cognition.

Quite a few studies document children's intrinsic motivation for reading (e.g., Guthrie et al., 1997; Shapiro & Whitney, 1997; Whitney, 1996; Wigfield & Guthrie, 1997). Wigfield and Guthrie (1997) found that children's interest in reading and attitudes

about reading are correlated with their intrinsic motivation for reading. In addition, research has found that reading motivation is related to the amount and breadth of reading (Guthrie et al., 1997; Shapiro & Whitney, 1997; Wigfield & Guthrie, 1997). In other words, research reveals that children with higher intrinsic motivation read more and with more breadth than children with lower intrinsic motivation.

Another interesting finding in the research on children's intrinsic motivation for leisure reading involves a gender effect (Shapiro & Whitney, 1997; Whitney, 1996; Wigfield & Guthrie, 1997). Overall, girls spent more time in leisure reading than boys did. Shapiro and Whitney (1997) espouse that differences in home variables, such as parental encouragement and parental reading to children, largely account for differences in children's motivation to read. The authors found that non-avid readers indicated that they were "rarely" encouraged to read at home and also mentioned younger ages at which parents stopped reading to them. This gender difference is a particularly interesting finding because need for cognition is not affected by gender. However, it may be that boys and girls express need for cognition in different activities.

The present study investigated the gender effect evident in children's intrinsic motivation for leisure reading. By asking children of both genders what activities they enjoyed that made them think, one may determine whether need for cognition is reflected by different types of activities for boys and girls. The current study may also determine whether there is a gender difference in the rate of development of need for cognition. In other words, one may determine if girls spend more time in leisure reading because their interest develops earlier than boys.

Intrinsic motivation and goal orientations. Recent research investigating students' academic motivation has revealed the important role that goals play in determining children's academic behavior. Achievement goal theory espouses that students pursue either mastery (task or intrinsic) goals or performance (extrinsic) goals (Anderman & Midgley, 1997; Harackiewicz, Barron, Carter, Lehto, & Elliot, 1997; Kaplan & Midgley, 1997; Middleton & Midgley, 1997; Midgley et al., 1998; Seifert, 1996). Individuals who are performance goal oriented are motivated by the desire to demonstrate, or prove, their ability relative to others, while those who are mastery goal oriented are motivated by the desire to develop and improve their ability. Furthermore, students who are mastery goal oriented engage in learning to acquire knowledge and increase their competence. These students view difficult problems as challenges and have a greater preference for challenge. Meyer, Turner, and Spencer (1997) refer to these mastery goal oriented students with preferences for challenge as "challenge seekers" (p. 501). The documented relationship between mastery goals, intrinsic motivation, and preference for challenge seems to indicate a relationship between those who are mastery goal oriented and those who have a high need for cognition.

Cognitive Development Literature

It was important to conduct a review of cognitive developmental literature because a child's cognitive developmental stage determines what is mentally challenging for him or her. Neugebauer (1997) considers a child's cognitive development in setting his guidelines for purchasing educational toys. Neugebauer (1997) espouses that toys should place realistic demands on children's cognition and should provide a challenge. For instance, putting together a puzzle may be frustrating and challenging for a young

preschooler but would not require much effortful thinking for an older child. Piaget's cognitive developmental theory provided the focus for this review of the literature of cognitive development.

Piagetian theory. Piaget, whom Siegler and Ellis (1996) refer to as the "prototypic developmental stage theorist," (p. 214) sought an understanding and explanation of the variability of children's thinking. Ginsburg (1997) states that researchers typically rely heavily on the work of Piaget in understanding children's intellectual development. Siegler and Ellis (1996) believe that, "Piaget's ideas remain central to current understanding of cognitive development during childhood" (p. 210).

According to Piaget, children "have a biologically based propensity to learn" (Ginsburg, 1997, p. 21). In other words, children are natural learners and are intrinsically motivated to acquire mastery knowledge. This view of children as natural learners who are intrinsically motivated to learn poses an interesting question concerning individual differences in need for cognition: If all children are intrinsically motivated to make sense out of their world, would there even be apparent differences in their need for cognition, or intrinsic motivation to engage in cognitive activity? From the research on intrinsic motivation and goal orientations, one finds that there are differences in children's goal orientations and their preference or avoidance of challenges.

Piaget explains children's cognitive development by giving clear, concise stages depicting children's thinking at particular ages (Siegler & Ellis, 1996; Wadsworth, 1988). However, Siegler and Ellis (1996) believe that cognitive development is more complex than Piaget's "crisp characterizations" suggest (p. 212). Siegler and Ellis believe that the

goal of cognitive developmental research should be to identify characteristic tendencies in children's thinking with the aim of capturing the variability in children's thinking.

Because children's thinking changes, becoming more abstract as the child develops with age, Dev (1997) asserts that, in determining what is challenging to a particular child, it is crucial to know the child's developmental level. Dev (1997) implies that age is an important variable when stating that motivational orientation can change with the cognitive development of the learner. Based on this rationale, the present study used age as a participant variable. Therefore, the question of whether need for cognition will change with age is key.

Thinking Dispositions

Perkins, Jay, and Tishman (1993) believe that good thinking can be characterized by seven key intellectual tendencies, or dispositions. These dispositions are:

1. The disposition to be broad and adventurous. This first disposition, or level of thinking, refers to one's tendency to be open-minded and explore alternative views.
2. The disposition toward sustained intellectual curiosity. This refers to the "tendency to wonder, probe, find problems; a zest for inquiry" (Tishman et al., 1993, p. 148).
3. The disposition to clarify and seek understanding. The third disposition refers to one's desire to understand clearly and one's alertness to unclarity and need for focus (Tishman et al., 1993).

4. The disposition to be planful and strategic. This level of thinking refers to the drive to set goals and make plans, and one's ability to formulate goals and plans.
5. The disposition to be intellectually careful. The fifth disposition reflects one's urge for precision, organization, and thoroughness.
6. The disposition to seek and evaluate reasons. This disposition refers to the tendency to question the given, demand justification and evidence.
7. The disposition to be metacognitive. The seventh level of thinking refers to the tendency and ability to be aware of and exercise control over one's own thinking (Perkins, Jay, & Tishman, 1993, pp. 6-8).

The authors propose that these dispositions reflect one's inclinations, sensitivities, and abilities. When referring to inclinations, they argue that thinking dispositions may reflect one's motivations or habits (Perkins et al., 1993). According to their theory, "inclination" refers to "the person's felt tendency toward behavior X" (Perkins et al., 1993, p. 4). In addition, Perkins et al.'s dispositional model of thinking supports the notion that thinking dispositions reflect one's "sensitivity." Sensitivity refers to "the person's alertness to X occasions" (Perkins et al., 1993, p. 4). The third component of dispositions is ability, which refers to the "actual ability to follow through with X behavior" (Perkins et al., 1993, p. 4). For example, open-minded thinking would reflect the inclination or tendency to think in an open-minded way, sensitivity to occasions in which open-mindedness is called for, and the ability to be open-minded.

According to this dispositional model of thinking, the ideal thinker is disposed toward all seven of these thinking behaviors. Perkins et al. (1993) believe that children

begin developing these dispositions by the beginning of their formal schooling. Based on this model the current study expected that older children would possess and demonstrate more of these thinking dispositions than would younger children. In addition, it was expected that older children would demonstrate more higher level thinking dispositions than would younger children.

Act Prototypicality

In the present study, children's activities were examined with the goal of identifying those activities which were more prototypical of activities which make children think. Buss and Craik (1983) developed an act frequency approach to personality, which represents a "systematic analysis of dispositional constructs as categories of acts occurring in everyday human conduct" (Buss & Craik, 1986, p. 389). Shopshire and Craik (1996) state that "personality dispositions refer to behavioral exemplars varying on a dimension of prototypicality; some behavioral exemplars are highly prototypical of, or central to, the category whereas others lie on the periphery, or fuzzy boundary" (p. 205). Act prototypicality refers to the extent to which a behavior exemplifies a particular disposition, or category of acts. For example, one might rate the behavior of "picking a fight with the stranger at a party" as highly prototypical, or central, to the disposition of quarrelsomeness. However, one might rate "insisting upon doing the driving on the trip" as not very typical of the category of quarrelsome acts (Buss & Craik, 1983, p. 110). This latter behavior might be interpreted as one that is included in the category of quarrelsome acts but lies on the periphery of the category of quarrelsomeness. In other words, acts within each category differ in their prototypicality of membership. Based on Buss and Craik's concept of prototypicality, this study

examined children's activities to determine their prototypicality of membership in the category of "Activities which children enjoy that make them think."

In act frequency analysis, Buss and Craik (1983) used judges to rate the prototypicality of each act. In other words, the panel of judges determined the extent to which certain behavioral descriptors were good examples of a particular personality disposition. The judges used a 7-point rating scale, ranging "from 7 for the most prototypical instances to 1 for those judged as either poor examples or not at all relevant to the personality disposition" (Shopshire & Craik, 1996, p. 210). Buss and Craik used this rating procedure to identify the consensual prototypicality judgement of each act. They found that the judges show reasonable agreement as indicated by alpha reliability coefficients ranging from .77 to .96 (Buss & Craik, 1983).

This study used some of the same procedures as outlined by Buss and Craik's act frequency approach to determine the prototypicality of children's cognitive activities. Because of their expertise in the field of children's cognitive development, elementary school teachers were used to judge the activities according to their prototypicality of membership in the category of activities children enjoy that make them think. The teachers judged the prototypicality of the children's activities using a similar 7-point scale.

Summary

Major research studies related to the need for cognition and intrinsic motivation have been discussed. Research that investigated need for cognition focused on the concept in general; however, no studies were found in which the sample was composed of young children. The review of the literature revealed that the phenomenon of need for

cognition is one that has been studied in college-age and older adult populations, but further studies are needed using younger populations. The present study fills a gap in the literature because activities related to need for cognition of younger children were explored.

After reviewing the literature on children's cognitive development, it was apparent that the cognitive activities which children participate in in their leisure time may vary depending on their age or gender. This research provides new information on individual differences in young children's need for cognition, or intrinsic motivation to engage in cognitive activity, thus aiding in the development of a need for cognition scale for younger subjects. Specifically, this study investigated the following research question: Do children participate in particular cognitive activities depending on their age and gender?

In particular, this study investigated three basic issues. First, the study addresses identifying the prototypical activities at particular grade levels. Elementary school teachers rated the activities according to their prototypicality of membership in the category of thinking activities. These ratings were then used to determine which activities were prototypical thinking activities for particular grade levels, and the validity of these prototype ratings was investigated. Secondly, the study addresses whether there were age differences in the cognitive activities which children enjoy. In other words, the research examines whether children at different grade levels participate in different cognitive activities and whether the same activity reflects higher levels of thinking at higher grade levels. The third issue was whether there were gender differences in the cognitive activities which children enjoy and if the actual gender orientations, as reflected

by the gender of the children who mentioned particular activities in the interviews, corresponded to the perceived gender orientations, as reflected by the teachers' gender ratings for the activities.

Method

Participants

Among a population of 760 elementary school children in first - sixth grades at a large urban Alabama public school, 261 children were obtained to participate in the study (137 girls and 124 boys). The participation rate varied across the six grades, with first-grade students having the highest participation rate of 47% and the sixth-grade students having the lowest participation rate of 20% (See Table 1). Approximately 43% of the sample was African American, and 54% was Caucasian. Parental consent was obtained, and participants in the study also agreed to participate by signing informed consent forms (See Appendix A).

Table 1

Student Participation Rates across Grade Levels

Grade Level	Participation Rate	Percentage of Participation
Grade 1	60/126	47.62%
Boys	32/60	
Girls	28/60	
Grade 2	51/116	43.97%
Boys	22/51	
Girls	29/51	
Grade 3	48/133	36.09%
Boys	18/48	
Girls	30/48	
Grade 4	45/125	36.00%
Boys	21/45	
Girls	24/45	
Grade 5	31/130	23.85%
Boys	16/31	
Girls	15/31	
Grade 6	26/130	20.00%
Boys	15/26	
Girls	11/26	

Twenty-one elementary school teachers volunteered to participate as raters in the study. Ten teachers rated each of the children's activities, which were collected from interviews with children, according to the gender and grade level they believed best corresponded to the particular activity. Eleven teachers rated the activities, grouped by grade level, according to their prototypicality of membership in the category of "activities children enjoy that make them think." The researcher obtained the raters by asking for volunteers from graduate students who were enrolled in Auburn University Montgomery's Elementary Education Master's Program and who were currently teaching elementary school. These teachers agreed to participate by signing informed consent forms (See Appendix B). In addition, all participants were treated in accordance with the ethical standards of the American Psychological Association.

Materials

The materials used in this study included an unpublished, structured interview (See Appendix C). The goal of the interview was to obtain a list of cognitive activities in which children engage. The equipment employed in the interviews included a cassette recorder and audiotapes, which were used to record the interviews. Due to the use of an unpublished, unestablished interview schedule, there is no existing information on the reliability or validity of the measure used. However, all participants received the same questions and prompts, so this standardization contributed to optimum reliability.

In addition to the interview, the materials in the study included three teacher questionnaires (See Appendices D and E). These questionnaires asked elementary school teachers to rate the activities according to their appropriate gender, grade level, and prototypicality of membership in the category of "activities children enjoy that make

them think." Ten teachers rated the activities according to the gender and grade level they believed best corresponded to the particular activity. Eleven teachers rated the activities according to their prototypicality of membership in the category of "activities children enjoy that make them think."

Lastly, the activities were coded according to associated levels of thinking (Perkins et al., 1993). The researcher and a partner coded each activity with its associated level(s) of thinking. These levels of thinking were analyzed across grade levels to determine whether there was a developmental difference in the levels of thinking which children employ.

Design and Procedure

The standardized interviews were conducted with participants over a period of four weeks. Each interview lasted an average of three minutes. The participants' verbalizations were tape recorded, also with their permission, and each tape-recorded interview was then transcribed into text at the end of the interview.

Each child was interviewed in a quiet area outside of his/her classroom. Prior to administering the interview, the following instructions were given to each child: "Some activities make us think more than other activities." Due to the young ages of some of the children, examples of activities that make children think were provided. For example, the participants were told that, "Working on a challenging homework problem or puzzle makes us think more than watching a cartoon." Once the participants were given this information, they were asked the following standardized question: "What do you like to do that makes you think?" If the child paused, or otherwise indicated that he or she might not understand the question, the researcher then asked the participant to try to repeat the

question in his/her own words. Once the participant correctly repeated the question, the researcher then rephrased the question by asking, "What games or other activities do you like to do that make you think?"

After children responded to the question concerning what kinds of activities they enjoy that make them think, children were asked, "What is it about that activity that makes you think?" An example was then provided. "For instance, playing chess may make you think about strategy, and playing with a puzzle may make you think about how to connect all the pieces properly." Once it was certain the child understood the question, the question was repeated, "What is it about _____ (insert the activity the child mentioned) that makes you think?" This was asked for each activity that they mentioned as an activity they enjoyed that made them think. Based on children's responses to this question, activities were coded into different kinds of categories. For instance, children of different ages often mentioned the same activity as one they enjoyed that made them think, but it was usually something different about the activity that made them think. Children in higher grade levels were predicted to participate in activities that reflected higher levels of thinking than younger children.

In addition to discovering what activities children enjoy that make them think, children were asked, "What activities do you enjoy that do not make you think?" This question was used to determine the ratio of thinking activities to overall activities, both thinking and nonthinking activities. Investigating the ratio of thinking activities to overall activities allowed for examining whether thinking activities occur at higher rates in higher grade levels. Once the child answered all interview questions, the child was escorted back to his or her classroom.

Teacher questionnaire. All interviews were transcribed to compile a list of 74 unique children's activities. The researcher then included these activities on the teacher's questionnaires so that the teachers could rate them according to their appropriate gender, grade, and prototypicality of membership in the category of activities that require effortful thinking (See Appendixes D and E). Gender and grade level ratings were combined on one questionnaire so that the same teacher could rate all the activities mentioned during the interviews according to both their appropriate gender and grade level. Prototypicality ratings were done on a separate questionnaire by a different set of teacher judges ($N = 11$); for these ratings the researcher had the activities grouped by grade level.

Twenty-one elementary school teachers volunteered to participate as raters in the study (See Appendix B). These teachers, considered experts in the field of children's cognitive development, were used as raters in the process of ensuring construct validity. The expert elementary school teachers assisted in rating activities according to their grade-appropriateness, the typical gender associated with the activity, and the activity's prototypicality of membership in the category of "activities which children enjoy that make them think" (See Appendixes D and E).

Grade rating. Ten teachers were used as judges to rate each particular activity according to the school grade for which they believed the activity was appropriate. Teachers were asked to circle the grade level, from first through sixth, which they believed best corresponded to the activity. If teachers believed the activity to be one in which children at a variety of grade levels were likely to engage in, they were to indicate the grade level at which they believed the activity was most typical.

Gender rating. The same ten teachers used for the grade ratings were also asked to rate each particular activity according to the gender that was typically associated with the activity. In this rating, the teachers indicated whether an activity was more likely to be one engaged in by a girl, a boy, or was one that was likely to be engaged in by either a boy or a girl. The teachers were asked to either circle "G" for girl, "B" for boy, or "N" for neutral activity. For statistical analysis, the girl ratings were scored as "1," boy ratings were scored as "-1," and neutral ratings were scored as "0." By rating activities according to the gender they were typically associated with, one was able to identify gender-type activities. In addition, one could analyze the resulting data to determine if there is a gender difference in the cognitive activities in which children participate.

Act prototypicality ratings. Eleven teachers assisted the researcher in determining which activities, from among the children's responses, actually required effortful thinking from the particular-aged child. The activities were already grouped by grade level, based on the grade level of the child who mentioned each activity. The teachers judged the activities according to their prototypicality of membership in the category of "Activities children enjoy that make them think" (Sadowski, Tidwell, & Ray, 2000). According to Buss and Craik (1983), acts within each category differ in their prototypicality of membership. The judges rated the prototypicality of the activity on a 7-point scale, which is described in Buss and Craik's Act Frequency Approach research (1983). Highly prototypical acts are the clearest cases of "Activities children enjoy that make them think" and were those that were rated as "7"'s. In other words, each judge was told to give a "7" to an activity that is a "very good example of your idea of what an activity that children enjoy that make them think." A "1" means that they felt the activity "fits very

poorly" with their "idea of what an activity that children enjoy that makes them think is, or is not a member of the category at all. A "4" means they felt the activity fits moderately well with their idea of activities that children enjoy that make them think (Buss & Craik, 1986). The other numbers on the scale represent more intermediate judgments.

The purpose of the prototypicality ratings was to identify the consensual prototypicality judgment of each act that children mentioned as one they enjoyed that made them think. The individual teacher ratings were used to determine the consensual gender, grade, and prototypicality ratings. Once the consensual ratings were determined, the researcher could analyze the results of the actual interviews in comparison with the consensual ratings on gender, grade, and prototypicality for the children's activities. After the teachers completed their ratings of the activities, the reliability of the rating panel in judging which activities were more or less prototypical of activities requiring effortful thinking was analyzed. The reliability of the judges was determined by examining the reliabilities of the prototypicality ratings and the average between-rater agreements. The activities could then be listed according to prototypicality rankings, from the most prototypical thinking activities to the least prototypical thinking activities.

Barber and Wesson (1998) espouse the view that verbal protocol analysis is a well-established instrument for collective qualitative research. A protocol analysis was used to assign codes, on the basis of predetermined coding categories, to the participants' responses. This method was used in transcribing and analyzing the content of the interviews. In this study, the researcher identified and interpreted protocols addressing Perkins et al.'s (1993) seven thinking dispositions, or levels of thinking. The activities

were coded according to the thinking level or levels that were required of the activity (See Table 2). Two coders were used, and discrepancies were resolved so there was agreement on all activities.

Table 2

Coding of Activities According to the Levels of Thinking Which are Involved

Activity	Level of Thinking
Addition	5
Subtraction	5
Multiplication	5
Division	5
Developing Football plays	4
Practicing baseball strategy	4
Practicing basketball strategy	4
Practicing efficient swimming strokes	4
Thinking about gymnastics routine	4
Riding bike	4
Playing kickball	4
Hide 'n go seek	4
Swinging through the air	1
Working on trampoline	4
Washing bike	4
Playing with dolls	1
Art projects	1,4,5
Drawing pictures	1,4,5
Coloring	1,4,5
Painting	1,4,5
Playing educational computer games	2,4,5
Spelling quizzes	5
Answering science questions	5
Playing board games	4
Writing stories	1,2,3,4,6,7
Reading books	1,2,3,6

Coding of Activities According to the Levels of Thinking Which are Involved

Activity	Level of Thinking
Playing w/ math flashcards (ex. Timetables)	2,5
Sitting in a quiet place	7
Singing	1,5
Watching the news	1,2,3,6
Watching cartoons	1
Watching the History or Discovery channel	1,2,3,6
Watching game show	2,4,5
Ice skating	5
Playing card games (ex. Poker)	4,5,7
Listening to music	1
Playing tag	4
Reading instructions for toy assembly	4,5
Hunting strategy	4,5
Playing golf	4,5
Setting dinner table	4
Listening & following game directions	4,5
Doing word search puzzles	2,4,5
Crossword puzzles	2,4,5
Research Encyclopedia	1,2,3,4,6
Playing tennis	4,5
Eating new foods	1
Fishing	4,5
Walking dog	1
Sleeping	1
Learning how to cook	2,3,4,5
Karate technique	4,5
Brainteaser games	2,3,5
Watch weather channel	1,2,3,6
Teach ABCs to younger sibling	2,4,5,7
Solve math word problems	2,4,5,6,7
Study history	2,3,5
Study word definitions	5
Wrestling	4
Trivia questions	1,2,5
Typing on computer	5

A response was coded as "asking for further clarification" if the child indicated confusion about a particular question. A response was coded as an "irrelevant response" if the participant spoke of anything other than activities he or she enjoys that do or do not make them think. Thus, protocol analysis was used to interpret the child's responses.

Protocol analysis is a qualitative technique for assessing the construct validity of a measure (Barber & Wesson, 1998). In assessing the construct validity, one is asking whether the instrument measures what was intended to be measured. The verbal protocol analysis was useful in examining the respondents' answers to the questions in the interview. Barber and Wesson (1998) state that "in order for a measure to be deemed construct valid, its items must have meaning to respondents, and responses must also have meaning" (p. 74). The protocol analysis analyzed the construct validity of the measure.

One concern that the researcher had about this study involved whether respondents would know the meaning of the questions. To alleviate this concern, the researcher asked participants who seemed confused to try to restate the question in their own words. This precaution enabled the researcher to assess the respondents' comprehension. This step was important since participants' understanding was crucial to the study's validity. Thus, the protocol analysis helped to ensure that the items and the responses in the study are meaningful.

Interviewing began with first-grade children to ensure that the respondents, particularly the younger children, would understand the questions. The children could comprehend all questions. The simple word choice and the example, which were used by the interviewer, ensured the participants' understanding of the questions and concepts of

interest. These strategies controlled for the chance that participants might respond at random and promoted the likelihood of participants' providing meaningful responses.

Results

The purpose of the current study was to facilitate discovery and description of children's individual differences in need for cognition or intrinsic motivation to think. In analyzing the results, the researcher dealt with both qualitative and quantitative data since the research project involved both interviews and questionnaires.

Qualitative Data

QSR NUD.IST, software for qualitative data analysis, was employed to assist in coding the interview data into common categories. In coding the data, male responses were separated from female responses and thinking activities from nonthinking activities. In addition, responses were separated according to grade level. Multiple text searches were performed to code the interview data according to the common categories of activities that the children mentioned in the interviews. For instance, after transcribing the data it was evident that "reading books" was a common thinking activity mentioned by children in the interviews. A text search for "read/reading books" from the data coded as first grade males' thinking activities was then performed. The computer showed every respondent who mentioned the words "read/reading books" and counted the number of first grade males who mentioned this activity. With this frequency count, the data was coded as the category "reading.firstgrademales." Thus, this program aided the analysis by counting the frequency of common activities and coding the data into common categories.

Quantitative Data

Reliability of the measures.

In evaluating the reliability of the measures, the researcher examined the interrater reliabilities and the Spearman-Brown composite reliabilities of the teacher questionnaires. The Spearman-Brown reliabilities of the composite ratings (average rating over raters) and the average between-rater agreements are as follows: gender ratings, .89, .45; grade ratings, .91, .50; and prototypicality ratings, .85, .33. These indices are high, indicating that the raters displayed adequate composite reliability in judging the activities' appropriate gender and grade level and in judging which activities were more or less prototypical of the category of "activities children enjoy that make them think." Overall, the composite reliabilities of the questionnaires indicate that they were highly reliable measures.

In analyzing the quantitative data, three basic issues were investigated: 1) Validity of the prototypicality ratings; 2) Developmental trends; and 3) Gender differences.

Prototypicality ratings. The teacher-judges who completed the questionnaires provided ratings for three categories: 1) prototypical thinking activities; 2) grade level; and 3) gender. First, the prototypical thinking activities for the particular grade levels were identified. The researcher and a partner also coded each of the activities with respect to levels of thinking so that one can examine the activities by grade according to their prototypicality ratings and their associated levels of thinking, or highest level of thinking associated with each activity. See Table 3 for the complete listing of cognitive activities with their respective prototypicality ratings and levels of thinking.

Table 3

Examining Activities by Grade in Terms of Prototypicality Ratings and Highest Level of Thinking

Activity	Prototypicality Rating	HLOT
Grade 1		
Educational computer games	6.18	5
Putting a puzzle together	5.82	5
Writing stories	5.73	7
Reading books	5.55	6
Board games	5.45	4
Addition	5.45	5
Subtraction	5.27	5
Science questions	5.27	5
Drawing pictures	5.09	5
Math flashcards	5.00	5
Watching history channel	4.82	6
Learning how to cook	4.82	5
Brainteasers	4.82	5
Spelling quizzes	4.73	5
Planning football plays	4.55	4
Teach ABCs to sibling	4.45	7
Playing video games	4.36	5
Practicing basketball	4.18	4
Playing hide 'n seek	4.18	4
Coloring	4.09	5
Singing	4.09	5
Jump rope	3.73	4
Playing with dolls	3.64	1
Playing kickball	3.27	4
Rollerblading	3.27	5
Watching weather channel	3.00	6
Sitting in a quiet place	2.82	7
Fishing	2.55	5
Playing tag	2.36	4
Walking dog	2.09	1
Watching cartoons	1.91	1
Swinging	1.91	1
Sleeping	1.45	1

Activity	Prototypicality Rating	HLOT
Grade 2		
Educational computer games	6.09	5
Writing stories	6.00	7
Telling time	5.45	5
Addition	5.18	5
Putting a puzzle together	5.18	5
Science questions	5.18	5
Subtraction	5.09	5
Art projects	5.09	5
Spelling quizzes	5.09	5
Reading books	5.00	6
Math flashcards	5.00	5
Division	4.91	5
Playing board games	4.82	4
Drawing pictures	4.73	5
Practicing baseball	4.64	4
Practicing basketball	4.55	4
Practicing karate	4.55	5
Playing video games	4.18	5
Trampoline technique	3.91	4
Playing card games	3.82	7
Practicing swim strokes	3.73	4
Playing with dolls	3.55	1
Playing kickball	3.36	4
Coloring	3.27	5
Riding bike	3.09	4
Eating new foods	3.09	1
Rollerblading	3.00	5
Watching game shows	2.91	5
Sitting in a quiet place	2.73	7
Watching TV sitcoms	2.45	1
Washing a bike	2.45	4
Watching movies	2.27	1
Swinging	2.27	1
Watching cartoons	1.91	1

Activity	Prototypicality Rating	HLOT
Grade 3		
Reading books	5.91	6
Educational computer games	5.91	5
Writing stories	5.91	7
Science questions	5.55	5
Word search puzzles	5.55	5
Fraction problems	5.45	5
Toy assembly instructions	5.18	5
Board games	5.09	4
Study history	5.09	5
Putting a puzzle together	5.00	5
Multiplication	5.00	5
Math flashcards	5.00	5
Subtraction	4.91	5
Addition	4.82	5
Spelling quizzes	4.82	5
Practicing basketball	4.64	4
Planning football plays	4.64	4
Division	4.45	5
Drawing pictures	4.45	5
Research encyclopedia	4.36	6
Practicing baseball	4.36	4
Thinking about gymnastics routine	4.36	4
Watching history channel	4.27	6
Listening to music	4.27	1
Playing video games	4.18	5
Playing card games	4.09	7
Watching news	3.91	6
Hunting strategy	3.91	5
Playing golf	3.91	4
Algebra questions	3.82	5
Setting dinner table	3.64	4
Practicing swim strokes	3.45	4
Riding bike	3.18	4
Playing hide 'n seek	3.09	4
Playing kickball	3.09	4
Ice skating	3.09	5
Coloring	2.82	5
Jump rope	2.73	4
Playing with dolls	2.64	1

Activity	Prototypicality Rating	HLOT
Grade 3		
Sitting in a quiet place	2.64	7
Doing flips	2.55	4
Playing tag	2.27	4
Watching TV sitcoms	2.00	1
Watching cartoons	1.64	1
Grade 4		
Writing stories	6.45	7
Educational computer games	6.00	5
Math word problems	5.91	7
Reading books	5.73	6
Crossword puzzles	5.55	5
Trivia questions	5.45	5
Art projects	5.45	5
Division	5.27	5
Science questions	5.18	5
Study history	5.09	5
Telling time	5.09	5
Multiplication	5.00	5
Putting a puzzle together	5.00	5
Practicing baseball	5.00	4
Practicing basketball	5.00	4
Spelling quizzes	4.82	5
Math flashcards	4.73	5
Subtraction	4.64	5
Watch history channel	4.55	6
Gymnastics routines	4.55	4
Study word definitions	4.45	5
Planning football plays	4.45	4
Addition	4.45	5
Playing soccer	4.36	4
Board games	4.27	4
Watching game shows	3.18	5
Wrestling	3.18	4
Listening to music	2.82	1
Riding bike	2.73	4
Playing catch with dog	2.09	4
Watching cartoons	1.64	1

Activity	Prototypicality Rating	HLOT
Grade 5		
Writing story	6.00	7
Math word problems	5.73	7
Educational computer games	5.73	5
Science questions	5.55	5
Reading books	5.45	6
Reading comprehension questions	5.45	6
Crossword puzzles	5.45	5
Word search puzzles	5.27	5
Division	5.18	5
Typing on the computer	5.18	5
Trivia questions	5.00	5
Multiplication	4.91	5
Spelling quizzes	4.73	5
Painting	4.64	5
Practicing basketball strategy	4.64	4
Practicing baseball strategy	4.45	4
Study word definitions	4.36	5
Board games	4.27	4
Addition	4.27	5
Putting a puzzle together	4.18	5
Subtraction	4.18	5
Drawing pictures	4.18	5
Practicing swim strokes	3.73	4
Playing video games	3.55	5
Sitting in a quiet place	2.64	7
Watching movies	2.27	1
Riding bike	2.18	4
Watching TV sitcoms	2.00	1
Watch cartoons	1.55	1

Activity	Prototypicality Rating	HLOT
Grade 6		
Reading books	5.82	6
Word search puzzles	5.64	5
Math word problems	5.64	7
Crossword puzzles	5.64	5
Reading comprehension questions	5.55	6
Science questions	5.36	5
Planning football plays	5.36	4
Art projects	5.18	5
Multiplication	5.09	5
Division	5.00	5
Practicing baseball strategy	4.91	4
Playing tennis	4.91	4
Practicing swim strokes	4.73	4
Playing soccer	4.73	4
Spelling quizzes	4.73	5
Practicing basketball strategy	4.64	4
Addition	4.36	5
Subtraction	4.27	5
Putting a puzzle together	4.27	5
Drawing pictures	4.18	5
Playing video games	3.73	5
Wrestling	3.55	4
Singing	3.45	5
Listening to music	2.64	1
Watching TV sitcoms	2.45	1

Note. "Prototypicality Rating" refers to the mean prototypicality rating for each activity. "HLOT" refers to the highest level of thinking that was associated with an activity.

The prototypicality ratings, which are listed along with each activity, refer to the average teacher ratings, on a scale of 1 to 7, which were given to reflect their judgment of the activities' membership in the category of "Activities which children enjoy that make them think." The ratings were used to rank order the activities for each grade from the most prototypical cognitive activity to the least prototypical activity. For example, for

first grade the activity of playing "educational computer games" received an average prototypicality rating of 6.18 from the eleven teacher judges. This prototypicality rating placed "educational computer games" as the most prototypical cognitive activity for the sample of first grade students.

After the consensual prototypicality rating was determined for each activity, the activities were then coded according to their respective levels of thinking. The researcher listed the highest level of thinking associated with the activities (See Table 3). For example, for the activity of "educational computer games" the highest level of thinking which is required of this activity is "5," which reflects the tendency and ability to be "intellectually careful," or precise and thorough (Perkins et al., 1993). The activities were then analyzed in terms of the highest level of thinking associated with each activity to determine if older students (in higher grade levels) mentioned more activities with higher levels of thinking than younger students.

Validity of Prototypicality Ratings

In examining the validity of the prototypicality ratings, the researcher investigated three basic issues: 1) The more prototypical acts should be related to higher levels of thinking; 2) The more prototypical acts should have greater agreement in terms of grade level identification; and 3) The more prototypical acts should have greater agreement in terms of gender identification. First, it is important to analyze the level(s) of thinking associated with each activity because the researcher believes that highly prototypical activities should be easier to identify in terms of their associated levels of thinking. In other words, the more prototypical activities should be related to higher levels of thinking. If the highly prototypical activities are indeed found to be associated with

higher levels of thinking, this relationship will contribute to the validity of the prototypicality ratings. Table 3 gives the complete listing of cognitive activities with their respective prototypicality ratings and levels of thinking.

Prototypicality and levels of thinking. To examine the relationship between prototypicality ratings and the levels of thinking, the correlation between the prototypicality ratings and the highest level of thinking disposition associated with an activity was calculated. Based on the concept of prototypicality, it would be expected that the more prototypical thinking activities would be associated with higher levels of thinking. The resulting correlations for grades one through six ranged from .49 to .75, with an average correlation of .63 (See Table 4). Overall, the correlations indicate a strong positive relationship between prototypicality and level of thinking for the activity. This provided support for the expected relationship between highly prototypical thinking activities and their associated higher levels of thinking, thus contributing to the validity of the prototypicality ratings.

Table 4

Examining Prototypicality and Grade Difference Correlations and Prototypicality and High Level of Thinking Correlations across Grade Levels

Grade Level	Prot/Grade Difference Correlation*	Prot/HLOT Correlation**	df
Grade 1	0.17	0.60	31
Grade 2	-0.08	0.59	32
Grade 3	-0.16	0.49	42
Grade 4	-0.17	0.75	29
Grade 5	-0.34	0.71	27
Grade 6	-0.18	0.72	23

Note. "Prot" refers to Prototypicality Ratings. "HLOT" refers to the highest level of thinking associated with the activities. The average Prototypicality/Grade Difference Correlation was -0.12. The average Prototypicality/Highest Level of Thinking Correlation was 0.63.

*All p's > .05. **All p's < 001.

Prototypicality and grade identification. Secondly, in looking at the validity of the prototypicality ratings, it was important to examine the agreement between the actual grade levels of the children and the judges' grade level ratings for the same activities. Based on the concept of prototypical events being more apparent indicators of an activity, it was expected that the raters would be able to better identify the true grade levels for highly prototypical activities than for less prototypical activities. In examining this second issue of grade identification, it is being determined whether the highly prototypical activities were truly easier to identify in terms of their grade level prototypicality. If the grade identification actually occurred in this manner, it validates the prototypicality ratings. Thus, in order for the prototypicality ratings to have sufficient validity, the more prototypical activities should be shown to have higher agreement in terms of the grade level identification. For example, if the activity of "addition problems" is a highly prototypical first grade activity, more teacher judges should be able to identify addition as a first grade activity.

In analyzing the activities with respect to grade level of the respondents, the mean grade levels of the children associated with the activities mentioned in the interviews were calculated. In determining the mean grade-level, the percentages of all grade levels represented in a particular activity were first calculated. These grade-level percentages were then converted to mean decimal values (integers) by calculating the sum of all percentages multiplied by their respective grade level. The researcher compared these mean grade levels with the judges' mean grade ratings for the activities (See Table 5).

Table 5

Examining Actual Grade Levels versus Grade Level Ratings

Activity	Actual Grade	Grade Rating
Addition	3.30	1.3
Subtraction	2.91	1.6
Multiplication	4.31	3.2
Division	4.48	3.8
Fraction problems	3.00	4.0
Algebra questions	3.00	5.9
Telling time	2.72	1.4
Planning football plays	4.19	5.4
Practicing baseball	4.13	5.3
Practicing basketball	4.69	4.8
Practicing swim strokes	4.44	3.5
Gymnastics routines	3.35	3.6
Riding bike	2.55	1.7
Playing kickball	2.07	1.5
Playing hide 'n seek	1.77	1.0
Swinging	1.70	1.2
Trampoline technique	2.00	3.7
Washing bike	2.00	2.3
Playing with dolls	2.09	1.3
Art projects	4.97	2.3
Drawing pictures	2.53	2.1
Coloring	1.46	1.4
Painting	5.00	1.6
Educational computer games	3.67	2.4
Putting a puzzle together	3.41	1.7
Following game directions	3.00	2.9
Word search puzzles	4.11	3.4
Crossword puzzles	5.21	4.5
Research Encyclopedia	3.52	4.7
Playing tennis	6.00	4.6
Playing soccer	5.27	3.0
Jump rope	2.11	1.9
Doing flips	3.00	2.2
Playing catch with dog	4.00	2.8
Eating new foods	4.65	3.8
Fishing	1.00	2.7

Activity	Actual Grade	Grade Rating
Walking dog	1.00	3.2
Sleeping	1.00	1.5
Learning how to cook	1.00	4.7
Practicing karate	2.00	3.2
Brainteaser games	1.00	4.4
Watch weather channel	1.00	4.6
Watching TV sitcoms	3.92	3.1
Teach ABCs to sibling	1.00	2.4
Math word problems	4.79	3.4
Study history	4.54	4.3
Study word definitions	4.42	3.6
Wrestling	5.27	4.3
Trivia questions	4.59	5.1
Typing on the computer	3.64	3.6
Spelling quizzes	3.31	2.3
Science questions	3.49	3.5
Board games	2.08	2.7
Writing story	2.96	2.9
Reading books	4.04	2.1
Reading comprehension questions	5.44	3.1
Math flashcards	2.41	2.7
Sitting in a quiet place	3.11	2.7
Singing	4.49	2.7
Watching the news	3.00	4.6
Watching cartoons	3.29	1.4
Watching history channel	2.81	4.3
Watching game shows	3.06	4.2
Watching movies	3.35	2.9
Playing video games	3.57	3.1
Ice skating	3.00	3.3
Rollerblading	1.54	3.3
Playing card games	2.52	4.5
Listening to music	4.80	3.3
Playing tag	1.77	1.8
Assembling a toy	3.00	4.4
Hunting strategy	3.00	5.4
Playing golf	3.00	5.6
Setting dinner table	3.00	2.6

Table 5 lists the "Actual Grade" along with the "Perceived Grade" for each activity so that one can examine the relationship between the two. The "Actual Grade" refers to the mean grade level of the student(s) who mentioned the activity as one he or she engaged in and enjoyed. The "Perceived Grade" refers to the consensual grade level that the teachers believed was associated with an activity—as indicated by their grade level ratings. This relationship between Actual Grade and Perceived Grade is important to investigate because it also contributes to the validity of the grade prototype ratings. One would expect less difference between the actual and perceived grade levels for highly prototypical activities than for less prototypical activities.

To examine whether more accurate grade level identification actually occurred for the highly prototypical activities, the prototypicality ratings of the activities were correlated with the absolute difference between the actual mean grade levels of the children and the perceived grade level ratings from the teachers, who rated these same activities on the questionnaire (See Table 4). This correlation indicates how well the judges were able to match the activities with appropriate grade levels, with respect to the prototypicality of the activity. According to Buss and Craik's (1983) act prototypicality theory, one should be able to more easily identify highly prototypical activities than those that are not as prototypical. Thus, the researcher predicted that the teacher's mean grade ratings would more closely match the actual mean grade level for those activities that were more prototypical of thinking activities for a particular grade level child.

The average prototypicality/grade difference correlation for grades one through six was –.12 (χ^2= 4.49, critical χ^2 = 12.83). The correlations ranged from –.34 to .17. The insignificant χ^2 , χ^2 (5) = 4.49, $p > .05$, indicates homogeneity among the r's. Thus,

overall there was a negative relationship between prototypicality and grade difference. Although this relationship is not strong, the negative correlation indicates that there was better grade identification, as indicated by smaller grade differences for highly prototypical activities than for less prototypical activities. In other words, the researcher found, in agreement with the prediction, that the raters were able to more easily match grade levels with the highly prototypical thinking activities for the particular grade level.

In addition to examining the correlation between average prototypicality and grade difference, the correlation between the actual and perceived grade levels was analyzed. After determining the mean grade levels associated with the activities, the actual mean grade levels of the respondents were compared with the mean grade level ratings from the teacher raters. The actual mean grade levels of the children were correlated with the mean grade level ratings to determine how well the teachers rated the activities according to grade level, r (72) = .27, p = .02.

The researcher also performed two-tailed t-tests to discover how the grade level ratings differed from the actual grade levels of the source (children in the interviews). A Bonferroni alpha correction was employed (.05/number of comparisons) to control for the possibility of alpha inflation. These t-tests indicated that there were only three activities—addition problems, reading books, and watching cartoons--with significant t-values, t (9) = 5.04, p = .0007. These results reveal that overall the judges' grade level ratings did not differ reliably from the actual mean grade level of the respondents.

The researcher then looked at those activities to see how prototypical they were of thinking activities. The average prototypicality ratings for the activities were calculated and correlated with the absolute t-values for the activities. The absolute t-values

indicated the grade-level ratings' degree of proximity to the actual grade levels. Based on Buss and Craik's concept of prototypicality, it was expected that the raters would be able to identify the grade levels of highly prototypical activities with greater proximity to the actual grade levels, as indicated by smaller absolute t-values for highly prototypical activities. The correlation between prototypicality ratings and the absolute t-values indicated the relationship between the activities' prototypicality and the raters' ability to identify the appropriate grade levels for the activities. The resulting correlation, $r\ (72) = -.11$, $p = .37$, indicates that there was a negative relationship between the average prototypicality ratings and the absolute t-values for these activities. Although this relationship was neither significant nor strong, the negative relationship indicates that the raters were able to more closely match the grade level with the activity for highly prototypical activities than for less prototypical thinking activities.

Prototypicality and gender identification. The third issue in studying the validity of the prototypicality ratings involved gender identification. In examining this issue of gender identification, based on identifying prototypical activities, it was expected that highly prototypical activities would be easier to identify in terms of their gender prototypicality than less prototypical activities. In other words, the raters should be able to better identify the gender for highly prototypical activities.

In this study, the interest was in identifying the prototypical boy and girl activities. In analyzing the gender orientation of the activities, both the actual gender orientation and the perceived gender orientation were examined. The actual gender orientation refers to the activities' actual gender orientation, as reflected by the gender of the particular source of the interview responses. The perceived gender orientation refers

to the gender orientation, as reflected by the teachers' gender ratings that they believed best corresponded to the activities. For example, the actual gender orientation of the activity of addition may be gender-neutral; however, the teachers may perceive the gender orientation of this activity as a predominantly male activity. Thus, these perceived and actual gender orientations often differed from each other. The overall concern was in determining how well the perceived gender orientations correlated with the actual gender orientations. For this reason, the "Actual Gender" is listed with the "Perceived Gender" in Table 6 for comparison.

Table 6

Examining Actual Gender Orientation Versus Perceived Gender Orientation

Activity	Actual Gender	Perceived Gender
Addition	0.12	0.20
Subtraction	0.17	-0.40
Multiplication	-0.47	0.00
Division	-0.16	-0.20
Fraction problems	1.00	-0.30
Algebra questions	-1.00	-0.10
Telling time	1.00	0.30
Planning football plays	-1.00	-1.00
Practicing baseball	-0.85	-1.00
Practicing basketball	-0.42	-0.80
Practicing swim strokes	1.00	0.60
Gymnastics routines	1.00	1.00
Riding bike	0.29	-0.20
Playing kickball	0.38	0.00
Playing hide 'n seek	0.29	0.20
Swinging	1.00	-0.30
Trampoline technique	1.00	0.60
Washing bike	-1.00	-0.20
Playing with dolls	1.00	1.00

Activity	Actual Gender	Perceived Gender
Art projects	0.46	0.30
Drawing pictures	0.34	0.10
Coloring	0.15	0.40
Painting	1.00	0.50
Educational computer games	-0.19	-0.30
Putting a puzzle together	-0.23	0.00
Following game directions	-1.00	0.30
Word search puzzles	0.46	0.00
Crossword puzzles	0.57	0.00
Research Encyclopedia	-1.00	0.00
Playing tennis	1.00	0.30
Playing soccer	-1.00	-0.20
Jump rope	-0.05	0.60
Doing flips	1.00	0.80
Playing catch with dog	-1.00	-0.50
Eating new foods	-1.00	-0.10
Fishing	-1.00	-0.70
Walking dog	-1.00	-0.10
Sleeping	-0.38	-0.20
Learning how to cook	1.00	0.70
Practicing karate	-1.00	-0.80
Brainteaser games	-1.00	0.10
Watch weather channel	1.00	0.20
Watching TV sitcoms	0.39	0.30
Teach ABCs to sibling	1.00	0.70
Math word problems	0.15	0.00
Study history	-0.05	-0.10
Study word definitions	0.29	0.30
Wrestling	-1.00	-1.00
Trivia questions	-0.05	0.00
Typing on the computer	-0.05	0.40
Spelling quizzes	0.19	0.40
Science questions	-0.19	-0.20
Board games	-0.09	0.40
Writing story	0.02	0.50
Reading books	0.27	0.30
Reading comprehension questions	-0.63	0.40
Math flashcards	0.64	0.30

Activity	Actual Gender	Perceived Gender
Sitting in a quiet place	-0.25	0.50
Singing	1.00	0.70
Watching the news	1.00	-0.10
Watching cartoons	0.25	-0.30
Watching history channel	-0.38	0.00
Watching game shows	1.00	0.00
Watching movies	0.29	-0.10
Playing video games	-1.00	-0.60
Ice skating	1.00	0.70
Rollerblading	-1.00	-0.40
Playing card games	1.00	-0.60
Listening to music	0.15	0.30
Playing tag	-0.38	-0.30
Assembling a toy	1.00	0.00
Hunting strategy	-1.00	-0.80
Playing golf	-1.00	-0.90
Setting dinner table	-1.00	0.60

The researcher calculated the correlation between the actual gender orientation and the perceived gender orientation values. There was a positive correlation, r (72) = .57, $p < .05$, between the actual and perceived gender orientation values. Thus, there was a moderate positive relationship between actual and perceived gender orientations. This finding also supports the validity of the prototypicality ratings as it indicates that the teachers were able to accurately match grade levels with the activities.

Two-tailed t-tests (9 df, $p = .0007$) were performed to test whether the mean gender ratings reflected the actual genders of the interviewees. A Bonferroni alpha correction was employed (.05/number of comparisons) to control for the possibility of alpha inflation. The resulting t-values indicated whether there were significant differences between the actual and perceived gender values. These t-tests identified the

activities for which there was a significant difference between the actual gender of the interviewee(s) and the teachers' perceived gender orientation for the activities.

In evaluating the t-tests for gender ratings, the researcher found only twelve of the 74 activities, which account for only 16% of the activities, for which there was a significant difference between the actual gender of the interviewee and the teachers' mean gender rating for the activity. These activities were: "Fraction problems," "Swinging through the air," "Research Encyclopedia," "Eating new foods," "Brainteaser games," "Watch weather channel," "Watch game shows," "Playing card games," "Following toy assembly instructions," and "Setting the dinner table." The raters were accurate in the gender identification of a large majority (84%) of the activities. The agreement was significantly above chance, $z = 2.86$, $p < .005$. A reasonable degree of agreement was found between actual and perceived gender orientation, thus contributing to the validity of the prototypicality ratings.

In addition, the relationship between the raters' gender identification of the activities and the activities' prototypicality ratings was examined. It was expected that there would be a correspondence between the accuracy of the raters' gender identification and the activities' prototypicality. The researcher examined the raters' ability at appropriately matching gender orientation with activities by investigating the relationship between the actual gender orientations and the teachers' perceived gender orientation ratings. Thus, it was expected there would be a negative relationship between the activities' prototypicality and the difference between actual gender orientations and perceived gender orientation ratings. In other words, the raters would be able to better identify the true gender orientation for highly prototypical activities, as indicated by

insignificant differences between actual and perceived gender orientation values for highly prototypical activities.

The researcher examined the correlation between average prototypicality ratings and the absolute t-values for the activities, as indicated by the t-tests which compared the two values. The resulting correlation, $r(72) = -.11$, $p = .37$, indicated that there was no significant relationship between the activities' prototypicality and the accuracy of the teachers' gender identification. Overall, the expectation that the teachers would better identify the gender orientation for those highly prototypical activities was not supported. This indicates that the teachers were gender-biased in their ratings of activities' gender orientations.

Developmental Trend

In addition to examining the validity of the prototypicality ratings, the researcher was interested in evaluating whether there were apparent grade differences in the rate of development of need for cognition. In studying whether there was a developmental trend in need for cognition, the number of thinking activities mentioned across the grade levels was examined to see if the rate of thinking activities increases with grade level. After the researcher had transcribed the interviews and coded the data into common categories, the ratio of thinking activities to overall activities--both thinking and nonthinking activities--was calculated. After analyzing this ratio across grade levels, it was evident that the thinking and nonthinking proportions do not change significantly with grade level (See Table 7).

Table 7

Proportion of Thinking Activities Across Grade Levels

Grade Level	TA/Total Ratio	Proportion of TA	$F(5,\infty)$
Grade 1	104/185	0.56	.02*
Grade 2	93/186	0.50	
Grade 3	109/194	0.56	
Grade 4	86/169	0.51	
Grade 5	59/116	0.51	
Grade 6	36/74	0.49	

Note. "TA/Total Ratio" indicated the ratio of thinking activities to the overall combined total of both thinking and nonthinking activities. "Proportion of TA" is the proportion of thinking activities which a particular grade level mentioned.

*$p > .05$.

However, it might be more appropriate to consider the level(s) of thinking which the activities demand from the children. For instance, it might be expected that older children participate in more activities that require higher levels of thinking than younger children do. A Kolmogorov-Smirnov test was used to analyze levels of thinking across grade levels. In examining this data, it was found that there were no real differences in levels of thinking across grade levels (See Tables 8 and 9). However, this finding may be explained by the fact that the children may likely have given their best examples of thinking activities they enjoyed, thus eliminating any real differences in levels of thinking across grade levels.

Table 8

Proportion of Thinking Activities by Level of Thinking and Grade

Kolmogorov-Smirnov Test						
Levels of Thinking	G1	G2	G3	G4	G5	G6
Level 1	0.19	0.19	0.09	0.08	0.09	0.11
Level 2	0.19	0.19	0.09	0.08	0.09	0.11
Level 3	0.19	0.19	0.09	0.08	0.09	0.11
Level 4	0.35	0.38	0.32	0.42	0.23	0.37
Level 5	0.77	0.95	0.82	0.85	0.82	0.84
Level 6	0.87	0.95	0.94	0.88	0.91	0.95
Level 7	1.00	1.00	1.00	1.00	1.00	1.00

Note. "G1" – "G6" = Grades 1 through 6.

Table 9

Results of Kolmogorov-Smirnov Tests of Distribution of Thinking Levels

Grade	χ^2
Grades 1 & 2	1.59
Grades 2 & 3	0.86
Grades 3 & 4	0.58
Grades 4 & 5	1.83
Grades 5 & 6	0.81
Grades 1 & 6	0.37
Grades 2 & 5	1.06
Lower & Upper	0.81
Lower & Middle	1.33
Middle & Upper	0.55

Note. 5.99 is the critical chi-square value.

In evaluating the interview data with respect to grade differences, the researcher also determined the number of "grade-overlapping" activities. In other words, the researcher identified which activities were mentioned by children across multiple grade levels. Six activities were mentioned by children from all six grade levels. These grade-common activities were: putting a puzzle together; addition problems; practicing basketball technique; reading books; spelling quizzes; and subtraction problems. In further evaluating the grade-common activities, the researcher performed a univariate between-groups analysis of variance (ANOVA) for each of the grade-common activities to determine if any of them were mentioned more often by older children. The F-values

for these six grade-common activities were: putting a puzzle together ($F = 1.40$, $df = 5$, $p < .24$); addition problems ($F = .64$, $df = 5$, $p < .67$); practicing basketball technique ($F = .22$, $df = 5$, $p < .95$); reading books ($F = .76$, $df = 5$, $p < .58$); spelling quizzes ($F = .05$, $df = 5$, $p < .99$); and subtraction problems ($F = .51$, $df = 5$, $p < .76$). However, none of these grade-common activities showed any significant grade main effect; all F-values were insignificant (See Tables 10 and 11).

Table 10

Analysis of Variance for Prototypicality of Grade-Common Activities by Grade

Activity	Source	SS	MS	F(5,60)
Puzzles	Grade	20.36	4.07	1.40*
	Error	175.09	2.92	
Addition	Grade	12.67	2.53	.64*
	Error	237.45	3.96	
Basketball	Grade	3.76	.75	.22*
	Error	208.00	3.47	
Reading	Grade	5.94	1.19	.76*
	Error	94.18	1.57	

Activity	Source	ANOVA SS	MS	F(5,60)
Spelling	Grade	1.09	.22	.05*
	Error	250.73	4.18	
Subtraction	Grade	10.73	2.15	.51
	Error	250.36	4.17	

Note. *All ps > .05.

Table 11

Mean Prototypicality Ratings for Common Activities by Grade

Activity	Grade					
	1	2	3	4	5	6
Puzzles	5.82	5.18	5.00	5.00	4.18	4.27
Addition	5.45	5.18	4.82	4.45	4.27	4.36
Basketball	4.18	4.55	4.64	5.00	4.64	4.64
Reading books	5.55	5.00	5.91	5.73	5.45	5.82
Spelling quizzes	4.73	5.09	4.82	4.82	4.73	4.73
Subtraction	5.27	5.09	4.91	4.64	4.18	4.27

Note. Numbers in table represent the mean prototypicality ratings for each activity.

In analyzing the results to determine whether there was a developmental trend, the prototypicality ratings across the grade levels were examined to establish whether these ratings increased with grade level. After the mean prototypicality ratings were calculated, the researcher ranked, by grade, the activities according to the prototypicality rankings. The researcher then developed a list of the top ten prototypical activities for each grade and calculated the mean prototypicality rating for each of those top ten lists of

activities (See Table 12). The mean prototypicality ratings for first through sixth grades' top-ten prototypical activities were 5.48, 5.34, 5.46, 5.61, 5.50, and 5.43, respectively.

Table 12

Top 10 Prototypical Thinking Activities by Grade Level

Grade	Top 10 Prototypical Thinking Activities	Levels of Thinking
Grade 1	1. Educational computer games	5
	2. Putting a puzzle together	4,5
	3. Writing stories	4,5
	4. Reading books	1,2,3
	5. Playing board games	4,5
	6. Addition	5
	7. Subtraction	5
	8. Answering science questions	2
	9. Drawing pictures	1,4,5
	10. Math Flashcards	2,5
Grade 2	1. Educational computer games	2,4,5
	2.Writing stories	2,4,5
	1. Telling time	5
	2. Addition	2,5
	3. Putting a puzzle together	4,5
	4. Answering science questions	2,3,5
	5. Subtraction	3,5
	6. Art projects	1,4
	7. Spelling quizzes	5
	8. Reading books	1,2,3
Grade 3	1. Reading books	1,2,3,5,6
	2. Educational computer games	2,4,5
	3. Writing stories	1,2,4,5
	4. Answering science questions	5
	5. Word search puzzles	2,4,5
	6. Math problems with fractions	5
	7. Reading instructions for toy assembly	4,5
	8. Playing board games	4
	9. Study history	2,3,5
	10. Putting a puzzle together	2,4,5

Grade	Top 10 Prototypical Thinking Activities	Levels of Thinking
Grade 4	1. Writing stories	1,2,3,4,5
	2. Educational computer games	4,5
	3. Math word problems	2,4,5,6,7
	4. Reading books	1,2,3,6,7
	5. Crossword puzzles	2,4,5
	6. Trivia questions	1,2,4,5
	7. Art projects	1,4,5
	8. Division	5
	9. Answering science questions	2,5
	10. Study history	2,3,5
Grade 5	1. Writing stories	1,2,3,4,5
	2. Math word problems	2,4,5,6,7
	3. Educational computer games	2,3,4,5
	4. Answer science questions	2,5
	5. Reading books	1,2,3,6,7
	6. Reading comprehension questions	3,7
	7. Crossword puzzles	2,4,5
	8. Word search puzzles	2,4,5
	9. Division	5
	10. Typing	5
Grade 6	1. Reading books	1,2,3,6
	2. Word search puzzles	2,4,5
	3. Math word problems	2,3,5
	4. Crossword puzzles	2,4,5
	5. Reading comprehension questions	1,2,3,5,6
	6. Answering science questions	5
	7. Developing football plays	4
	8. Art projects	1,4,5
	9. Multiplication	5
	10. Division	5

There was no significant difference among the mean prototypicality ratings of the top ten prototypical activities across the grades, as indicated by a univariate between-groups analysis of variance (ANOVA) which was performed on the prototypicality ratings. Grade level (1-6) was used as a between-subjects variable, while prototypicality ratings was the dependent variable. The analysis revealed an insignificant Grade main effect, F (5,54) = .65, $p < .66$. Overall, the ANOVA indicated that there was no significant difference in the mean prototypicality ratings of the top ten prototypical activities across grade levels. In other words, the prototypicality ratings did not appear to increase with grade level. The absence of a grade effect, with respect to the prototypicality ratings, suggests that children of all grade levels were focusing on more elaborate thinking activities and excluding those less prototypical thinking activities when responding in the interviews.

The researcher further examined each grade's list of top ten prototypical activities by looking at the children's qualitative responses associated with these activities, with regards to the question of "What is it about that activity that makes you think?". While examining these responses, the researcher and a partner coded them according to the seven levels of thinking. Thus, the researcher developed levels of thinking associated with these lists of top-ten prototypical activities based on the children's responses to question two of the interview--What is it about that activity (the one they mentioned they enjoyed that makes them think) that makes you think? (See Table 12).

In evaluating whether there were age differences in the activities which children mentioned as those they enjoyed which made them think, the researcher examined the grade-common activities to determine whether they reflect higher levels of thinking at

higher grade levels and whether they reflected more levels of thinking at higher grade levels. To investigate this question the researcher coded the qualitative responses on the grade-common activities according to their associated levels of thinking (See Table 13).

Table 13

The Number of Levels of Thinking and Highest Level of Thinking for Grade-Common Activities

Activity	Grade	# Levels	HLOT
Puzzles	1	2	5
	2	2	5
	3	3	5
	4	4	5
	5	3	5
	6	3	5
Reading books	1	3	3
	2	3	3
	3	5	6
	4	5	7
	5	5	7
	6	4	6
Spelling quizzes	1	1	5
	2	1	5
	3	3	5
	4	3	5
	5	3	5
	6	3	5
Basketball	1	1	2
	2	2	5
	3	2	5
	4	2	5
	5	2	5
	6	2	5

Activity	Grade	# Levels	HLOT
Addition	1	1	5
	2	2	5
	3	2	5
	4	1	5
	5	1	5
	6	3	5
Subtraction	1	1	5
	2	2	5
	3	2	5
	4	1	5
	5	1	5
	6	3	5

The researcher performed two univariate between-groups ANOVAs on the grade-common activities to investigate existing grade effects, using the dependent variables of highest level of thinking and number of thinking levels (See Tables 14-17). Grade level was used as the independent, or grouping variable, for both of these one-way ANOVAs, and the various levels of thinking were used as the dependent variable. The analysis of the grade-common activities using the highest level of thinking across grade levels did not indicate that there was a significant grade effect, $F(5, 30) = 1.96$, $p = .11$. In addition, the analysis using the number of thinking levels did not indicate a significant grade effect, $F(5,30) = 1.46$; $p = .23$. Thus, it appears that with regard to actitivities mentioned by children in all grade levels, the older children's responses did not reflect more elaborate thinking with respect to the levels of thinking that they employ. These results do not support Perkins et al.'s (1993) theory espousing that the more mature, more ideal thinkers will employ more of the seven levels of thinking than less mature thinkers.

One possible explanation for the lack of a developmental trend may be that the children in all grade levels were providing elaborate responses, in terms of their associated levels of thinking.

Table 14

Analysis of Variance for Number of Levels of Thinking Across Grade Levels

	ANOVA		
Source	SS	MS	F (5,30)
Grade	9.58	1.92	1.46*
Error	39.17	1.31	

Note. *p = .23.

Table 15

Mean Number of Levels of Thinking by Grade

Grade					
1	2	3	4	5	6
1.50	2.00	2.83	2.50	2.67	3.00

Note. Numbers in table reflect mean number of levels of thinking for grade-common activities by grade.

Table 16

Analysis of Variance for Highest Level of Thinking Across Grade Levels

	ANOVA		
Source	SS	MS	F (5,30)
Grade	5.89	1.18	1.96*
Error	18.00	.60	

Note. *p = .11.

Table 17

Mean Highest Level of Thinking by Grade

Grade					
1	2	3	4	5	6
4.17	4.67	5.17	5.17	5.33	5.17

Note. Numbers in table represent the mean highest level of thinking for grade-common activities by grade.

After the researcher had found which activities were grade-common activities, it was also possible to calculate grade-common to grade-different activity ratios for each individual respondent in each grade level. The activities that were considered to be "grade-different" activities for a particular grade were those that were only mentioned by that one particular grade level of respondents. These proportions of grade-common activities (to overall thinking activities mentioned) were transformed to arcsine values (Langer & Abelson, 1972; Winer, 1971; Zanna, Abelson, & Lepper, 1973) and then averaged across each grade level. The researcher then performed a univariate ANOVA on these average arcsine values to determine whether the proportion of grade-common activities changed across grade levels (See Table 18). The average arcsine values for grades 1-6 were 1.34, 1.13, .92, .97, and 1.05, respectively. Overall, the ANOVA results indicated that there was no significant age difference in these proportions of grade-common activities, $F(5,250) = .88$, $p < .49$. One possible interpretation for the similar proportions of grade-common activities is that the children in all six grade-levels had similar levels of agreement concerning the types of activities which are truly thinking activities.

Table 18

Analysis of Variance for Proportions of Grade-Common Activities Across Grades

Source	SS	MS	F (5, 250)
Grade	5.75	1.15	.88
Error	327.97	1.31	

*p = .50.

Gender Differences

In examining whether there were gender differences in need for cognition, the researcher investigated whether different types of activities reflected need for cognition in boys and girls. In analyzing the interview results, the researcher calculated the mean gender of the children associated with the activities mentioned in the interviews. In determining the mean gender, the researcher first calculated the percentage of boys and girls who had mentioned particular activities. It was then necessary to convert the gender values from B (boy), G (girl) and N (neutral) to numerical values so that they could be analyzed. The gender values were coded as numerical values, +1 for girl, 0 for neutral, and –1 for boy. The researcher then converted these gender percentages to decimal values by multiplying the boys' percentages by –1 and the girls' percentages by +1. Once the researcher had determined the gender values associated with the activities, the

researcher ranked the activities according to gender prototypicality. In other words, activities that were prototypical boy or prototypical girl activities were identified.

The activities that the researcher labeled as "prototypical boy/girl activities" were those which were 100% boy/girl activities. For example, "developing football plays" was identified as a prototypical boy activity because all seven of the respondents who mentioned this thinking activity were boys. There were 19 prototypical boy activities and 19 prototypical girl activities (See Table 19). Thus, it was found that need for cognition is often reflected by different activities for boys and girls.

Table 19

100% Prototypical Boy and Girl Activities

Prototypical Boy Activities	Prototypical Girl Activities
1. Wrestling	1. Singing
2. Playing video games	2. Watching news
3. Rollerblading/Rollerskating	3. Watching game shows
4. Hunting strategy	4. Ice skating
5. Playing golf	5. Playing card games
6. Set dinner table	6. Teach ABC's to younger sibling
7. Karate technique	7. Reading instructions for toy assembly
8. Brainteasers	8. Learning to cook
9. Fishing	9. Watching weather channel
10. Walking dog	10. Doing flips
11. Playing catch with dog	11. Painting
12. Washing bike	12. Playing tennis
13. Eating new foods	13. Playing with dolls
14. Planning football plays	14. Swinging through the air
15. Soccer	15. Practicing Trampoline technique
16. Algebra questions	16. Thinking about Gymnastics routine
17. Listening & following game directions	17. Practicing efficient swim strokes
18. Research Encyclopedia	18. Math problems with fractions
19. Sitting in a quiet place	19. Tell time

In addition, the researcher performed t-tests to compare the mean gender orientation against "0" to determine if the gender orientation was neutral or not. A Bonferroni alpha correction was employed (.05/number of comparisons) to control for the possibility of alpha inflation. The results of these t-tests indicated that there was only one activity--"practicing baseball"--that was a gender-type activity. While this activity was evident as a prototypical male activity, the remaining activities were gender-neutral activities. Table 20 gives the Mean Gender Orientation of the Activities along with the resulting t-values. Overall, the t-tests indicate that the activities, with one exception, were gender-neutral activities; thus, the researcher did not find any significant gender differences in the cognitive activities in which children participate.

Table 20

Actual Gender Orientation of Activities

Activity	Mean Gender Orientation	SD	t
Addition problems	.12	.99	.58
Subtraction problems	.17	.98	.83
Multiplication problems	- .47	.90	-1.37
Division problems	- .16	.99	- .48
Fraction problems	1.00	.00	------
Algebra questions	-1.00	.00	------
Telling time	1.00	.00	------
Planning football plays	-1.00	.00	------
Practicing baseball	- .85	.55	-5.31
Practicing basketball	- .41	.89	-1.54
Practicing swim strokes	1.00	.00	------
Thinking about gym routine	1.00	.00	------
Riding bike	.29	.94	.75
Playing kickball	.38	.94	.69
Playing hide 'n go seek	.29	.94	.53
Swinging	1.00	.00	------
Working on trampoline technique	1.00	.00	------
Washing bike	-1.00	.00	------
Playing with dolls	1.00	.00	------
Art projects	.46	.87	1.07
Drawing pictures	.34	.92	1.33
Coloring	.15	.98	.49
Painting	1.00	.00	------
Playing educational computer games	- .19	.99	- .51
Putting a puzzle together	- .23	.98	-1.23
Following game directions	-1.00	.00	------
Doing word search puzzles	.46	.87	1.07
Crossword puzzles	.57	.80	1.58
Research Encyclopedia	-1.00	.00	------
Playing tennis	1.00	.00	------
Playing soccer	-1.00	.00	------
Jump rope	- .05	1.00	-.07
Doing flips	1.00	.00	------
Playing catch with dog	-1.00	.00	------

Activity	Mean Gender Orientation	SD	t
Eating new foods	-1.00	.00	-------
Fishing	-1.00	.00	-------
Walking dog	-1.00	.00	-------
Sleeping	- .38	.94	- .69
Learning how to cook	1.00	.00	-------
Practicing karate	-1.00	.00	-------
Brainteaser games	-1.00	.00	-------
Watch weather channel	1.00	.00	-------
Watching TV sitcoms	.39	.90	1.60
Teach ABCs to younger sibling	1.00	.00	-------
Solve math word problems	.15	.99	.34
Study history	- .05	.98	- .10
Study word definitions	.29	.90	.55
Wrestling	-1.00	.99	- .14
Trivia questions	- .05	.00	-------
Typing on computer	- .05	.00	-------
Spelling quizzes	.19	.00	-------
Answering science questions	-.19	.00	-------
Playing board games	-.09	.55	- .81
Writing story	.02	.89	.07
Reading books	.27	.00	-------
Reading comprehension questions	-.63	.00	-------
Playing with math flashcards	.64	.94	1.66
Sitting in a quiet place	-.25	.94	- .59
Singing	1.00	.94	1.50
Watching the news	1.00	.00	-------
Watching cartoons	.25	.00	-------
Watching history channel	- .38	.00	-------
Watching game shows	1.00	.00	-------
Watching movies	.29	.87	.58
Playing video games	-1.00	.92	-2.86
Ice skating	1.00	.98	1.02
Rollerskating/Rollerblading	-1.00	.00	-------
Playing card games	1.00	.99	1.43
Listening to music	.15	.98	.35
Playing tag	- .38	.00	-------
Instructions for toy assembly	1.00	.87	1.15
Hunting strategy	-1.00	.80	-1.25
Playing golf	-1.00	.00	-------
Setting the dinner table	-1.00	.00	-------

Discussion

While need for cognition has been widely studied in adult populations (Cacioppo et al., 1996), there is a need for studies that investigate children's need for cognition. The purpose of the current research was to explore the cognitive activities in which children participate to determine if there are age-related and gender-related differences in children's participation in cognitive activities.

This study involved interviewing first-through sixth-grade children to identify the activities they enjoy which make them think. In addition, the researcher used elementary school teachers to rate the activities in terms of their appropriate grade level, gender orientation, and prototypicality of membership in the category of "Activities children enjoy that make them think." In summary, the current study analyzed the children's cognitive activities along with the teachers' ratings to determine the prototypical thinking activities for each grade level and the validity of these prototypicality ratings and to examine whether there were developmental and gender differences in the types of cognitive activities which children enjoyed.

The highly prototypical thinking activities for each grade level were identified, and there was evidence that these prototypes were valid. To investigate the validity of the prototypicality ratings, the researcher investigated the relationship between the activities' prototypicality ratings and associated levels of thinking (Perkins et al., 1993), the relationship between the prototypicality ratings and the teachers' grade-level identification, and the relationship between the prototypicality ratings and the teachers' gender identification. Overall, there was a positive relationship between prototypicality and levels of thinking.

In addition, it was expected that the raters would be able to better identify the true grade levels for highly prototypical activities than for less prototypical activities. This relationship between the children's actual grade levels and the teachers' perceived grade was important to investigate because it also contributed to the validity of the prototypicality ratings. According to Buss and Craik's (1983) act prototypicality theory, one should be able to more easily identify highly prototypical activities than those that are not as prototypical. Overall there was a negative relationship between prototypicality and grade difference--the difference between the actual grade levels and the teachers' grade level ratings. Thus, the more highly prototypical activities were more accurately associated with appropriate grade level.

In examining the third issue of gender identification, the researcher examined the position that highly prototypical activities should be easier to identify in terms of their gender orientation than less prototypical activities. This received only mixed support. Overall, the teachers were able to accurately identify the gender orientation. That is, their gender ratings were positively correlated with the actual gender orientations for the activities. However, there was no relationship between the prototypicality ratings and the accuracy of the teachers' gender identifications (ratings). The teachers were not able to more accurately identify the gender orientation for highly prototypical activities than for less prototypical activities. Overall, however, the results indicated that the prototypicality ratings were valid.

In addition to addressing the validity of the prototypicality ratings, developmental trends in the children's cognitive activities were investigated by examining the activities according to their prototypicality ratings and associated levels of thinking in relation to

grade level. While it was expected that there would be age-differences in terms of the prototypicality ratings of the activities, the data did not provide clear evidence on this issue. Moreover, it was expected that higher levels of thinking would more likely be associated with the cognitive activities in which children in higher grade levels participated. The data did not adequately illuminate this issue either. It is likely that the absence of a developmental difference, with respect to prototypicality and higher levels of thinking, may be due to the fact that the children from all grade levels were focusing on more elaborate cognitive activities. In other words, all of the children focused on those more prototypical activities and, for the most part, were eliminating those less prototypical activities that require lower levels of thinking.

Six activities that were common across all grade levels were identified, and prototypicality ratings and levels of thinking associated with these activities were examined. There was no evident relationship between grade-level and the prototypicality ratings of children's grade-common cognitive activities. Moreover, there was no evidence that the older children's responses reflected higher levels of thinking when compared to the younger children's responses for the same activities. In addition, the data did not indicate that older children's responses reflected more levels of thinking per activity than did the younger children's responses when analyzing these six grade-common activities across grade levels. This suggests that all children had equally-elaborate conceptualizations of the activities.

The final question which this study addressed was whether there were gender differences in the cognitive activities in which children participated. There were 19 gender-prototypical activities identified, which indicates that there are different activities

in which boys and girls engage that reflect need for cognition. However, the overwhelming majority of the cognitive activities in which the children engaged were gender-neutral activities. That is, they were equally likely to be mentioned by boys and girls. It was evident that the teachers were more gender-biased in their gender ratings than the children were, as the teachers were more likely to identify activities in terms of gender to greater extent than the children's preferences indicated.

The results of this study clearly indicate that prototypical activities that reflect need for cognition in elementary school children can be identified. According to the Buss and Craik (1983) act prototypicality model, such prototypical activities can be used to infer stable personality characteristics. Thus, the prototypical age-related behaviors identified in this study may allow for determining the stability of need for cognition throughout childhood.

It should also be noted that some of the activities, albeit only a small proportion, were clearly gender-typed. While need for cognition, the motivation to engage in and enjoy effortful thought, has been found to be gender-neutral among college populations (Cacioppo et al., 1996), gender differences in activities which reflect the goal of such motivation have not been examined. Thus, the findings suggest that need for cognition as a construct may be differentially predictive of specific activities for boys and girls.

Similarly, these findings add further voice for the development of a need for cognition scale that is targeted at children. If such a scale or scales were available, it could be useful for predicting academic performance, as has been evidenced among college students (Cacioppo et al., 1996). Moreover, it could provide information about

how children might select themselves into different social groups which encourage or discourage intellectual motivation.

Limitations of the current study of the developmental and gender differences in children's cognitive activities that reflect need for cognition warrant discussion. One limitation was the use of convenience samples for both the children's interviews and the teachers' ratings. Whenever convenience samples are employed, there is concern regarding the generalizability of the results. An additional limitation concerning the convenience sample of children involves the fact that the study only sampled one group of volunteer children at one school. Thus, this also reduces the generalizability of the study's results.

In addition, the sample of raters was assumed to have expertise with regards to the types of activities which reflect children's cognitive development. However, the teachers who rated the activities were unfamiliar with the children in the sample. Thus, the teachers were not as knowledgeable as might be desired.

Furthermore, the present study depended on children's self-reports of their cognitive activities. This presents a concern about whether the children felt they needed to mention academic activities. Their responses may have been biased by their expectations of the types of activities that are appropriate responses as thinking activities because of the setting in which the interviews took place--school. In addition, shy children may not express themselves as thoroughly through an interview format.

The lack of a large number of fifth- and sixth-grade children also must be acknowledged. The lower grade levels had much higher levels of participation than the higher grade levels. The researcher tried to obtain a larger sample of fifth- and sixth-

grade students by sending out a second batch of consent forms to these grade levels. However, efforts to sample equal percentages from each grade level were not successful. Future studies should strive to obtain more equal percentages across the age groups for better analysis of the results.

While the limitations of the study certainly warrant mention, it also is important to note the strengths that were evident in the study. One strength of the study was the large sample size of children ($\underline{N} = 261$) who were interviewed by the researcher. While fifth and sixth grades did not have high participation rates, the lower grade levels had high response rates. In addition, sampling children from six grade levels provided significant amounts of data for analysis across grade levels.

Additional strengths pertain to the strong reliability of the measures employed in the study, as well as the validity of the prototypicality ratings. The inter-rater reliabilities of the judges were adequate, ranging from .33 to .50. In addition, the composite reliabilities of the questionnaires, ranging from .85 to .91, indicated that they were highly reliable measures.

Overall, this study was beneficial because it provided information from children's perspectives concerning what activities make them think. The activities which were identified as highly prototypical cognitive activities can be considered in future studies which may focus on developing a need for cognition scale for children. This measure may be used to predict activities at a particular grade level, by using those highly prototypical activities that stimulate cognition for that particular child's grade level.

As need for cognition research moves forward it will be interesting to analyze additional studies which also involve younger populations. More extensive research is

needed in the area of children's need for cognition. This study was beneficial in identifying the prototypical cognitive activities, which reflect children's need for cognition.

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Appendix A

Dear Parent:

At Auburn University at Montgomery we are studying children's motivation to think. We are going to interview children concerning activities they enjoy that make them think. All first through sixth graders at your child's school are being invited to participate. Children will be asked a few questions about the activities they enjoy.

We would like for your child to participate in this project. Your child will be interviewed individually in a quiet area outside of their classroom. The interview will last about five minutes. These interviews will be audiotaped to enable us to review and analyze the data. However, your child will not be identified on the audiotape. Following analysis of the data, the audiotapes will be destroyed. At no time will your child leave the school building.

The project will be completed during times approved by the classroom teacher. All names will be held strictly confidential and will not appear in any written reports. Only group analysis of answers will be conducted. There are no risks to participants. The results of this study will benefit educators by informing them of activities which will mentally challenge children. The project has been approved by the principal, Mr. Armistead. We need your permission to include your child in this study.

Please complete this letter and have your child return it to his/her homeroom teacher. Your child will be informed before the project that he/she may decline to participate in the project, and that he/she may stop at any time without penalty. In addition, your child will be asked to sign this form giving his/her permission. You are encouraged to address Leslie Moro or Dr. Cyril Sadowski at 244-3306 with any questions or concerns about this project. Thank you very much for your help.

YOU ARE MAKING A DECISION WHETHER OR NOT TO HAVE YOUR CHILD PARTICIPATE. YOUR SIGNATURE INDICATES THAT YOU HAVE DECIDED TO ALLOW YOUR CHILD TO PARTICIPATE, HAVING READ THE INFORMATION PROVIDED ABOVE.

Sincerely,

Leslie M. Moro 244-3306 (AUM) Dr. Cyril Sadowski, Supervisor 244-3589

Child's name: _____

_____ Yes, my child may participate in the project mentioned above

_____ No, my child may not participate in the project mentioned above

Parent's signature: _____ Date: _____

Child's signature: _____ Date: _____

Appendix B

Dear Teacher,

At Auburn University at Montgomery we are studying the relationship between children's activities and their tendency to engage in and enjoy effortful thinking. In analyzing the children's responses, we will need help from experts on children's cognitive development. At this time, we are requesting your assistance in rating children's activities according to the gender that is typically associated with the activity, the grade level appropriate for the activity, and according to whether the activity is one that requires effortful thinking. This rating will take about two hours of your time. Your name will be held strictly confidential and will not appear in any written reports. There are no perceived risks involved with your participation as a rater in this project. The results of this study will benefit educators by informing them of activities which will mentally challenge children. The project has been approved by your instructor. We need your permission to include you as a rater in this study of children's activities. Please complete this letter and return it to Leslie Moro, project investigator. You may decline to participate in this project and may stop at any time without penalty. You are encouraged to address Leslie Moro or Dr. Cyril Sadowski at 244-3306 with any questions or concerns about this project. Thank you very much for your help.

YOU ARE MAKING A DECISION WHETHER OR NOT TO PARTICIPATE. YOUR SIGNATURE INDICATES THAT YOU HAVE DECIDED TO PARTICIPATE, HAVING READ THE INFORMATION PROVIDED ABOVE.

Sincerely,

Leslie M. Moro 244-3306 (AUM)

Dr. Cyril Sadowski, Supervisor, 244-3589

Name: _____

_____ Yes, I agree to participate in the project mentioned above.

_____ No, I do not agree to participate in the project mentioned above.

Signature: _____ Date: _____

Appendix C

Children's Cognitive Activities Interview

Introduction: "Some activities make us think more than other activities. Working on a challenging homework problem or puzzle makes us think more than watching a cartoon."

1. What do you like to do that makes you think?

(Prompt if child seems confused: "Tell me what I just asked you in your own words.")

If child says "yes," allow child to continue to think and wait for a response

If child says, "no," ask: "Are there any games that you like to play that make you think?"

If reply is "yes," ask, "What games or other activities do you play that make you think?"

2. What is it about that activity that makes you think?

For instance, playing the game of chess may make you think about strategy, and playing with a puzzle may make you think about how to properly connect all the pieces.

What is it about _____ (insert each activity that the child mentions) that makes you think?

3. What activities do you enjoy that do not make you think?

Appendix D

GRADE AND GENDER RATING INSTRUCTIONS

Grade ratings

In this study you are asked to indicate the grade level of a child who is likely to engage in a particular activity. If the activity is one in which a variety of grade levels is likely to engage in, indicate the grade level at which you think the activity is most typical.

Gender ratings

In this study you are asked to indicate whether an activity is more likely to be one engaged in by a girl, a boy, or is engaged in by either a girl or a boy.

Teacher's Rating Questionnaire

Grade ratings

Please indicate the grade level of a child who is likely to engage in a particular activity. If the activity is one in which a variety of grade levels is likely to engage in, indicate the grade level at which you think the activity is most typical.

Activity	**Grade Rating (circle one)**
Addition problems	**1…2…3…4…5…6**
Subtraction problems	**1…2…3…4…5…6**
Multiplication problems	**1…2…3…4…5…6**
Division problems	**1…2…3…4…5…6**
Math problems with fractions	**1…2…3…4…5…6**
Answering Algebra questions	**1…2…3…4…5…6**
Questions about telling the time	**1…2…3…4…5…6**
Planning football plays	**1…2…3…4…5…6**
Practicing baseball strategy	**1…2…3…4…5…6**
Practicing basketball strategy	**1…2…3…4…5…6**
Practicing efficient swimming strokes	**1…2…3…4…5…6**
Thinking about gymnastics routine	**1…2…3…4…5…6**
Riding bike	**1…2…3…4…5…6**
Playing kickball	**1…2…3…4…5…6**
Playing hide 'n go seek	**1…2…3…4…5…6**
Swinging through the air	**1…2…3…4…5…6**
Working on trampoline technique	**1…2…3…4…5…6**
Washing bike	**1…2…3…4…5…6**

Activity	**Grade Rating (circle one)**
Playing with dolls	**1…2…3…4…5…6**
Art projects	**1…2…3…4…5…6**
Drawing pictures	**1…2…3…4…5…6**
Coloring	**1…2…3…4…5…6**
Painting	**1…2…3…4…5…6**
Playing educational computer games	**1…2…3…4…5…6**
Putting a puzzle together	**1…2…3…4…5…6**
Listening and following directions to a game	**1…2…3…4…5…6**
Doing word search puzzles	**1…2…3…4…5…6**
Crossword puzzles	**1…2…3…4…5…6**
Research Encyclopedia on different countries	**1…2…3…4…5…6**
Playing tennis	**1…2…3…4…5…6**
Playing soccer	**1…2…3…4…5…6**
Jump rope	**1…2…3…4…5…6**
Doing flips	**1…2…3…4…5…6**
Playing catch with dog	**1…2…3…4…5…6**
Eating new foods	**1…2…3…4…5…6**
Fishing	**1…2…3…4…5…6**
Walking dog	**1…2…3…4…5…6**

Activity	**Grade Rating (circle one)**
Sleeping	**1…2…3…4…5…6**
Learning how to cook	**1…2…3…4…5…6**
Practicing Karate technique	**1…2…3…4…5…6**
Brainteaser games	**1…2…3…4…5…6**
Watch weather channel	**1…2…3…4…5…6**
Watching TV sitcoms	**1…2…3…4…5…6**
Teach A B C's to younger sibling	**1…2…3…4…5…6**
Solve math word problems	**1…2…3…4…5…6**
Study history	**1…2…3…4…5…6**
Study word definitions	**1…2…3…4…5…6**
Wrestling	**1…2…3…4…5…6**
Trivia questions	**1…2…3…4…5…6**
Typing on the computer	**1…2…3…4…5…6**
Spelling quizzes	**1…2…3…4…5…6**
Answering science questions	**1…2…3…4…5…6**
Playing board games	**1…2…3…4…5…6**
Writing story	**1…2…3…4…5…6**
Reading books	**1…2…3…4…5…6**
Answering reading comprehension questions	**1…2…3…4…5…6**
Playing with math flashcards (ex. Timetables)	**1…2…3…4…5…6**
Sitting in a quiet place	**1…2…3…4…5…6**

Activity	**Grade Rating (circle one)**
Singing	**1…2…3…4…5…6**
Watching the news	**1…2…3…4…5…6**
Watching cartoons	**1…2…3…4…5…6**
Watching the History or Discovery channel	**1…2…3…4…5…6**
Watching game shows	**1…2…3…4…5…6**
Watching movies	**1…2…3…4…5…6**
Playing video games (ex. Nintendo)	**1…2…3…4…5…6**
Ice skating	**1…2…3…4…5…6**
Rollerblading/rollerskating	**1…2…3…4…5…6**
Playing card games (ex. Poker)	**1…2…3…4…5…6**
Listening to music	**1…2…3…4…5…6**
Playing tag	**1…2…3…4…5…6**
Reading instructions for assembling a toy	**1…2…3…4…5…6**
Hunting strategy	**1…2…3…4…5…6**
Playing golf	**1…2…3…4…5…6**
Setting the dinner table	**1…2…3…4…5…6**

Teacher's Rating Questionnaire

Gender ratings

Please indicate whether an activity is more likely to be one engaged in by a girl (G), a boy (B), or is engaged in by either a girl or a boy (N).

Activity	**Gender Rating (circle one)**
Addition problems	**G....B....N**
Subtraction problems	**G....B....N**
Multiplication drills	**G....B....N**
Division problems	**G....B....N**
Math problems with fractions	**G....B....N**
Answering Algebra Questions	**G....B....N**
Questions about telling the time	**G....B....N**
Planning football plays	**G....B....N**
Practicing baseball strategy	**G....B....N**
Practicing basketball strategy	**G....B....N**
Playing soccer	**G....B....N**
Playing catch with dog	**G....B....N**
Practicing efficient swimming strokes	**G....B....N**
Thinking about gymnastics routine	**G....B....N**
Doing flips	**G....B....N**
Jump rope	**G....B....N**
Riding bike	**G....B....N**

Activity	**Gender Rating (circle one)**
Playing kickball	**G....B....N**
Playing hide 'n go seek	**G....B....N**
Swinging through the air	**G....B....N**
Working on trampoline technique	**G....B....N**
Washing bike	**G....B....N**
Playing with dolls	**G....B....N**
Art projects	**G....B....N**
Drawing pictures	**G....B....N**
Coloring	**G....B....N**
Painting	**G....B....N**
Playing educational computer games	**G....B....N**
Putting a puzzle together	**G....B....N**
Listening and following directions to a game	**G....B....N**
Doing word search puzzles	**G....B....N**
Crossword puzzles	**G....B....N**
Research Encyclopedia on different countries	**G....B....N**
Playing tennis	**G....B....N**
Eating new foods	**G....B....N**
Fishing	**G....B....N**
Walking dog	**G....B....N**
Sleeping	**G....B....N**

Activity	**Gender Rating (circle one)**
Learning how to cook	**G....B....N**
Practicing Karate technique	**G....B....N**
Brainteaser games	**G....B....N**
Watching weather channel	**G....B....N**
Watching movies	**G....B....N**
Watching TV sitcoms	**G....B....N**
Teach A B C's to younger sibling	**G....B....N**
Solve math word problems	**G....B....N**
Study history	**G....B....N**
Study word definitions	**G....B....N**
Wrestling	**G....B....N**
Trivia questions	**G....B....N**
Typing on the computer	**G....B....N**
Spelling quizzes	**G....B....N**
Answering science questions	**G....B....N**
Playing board games	**G....B....N**
Writing story	**G....B....N**
Reading books	**G....B....N**
Answering reading comprehension questions	**G....B....N**
Playing with math flashcards (ex. Timetables)	**G....B....N**
Sitting in a quiet place	**G....B....N**

Activity	**Gender Rating (circle one)**
Singing	**G....B....N**
Watching the news	**G....B....N**
Watching cartoons	**G....B....N**
Watching the History or Discovery channel	**G....B....N**
Watching game shows	**G....B....N**
Playing video games (ex. Nintendo)	**G....B....N**
Ice skating	**G....B....N**
Rollerblading/Rollerskating	**G....B....N**
Playing card games (ex. Poker)	**G....B....N**
Listening to music	**G....B....N**
Playing tag	**G....B....N**
Reading instructions for assembling a toy	**G....B....N**
Hunting strategy	**G....B....N**
Playing golf	**G....B....N**
Setting the dinner table	**G....B....N**

Appendix E

PROTOTYPE RATINGS INSTRUCTIONS

Activities that make children think

In this study you are asked to judge how good an example of a category various activities are. The category is "Activities children enjoy that make them think." You are to rate how good an example of the category each activity is on a 7-point scale. A "7" means that you feel the activity is a very good example of your idea of what an activity that children enjoy that make them think is; a "1" means you feel the activity fits very poorly with your idea of what an activity that children enjoy that makes them think is (or is not a member of the category at all). A "4" means you feel the activity fits moderately well. Use the other numbers of the 7-point scale to indicate intermediate judgments. The activities are grouped according to the grade level of the children.

Teacher's Rating Questionnaire

Grade 1 Activities	**Prototypicality Rating** (circle one) **fits very poorly.....very good**
Playing board games	**1....2....3....4....5....6....7**
Addition problems	**1....2....3....4....5....6....7**
Subtraction problems	**1....2....3....4....5....6....7**
Reading books	**1....2....3....4....5....6....7**
Sitting in a quiet place	**1....2....3....4....5....6....7**
Singing	**1....2....3....4....5....6....7**
Drawing pictures	**1....2....3....4....5....6....7**
Coloring	**1....2....3....4 ....5....6....7**
Playing hide 'n go seek	**1....2....3....4....5....6....7**
Putting a puzzle together	**1....2....3....4....5....6....7**
Watching cartoons	**1....2....3....4....5....6....7**
Playing tag	**1....2....3....4....5....6....7**
Spelling quizzes	**1....2....3....4....5....6....7**
Developing football plays	**1....2....3....4....5....6....7**
Playing with math flashcards (addition, subtraction)	**1....2....3....4....5....6....7**
Playing kickball	**1....2....3....4....5....6....7**
Practicing basketball strategy	**1....2....3....4....5....6....7**
Fishing	**1....2....3....4....5....6....7**
Playing video games (ex. Nintendo)	**1....2....3....4....5....6....7**

Grade 1 Activities	**Prototypicality Rating (circle one) fits very poorly.....very good**
Playing educational computer games	**1....2....3....4....5....6....7**
Swinging through the air	**1....2....3....4....5....6....7**
Writing stories	**1....2....3....4....5....6....7**
Watching the Discovery channel	**1....2....3....4....5....6....7**
Walking a dog	**1....2....3....4....5....6....7**
Sleeping	**1....2....3....4....5....6....7**
Learning how to cook	**1....2....3....4....5....6....7**
Answering science questions	**1....2....3....4....5....6....7**
Playing with dolls	**1....2....3....4....5....6....7**
Brainteaser games	**1....2....3....4....5....6....7**
Watching the weather channel	**1....2....3....4....5....6....7**
Teach ABCs to a younger sibling	**1....2....3....4....5....6....7**
Jump rope	**1....2....3....4....5....6....7**
Rollerskating	**1....2....3....4....5....6....7**

Grade 2 Activities	**Prototypicality Rating (circle one) fits very poorly.....very good**
Practicing basketball strategy	**1....2....3....4....5....6....7**
Addition problems	**1....2....3....4....5....6....7**
Subtraction problems	**1....2....3....4....5....6....7**
Division problems	**1....2....3....4....5....6....7**
Telling the time	**1....2....3....4....5....6....7**
Drawing pictures	**1....2....3....4....5....6....7**
Watching TV. sitcoms	**1....2....3....4....5....6....7**
Playing educational computer games (ex. Math Blaster)	**1....2....3....4....5....6....7**
Putting a puzzle together	**1....2....3....4....5....6....7**
Coloring	**1....2....3....4....5....6....7**
Working on trampoline technique	**1....2....3....4....5....6....7**
Art projects	**1....2....3....4....5....6....7**
Practicing baseball strategy	**1....2....3....4....5....6....7**
Reading a book	**1....2....3....4....5....6....7**
Washing a bike	**1....2....3....4....5....6....7**
Writing stories	**1....2....3....4....5....6....7**
Spelling quizzes	**1....2....3....4....5....6....7**
Playing video games	**1....2....3....4....5....6....7**
Practicing swimming strokes	**1....2....3....4....5....6....7**
Playing card games (ex. Poker)	**1....2....3....4....5....6**....7

Grade 2 Activities	**Prototypicality Rating (circle one) fits very poorly.....very good**
Playing board games	**1....2....3....4....5....6....7**
Watching cartoons	**1....2....3....4....5....6....7**
Playing kickball	**1....2....3....4....5....6....7**
Swinging through the air	**1....2....3....4....5....6....7**
Eating new foods	**1....2....3....4....5....6....7**
Sitting in a quiet place	**1....2....3....4....5....6....7**
Playing with dolls	**1....2....3....4....5....6....7**
Watching movies	**1....2....3....4....5....6....7**
Playing with flashcards—addition, subtraction	**1....2....3....4....5....6....7**
Answering problems with clocks (telling time)	**1....2....3....4....5....6....7**
Practicing karate technique	**1....2....3....4....5....6....7**
Roller-skating	**1....2....3....4....5....6....7**
Riding a bike	**1....2....3....4....5....6....7**
Watching game shows	**1....2....3....4....5....6....7**

Grade 3 Activities	**Prototypicality Rating (circle one) fits very poorly.....very good**
Putting a puzzle together	**1....2....3....4....5....6....7**
Addition problems	**1....2....3....4....5....6....7**
Subtraction problems	**1....2....3....4....5....6....7**
Division problems	**1....2....3....4....5....6....7**
Problems with fractions	**1....2....3....4....5....6....7**
Multiplication problems	**1....2....3....4....5....6....7**
Answering science questions	**1....2....3....4....5....6....7**
Watching TV sitcoms	**1....2....3....4....5....6....7**
Drawing pictures	**1....2....3....4....5....6....7**
Jump rope	**1....2....3....4....5....6....7**
Practicing swimming strokes	**1....2....3....4....5....6....7**
Playing hide 'n go seek	**1....2....3....4....5....6....7**
Spelling quizzes	**1....2....3....4....5....6....7**
Playing board games	**1....2....3....4....5....6....7**
Watching History/Discovery channel	**1....2....3....4....5....6....7**
Reading a book	**1....2....3....4....5....6....7**
Flashcard games—multiplication questions	**1....2....3....4....5....6....7**
Watching the news	**1....2....3....4....5....6....7**

Grade 3 Activities	**Prototypicality Rating (circle one) fits very poorly.....very good**
Playing with dolls	**1....2....3....4....5....6....7**
Thinking about gymnastics routine	**1....2....3....4....5....6....7**
Answering Algebra questions	**1....2....3....4....5....6....7**
Listening to music	**1....2....3....4....5....6....7**
Playing tag	**1....2....3....4....5....6....7**
Sitting in a quiet place	**1....2....3....4....5....6....7**
Practicing basketball strategy	**1....2....3....4....5....6....7**
Developing football plays	**1....2....3....4....5....6....7**
Coloring	**1....2....3....4....5....6....7**
Reading & following instructions for assembling a toy	**1....2....3....4....5....6....7**
Hunting strategy	**1....2....3....4....5....6....7**
Playing golf	**1....2....3....4....5....6....7**
Practicing baseball strategy	**1....2....3....4....5....6....7**
Putting a puzzle together	**1....2....3....4....5....6....7**
Setting the dinner table	**1....2....3....4....5....6....7**
Watching cartoons	**1....2....3....4....5....6....7**
Playing kickball	**1....2....3....4....5....6....7**
Riding a bike	**1....2....3....4....5....6....7**
Writing stories	**1....2....3....4....5....6....7**
Doing flips	**1....2....3....4....5....6....7**

Grade 3 Activities	**Prototypicality Rating (circle one) fits very poorly.....very good**
Doing word search puzzles	**1....2....3....4....5....6....7**
Playing educational computer games	**1....2....3....4....5....6....7**
Playing video games	**1....2....3....4....5....6....7**
Playing card games	**1....2....3....4....5....6....7**
Study history	**1....2....3....4....5....6....7**
Research in Encyclopedia	**1....2....3....4....5....6....7**
Ice-skating	**1....2....3....4....5....6....7**

Grade 4 Activities	**Prototypicality Rating (circle one) fits very poorly.....very good**
Planning football plays	**1....2....3....4....5....6....7**
Watching cartoons	**1....2....3....4....5....6....7**
Spelling quizzes	**1....2....3....4....5....6....7**
Addition problems	**1....2....3....4....5....6....7**
Subtraction problems	**1....2....3....4....5....6....7**
Multiplication problems	**1....2....3....4....5....6....7**
Division problems	**1....2....3....4....5....6....7**
Questions about telling time	**1....2....3....4....5....6....7**
Reading a book	**1....2....3....4....5....6....7**
Practicing basketball strategy	**1....2....3....4....5....6....7**
Practicing baseball strategy	**1....2....3....4....5....6....7**
Solve math word problems	**1....2....3....4....5....6....7**
Study history	**1....2....3....4....5....6....7**
Play soccer	**1....2....3....4....5....6....7**
Putting a puzzle together	**1....2....3....4....5....6....7**
Playing with math flashcards	**1....2....3....4....5....6....7**
Study word definitions	**1....2....3....4....5....6....7**
Art projects	**1....2....3....4....5....6....7**
Wrestling	**1....2....3....4....5....6....7**

Grade 4 Activities	**Prototypicality Rating (circle one) fits very poorly.....very good**
Thinking about gymnastics routine	**1….2….3….4….5….6….7**
Trivia questions	**1….2….3….4….5….6….7**
Watch game shows	**1….2….3….4….5….6….7**
Write stories	**1….2….3….4….5….6….7**
Play catch with a dog	**1….2….3….4….5….6….7**
Riding bike	**1….2….3….4….5….6….7**
Crossword puzzles	**1….2….3….4….5….6….7**
Play educational computer games	**1….2….3….4….5….6….7**
Answer science questions	**1….2….3….4….5….6….7**
Study history	**1….2….3….4….5….6….7**
Play board games	**1….2….3….4….5….6….7**
Listen to music	**1….2….3….4….5….6….7**
Watch history channel	**1….2….3….4….5….6….7**

Grade 5 Activities	**Prototypicality Rating (circle one) fits very poorly.....very good**
Sitting in a quiet place	**1....2....3....4....5....6....7**
Practicing basketball strategy	**1....2....3....4....5....6....7**
Watch cartoons	**1....2....3....4....5....6....7**
Read books	**1....2....3....4....5....6....7**
Doing word search puzzles	**1....2....3....4....5....6....7**
Answer science questions	**1....2....3....4....5....6....7**
Solve math word problems	**1....2....3....4....5....6....7**
Play educational computer games	**1....2....3....4....5....6....7**
Put a puzzle together	**1....2....3....4....5....6....7**
Trivia questions	**1....2....3....4....5....6....7**
Addition problems	**1....2....3....4....5....6....7**
Subtraction problems	**1....2....3....4....5....6....7**
Multiplication problems	**1....2....3....4....5....6....7**
Division problems	**1....2....3....4....5....6....7**
Watch TV sitcoms	**1....2....3....4....5....6....7**
Answer reading comprehension questions	**1....2....3....4....5....6....7**
Type on a computer/word processor	**1....2....3....4....5....6....7**
Practicing baseball strategy	**1....2....3....4....5....6....7**
Study word definitions	**1....2....3....4....5....6....7**
Riding bike	**1....2....3....4....5....6....7**
Practicing efficient swimming strokes	**1....2....3....4....5....6....7**

Grade 5 Activities	**Prototypicality Rating (circle one) fits very poorly.....very good**
Crossword puzzles	1....2....3....4....5....6....7
Play board games	1....2....3....4....5....6....7
Writing a story	1....2....3....4....5....6....7
Watch movies	1....2....3....4....5....6....7
Play video games	1....2....3....4....5....6....7
Drawing pictures	1....2....3....4....5....6....7
Painting	1....2....3....4....5....6....7
Spelling quizzes	1....2....3....4....5....6....7

Grade 6 Activities	**Prototypicality Rating (circle one) fits very poorly.....very good**
Watch TV sitcoms	1....2....3....4....5....6....7
Addition problems	1....2....3....4....5....6....7
Subtraction problems	1....2....3....4....5....6....7
Division problems	1....2....3....4....5....6....7
Multiplication problems	1....2....3....4....5....6....7
Answering science questions	1....2....3....4....5....6....7
Crossword puzzles	1....2....3....4....5....6....7
Reading books	1....2....3....4....5....6....7
Wrestling	1....2....3....4....5....6....7
Listening to music	1....2....3....4....5....6....7
Putting a puzzle together	1....2....3....4....5....6....7
Practicing baseball strategy	1....2....3....4....5....6....7
Art projects	1....2....3....4....5....6....7
Play video games	1....2....3....4....5....6....7
Solve math word problems	1....2....3....4....5....6....7
Drawing pictures	1....2....3....4....5....6....7
Answer reading comprehension questions	1....2....3....4....5....6....7
Word search puzzles	1....2....3....4....5....6....7
Playing tennis	1....2....3....4....5....6....7
Practicing efficient swimming strokes	1....2....3....4....5....6....7

Grade 6 Activities	**Prototypicality Rating (circle one) fits very poorly.....very good**
Singing	1....2....3....4....5....6....7
Playing soccer	1....2....3....4....5....6....7
Practicing basketball strategy	1....2....3....4....5....6....7
Planning football plays	1....2....3....4....5....6....7
Spelling quizzes	1....2....3....4....5....6....7