

Encouraging Critical Thinking: The Role of Attachment, Cognitive Individual Differences, and
Parent-Child Interaction on How Children Evaluate Information

A research grant application submitted to the Timberlawn Psychiatric Research Foundation,
INC.

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Statement of Purpose and Background

In today's complex world, children are bombarded with information from a variety of sources. How do they make sense of all of the complexity to determine what sources to believe and what sources to question or dismiss? Recent research in developmental psychology has examined these issues, finding that children's critical thinking skills develop drastically over the elementary years (e.g., Mills & Grant, 2009). Even before beginning elementary school, children can recognize that some sources are untrustworthy due to inaccuracy or deception (Mascaro & Sperber, 2009). However, claims can be wrong for many other reasons: they can be skewed due to self-report (e.g., someone claims to be the smartest person in the class to appear in a positive light), biased due to group membership or self interest (e.g., a friend decides his best friend should receive an award over others that are not friends), or misconstrued due to persuasive intent (e.g., a salesperson focuses on emphasizing and exaggerating the strengths of his product while ignoring the weaknesses). Understanding this kind of misinformation is more difficult, and children's grasp of these issues develops drastically between the ages of 7 to 10 (e.g., Heyman & Legare, 2005; Mills & Grant, 2009). Moreover, along with the developmental differences, there are some strong individual differences: some children are better at evaluating the information they encounter than others in their age group (e.g., Mills & Keil, 2008; Mills & Grant, 2009). What accounts for these differences?

Understanding this disparity is a particularly important issue given that skill at evaluating sources helps children arm themselves against misleading information, such as false advertising (Moses & Baldwin, 2005). Moreover, most people desire adults to be good at critical thinking, and yet there is a relative paucity of research examining and evaluating the development of the ability to evaluate information (e.g., Heyman, 2008). Therefore, the proposed study examines

individual differences that may play a role in how children evaluate information. The study has three objectives: 1) to examine the role that attachment security plays in how children evaluate information; 2) to examine the role that two cognitive measures—need for cognition and interpretive theory of mind—play in how children evaluate information; and 3) to gather preliminary data regarding how parents interact with their children when discussing biased and misleading information.

First, there is no question that parent-child relationships play an important role in children's thinking. One particularly important aspect of parent-child relationships in the development of critical thinking skills may be a child's attachment security. Past research has found that children with secure attachments display greater degrees of cognitive flexibility and problem solving abilities than those with insecure attachment styles (Ainsworth, 1979). Recent research has found that preschool-aged children's attachment security relates to how they evaluate claims made by their mother and an unfamiliar person (Corriveau et al, 2009). In particular, preschoolers with secure attachment styles are best at demonstrating what the researchers call "selective trust": they trust the claims made by their mothers most of the time, but they are also willing to trust the unfamiliar person when the evidence supports that the unfamiliar person knows best. In contrast, children who are insecurely attached are less successful at determining the most reliable source of information. These findings emphasize how attachment security plays an important role in how preschoolers evaluate different sources of information, but how does this change over the course of development? To date, the only study examining this issue has been conducted with preschoolers (Corriveau et al, 2009).

Therefore, one goal for the current research is to examine how attachment security in elementary school-aged children relates to how they evaluate information and engage in critical

thinking. To examine this issue, we will examine attachment in two ways. For children, the Kerns Attachment Security Scale will be used to examine their attachment (Kerns, Klepac, & Cole, 1996). Because there is also evidence that the attachment style of a child's primary caregiver may relate to some cognitive factors in children (e.g., a child's level of suggestibility; Bruck & Melnyk, 2004), we will examine the attachment style of the parents using the Relationships Questionnaire (Bartholomew & Horowitz, 1991).

A second related goal is to examine two key individual differences related to cognition that may play a role in how children evaluate information. One factor relates to the parent's and child's need for cognition (i.e., how deeply an individual chooses to think about subject matter and the degree to which they enjoy thinking; Cacioppo & Petty, 1982). Adults high in need for cognition tend to think more complexly about decisions (Fletcher et al., 1986; Verplanken, Hazenberg, & Palenewen, 1992) and are better at coping with persuasive testimony (e.g., Cacioppo, Petty, Feinstein, & Jarvis, 1996). Therefore, it is likely that children with high need for cognition and/or who have parents with high need for cognition are better at evaluating testimony. Another important factor relates to the child's interpretive theory of mind (i.e., the ability to understand that mental states like thoughts and desires can influence how people interpret what happens in the world around them; Flavell, 1999). This ability develops drastically between preschool and middle elementary school, but there are also a large number of individual differences. Some have claimed that this ability to recognize that different people can think about information in different ways may be necessary in order for children to fully recognize how information can be skewed and biased (Carpendale & Chandler, 1996; Moses & Baldwin, 2005). Although need for cognition and interpretive theory of mind have been found to be important in

other kinds of cognitive tasks, little is known regarding how they relate to children's ability to evaluate information. This study will provide evidence regarding this issue.

A third goal for this study is to gather information on how parents and children interact when discussing questionable sources. There is no question that children often rely on others to learn about the world (e.g., Callanan, 2006; Koenig & Harris, 2006; Paradise & Rogoff, 2009; Rogoff, 2003). Parents are particularly important sources of information, yet there are a number of individual differences in how parents interact with their children when discussing science, thinking, and learning (e.g., Crowley, Callanan, Tenenbaum, & Allen, 2001; Heyman, Fu, & Lee, 2007; Tenenbaum & Callanan, 2008). Moreover, these individual differences in how parents and children interact have been found to relate to children's attitudes towards mathematics (Lindberg, Hyde, & Hirsch, 2008), their understanding of certain scientific concepts (Fender & Crowley, 2007), their reading comprehension for science text (Tenenbaum, Snow, Roach, & Kurland, 2005), as well as many other factors in life. Given that parent-child interaction is so important for so much of children's learning, what do we know about how parents and children talk about misinformation?

Although researchers have recently proposed that children may glean important information about how to evaluate information from talking with their parents (e.g., Heyman, 2008), there is little research examining that issue to date. The closest related evidence finds that parents sometimes avoid discussing lies with their children or talk about lies as being "bad" without providing much information about why (Lewis, 1993). It is clear that children often encounter circumstances where they must evaluate incomplete, misleading, and biased sources of information, but the way parents respond to these experiences may vary drastically between families as well as depending on the type of misinformation. Therefore, to examine how parents

and children discuss misinformation, we will use a storybook task, a task often used in other cognitive development research (e.g., Ganea, Pickard, & DeLoache, 2008; Woolley & Cox, 2007). By coding the conversations parents and children have about different kinds of misinformation presented in storybooks, we can gain a better sense of how parent-child interactions may be important for how children evaluate information. The results from this aspect of the study will provide evidence to develop a longitudinal study examining how parent-child conversation relates to the development of critical thinking skills.

Together, these three goals will provide important information regarding some of the factors that likely contribute to how children evaluate information. It is clear that children often encounter circumstances where they must evaluate incomplete, misleading, and biased sources of information, yet we know surprisingly little about the reasons for developmental and individual differences in their ability to do so. By examining these issues, we can gain important insight into how to nurture the development of critical thinking skills.

Method

Participants. Sixty parents and their 7- to 9-year-old children will be recruited to participate in the study. Children will be recruited from local school districts with the goal that the sample's demographic characteristics reflect the distribution of ethnic and socioeconomic groups in the community. The experiment will take place in several quiet testing rooms. The interview with the child as well as the parent-child interaction phase will be recorded on video.

Procedure and Design. After being greeted by the researcher, the parent will be asked to provide his or her consent to participate, and the child will be asked to assent. For the first phase of the study, the parent and child will be in separate rooms. This phase of the study will take approximately 30 to 35 minutes. The parent will fill out several questionnaires: a demographics

information form, a need for cognition scale, a parental romantic attachment style form, and a child information form (see Appendix A).

Concurrently, the child will engage in an interview with the primary experimenter consisting of four tasks (see Appendix B). For each task, the experimenter will briefly explain what they will be doing and remind them that there are no right or wrong answers, and that they can say whatever they think. The child will first engage in the critical thinking task to examine children's understanding of three different kinds of potentially misleading sources: self-report, bias due to self-interest, and persuasive testimony. This will be followed by the interpretive theory of mind task, the attachment security task, and the need for cognition task.

Once these tasks are complete and after a short break, the second phase of the experiment will begin, which will take approximately 20 to 25 minutes. The parent and child will be brought into one room and given the instructions that they are to read through four short stories together and to try to come to an agreement on the answers to the questions at the end of each story (see Appendix C). The storybooks, created by the experimenters (a common practice in cognitive development research; see Woolley & Cox, 2007), will be created to present the parent-child dyad with scenarios in which a simple problem is presented and one person makes a claim on how to solve that problem. Several pages following the main story present questions for the dyad to discuss. The interactions will be videotaped, and the conversations will be transcribed according to the CHAT (codes for the human analysis of transcripts) format (MacWhinney, 1991). The transcripts will then be examined using the CLAN (computerized language analysis) program (MacWhinney, 1991; LaBounty et al., 2008).

Statistical Approaches. For the first phase of the study, descriptive as well as inferential statistics will be used to examine how these variables relate to each other. We can use path

analyses to establish the relationship between attachment style, the other individual differences measures, and performance on the critical thinking task.

For the second phase of the study involving parent-child interactions, a coding scheme will be developed to examine how parents and children discuss issues of misinformation. The coding will capture the following issues: 1) whether or not someone mentions the possibility of misinformation, and if so, who initially mentions it; 2) how parents discuss the misinformation (e.g., do they avoid the issue? Do they discuss explanations for the misinformation? Do they make moral evaluations of the sources providing misinformation?); 3) how children discuss the misinformation; and 4) how parents and children interact regarding the misinformation (e.g., does the child initially trust and need the parent to scaffold the child to recognize why they should doubt?). Reliability coding will be established by two experimenters independently coding 25% of the codes. After transcriptions and coding for the second phase of the study is complete, we will use descriptive statistics to capture how parents and children discuss different kinds of misinformation, and inferential ones to examine the differences between different types of misinformation. We will also examine the relationship between the results from this phase of the study to children's responses during the critical thinking task to better understand how conversation about these issues relates to children's knowledge about these issues.

Human Rights, Ethical Considerations, and Informed Consent

All aspects of this research will be approved by the Institutional Review Board. and the research team have taken training on the rights of human participants, and they will make it a top priority to make sure that participants' rights are maintained. Participants as well as parents will be encouraged to ask questions pertaining to the research at any time. Before beginning the study, families and

participants will be told about the risks and benefits of participating in the research. Participants will be told that there is no right or wrong answer to any of our questions, and that the researchers are just interested in what they think. They will also be informed that the greatest possible risks of participating are boredom or fatigue, and if the child experiences either of those side effects, we will take a break before resuming the activity, or we will stop the experiment. After completing the study, participants and families will be told the details about our research questions.

Time Frame

Preparation and piloting for the study will occur in January and February 2010. Full recruitment and data collection will occur from March to December 2010. Reports on the first and second goals of the study will be written during this time period. The parent-child interaction task will be transcribed and analyzed from January through April 2011. After this time, reports and papers on the third goal of the study will be written.

Interest to the Timberlawn Foundation

The Timberlawn Foundation is devoted to research and education related to the role of interpersonal relationships in psychological development. The proposed research examines several different aspects of interpersonal relationships and how they may relate to how children evaluate the information they encounter. The first two goals of the study will provide useful information about how attachment style, need for cognition, and interpretive theory of mind relate to how children evaluate information. The third goal of the study will shed insight into how parents and children actually discuss issues of misinformation, and how that may relate to how children evaluate information as well as other individual difference measures. Obtaining

insight into the factors that may shape the development of critical thinking skills can help us better understand how to nurture these skills.

Scientific Importance of Project

The proposed research will make several important contributions to the scientific community. First, although many researchers have pointed out the importance of examining developmental and individual differences in how children evaluate the information they encounter (e.g., Moses & Baldwin, 2005; Bergstrom, Moehlmann, & Boyer, 2006), most of the research related to this topic has focused on preschoolers with very simple tasks. Yet is clear that development does not stop at age 4, and children encounter many more complicated kinds of misinformation. Thus, one important contribution of this work is that developmental and individual differences will be examined with elementary school-aged children.

Second, although we know the way parents interact with their children varies (e.g., Rogoff, 2003), and that some of these differences can lead to differences in children's thinking (e.g., Lindberg, Hyde, & Hirsch, 2008), very little is known about how parents interact with their children to discuss how to evaluate different kinds of misinformation. Thus, a second important contribution of this work is that we can better understand how parents talk to their children about these issues. This work will allow the development of longitudinal studies to examine how parent-child conversation at one point in time relates to that child's ability to evaluate information later in life.

Practical or Applied Importance of Project

There is no question that children in today's culture are bombarded with information from many sources. If children make poor judgments regarding whom to believe about important issues (e.g., persuasive testimony regarding the various effects of drug use), this can lead to

negative outcomes. A major aim of the proposed research, therefore, is to gather evidence about the factors that influence the development of the ability to evaluate information.

Given the importance of parent-child interaction and relationships for other kinds of cognitive skills (e.g., Tenenbaum, Snow, Roach, & Kurland, 2005), it is essential to understand how these factors play a role in how children think about misinformation. By better understanding these factors, we can both inform teachers and educators about the correlates to critical thinking skills and design programs and interventions that help to strengthen the skills in children.

Budget

Appendix D presents the budget. The majority of the budget costs relate to staffing. One undergraduate student with experience in our laboratory will be hired to assist on the project for approximately 400 hours of assistance, being paid \$10/hour. This experienced student will be in charge of assisting with data collection, recruitment, organizing and leading testing, organizing and leading transcribing, and assisting with developing a coding scheme for the transcribed explanations. Undergraduate students will also be hired to assist on recruitment, data collection, transcribing explanations, and coding, being paid \$10/hour for approximately 100 hours of assistance. Summer salary (1.5 months) for the principal investigator (PI) is also being requested. This will allow the PI to prepare for piloting, make contacts with local elementary schools, and train research assistants to assist with data collection.

Given that most of the research needs to be conducted at our laboratory on the campus at _____ families will be offered \$25 each to participate in the study to compensate them for their time and travel expenses (approximately 60 families x \$25 = \$1500). A video camera and appropriate storage equipment for the videos will also be needed to record

the parent-child interaction portion of the experiment. The rest of the budget will be devoted to equipment for recording, storing, and coding experimental sessions as well as office supplies needed for running the study (e.g., photocopy expenses for recruitment letters, posters, consent forms, interview sheets; prizes for the child participants).

Funding is not anticipated from other resources.

Plan for Dissemination of Results

This research will be submitted for publication in scientific journals and will be presented at national research conferences, such as the Biennial Meeting of the Society for Research on Child Development. In addition, the research will also be presented in press releases to major newspapers and magazines to reach a more general audience.

Applicant Information

, the primary investigator on this project, began her appointment as _____ in July 2005 after receiving her Ph.D. from Yale University. _____ has published research on the development of critical thinking skills in several top psychology journals, and her research has also been featured in New York Times and National Public Radio. Appendix F includes _____ CV.

One of _____ current undergraduate students, _____ will be the head undergraduate student team leader for this project. _____ has been a member of _____ lab since June 2008, and she has extensive experience working with children and organizing projects. _____ can be reached at _____

Finally, _____ a collaborator who has expertise in the development of critical thinking skills, has agreed to consult on this project. _____ is an assistant professor at _____, and she can be contacted at _____

Appendix Summary Sheet

Appendix A: Parent forms

Appendix B: Child forms and scripts

Appendix C: Storybook task

Appendix D: Proposed budget

Appendix E: References

Appendix F: Curriculum vitae

Appendix D: Proposed Budget

Item	Year Budget
A. SENIOR PERSONNEL	
1. (1.5 month summer support)	\$9,700
B. OTHER PERSONNEL	
1. Undergraduate Student Team Leader (400 hours x \$10/hour)	4,000
2. Undergraduate Students (100 hours x \$10/hour)	1,000
C. FRINGE BENEFITS	2,800
TOTAL SALARIES & BENEFITS	\$17,500
D. EQUIPMENT (video camera, external hard drive for storing videos)	\$2,000
E. TRAVEL	0
F. PARTICIPANT SUPPORT	
1. Stipends	0
2. Travel reimbursement (60 families x \$25/family)	1,500
G. OTHER DIRECT COSTS	
1. Materials & supplies	1,500
2. Publications	0
3. Consultant	0
4. Computer services	0
TOTAL OTHER COSTS	5,000
H. INDIRECT COSTS @ 0% MTDC	0
TOTAL AMOUNT OF REQUEST	\$22,500

Appendix E: References

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March 2010

Dear Members of the Board of Trustees,

Thank you for your consideration of my grant application entitled "Encouraging Critical Thinking: The Role of Attachment, Cognitive Individual Differences, and Parent-Child Interaction on How Children Evaluate Information"

I spoke with Dr. Carlos Davis on March 10 regarding this application. He mentioned that reviews of the project were positive overall, but that one of the reviewers had mentioned several limitations to the grant proposal. Dr. Davis overviewed the three issues mentioned by the reviewer, and he invited me to write a cover letter addressing those issues to accompany my grant application.

The first issue mentioned by the reviewer was a theoretical one. The reviewer was wondering about whether it was appropriate to focus on cognitive measures such as need for cognition and interpretive theory of mind as opposed to something more general, like intelligence. From my understanding of the reviewer's comment, he wondered if intelligence is the central measure upon which a hierarchy of cognitive processes extends, and thus other kinds of cognitive measures may not be meaningful on their own.

We appreciate the opportunity to clarify this issue. Intelligence is certainly an important construct. One perspective on intelligence has focused on the idea that there is a general intelligence factor (typically called *g*) at the root of intelligence and other specialized cognitive abilities extend from that (e.g., Carroll, 1993). This perspective on intelligence predicts that performance on a number of different cognitive tasks are likely to correlate with one another. Although there is evidence supporting this, most researchers agree that focusing on intelligence or IQ alone ignores many important aspects of mental ability (e.g., Neisser, Boodoo, Bouchard, Boykin, Brody, Ceci, Halpern, Loehlin, Perloff, Sternberg, & Urbina, 1996). For critical thinking in adults, intelligence certainly matters, but the drive to think deeply about information correlates moderately with intelligence and also plays a major role in people's success in evaluating information (e.g., Cacioppo, Petty, Feinstein, & Jarvis, 1996; Stanovich & West, 2008). In other words, although people who score higher on IQ tests are more likely to do well in critical thinking tasks, there are a number of other factors that may be just as important as general intelligence in influencing critical thinking abilities.

Although our central interest is how the cognitive measures mentioned in our application relate to critical thinking abilities, we appreciate the suggestion regarding the relevance of intelligence. It seems that it would be useful to gather a measure of intelligence from our participants, and then we could control for the effects of intelligence when looking at how other cognitive measures such as interpretive theory of mind relate to critical thinking skills. Therefore, we propose adding the Wechsler Abbreviated Scale of Intelligence (WASI) to our test battery. The Vocabulary and Matrix Reasoning subtests offer an estimate of general intellectual ability and take approximately 15 minutes to administer, which would be

a reasonable addition to our current battery of tests. We think the addition of this measure would provide additional information that would strengthen our project.

The second issue mentioned by the reviewer relates to the psychometric properties for several of the measures. The reviewer was concerned that we did not provide much information about the psychometric properties of three of our measures: the Interpretive Theory of Mind Task, the Need for Cognition Scale, and the Critical Thinking Scale. As is often the case when research is moving in a new direction, there is less information available regarding the psychometric properties of these newer measures.

For the advanced social cognition measure, we chose to use the Interpretive Theory of Mind Task, which has been used by a number of other researchers (e.g., Brown, 2006; Carpendale & Chandler, 1996; Ross, Recchia, & Carpendale, 2005). This measure examines an important aspect of children's social-cognitive ability: the ability to recognize that different people can interpret ambiguous information in different ways. The closest related measure that we are aware of with a large amount of information about its reliability and validity is a Theory of Mind measure that is aimed at children under age 7 (Wellman & Liu, 2004). Unfortunately, this measure would be inappropriate for our older sample, and we are unaware of any other appropriate social-cognitive measure for use with our range that we could use. However, we do have some additional information on the Interpretive Theory of Mind task that we did not include in the original grant application: Brown (2006) found the Cronback alpha for of .72 for the measure.

The Need for Cognition Scale has been used with adults in hundreds of studies (see Cacioppo et al, 1995 for more information), but only recently have researchers begun adapting this measure for use with children. Kokis, Macpherson, Toplak, West, and Stanovich (2002) reported the split-half reliability of the scale to be .67 for their study. Cacioppo and his colleagues discussed the importance of the need for cognition and that "research with children.... would help to complete this picture" (Cacioppo et al, 1995, pp. 217).

The Critical Thinking Scale used in our study is a new measure that combines several different measures published by others and our own research team in the top journals in developmental psychology, such as Psychological Science, Child Development, Developmental Psychology, and Developmental Science. Although there are some measures with adults examining critical thinking skills, there is not much information available regarding the validity and reliability of these measures (e.g., Ennis, 1993). The tests with psychometric properties available are aimed for adults. For instance, the Minnesota Test of Critical Thinking has an overall Cronback alpha of .78 (Edman, Bart, Robey, & Silverman, 2004), but it is aimed at college-aged adults. Although there has been a wave of recent interest in understanding children's critical thinking skills when learning from others from a cognitive development perspective (see Heyman, 2008), research in this area is still new and developing. Researchers are continuing to explore the best ways to measure critical thinking abilities in school-aged children.

By conducting our study, we will be able to obtain more information about the psychometric properties of each of these measures that will make an important contribution to our field.

The third issue mentioned by the reviewer relates to the parent-child interaction task. The reviewer was concerned about the exploratory nature of the parent-child interaction task, and we understand that concern. However, there is unfortunately very little research that relates to how parents interact with their children in discussing issues of misinformation. Given how much misinformation children are

exposed to in a regular basis very early on in life, and given how important parent-child interaction is for other aspects of children's thinking and learning (e.g., Crowley, Callanan, Tenenbaum, & Allen, 2001; Heyman, Fu, & Lee, 2007), it seems quite important to conduct research to better understand how parents discuss misinformation with their children. Much of the research examining parent-child interaction involves providing the dyad with prompts using storybooks or other materials in order to encourage discussion of the topic at hand (e.g., Ganea, Pickard, & DeLoache, 2008; Woolley & Cox, 2007), so our task is structured in a similar way.

Our understanding of the grant guidelines was that there was some potential for projects to be considered that would lead to larger multi-year projects to be funded by other grantors. We believe that the data we gather regarding parent-child conversation about misinformation will help us to better characterize the nature of the conversations and to begin to identify individual differences in conversations that may be related to changes in the development of children's critical thinking skills over time. For instance, as Cacioppo and colleagues (1996) point out, "Children who learn, through observation and experience, that they can cope with their problems through reason and verbal influence rather than through physical force or flight should tend to develop higher levels of need for cognition because of the demonstrated import of good problem-solving skills and habits in charting a course through the hazards of life" (pp. 246). It is quite likely that one way children learn about the importance of reasoning is through interacting with their parents. The information that we gather from this study will help us to better understand that possibility, and we intend to use the results from our study in publications as well as in preparing an R01 grant with the National Institute of Child Health and Human Development to extend this research.

In sum, we appreciate the feedback to our grant application, and we feel that this feedback has helped us strengthen our project and our plans for this line of research in the future. We thank you for your time and effort in considering our grant proposal for funding from the Timberlawn Psychiatric Research Foundation.

Please feel free to contact me if you have any specific questions at

Sincerely,
