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## LOW-INCOME ADOLESCENT MOTHERS' KNOWLEDGE ABOUT DOMAINS OF CHILD DEVELOPMENT

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**ABSTRACT:** Sixty low-income adolescent mothers of children ranging in age from birth to 28 months were asked to estimate the ages at which children are first able to engage in specific activities in cognitive, language, motor, play, and social development. In general, mothers were quite knowledgeable about the *ordering* of developmental abilities relative to one another, but were less knowledgeable about the developmental *timing* of abilities. With respect to timing, mothers tended to *underestimate* the onset of all developmental abilities. That is, mothers predicted that children's developmental abilities would appear earlier than they actually do. Mothers' knowledge about cognitive, language, and motor abilities was stronger than their knowledge about abilities in play and social development. Across domains, mothers were more accurate at estimating the ages of abilities that emerge in the first year than those occurring during children's second and third years. Findings are discussed with respect to societal emphases on different domains of development, and the potential implications of unrealistic expectations for adolescent parenting.

**RESUMEN:** Se les pidió a 60 madres adolescentes de bajos recursos, con hijos cuyas edades variaban desde los recién nacidos hasta los de 28 meses, que calcularan las edades a las cuales sus hijos serían capaces por primera vez de llevar a cabo actividades específicas en el desarrollo a los niveles cognitivo, del lenguaje, motor, de juego y social. En términos generales, las madres estaban bien informadas del orden de las habilidades de desarrollo en cuanto a las relaciones entre unas y otras, pero conocían menos acerca del tiempo en que dichas habilidades se desarrollan en el infante. Con respecto al tiempo, las madres tendían a no poder calcular el principio de todas las habilidades de desarrollo. Eso significa que las madres predijeron que las habilidades de desarrollo de sus niños comenzarían mucho antes de cuando aparecen en realidad. El conocimiento que las madres tenían acerca de las habilidades cognitivas, de lenguajes y motoras era más fuerte que su conocimiento sobre las habilidades de desarrollo social y de juego. A través de los diferentes ámbitos, las madres fueron más precisas al calcular las edades de las habilidades que surgen en el primer año del infante que aquellas que ocurren durante el segundo y tercer año de vida. Los resultados se discuten con respecto al énfasis de la sociedad en diferentes terrenos del desarrollo, así como las implicaciones posibles de expectativas poco realistas que madres adolescentes puedan tener para la crianza.

**RÉSUMÉ:** On a demandé à soixante mères adolescentes pauvres ayant des enfants de 0 mois à 28 mois

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d'estimer les âges auxquels les enfants sont d'abord capables de s'investir dans des activités spécifiques dans le développement cognitif, linguistique, moteur, ludique et social. En général, les mères savaient assez bien dans quel ordre viennent les aptitudes du développement, mais elles savaient moins bien à quel moment vient le développement de ces aptitudes. Pour ce qui concerne le moment du développement de ces aptitudes, les mères avaient tendance à sous-estimer le commencement de toutes ces aptitudes de développement. Ainsi, les mères prédisaient que les aptitudes des enfants en matière de développement viendraient plus tôt qu'elles ne le font en vérité. Les connaissances des mères sur les aptitudes cognitives, linguistiques et motrices étaient plus fortes que leur connaissance des aptitudes dans le développement ludique et social. Tous domaines confondus, les mères étaient plus précises dans leur estimation des âges auxquels ces aptitudes émergent dans la première année que celles venant dans la deuxième ou la troisième année des enfants. Les résultats sont discutés par rapport à l'accent que la société place sur différents domaines de développement, et par rapport aux implications potentielles des attentes irréalistes pour le parentage adolescent.

ZUSAMMENFASSUNG: 60 arme, jugendliche Mütter von Kindern zwischen Geburt und 28 Monaten, wurden ersucht das Alter zu schätzen in dem die Kinder erstmals kognitive, sprachliche, bewegungsmässige, spielerische oder soziale Dinge können. Generell wußten die Mütter viel mehr über die Reihenfolge, als über den Zeitpunkt der Entwicklungsschritte. Im Bezug auf den Zeitpunkt tendierten die Mütter dazu diesen früher einzuschätzen. Das heisst sie dachten diese Entwicklungsschritte treten früher auf, als sie es tatsächlich tun. Die Kenntnisse der Mütter waren grösser im Bezug auf kognitive, sprachliche und bewegungsmässige Fähigkeiten, als ihre Kenntnisse über Spiel und die Entwicklung sozialer Fertigkeiten. Jenseits aller einzelnen Fähigkeiten wußten die Mütter mehr über das erste Lebensjahr, als über das zweite, oder dritte. Unsere Ergebnisse werden im Bezug auf die Bedeutung unterschiedlicher Fertigkeiten in der Entwicklung diskutiert und die möglichen Implikationen unrealistischer Erwartungen jugendlicher Mütter besprochen.

抄録：出生から生後 28 ヶ月までにわたる子どもの低所得層の青年期の母親 60 人に、子どもが認知、言語、運動、遊び、および社会性の発達の特定の活動が最初にできるようになる月齢を推定するようにと、質問した。一般的に、母親たちは発達上の能力の相互の相対的な順序付けについては、とてもよく知っていたが、能力の発達上のタイミングについては知識がより少なかった。タイミングに関して、母親たちは、すべての発達上の能力の開始時を低く推定しすぎる傾向があった。すなわち、母親たちは子どもたちが実際にするよりも早く、子どもたちの発達上の能力が現れるだろうと予測した。認知、言語および運動能力についての母親たちの知識は、遊びや社会性の発達についての知識よりも、しっかりしていた。各領域にわたって、母親たちは、子どもの 2、3 年目に起こる能力よりも、1 年目に現れる能力の月齢を推定するのがより正確だった。所見は、発達の様々な領域の社会的重要性に関して、そして青年期の子育て **parenting** における非現実的な期待に含まれる可能性のある意味に関して議論される。

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Over the past two decades, there has been a growing interest in understanding and describing the nature of parents' knowledge about child development (e.g., Benasich & Brooks-Gunn, 1996; Bornstein et al., 1996; Goodnow, 1995; Goodnow & Collins, 1990; Holden, 1995; MacPhee, 1981; McGillicuddy-DeLisi & Sigel, 1995; Pomerleau, Malcuit, & Sabatier, 1991; Sigel, 1986, 1992; Tamis-LeMonda, Chen, & Bornstein, 1998). Several reasons for this increased empirical inquiry are evident. First, parents' beliefs generally, and knowledge about child development more specifically, might guide their interactions with children, thereby serv-

ing as an indirect influence on children's development (e.g., Goodnow & Collins, 1990; Miller, 1988; Stoiber & Houghton, 1993). Mothers who are knowledgeable about child development might be more likely to create an environment that is appropriate to their children's emerging abilities (Benasich & Brooks-Gunn, 1996; Miller, 1988; Hunt & Paraskevopoulos, 1980; Sigel, 1986, 1992). Empirically, adult mothers who are knowledgeable respond sensitively to their children's initiatives (Damast, Tamis-LeMonda, & Bornstein, 1996), whereas adult and adolescent mothers with inaccurate expectations are more likely to respond harshly or negligently (Abel & Rouleau, 1995; Azar, Robinson, Hekimian, & Twentyman, 1984; Fry, 1985; Twentyman & Plotkin, 1982). Adult and adolescent mothers who have accurate expectations of their children's abilities have children with greater socioemotional and cognitive competencies (McGillicuddy-DeLisi, 1982; Miller, 1988; Stoiber & Houghton, 1993), and adult mothers of preterm infants who are more knowledgeable about development have babies with higher scores on the Bayley Mental Developmental Index and Physical Developmental Index (Dichtelmiller et al., 1992). Adolescent mothers who are more knowledgeable and realistic about child development have children who exhibit more appropriate coping strategies (Stoiber & Houghton, 1993).

Second, parents' knowledge is an area of compelling scientific inquiry in its own right. The study of parents' knowledge about child development offers a window onto parents' thoughts about children as well as their role as parents. Often, what parents know about children's development reveals what they care about: Parents who consider a particular area of child development to be important may be more likely to seek out information about that area (Bornstein, 1995; Tamis-LeMonda & Bornstein, 1996; Tamis-LeMonda et al., 1998). To the extent that parents' views are informed by broader cultural ideologies, the domains of development about which mothers are most knowledgeable might also reflect cultural emphases that are salient within specific societies (Goodnow & Collins, 1990; Lightfoot & Valsiner, 1992).

Finally, applied researchers engaged in early preventive interventions have become increasingly interested in what parents do and do not know about child development, in an effort to educate less knowledgeable adult and adolescent mothers and to support sensitive parent-child interactions (Field, Widmayer, Stringer, & Ignatoff, 1980; Fulton, Murphy, & Anderson, 1991; Stevens, 1984). Theoretical models of child abuse and neglect indicate the effectiveness of educating parents about child development, and behavioral therapists are often encouraged to teach parents who maltreat their children about developmental milestones (Azar & Siegel, 1990). In conjunction with other forms of treatment, adult and adolescent mothers who are taught to observe and understand their children's behaviors and development demonstrate reductions in child abuse and neglect, resulting in positive child outcomes (Azar & Siegel, 1990; Field et al., 1980; Fulton et al., 1991).

Research indicates that maternal knowledge is affected by factors such as socioeconomic status (Benasich & Brooks-Gunn, 1996; Tamis-LeMonda et al., 1998); maternal education (Benasich & Brooks-Gunn, 1996; LeVine, Miller, Richman, & LeVine, 1996); culture (Bornstein et al., 1996; Bril, Zack, & Nkounkou-Hombessa, 1989; Pomerleau et al., 1991); and children's gender (Mondschein, Adolph, & Tamis-LeMonda, 2000). Maternal knowledge has also consistently been associated with maternal age, particularly with respect to adolescent parenting. Adolescent mothers have been shown to know less about children's development than older mothers, even when controlling for differences in socioeconomic factors (Brooks-Gunn & Furstenburg, 1986; Field et al., 1980; Roosa, 1983).

The practical implications of inaccurate developmental expectations for adolescent mothers are noteworthy. Adolescent mothers have been characterized as being less responsive (Garcia Coll, Hoffman, Van Houten, & Oh, 1987), less verbal (Culp, Appelbaum, Osofsky, & Levy, 1988; Field et al., 1980; Garcia Coll et al., 1987), less sensitive to their infants' interactions

(Barratt & Roach, 1995), and more punitive toward their children (Brooks-Gunn & Furstenberg, 1986; Field et al., 1980), when compared to older mothers. Children of adolescent mothers have also been shown to suffer from higher rates of child abuse than those of adult mothers (Azar et al., 1984; Goerge & Lee, 1997). Although factors such as parenting stress, lack of social support, and psychological and economic distress likely contribute to these parenting differences (Garcia Coll et al., 1987; Ketterlinus, Lamb, & Nitz, 1991), the inaccurate knowledge adolescent mothers have about children's development may also play a role.

Although studies indicate that adolescent mothers may lack knowledge about child development, the specific nature and magnitude of their inaccuracies remain unclear. Several studies indicate that adolescent mothers underestimate the ages at which children achieve developmental milestones (De Lissoyov, 1973; Field et al., 1980; Karraker & Evans, 1996); others suggest they overestimate developmental milestones (Epstein, 1980; Vukelich & Kliman, 1985). One study showed that adolescent mothers both under- and overestimated developmental milestones (Roosa, 1983). Moreover, controversy exists as to the pervasiveness of adolescents' lack of knowledge. For example, although adult mothers are generally more knowledgeable about development than adolescents, investigators have also revealed adolescents to be fairly accurate in their judgments (e.g., Roosa). In a study of 119 racially diverse adolescent mothers attending the University of California, San Diego (UCSD) Teen Obstetric Follow-Up on average, mothers accurately responded to 16 of the 21 items on the Knowledge of Infant Development Inventory (KIDI; MacPhee, 1981; see also East & Felice, 1996). However, upon closer inspection, mothers were not particularly knowledgeable about developmental milestones—75% of the mothers answered all questions about health and safety issues correctly, while only 17% answered all developmental questions correctly. Although several investigators have examined adolescent mothers' knowledge of development, many studies are over 20 years old. Because there is a relative dearth of recent inquiry in this area, it is urgent to document which domains adolescent mothers know more or less about.

In the present investigation, we extend the literature on adolescent mothers' knowledge about child development by taking a specialized approach to the assessment of mothers' knowledge. We distinguished between two aspects of mothers' knowledge—knowledge about the relative *ordering* of developmental milestones versus knowledge about the developmental *timing* of milestones—as well as among five domains of child development: cognition, language, motor skills, social development, and play. Until recently, research on maternal knowledge of child development had adopted a generalized perspective of mothers' knowledge, attitudes, and expectations, rather than focusing on specific aspects of knowledge in specific developmental areas. It is likely that maternal knowledge of child development is both multidimensional and specialized—the developmental areas in which mothers are most knowledgeable may depend on the goals they have for their children. As a group, mothers may be more knowledgeable about certain domains than about others, and at an individual level mothers' knowledge may or may not be stable across domains (Tamis-LeMonda et al., 1998). This specialized focus contributes to theoretical models about the precise nature of parenting views, as well as to interventions that aim to prepare young parents for “what is to come.”

We expected mothers to be knowledgeable about the ordering of developmental abilities, but to be less knowledgeable about precisely when abilities emerge (i.e., developmental timing). We expected adolescent mothers to be most knowledgeable about language and motor abilities, due to strong societal emphases on achievements in these areas—first words and first steps are certainly landmark achievements for all parents. In contrast, more generalized cognitive abilities such as those measured by standardized assessment instruments (e.g., object permanence), and play abilities, such as those documented in the developmental literature (e.g., symbolic play), might be less familiar to parents. Therefore, we expected adolescent mothers

to be less knowledgeable about cognitive and play development. With respect to mothers' knowledge about social development, we expected social achievements also to be important for adolescent mothers, and to therefore be an area in which they might demonstrate relatively strong knowledge.

## METHODS

### *Participants*

Sixty adolescent mothers were recruited from families requesting services at one of three Early Head Start programs and a Living for Young Families through Education (LYFE) center at a high school for adolescent mothers (also containing an Early Head Start program) located in Brooklyn and the Lower East Side of New York City. All of the mothers, except for one, were either first-time mothers or pregnant with their first child. One mother, who had more than one child, was eliminated from the study, resulting in a sample of 59 (32 male, 17 female children). Mothers ranged in age from 13 to 18 years of age ( $M = 16.62$ ,  $SD = 1.15$ ). Ten mothers were pregnant, 33 had children between the ages of 1 and 12 months, and 16 mothers had children between 13 and 28 months of age. All participants were low income and eligible to receive some form of governmental assistance (e.g., Medicaid, food stamps, WIC). Participants came from diverse ethnic backgrounds: 40.7% ( $n = 24$ ) African American; 27.1% ( $n = 16$ ) Caribbean or West Indian; 22% ( $n = 13$ ) Puerto Rican; 5.1% ( $n = 3$ ) Dominican; and 3.4% ( $n = 2$ ) South American; 1.7% ( $n = 1$ ) missing. The majority of mothers (92%) were in high school. Almost half of the mothers reported a history of working part-time or full-time, with only 8% working at the time of the interview. Out of the 59 mothers, 10% reported living with a partner (1 marriage and 5 cohabitations). Because child gender, maternal ethnicity, and other demographic characteristics of the sample did not relate to maternal knowledge in any of the domains, they are not considered in analyses.

### *Procedures*

During visits to the Early Head Start programs and the LYFE center, mothers were asked to complete an age checklist of children's abilities for five developmental domains: cognition (11 items), language (11 items), motor skills (11 items), social development (8 items), and play (11 items), (see Table 1). Mothers were asked to estimate the ages (in months) at which the average child is first capable of performing each action within each of the five domains. They were encouraged to guess if they did not have an idea as to when a particular ability appears. Participation was voluntary and mothers received \$20 for their participation.

### *Domains of Development Instrument*

Items on each of the five lists were primarily obtained from the Hawaii Early Learning Profile Checklist (HELP Checklist; Furuno, 1987) and the Bayley Scales of Infant Development (BSID), 2nd edition (Bayley, 1993). In some instances, items from standardized tests were augmented with developmental milestones discussed in the research literature. Play and language items were adopted from Tamis-LeMonda et al. (1998). All items reflected developmental abilities that typically emerge in children within the first three years of life. Generally, items chosen were behaviors children display during everyday activities so as to lend ecological validity to the study.

**TABLE 1.** *Items in the Five Developmental Domains: Mothers' Estimated Ages of Emergence*

<i>Cognitive Milestone Items</i>	<i>Empirical Age of Milestone Onsets (Range in Months)</i>	<i>Mothers' Age Estimates (in Months)</i>	
		<i>M</i>	<i>SD</i>
Turns head when he or she hears a sound.	2–4	4.9	3.7
Reaches for objects held in front of him or her.	3–5	6.3	2.7
Imitates simple actions like clapping and waving.	7–11	7.7	3.1
Looks at pictures in books or magazines.	6–14	9.3	4.7
Takes off a lid from a box and looks inside.	8–13	8.8	3.2
Puts small objects or toys in a container.	11–16	10.1	3.8
Finds objects in a “3 card monte game”—or any game where objects are hidden under cups or bowls that are then mixed up.	12–16	16.4	8.6
Builds a tower of 8 or more blocks.	20–31	12.5	5.2
Can pick out specific people and objects in photographs.	24–28	11.4	5.6
Copies a line with a crayon on paper.	23–34	14.8	7.4
Groups objects by color (red, blue, yellow).	32–42	16.4	8.2
<i>Language Milestone Items</i>			
Look around the room and then look into the air and make “aaah, oooh” noises over and over.	1–4	8.4	5.2
Look over to caretaker and respond to that person talking to them with sounds such as “gagaga, bababa.”	4–10	9.0	4.4
Whining “mamama mama” when upset to ask to be picked up by mother or father.	7–12	9.9	3.7
Look at a person, reach for cup and grunt “uhh uhh” to ask for a cup.	8–12	10.8	5.2
Look at person leaving a room and say “bye-bye,” imitating that person saying “bye-bye.”	9–13	10.6	3.2
Look at mother getting a bottle and say “ba ba” naming the bottle without mother saying anything about the bottle.	11–16	10.8	3.6
See a dog’s ball and say “dog dog” meaning that the ball belongs to the dog.	16–20	15.9	6.7
Look over to juice, reach for juice, and say “more ju” to request juice.	18–24	13.3	5.6
Say “hat head” or something like that as mother leaves the shower with a towel on her head.	20–28	16.7	8.0
Say “baby down” or “baby fall down” to a picture of a baby down on the ground or floor, meaning that he/she really did see a baby fall down last week.	24–34	17.0	7.8
Look at a picture of a boy crying, point to the picture, and say “boy sad” or “boy cry.”	30–36	17.8	7.7
<i>Motor Milestone Items</i>			
Supports own head upright with good control.	1–3	5.7	2.9
Uses arms to lift head and chest off his or her crib.	2–4	6.3	3.3
Rolls over from back to stomach.	5–7	5.1	2.3
Sits without support with good balance.	5–9	6.7	2.3
Pulls himself or herself to stand up using furniture.	6–10	8.2	2.0
Crawls across the floor on hands and knees.	7–10	6.7	1.7
Walks alone while holding the wall or furniture.	8–13	9.3	2.2

*(Continued)*

TABLE 1. *Continued*

<i>Cognitive Milestone Items</i>	<i>Empirical Age of Milestone Onsets (Range in Months)</i>	<i>Mothers' Age Estimates (in Months)</i>	
		<i>M</i>	<i>SD</i>
<i>Motor Milestone Items (Continued)</i>			
Walks up stairs with help from an adult.	14–19	12.4	5.2
Climbs on and off furniture like a chair or couch.	18–21	11.0	5.9
Can run easily and with good coordination.	18–25	16.0	8.2
Gets both feet off the ground when jumping.	22–30	14.2	7.4
<i>Social Milestone Items</i>			
Makes sounds in response to another person's voice.	3–5	7.5	3.2
Smiles at himself or herself in the mirror.	5.5–8.5	8.9	4.3
Becomes upset when caregiver leaves the room or home.	6–9	8.5	3.9
Plays simple social games like peek-a-boo.	6–10	8.5	3.1
Imitates or copies movements such as clapping or waving.	9–12	8.2	2.6
Looks at an object or person when an adult points	9–14	8.5	3.8
Shows interest in other children besides brothers or sisters.	18–24	9.3	3.7
Shows a desire to please mother or caregiver.	24–36	9.9	5.1
<i>Play Milestone Items</i>			
Reach for a small nesting cup, hold on to it and look at it.	3–6	10.1	3.9
Grasp a toy telephone, touch the buttons on it, and push one of the buttons.	7–12	10.0	3.2
Get a toy teapot, look for its lid and fit the lid on top.	9–14	14.7	6.1
Pick up a toy spoon, hold it in hand, and eat from spoon.	11–15	10.7	4.6
Find a baby doll, hold it in arms, and kiss its face.	12–16	11.6	4.7
Put a toy bowl on the floor, stir in it, and scoop "pretend food" onto a toy plate.	13–18	12.7	5.4
Reach for a baby doll, hold onto its hand, and make it wave "bye-bye."	15–24	13.3	6.1
Use a toy to stand for another toy, for example, pick up a small ball, put it against the floor and scrub the floor.	16–25	11.6	4.6
Find a stuffed bunny, place bunny in a toy car, and make bunny drive away.	17–26	13.9	6.7
Hold out finger, stir in a toy frying pan, and eat from finger.	18–27	13.7	6.0
The child takes a skinny bottle, puts the bottle in the baby doll's hands, and makes the doll color. The child is pretending that the bottle is a crayon.	20–30	15.8	6.9

Where possible, attempts were made to equate the number of words used to describe each ability. The number of words used to describe abilities did not linearly relate to their developmental timing. Items within each of the five domains were presented in random order. Items reflecting earlier developmental abilities typically occur within the first four months of life. An example of an early-emerging cognitive item was: "Turns head when he or she hears a sound"; an example an early-emerging language item was: "Looks around the room and then looks in the air and makes 'ahhh, oooh' noises over and over." In general, items reflecting the latest developmental abilities on each list typically emerge between 30 and 36 months. An example

of a later-emerging cognitive item was: "Copies lines with a crayon"; an example of a later-emerging language item was: "Looks at a picture of a boy crying, points to the picture, and says 'boy sad'." To ensure mothers' comprehension of each item, basic and uncomplicated wording was used. Mothers were encouraged to ask questions if they did not understand any of the items. A researcher further explained the activity in such instances, without providing any additional information to the mother that would suggest developmental timing.

To measure the accuracy of mothers' age estimates, we created a "developmental window" around each of the items from the five developmental scales and estimated whether mothers' responses fell within or outside of the window. Developmental windows were based on the widest age range of the ability as documented in standardized instruments (e.g., BSID, HELP Checklist) and empirical research. Depending on the milestone, age windows were longer or shorter, with a range of 2 to 12 months for each item. For example, the motor item "support head up with control" has been documented to first occur between 1 and 3 months of age. Thus, mothers' estimates for this ability would be considered "accurate" as long as they fell within this 2-month window. In contrast, the cognitive item "groups objects by color" has been documented to emerge between 32 and 42 months. Thus, for this item, mothers' estimates were considered to be accurate as long as they fell within this 10-month window.

Because the number of items in each domain differed, estimation scores were created for each developmental domain based on the percentages of mothers' estimates that were (a) within the developmental window, (b) underestimates, and (c) overestimates. For example, if a mother accurately estimated milestones within the developmental window for 20% of the motor items, she would receive a *correct estimation score* of 20 for the motor domain. If, however, she believed that abilities emerge earlier than the developmental window in 50% of the motor items, she would receive an *underestimation score* of 50 for that developmental domain. Similarly, if a mother believed milestones would be reached later than the developmental window for 30% of the motor items, she would receive an *overestimation score* of 30.

## RESULTS

We report on mothers' knowledge about the developmental *ordering* of milestones followed by mothers' knowledge about the *timing* of developmental milestones for each domain separately. We next examine mothers' accuracy scores across domains, and asked whether they demonstrate consistent patterns in their tendency to under or overestimate developmental milestones. Finally, we examine whether mothers are more knowledgeable about earlier versus later developmental achievements.

Because mothers sometimes left items blank, we began analyses by tabulating missing item scores in each domain.<sup>1</sup> The missing item scores by domain ranged from 24 to 37. A within-subjects repeated-measures ANOVA was conducted to assess whether mothers differed in their missing item scores across the five developmental domains. The overall  $F$  was not significant, indicating no differences in the number of missing items across the five domains,  $F(4, 55) = .93, p = .46$ .

We next related mothers' *orderings* of developmental milestones to the empirical orderings for each domain separately, using the nonparametric Spearman  $\rho$  (see Table 2). As a group, mothers were highly accurate in their ordering of developmental abilities. Notably, mothers' ordering of cognitive, language and motor abilities was virtually perfect. Mothers' knowledge about the ordering of play and social abilities was significantly weaker (range of Cohen's  $q =$

<sup>1</sup>Missing items are by default counted as failed items.

**TABLE 2.** *Correlations Between Mothers' Orderings of Milestones and Empirical Orderings*

<i>Developmental Domain</i>	<i>r<sub>s</sub></i>
Cognitive	.91***
Language	.98***
Motor	.93***
Social	.68*
Play	.66*

\**p* < .05; \*\*\**p* < .001.

.699 to 1.505, *ps* < .01, two-tailed) than their knowledge of cognitive, language, and motor milestones, although also strong (Cohen, 1977).

Nonetheless, analyses on the ordering of abilities do not address how accurate mothers are at estimating the *timing* of abilities—that is, the ages at which children first exhibit each behavior. It is feasible that mothers could order abilities perfectly within a domain, yet inaccurately judge the developmental onsets of abilities by weeks or months. Mothers' *correct estimation scores* ranged from 24 to 35. Thus, in contrast to strong accuracy about the sequential placement of items relative to one another, mothers were less knowledgeable about precisely when developmental abilities emerge. At an individual level, mothers' *correct estimation scores* (i.e., those falling within developmental windows) covaried significantly across the five domains (*rs* range = .30 to .65, *ps* < .05 to .01).

To assess whether mothers' accuracy was stronger in certain domains relative to others, we next conducted a within-subjects repeated-measures ANOVA for mothers' *correct estimation scores* across the five developmental domains. The overall *F* was significant, indicating differential accuracy of mothers in their age estimates for the five developmental domains, *F*(4, 55) = 7.72, *p* < .01. Post-hoc *t* tests revealed that mothers were significantly more accurate in estimating developmental onsets for cognitive, language and motor milestones than they were at estimating milestones for play and social development (see Table 3).

We also examined whether mothers were more likely to *overestimate* or *underestimate* the developmental timing of abilities. To do so, differences between the *overestimation* versus *underestimation scores* were evaluated within each domain separately by conducting paired sample *t* tests. Across all domains mothers were more likely to under- than to overestimate onsets of abilities (*ts* range = 4.19 to 8.15, *ps* < .001; see Table 4).

**TABLE 3.** *Mothers' Correct Estimation Scores: t Test Comparisons Across Domains*

<i>Developmental Domain</i>	<i>Correct Estimation Score</i>	<i>SD</i>	<i>Language</i>	<i>Motor</i>	<i>Social</i>	<i>Play</i>
Cognitive	31	16	-.13	-1.91	1.74	3.15**
Language	32	18	—	-1.68	1.83	4.14***
Motor	35	16		—	3.57***	5.03***
Social	27	17			—	1.25
Play	24	16				

\*\**p* < .01; \*\*\**p* < .001.

**TABLE 4.** Mothers' Underestimates and Overestimates of Developmental Milestones: Paired *t* Test Comparisons Within Domains

Developmental Domain	Underestimates		Overestimates		Paired <i>t</i> Test
	Underestimation Score	<i>SD</i>	Overestimation Score	<i>SD</i>	
Cognitive	40	.21	13	.12	8.15***
Language	37	.23	16	.12	5.55***
Motor	34	.17	16	.12	6.72***
Social	39	.22	21	.19	4.19***
Play	43	.27	15	.16	5.99***

\*\*\**p* < .001.

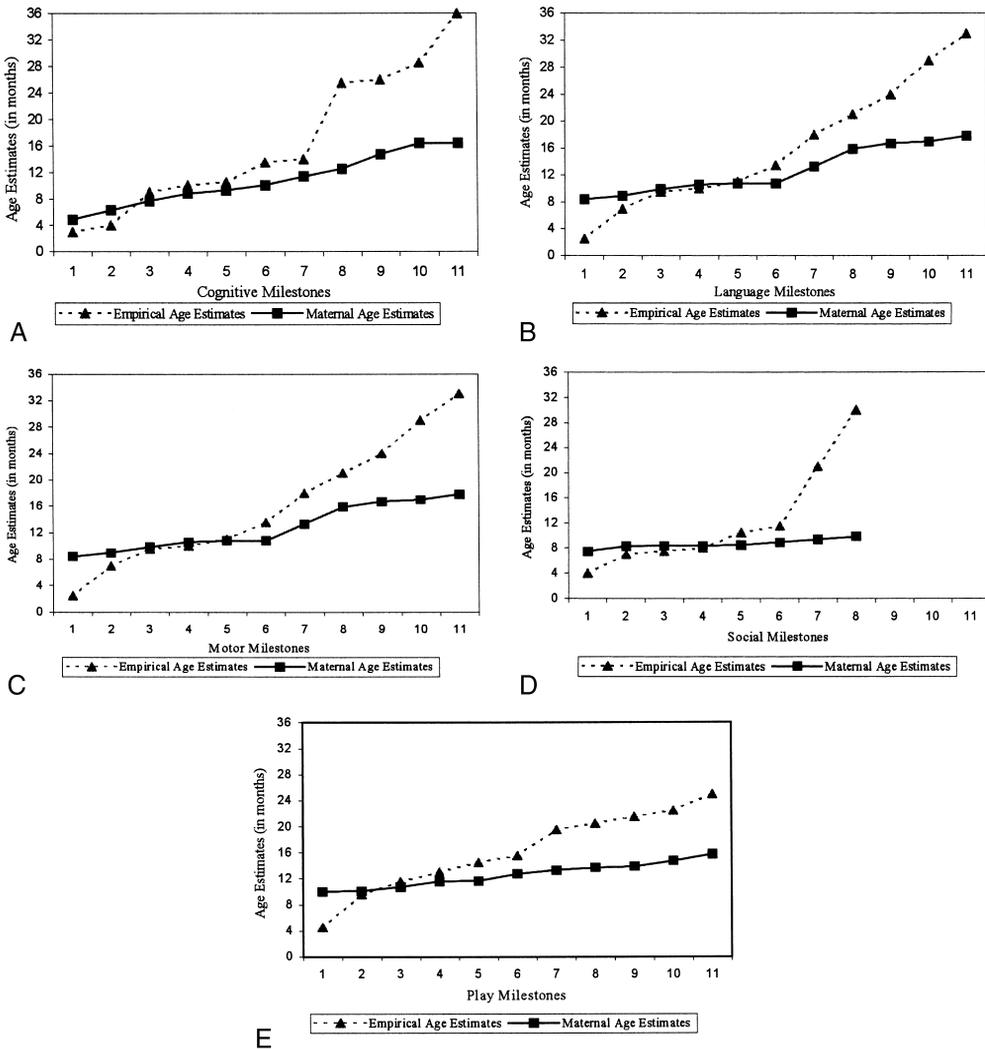
### Knowledge About Earlier Versus Later Developmental Milestones

In the next stage of analyses, we asked whether mothers' knowledge about development depended on the developmental window of emerging abilities—that is, whether mothers were more or less likely to accurately estimate milestones that occur earlier versus later in development. To examine this possibility, paired sample *t* tests were conducted to compare mothers' correct estimation scores for milestones that occur *before* 12 months of age with those that occur *after* 12 months of age. Across all five domains, mothers were significantly more accurate at estimating age onsets for earlier milestones than for those occurring after 12 months of age (*ts* range 3.51 to 12.75, *ps* < .001). This general finding is illustrated in Figures 1a through 1e, which plot mothers' age estimates against the actual age onsets of the target milestones. As can be seen, mothers' age estimates overlapped (or overestimated) with empirical ages for early abilities, but the two lines increasingly diverged for later abilities. This pattern might be expected, given the ages of the children of these mothers. Children in the present study averaged 8.6 months, with 64% being one year of age or younger at the time of the maternal interview. As such, mothers might be more aware of abilities that they have recently witnessed their children demonstrate, or be more aware of those that will soon emerge.

## DISCUSSION

In the first years of life, children exhibit rapid advances in cognition, language, motor skills, play, and social development. In this study we asked whether low-income adolescent mothers are knowledgeable about the relative ordering and developmental timing of abilities within each of these five domains. Awareness of developmental achievements might guide mothers' structuring of the home environment and provision of learning experiences for their young children (Damast et al., 1996; Miller, 1988), thereby indirectly affecting children's developmental outcomes.

Results indicated that adolescent mothers are generally knowledgeable about the *ordering* of developmental abilities, but are less aware of the *timing* (i.e., age onsets) of abilities. Mothers were better at estimating first-year abilities than they were at estimating abilities that occur in the second and third years. Given the majority of children were less than 12 months of age, this pattern suggests that a mother's knowledge is largely informed by the current or imminent developmental stage of her child (see also Tamis-LeMonda et al., 1998). This finding provokes speculation as to what factors explain such differential sensitivity. One possibility is that a



**FIGURE 1**(a) Mothers’ age estimates of cognitive milestones against the empirical estimates. (b) Mothers’ age estimates of language milestones against the empirical estimates. (c) Mothers’ age estimates of motor milestones against the empirical estimates. (d) Mothers’ age estimates of social milestones against the empirical estimates. (e) Mothers’ age estimates of play milestones against the empirical estimates.

mother’s knowledge of development is largely informed by her own child’s age (see also Tamis-LeMonda et al.). Mothers in the present study could be divided into three groups: those pregnant with a child, those with an infant, and those with a child over a year old. Given our limited sample size and hence power, it was not feasible to explore how parenting experiences with children of different ages interfaces with knowledge of development. However, future investigations with adolescent parents, and parents in general, might address this issue.

In general, adolescent mothers’ knowledge about cognitive, language, and motor development was significantly stronger than knowledge about play and social development. This

difference might reflect the strong societal emphasis placed on young children's cognition, language, and motor abilities, and the widespread acceptance that achievements in these areas are critical indicators of whether or not a child is developing "normally." As a consequence of these societal emphases, cognitive, language, and motor achievements may be very salient to mothers and/or mothers may be especially motivated to seek out information about normative development in these domains. In contrast, research on the relevance of play and social competencies may be less known or appreciated by adolescent mothers.

In this regard, it is possible that our methodological procedures underestimated mothers' knowledge. The empirical orderings of abilities used in this study were based on a compilation of research findings and items from standardized tests. However, such normative trends average across children, masking variation among children in the achievement of specific abilities. The developmental windows to which mothers' estimates were compared are not rigid "gold standards." Insofar as different mothers might experience different developmental trajectories in their children, or other children, their estimates of developmental abilities might reflect those experiences.

It is noteworthy that adolescent mothers systematically *underestimated* the timing of later emerging abilities across all domains, particularly abilities occurring after one year of age. Consequently, mothers appeared to have a very compact view of development, expecting children to achieve most abilities within a short span of a few months, rather than appreciating the protracted course of children's achievements in the five areas studied. This finding of "unrealistic expectations" accords with that of other research in which adolescent mothers were found to expect unusually early attainment of developmental milestones (e.g., Brooks-Gunn & Furstenburg, 1986; De Lissovoy, 1973; Field et al., 1980; Karraker & Evans, 1996). Figures 1a through 1e illustrate the narrow developmental window within which mothers expected most abilities to emerge. For example, even for motor abilities—a domain in which mothers were most accurate—mothers expected children to be able to jump with both feet off the ground at 14 1/2 months on average, only two months after beginning to walk. In the language domain, mothers expected children to combine words into simple sentences, and to include words of emotion in those sentences (e.g., "boy sad") by about 17 months; in reality, such linguistic abilities do not emerge until after 30 months (Kahana-Kalman & Walker-Andrews, 1996). The most compressed view of development occurred for social abilities, many of which were expected to occur within a 2-week window. The tendency toward underestimating age onsets for developmental abilities could potentially set mothers up for disappointment about their children's achievements. Inaccurate knowledge about developmental abilities may be a factor that plays a role in teenagers' parenting practices (Brooks-Gunn & Furstenberg, 1986). Nonetheless, knowledge about the timing and ordering of developmental achievements is not the only factor that matters. Other aspects of parenting knowledge, such as mothers' beliefs about *how* developmental milestones unfold and how parental involvement affects children's development are also critical (Goodnow & Collins, 1990; Fry, 1985; Stoiber & Houghton, 1993).

Several limitations to the present investigation should be noted. First, even though we assessed abilities thought to be critical indicators of children's development, our instruments remain selective. That is, other milestones might have been included in (or alternatively omitted from) our scales. For example, items pertaining to moral development, empathy, and self-help were absent and are certainly of interest. Second, participants were inner city, ethnically diverse adolescent mothers, most of whom did not live with a partner. Moreover, adolescent mothers who chose to participate in the study may have differed from those who did not. For example, the mothers in our study may have been more knowledgeable about child development and/or may have differed on a variety of sociodemographic and parenting characteristics when com-

pared to mothers who chose not to participate. These unmeasured differences may have affected our findings. Thus, the generalizability of our findings to other adolescent populations remains to be explored. Third, some mothers in the study regularly attended parenting programs. Data on individual mothers' program participation, as well as the extent mothers may have been provided with information about children's development at such programs, are unknown. It is possible that program participation enhanced the level of knowledge of some mothers, and that lack of participation resulted in limited knowledge for others. Finally, the purpose of this investigation was descriptive, rather than comparative. We did not contrast adolescent mothers' knowledge with that of adult mothers. It may be that the patterns revealed here are characteristic of low-income, inner city mothers more generally, rather than of adolescent mothers specifically. Again, this possibility remains to be explored.

Despite these caveats, the present findings have implications for interventions with adolescent mothers. Lack of knowledge about development can lead to unrealistic expectations of children (Shannon & Tamis-LeMonda, 2001). For instance, mothers who *underestimate* the age at which milestones occur might expect children to walk, talk, share, listen, and pretend sooner in development than is typical. At the least, such unrealistic expectations may lead to diminished efficacy in mothers and/or disappointment in children's abilities when children fail to live up to inaccurate expectations. In extreme cases, underestimations may contribute to mothers' impatience and misunderstanding of their children's otherwise appropriate behaviors, potentially, feeding into a cycle of harsh, punitive, and/or prohibitive parenting (Azar et al., 1984; Azar & Siegel, 1990). Conversely, mothers who *overestimate* the timing of developmental milestones may expect too little from their children and fail to challenge their children's thinking and behaviors in age-appropriate ways (Fry, 1985; Vukelich & Kliman, 1985). As an example, mothers who overestimate when talking or understanding of language is likely to occur might insufficiently vocalize or respond to their children, potentially leading to an impoverished language environment.

The finding that adolescent mothers are particularly limited in their knowledge of children's social and play abilities suggests that they might not recognize the value of supporting achievements in these areas. It therefore becomes essential that practitioners be sensitive to mothers' awareness of multiple domains of development in order to provide appropriate interventions. Teaching adolescent parents about normative achievements across domains of development is important preparation for the task of parenting. Interventions aimed at modifying the sensitivity of adolescent mothers have focused on links between maternal knowledge and behavior. Such efforts have enhanced both mothers' knowledge as well as the quality of their interactions with children (Goodnow & Collins, 1990; Miller, 1988; Stoiber & Houghton, 1993).

However, there exists the possibility that increased knowledge of development may create greater anxiety or stress in adolescent mothers (e.g., East & Felice, 1996). Thus, effective interventions should emphasize both normative achievements as well as the variation that exists among individual children. In addition, adolescent mothers should also be provided the emotional support and information necessary to acquire competent caregiving skills and to nurture their own psychological needs (Fulton et al., 1991). In addition, researchers and practitioners must be sensitive to the role of culture in affecting adolescent mothers' knowledge about children's development, as well as what domains of development are valued by individual mothers. A mother who values a particular domain might seek out and/or be receptive to information about developments in that area. As an example, a mother who is highly concerned about preparing her child for school may focus her energy on factors that promote school readiness and may be especially sensitive to developments in children's language and cognition. Professionals who are sensitive to relations among cultural ideologies, goals and

parenting knowledge might be in a better position to understand and intervene in the parent–child relationship.

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