THE CONCEPT OF EFFECTANCE MOTIVATION IN CHILDREN WHO HAVE LIMITED USE OF PRODUCTIVE LANGUAGE

David J. Messer
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I would like to provoke discussion about the measurement of behavior which has variously been called mastery motivation, effectance motivation, or a sense of competence. First of all it is worth pointing out that these terms cover a wide range of behavior and that it has been rare for these terms to be defined in a way that permits an easy operationalization of the concept. This has had both advantages and disadvantages. One benefit has been that a number of different approaches and important conceptual issues have been brought together in one field. The disadvantage of such diversity has been that different operational definitions have been used and there is still a lack of a clear understanding of what are the relevant behavioral measures.

What I would like to suggest is that the difficulties presented by the absence of clear operational definitions have been compounded by the fact that we are not always clear about what aspects of internal motivational states we are attempting to assess, observe or infer. If we truly seek to measure motivation then this process is fraught with difficulty. For example, I believe that motivation can only be assessed in relation to a goal that is set by the individual (although it should be noted that other people can influence the way individuals set their goals). This raises two issues with respect to mastery motivation. First, can we apply such terms to very young children? Are we being too sophisticated in talking about young children constructing goals for their behavior and having motivation to accomplish these goals? Second, can we disentangle the inter-relationship between perception, setting of goals and motivation? The following example serves to illustrate this problem in an imagined situation. Two children are playing with a shape register. One child works hard to put the shapes into the register but does not realize that the drawer of the shape register will open. Another child also puts the shapes in the register but perceives the register can be opened; however, this child quickly gives up on the more difficult part of the task. How can we deal with situations similar to this where perception of the task and motivation are inter-related but neither are easy to measure in children with limited use of language?

What I would like to propose is that we should clarify precisely what aspects of motivation we are attempting to investigate. One strategy that has been used is to examine a number of behaviors in order to obtain an index of mastery motivation, but as I have already pointed out I do not believe that we can accurately measure motivation, rather by using this strategy we will end up by indexing a constellation of abilities which include perception and motivation. Another possibility is that we should accept for the moment, that we will have great difficulty in measuring or assessing motivation with very young children. Instead we should simply admit that we are measuring mastery behavior rather than mastery

ISSUES IN MEASURING MASTERY/EFFECTANCE MOTIVATION IN INFANTS AND YOUNG CHILDREN*

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*This document includes the papers, handout, and a summary of the discussion from a session at the biennial meeting of the Society for Research in Child Development, Boston, April 1981. Preparation of this document was supported in part by funds from the Developmental Psychobiology Research Group Endowment, Department of Psychiatry, University of Colorado School of Medicine to Morgan and Culp.

INTRODUCTION

George A. Morgan
Colorado State University

The materials in this document are based on presentations and handouts at a session entitled Issues in Measuring Mastery/Effectance Motivation in Infants and Young Children at the 1981 Society for Research in Child Development meeting in Boston. The participants of this session were all actively involved in research on mastery motivation. This session gave us the occasion to step back and reflect on several issues concerning the measurement of mastery motivation. It also gave us a chance to share our thoughts with a wider audience and to obtain some feedback from the audience. The issues discussed were an outgrowth of the theoretical writings of Robert White on effectance or competence motivation, but were based more directly on research begun at the Child and Family Research Branch of the National Institute of Child Health and Human Development. All but two of the participants were current or former colleagues of Leon Yarrow, chief of that intramural research branch.

This document contains two types of materials: a) the presentations and a summary of the discussion and b) the three tables and a bibliography which were handed out at the session. The presentations include: a) a brief overview of the concept of mastery motivation and early attempts to measure it, b) some responses to each of three main questions around which the discussion was focused, c) a summary of some of the questions and comments raised in the discussion, and d) concluding comments. The first question was whether mastery motivation can be measured in infants and young children. Second, the group discussed whether and how it is possible to distinguish mastery motivation from cognitive functioning. Third, the advantages and disadvantages of using deviant populations was discussed.

The handouts included tables describing the objectives and methods used in eight recent or ongoing studies of mastery motivation and a bibliography of papers (most unpublished as yet) which can be obtained from appropriate participants.

Although our samples were relatively small, and limited to a rather homogeneous social class, we were concerned with measurement issues. A large number of measures were developed to code the behaviors in which infants engaged. Four measures emerged as primary indices of mastery motivation. One measure, latency to task involvement, was the amount of time that elapsed between presentation of the item and the child's efforts to seek a solution. This measure was thought to reflect the child's eagerness to become involved in the task. The second measure, persistence, was the length of time spent in task-directed behavior. It is an indicator of the infant's ability to focus on the task and maintain attention to it, which might reflect the extent to which the infant was challenged by it. The third measure was positive affect while engaged in or after completing the task. The simple assumption was that the infant who showed positive affect was indicating pleasure in being challenged by a problem. This measure of task-involvement was found to be quite infrequent; infants typically showed very little positive affect. A fourth measure, task completion, the number of times the child completed the task successfully, was thought to be both a measure of competence and degree of involvement.

The studies that the members of this group will report on grow out of the initial studies at NICHHD. They deal with the development of mastery motivation from infancy to the early preschool period. Essentially, they are focused on the development of methods for measuring mastery motivation. Methodology can never be studied in the abstract; it cannot be separated from basic substantive issues. The methods we have developed raise questions about basic measurement issues--how one assesses construct validity, how one assesses short-term reliability as well as whether there exists any long-term predictability. The latter question, for example, deals with whether in the course of early development there are predictable transformations in the behaviors that index mastery. Related to this is another issue. We know that many aspects of functioning which are relatively undifferentiated early in life become increasingly distinct as the child matures. Does mastery motivation become more differentiated with increasing developmental age; does its interdependence with cognitive development diverge? The extent to which mastery motivation and cognitive development are related is a significant issue. Growing out of this issue is the question of whether mastery motivation is a prerequisite for cognitive growth, or to put it another way, to what extent is mastery motivation necessary for cognitive development, and to what extent might there be a reciprocal interaction between the two? All of these questions lead back to the necessity for sharper conceptualization of mastery motivation.

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What I would like to suggest is that the difficulties presented by the absence of clear operational definitions have been compounded by the fact that we are not always clear about what aspects of internal motivational states we are attempting to assess, observe or infer. If we truly seek to measure motivation then this process is fraught with difficulty. For example, I believe that motivation can only be assessed in relation to a goal that is set by the individual (although it should be noted that other people can influence the way individuals set their goals). This raises two issues with respect to mastery motivation. First, can we apply such terms to very young children? Are we being too sophisticated in talking about young children constructing goals for their behavior and having motivation to accomplish these goals? Second, can we disentangle the inter-relationship between perception, setting of goals and motivation? The following example serves to illustrate this problem in an imagined situation. Two children are playing with a shape register. One child works hard to put the shapes into the register but does not realize that the drawer of the shape register will open. Another child also puts the shapes in the register but perceives the register can be opened; however, this child quickly gives up on the more difficult part of the task. How can we deal with situations similar to this where perception of the task and motivation are inter-related but neither are easy to measure in children with limited use of language?

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motivation. The distinction is one similar that used in the attachment literature between, attachment - the bond between adult and child, and attachment behavior - the behavioural expression of the bond which is unlikely to bear an exact correspondence to the underlying construct. Our strategy might be to examine those forms of behavior that we would expect to be influenced by mastery motivation. Thus, one could examine different aspects of the child's behavior such as attention to a task, exploration, persistence, and the dimension of social mastery. It would be expected that the different behaviors would be related, but not necessarily closely related. The important analysis, as I see it, would concern whether cognitive development can be predicted from these behaviors. Moreover, there may be advantages in measuring what the child is doing, rather than attempting to interpret the child's motivational state. The way we see a child investigating, attending and persisting in a problem may give a better idea of the way that a child interacts with his or her environment than would a more abstract measurement (if possible) of motivational state. Thus from such observations of behavior we may have a more reasonable basis for starting to examine the relationship between mastery and cognition.

THE RELATIONSHIP BETWEEN MASTERY MOTIVATION AND COGNITIVE DEVELOPMENT

Susan McQuiston and Mary E. McCarthy
Child and Family Research Branch
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We have been interested in examining the relationship between mastery motivation and cognitive development. On theoretical grounds, we predicted that motivation and cognition would be related and, in fact, that mastery motivation precedes and leads to cognitive competence. However, when testing this hypothesis empirically, we wanted to feel confident that any relationship we obtained did not simply reflect the correlation between two measures of the same construct. That is, we wanted to be sure that our measures of mastery and cognitive level did, in fact, tap what we see as two different constructs. So, I would like to highlight for you the differences between our assessment of mastery motivation and our assessment of cognitive competence. While these assessment procedures to some extent involved similar skills on the part of the infant, both the measures which we derived and the mode of presentation of the tasks differed, and it is on these differences that I would like to focus briefly.

The instrument we chose to measure cognitive competence was the Bayley Scales of Infant Development. As you undoubtedly know, the Bayley is a test of optimal performance; the baby is given a number of attempts to succeed and encouragement is provided to the infant by the mother and examiner during its administration. In contrast, each of the mastery tasks was demonstrated once and then the child was given an opportunity to do whatever he or she wanted with the toy for three minutes, uninterrupted by the mother or examiner. Secondly, the Bayley items are scored on a Pass/Fail basis and the child's successful completion of the task is the criterion measure. As opposed to a success criterion, our measures of mastery motivation included latency to task involvement and persistence: the percent of time that the child engaged in task related or goal directed behaviors which could potentially lead to success but which would not necessarily do so. In sum, our measure of cognitive level was based on the outcome of the child's efforts to demonstrate proficiency on a task, while our measure of mastery motivation focused on the process through which the child approached a task or problem solving situation, maintained attention to it, and engaged in behaviors which were directed toward a particular goal.

WHAT ARE THE ADVANTAGES AND DISADVANTAGES OF USING AT-RISK POPULATIONS TO HELP UNDERSTAND THE CONCEPT OF MASTERY MOTIVATION?

Anita D. Glicken and Robert J. Harmon
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We feel there are a number of advantages in the use of at-risk populations such as preterm infants and infants with Down's Syndrome. In our work with preterm infants we were impressed with the need to re-examine many of our key measures which we had previously accepted as reasonable reflections of the concepts we hoped to be measuring. For example, persistence has served as a primary measure of "mastery motivation." Early in our sessions with preterm infants it became clear that some infants would continue to show task or goal directed behavior in an almost stereotypic way. This raises the issue of whether we are measuring persistence or rather seeing evidence of perseveration. This has important implications for how tasks are administered, the duration of the task, and how and when the experimenter should intervene during the task.

At-risk populations also provide us with an opportunity to investigate which tasks best measure the concept of mastery motivation. One task may not highlight differences within a population but may show important differences across populations. For example, there is some evidence (Harmon and Culp, in press) that our preterm infants prefer less complex tasks which produce effects while fullterm infants prefer more complex tasks . The within-group differences on these tasks may be small, but the across-group differences may be quite meaningful. Similarly, fullterm infants may show low persistence on tasks on which the preterm infants show high scores, again emphasizing the need to look at what "persistence" on a given task may mean developmentally. What is perhaps more useful in such cases is to look at the "process" of how the child approaches the task rather than a summary "persistence" score.

A third advantage of at-risk populations is to highlight the need for additional measures during testing. It is clear that our preterm infants need increased social feedback from both the mother and the experimenter. Although perhaps not relevant to the measure of mastery motivation, it certainly is relevant to issues of social competence and help-seeking on tasks which the child is finding difficult or frustrating.

A major disadvantage of using at-risk populations concerns difficulties which arise in explaining differences between them and low-risk populations. In preterms, for example, although one can control for

birth weight and gestational age, it is impossible to control for medical course and complications, degree of psycho-social stress in the family, length of hospital stay, etc. When one does find differences in mastery motivation, what can one say about the underlying mechanisms that lead to these differences? Perhaps in Down's Syndrome it is easier, where a clear genetic component is present, however, even in that case the complexities of genetic penetrance and associated additional medical problems present in some infants but not others does not make this a homogeneous population either.

Finally, we wanted to emphasize that measuring mastery motivation in at-risk populations may help us understand those populations better, even if the mechanisms may be less clear. For example, in the Vietze, et al. (1980) study, clinical impressions of child care workers of Down's Syndrome infants predicted that these infants could not begin to approach the mastery tasks, let alone persist and/or solve them. However, the results of the study would indicate that although they interacted less with the tasks, their pattern of behaviors at all levels of involvement was similar to fullterm infants. A similar point should be made regarding the preterm infants. Although our preliminary findings do not seem to indicate a similar pattern on each task by group, we are finding a preference for task-directed behavior on particular tasks by group. This may reflect something about a less mature developmental level or perhaps a greater uneveness in preterm infant development.

CAN MASTERY MOTIVATION BE MEASURED INDEPENDENTLY OF COMPLIANCE AND IMITATION ?

Kay D. Jennings
University of Pittsburgh

This issue arises because we are attempting to measure something that is unobservable. Motivation can only be inferred from behavior; it can never be directly assessed. In devising situations to measure mastery motivation, the researcher must structure the situation so that any observed behavior of interest is in fact motivated by the desire to master the task. Alternative motivations for producing the observed behavior must be ruled out or at least ruled unlikely.

While this problem is central to the study of any motivation (e.g., hunger, social approval) it is especially troublesome in studying mastery motivation. Striving for mastery is conceptualized as an intrinsic motivation; that is, motivation to meet internal standards. Thus, two internal processes are involved; neither the motivation nor internal standards can be directly observed.

In attempting to assess mastery motivation, a competing explanation for persistent effort can be compliance or a desire to please the adult. Mastery motivation is typically assessed by a series of tasks; the persistence of efforts to master or solve these tasks is taken as an index of mastery motivation. These tasks, however, are adult-defined rather than child-defined. Furthermore, the experimenter frequently demonstrates or explains the tasks in order to make sure they are equally understood by the infants and children. Thus, it is almost impossible to avoid giving the infant or child the message, either implicitly or explicitly, that the adult wants the child to work on the task.

There are a number of steps that the investigator can take to minimize the problem of compliance:

1. Tasks must be carefully selected so that they are interesting for the particular age group under study, i.e., tasks that are likely to elicit mastery motivation.

2. If reinforcement is given, it should be given at specific times independently of what the child is doing.

3. To minimize compliance, alternative activities of low interest should be provided or the task should contain within itself opportunities for nonmastery behaviors so that the child is not faced with the choice of working on mastery tasks or doing nothing. For older children, the adults should be preoccupied, "busy," or out of the room so that the child feels more free to do as (s)he pleases.

4. A possible strategy might be to provide simultaneously several mastery and nonmastery tasks, demonstrate each and then let the child engage in free play.

The possibility of imitation as an alternative explanation of the infant's persistent behavior seems less problematical. Tasks for infants are frequently demonstrated by the adult to ensure that all infants see the possibilities of the object and, thus, have an equal understanding of the task. Thus, some infants may accomplish the task by purposely imitating the experimentor Others, less inclined to imitate, may solve the task in other ways. Some infants may never successfully do the task, but still persist in their efforts, thus, demonstrating their mastery motivation. Thus, imitation is only one strategy among several available to the infants that can be used to work on the task.

SELECTIVE SUMMARY OF DISCUSSION

Participants and Audience

A member of the audience stated that the Bayley Scales of Infant Development measure motivation as well as cognition. The participants agreed that they do. Indeed, Yarrow's early writing about the relationship between cognition and motivation in early infancy was based on the observation that some Bayley items have a heavy motivational component. In our research, we have frequently obtained motivational measures from aspects of the Bayley. For example, study 1 used a rating of persistence during the Bayley scales to assess the concurrent validity of the mastery tasks, and study 7 is using Matheny's (CD, 1980) Task Orientation cluster derived from the Bayley Infant Behavior Record. Several individual Bayley items seem to have clear motivational components. For example, it is hard to understand why an infant should be said to be cognitively more advanced if he/she puts several, as contrasted to one, peg in a board or cubes in a cup. Persistence seemed to some participants to be the key factor on these Bayley items. Someone suggested that the Uzgiris-Hunt scales may be a more nearly pure index of cognition in infancy than the Bayley.

Some participants prefer to use the label "mastery behaviors" rather than "mastery motivation". While there may be advantages to the former label, it too has the possibility for confusion. "Mastery behaviors" might seem to refer only to behaviors that are actually successful in mastering or solving a task. Since we have inferred mastery motivation not only from such solution behaviors but also from unsuccessful attempts to solve or master the tasks, "task-directed behaviors" might be a more descriptive label.

Because the child's goal may not be the same as the experimenter's, a child might receive a low score because he/she was low on cooperativeness or highly motivated to master his/her own task. The investigators have usually made some record of creative, non-traditional or "own-task" behaviors, but have found them to be relatively uncommon in the structured testing situation. Therefore, it seems that the child's goal and experimenter's goal are either quite similar or very different, i.e., the child either focuses on the object and task or on exploring the room, getting a mother's attention or obtaining another toy. We have always given a number of tasks so that a low score on mastery motivation would be assigned only if the child showed little interest in several of the toys/objects.

The discussion also brought out the fact that if a child does not perceive what the task is he/she will not be able to begin working toward the solution. This has not seemed to be a major problem because the objects/toys used in the mastery studies have readily elicited task-directed behavior, at least in most normally developing subjects. However, to make certain that our perception of the tasks was the same as the child's, mastery investigators have demonstrated to the child what could be done before it was assumed that the child was not motivated to do the task.

Another point of discussion was that there is conceptually a difference between the motivation to begin a task and the motivation to continue or persist at it. Participants agreed that mastery/effectance motivation is imperfectly measured by persistence. It was pointed out that although persistence has been the most used measure so far, we have obtained a score

intended to measure the motivation to start the task, latency to task involvement. In study 1 (see attached table), such a latency measure was found to be highly negatively correlated with persistence.

One participant explained that with the 2 to 3 1/2 year old children in studies, 2, 5, 7 and 8 there has been less emphasis on persistence as a measure and that the tasks and procedures have been quite different from those used for the 6 and 12 month children in studies 1, 3, 4 and 6. Note that the preceeding papers refer primarily to studies of infants aged one year or younger.

Susan Harter's (Human Develop., 1978) conceptualization and measures have proven most helpful, especially in the studies with toddlers and preschoolers. For example, "preference for challenging or difficult tasks" can be assessed by having the child choose between two or more tasks that vary in difficulty level. "Self-initiated mastery" motivation might be assessed by recording the child's spontaneous attempts to master a task that he/she has not yet been shown how to do. This measure is based on one used by Susan Harter (Develop. Psych., 1974) with school-aged children and more recently by Belsky (SRCD, 1981) with toddlers. The strategy is to compare how well the child does spontaneously with the best performance that can be elicited by the experimenter. This aspect of mastery/effectance motivation is indexed by the child's attempts to figure out on his/her own how to use an object.

The discussion of other measures raised the question of causality pleasure or positive affect as an indicator of mastery/effectance motivation. Several participants stated that they have observed relatively little smiling or other indicators of joy during the mastery tasks. Most children seem to "work" with purposeful, sober determination. A member of the audience suggested that pleasure might be more common in toddlers and preschoolers than in infants, but the investigators studying older children did not think this was the case. The testing situation itself may attenuate positive affect because the tester tries not to reinforce the child for completing the tasks. Since the tasks tend to be fairly hard to complete, some children do not complete very many of them. Furthermore, most of the time for all children is spent trying to do rather than succeeding at the task, thus, decreasing the opportunity for causality pleasure which would only be expected to occur when the task is successfully completed. One participant noted that even in natural mother-infant interaction, infant smiling is an unusual event. On the other hand, observers need to be careful not to miss smiling when it does occur -- an easy thing to do when focusing on the task-directed aspects of the child's behavior. It was also pointed out that Harter's (JECP, 1977) work indicates that a number of factors, including task difficulty, influence behavioral indexes of pleasure. Affect, especially upon completion of the task, is certainly a behavioral dimension that needs more attention in future studies of mastery motivation.

CONCLUDING COMMENTS

George A. Morgan
Colorado State University

Although there is some disagreement about the details of definition and measurement, I believe that the research mentioned in the preceeding papers and in the following tables has been fruitful.

To summarize, the research has shown that it is possible to operationalize at least some aspects of the very young child's motivation to master the physical environment. We started from the observation that infants exhibit a variety of behaviors that appear to be goal or task directed. These behaviors include those involved in trying, perhaps unsuccessfully, to solve a problem or complete a task. The specific behaviors vary from task to task, but have in common that they are directed toward a goal. Observers have been reliably able to score several aspects of task directed behavior, especially persistence.

The studies outlined in the table provided preliminary evidence about the reliability and validity of the mastery motivation measures.* For example, studies 3 and 4 are examining the short term stability of mastery motivation. Evidence about longer term continuity will be obtained from studies 5, 7 and 8. The results from studies 1 and 2 indicate that there are meaningful antecedant experiences and that the mastery motivation measures are related to contemporaneous and later functioning. Whether early mastery motivation is a better predicter of later competence than early cognitive development is not yet known.

Similar procedures have now been used to assess mastery motivation in a wide variety of children. Subjects have been as young as 6 months and as old as 3 1/2 years. At-risk and developmentally delayed children are being compared to normally developing children. That is, the subjects in study 4 were Down's Syndrome infants and those in study 6 were preterms; physically handicapped preschoolers are being investigated in study 8.

Preliminary work is underway in study 7 to develop a questionnaire for mothers to rate several dimensions of their child's mastery/effectance motivation. Also in study 7, we are attempting to refine a procedure and a simplified scoring system that can be used by a single tester outside a laboratory setting. A long term aim of this project is to develop several age-graded sets of tasks appropriate for children from approximately 9 months to 2 1/2 years. The tester will, through a series of trials, identify tasks that are challenging but not beyond the capability of the individual child and then record the task directedness of the child's play on those tasks.

I feel we have made considerable progress in understanding mastery motivation in infants and young children, but it is clear that much more research and conceptual clarification is needed.

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*The papers about these studies which are listed in the bibliography are available from the first authors.

MASTERY MOTIVATION STUDIES

Investigators/Location	Objectives	Sample	Methods*
1) Yarrow, Morgan, Jennings, Harmon and Gaiter Child and Family Research Branch, NICHD Bethesda, MD 20205	Develop measures of mastery motivation for infants Study relationships of mastery motivation to: a) Cognitive development b) Qualitative aspects of spontaneous play with toys c) Social and inanimate environment at 6 mos.	44 normal, middle-class, 12-13 month infants	11 structured mastery tasks, approximately 2 minutes each Bayley Scales Free Play Home observation of mother and child
2) Jennings, Yarrow and Martin NICHD	Study continuity in mastery motivation and cognitive functioning from infancy to early childhood.	35 normal 3 1/2 year old children who had participated in the 12 month study above (Yarrow, Morgan, Jennings, Harmon & Gaiter)	Persistence at difficult problems, assessed by 3 problems (e.g., fitting wooden cutouts into a small box). Curiosity, assessed by letting the child play with a "curiosity box". McCarthy Scales

*The procedure for the structured mastery motivation tasks has varied somewhat between and within the several studies in these tables. In general, a toy is put in front of the child who is given the opportunity to play with it for a set period of time (usually 2-5 minutes) with little or no help or encouragement from the experimenter or mother. The toys pose tasks of several types. Some give the infant an opportunity to produce feedback from the toy by using a manipulandum such as a button, lever, or dial. Some tasks offered the infant an opportunity to take apart or combine objects in an appropriate way such as putting pegs in holes or shapes in forms. Finally, some tasks required the infant to circumvent an obstacle such as a glass barrier or latch to get a goal object. Latency to start task-directed behavior, duration of task-directed behavior (the persistence score), affect, and sometimes other behaviors have been recorded.

Investigators/Location	Objectives	Sample	Methods
3) Yarrow, Vietze, MacTurk, McCarthy and McQuiston NICHD	Develop measures of mastery motivation Study relationship of mastery motivation to: a) Cognitive development b) parent's perception of temperament c) parent-child interaction in home	75 normal, firstborn 6 and 12 month infants of middle-class backgrounds.	12 structured mastery tasks, 3 minutes each. Bayley Scales Parent perception of baby temperament Home observation of father, mother and infant Baby diary
4) Vietze, MacTurk, McCarthy and McQuiston NICHD	Study similarities and differences between infants with Downs Syndrome and normal infants in mastery behavior. Study similarities and differences in relationship between developmental status and mastery behavior.	Thirty 6, 8, and 12 month infants with Downs Syndrome from middle-class backgrounds.	12 structured mastery tasks, as outlined above. Bayley Scales Parent perception of baby temperament Home observation of father, mother and infant
5) Yarrow, Messer, Rachford, McCarthy, MacTurk, Marcus NICHD	Develop measures of mastery motivation Study relationships of mastery motivation to: a) cognitive development b) mastery behaviors in developmental test situations c) behavior in free play d) mother-child interaction e) operant learning behavior Study relationships between mastery at 6 and 12 months and mastery at 2 1/2 years.	53 normal 2 1/2 year old infants studied previously at 6 and 12 months by Yarrow, Vietze, et al.	6 structured mastery tasks, 5 to 10 minutes each. McCarthy Scales Free Play Interview with mothers Operant learning task Mother-child play

Investigators/Location	Objectives	Sample	Methods
6) Harmon, Glicken and A.Culp Department of Psychiatry Univ. Colo. Sch. Med. Denver, CO 80262	Study similarities and differences in mastery behavior between term and pre-term infants Study the relationship between mastery behavior and: a) cognitive development b) affective development c) free play behavior d) attachment	30 very low birth weight (less than 1500 gram) pre-term infants at 12 months (corrected gestational age) and 30 full term comparison infants.	8 structured mastery tasks, 3 minutes each. Bayley Scales Stranger approach Free Play Attachment Sequence Interview
7) Morgan, R.Culp, Jacobs, Busch and McCornack Human Development and Family Studies Colorado State Univ. Fort Collins, CO 80523	Develop/refine Measures of Mastery Motivation Develop Maternal Questionnaire to assess Intrinsic Motivation Study Continuity and Change from 9 to 24 months Study Relationships of Mastery Motivation to: a) Task-directed free play b) Mothers reports of intrinsic motivation c) Temperament	Approximately 25 normal, 9, 12 and 24 month children.	8 or 9 structured mastery tasks designed to assess: persistence at difficult tasks, self-initiated mastery and preference for challenge Intrinsic Motivation Questionnaire DOTS Temperament Scale Free Play Social Sequence
8) Jennings Western Psychiatric Institute & Clinic Univ. of Pittsburgh Pittsburgh, PA 15261	Determine whether physically handicapped children differ from normal children in mastery behavior Study relationship to: a) mother-child interaction b) Free play c) Intelligence Study consistency in mastery behavior from age 3 to age 4	Approximately 30 physically handicapped and 40 normal, 3 year-old children, followed up at age 4.	Persistence at solving difficult problems (as in Jennings, et al. above) Curiosity (as in Jennings, et al. above) Preference for challenging tasks (e.g., asking which height block tower (s)he would like to build)

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