PARENT-COMPLETED DEVELOPMENTAL SCREENING FOR PRESCHOOL CHILDREN: A STUDY OF CONCURRENT VALIDITY AND RELIABILITY

by

JULI LULL POOL

A DISSERTATION

Presented to the Department of Special Education and Clinical Sciences
and the Graduate School of the University of Oregon
in partial fulfillment of the requirements
for the degree of
Doctor of Philosophy

March 2008

University of Oregon Graduate School

Confirmation of Approval and Acceptance of Dissertation prepared by:

Juli Pool

Title:

"Parent-Completed Developmental Screening for Preschool Children: A Study of Concurrent Validity and Reliability"

This dissertation has been accepted and approved in partial fulfillment of the requirements for the Doctor of Philosophy degree in the Department of Special Education and Clinical Sciences by:

Jane Squires, Chairperson, Special Education and Clinical Sciences
Deanne Unruh, Member, Special Education and Clinical Sciences
Debra Eisert, Member, Special Education and Clinical Sciences
Patricia A. Gwartney, Outside Member, Sociology

and Richard Linton, Vice President for Research and Graduate Studies/Dean of the Graduate School for the University of Oregon.

March 22, 2008

Original approval signatures are on file with the Graduate School and the University of Oregon Libraries.

An Abstract of the Dissertation of

Juli Lull Pool for the degree of Doctor of Philosophy

in the Department of Special Education and Clinical Sciences

to be taken March 2008

Title: PARENT-COMPLETED DEVELOPMENTAL SCREENING FOR PRESCHOOL CHILDREN: A STUDY OF CONCURRENT VALIDITY AND RELIABILTY

Approved: _____
Jane K. Squires

Identifying children with developmental delays or disabilities as early as possible is a growing concern and has increased focus on the development of valid, reliable screening tools. The previous editions of the Ages and Stages Questionnaires (ASQ) have been investigated and found to be valid and reliable for screening children at risk for delay and in need of further evaluation. This study examined the psychometric properties of a newly revised third edition, including the utility of the addition of a "monitor" scoring category with preschool age children.

Participants included 59 child/parent dyads ages 45-65 months with either no known risk factors (n = 39) or one or more risk factors (n = 20). Results from data

analyses evaluating the psychometric properties were promising. Validity was investigated by examining concurrent validity using the Battelle Developmental Inventory, 2nd Edition (BDI-2). Classifications (i.e., "typically developing" or "identified") of child's performance based on the domain scores of the ASQ were compared to the classifications of the child's performance based on total developmental quotient scores of the BDI-2. Percentage of agreement between classifications (91%) was computed. Based on BDI-2 and ASQ agreement, specificity was 91%, sensitivity 100%, and positive predictive value 20%. Reliability was examined with test-retest, inter-observer, and internal consistency. Intraclass correlations (ICC) and percent agreement were used to calculate test-retest and inter-observer reliability. ICC for test-retest ranged from .29 to a .88 when comparing individual domain scores from time one to time two. Percent agreement was calculated by comparing classifications at time one to classifications at time two, with 96% agreement. ICC for inter-observer reliability ranged from .22 to 1.00, with a percent agreement of 100%. Internal consistency means were calculated at: communication .66, gross motor.70, fine motor.52, problem solving .35, and personal-social .61. Results from the analyses addressing the utility of a "monitor" scoring category and using learning activities suggested that (a) parents and teachers found the activities easy to understand and use, and (b) the learning activities would be effective with a child scoring in this category.

CURRICULUM VITAE

NAME OF AUTHOR: Juli Lull Pool

PLACE OF BIRTH: Denver, Colorado

DATE OF BIRTH: September 8, 1974

GRADUATE AND UNDERGRADUATE SCHOOLS ATTENDED:

University of Oregon
University of Texas at Austin

DEGREES AWARDED:

Doctor of Philosophy in Early Intervention, 2008, University of Oregon
Master of Science in Early Intervention, 2003, University of Oregon
Bachelor of Science in Applied Learning and Development, 1999, University of Texas at Austin

AREAS OF SPECIAL INTEREST:

Inclusive practices
Early literacy development
Professional development of early childhood personnel

PROFESSIONAL EXPERIENCE:

Practicum Supervisor/Graduate Teaching Fellow, Early Childhood/Elementary Special Education Licensure Program, University of Oregon, 2005-2007.

Practicum Supervisor, Early Intervention Program, University of Oregon, 2003-2005.

Teaching Assistant, Early Intervention Program, University of Oregon, 2004-2006.

Teaching Assistant, Special Education, University of Oregon, 2006-2007.

Special Education Teacher, Mathews Elementary, Austin Independent School District, 2000-2002.

GRANTS, AWARDS AND HONORS:

Clare Wilkins Chamberlin Memorial Award, 2007

Graduate School Research Award, 2007

Graduate Teaching Fellowship, University of Oregon, 2005-2007.

Leadership Training Grant, United States Department of Education, 2003-2005.

Professional Training Grant, United States Department of Education, 2002-2003.

ACKNOWLEDGMENTS

I would like to express my sincere appreciation and gratitude to Professor Jane Squires, who has provided support, encouragement, and advice throughout my time at the University of Oregon. I feel very fortunate to have been one of your students and I am hopeful for future collaborations.

I would also like to thank the rest of my committee, Deanne Unruh, Debra Eisert, and Patricia Gwartney. Your feedback and support made this study and dissertation possible.

A great big thank you to Angela Gonzalez, Krista Swanson, Rebecca Briggs, Jason Harlacher, Carolina Preciado, and Melissa Bandy! Thank you for being such for being diligent data collectors and working with all these families. This study would not have been successful without your help.

Thank you to the Special Education and Early Childhood Studies Department at Boise State University (Keith, Carrie, Bea, Melissa, Michael, Lee, Evelyn and Bryon). Without your assistance, support and encouragement, continuing this study in Idaho would have been impossible!

I especially want to thank the families and children that participated in the study. Your contribution is invaluable. Also, thank you to the childcare centers, preschools and agencies that allowed me to recruit children from your program.

I would also like to thank the friends I have made at the U of O over the last six years: Debby (Graduate School for Dummies?), Ginger, Dave, and my cohort in the EIP.

And last but certainly not least, I am thankful for my family. You did not want me to move so far away for school, but you supported me every step of the way. You have always believed in me. Thank you for encouraging and supporting my dream. I hope I do you proud!

This research study was supported in part by the University of Oregon Graduate School Research Award and the Claire Wilkins Chamberlain Dissertation Award.

DEDICATION

This dissertation is dedicated to two very important people in my life: my husband Noah Lull and my sister Brandi Pool. Without Noah's support and encouragement I may never have made it through. Thank you for the sacrifices you have made for me and my studies. You kept the dream alive when I was ready to give up. I hope that I can give back a fraction of what you have given me. You are my best friend…keep the laughter coming! My sister Brandi is my inspiration in everything I do and accomplish. Thank you for being you and giving me unconditional love, daily phone calls, and the sweetest smile I have ever seen. You are my world…this is for you! I love you both with all my heart.

TABLE OF CONTENTS

Chapter	Page
I. INTRODUCTION	1
Early Identification	3
Plasticity of the Brain and the Influence of the Environment	5
Preparation for the School Environment	6
Social and Emotional Competence	6
Statement of the Problem	8
Diversity of Population	8
Access to Screening	11
Need for Low-Cost Measurement Tool	12
Summary	13
II. REVIEW OF THE LITERATURE	15
Why Early Identification?	15
Brain Development	16
Quality Early Childhood Experiences	17
Preschool Years	17
The High/Scope Perry Preschool	19
The Carolina Abecedarian Project	20
The Chicago Child-Parent Center	20
Summary	22
Screening	23
Rationale for Using Screening Instruments for Early Identification	23
Purpose of Screening	24
Using Screening to Monitor Development	30
Rationale for Using the ASQ	31
ASQ Reliability and Validity	32
Past Studies on the ASQ	33
Renorming the ASQ	34

Chapter Page

Utility of the ASQ 35
Purpose of Study 36
Research Questions 37

III. METHOD OF STUDY 38
Participants 38
Children and Parents 38
Teachers/Program Staff 39
Protection of Human Subjects 39
Measures 40
Demographic Form 40
Ages and Stages Questionnaires 41
Battelle Developmental Inventory, 2nd Edition 43
Utility Survey 47
Procedures 47
Recruitment of Subjects 48
Data Collection 50
Experimental Procedures 51
Phase One 51
Phase Two 52
Data Analysis 54
Summary 58

IV. RESULTS 61
Participants 61
Children and Parents 61
Teachers/Program Staff 65
Technical Adequacy 65
Validity 66
Research Question #1 66
Concurrent Validity 68

Chapter Page

Sensitivity, Specificity, and Positive Predictive Value for Participants With Total DQ Scores. 69
Sensitivity, Specificity, and Positive Predictive Value For Participants Without Total DQ Scores (Domain DQs Only)..... 69
Reliability 70
Research Question #2 72
Test-Retest Reliability 72
Inter-Observer Reliability 73
Internal Consistency 74
Utility 75
Research Question #3 76
Parents 76
Teachers 78

V. DISCUSSION 83
Interpretation of Results 83
Participants 83
Phase One 83
Phase Two..... 86
Validity 88
Research Question #1 88
Concurrent Validity 88
Reliability 92
Research Question #2 92
Test-Retest Reliability 92
Inter-Observer Reliability 94
Internal Consistency 96
Utility 97
Research Question #3 97
Parents 98
Teachers 99

Chapter Page

Limitations 99
Sample 99
Distribution of Participants 100
Diversity 101
Disability 101
Implications 103
Research 103
Practice 104
Future Directions 106

APPENDICES

A. CONSENT LETTERS 108
B. RECRUITMENT 114
C. MEASURES 121
D. MISCELLANEOUS 132

BIBLIOGRAPHY 136

LIST OF FIGURES

Figure Page

1. ASQ summary sheet with "monitor" category 42
2. Description of phases of study 53
3. Classification criteria for ASQ and BDI-2 55
4. Cross tabulation of agreement between total DQ and BDI-2 and the ASQ for 48, 54, and 60 month age intervals 68
5. Cross tabulation of agreement between domain DQ on BDI-2 and domain ASQ scores for 48, 54, and 60 month age intervals 69
6. Cross tabulation of agreement between BDI-2 and ASQ by age interval 71
7. How much did reviewing the ASQ help you to identify your child's specific needs? 76
8. How difficult or easy are the learning activities to understand? 77
9. How difficult or easy are the learning activities to use? 77
10. How useful do you think the learning activities will be for focusing attention on your child's needed skills in the developmental areas? 77
11. How likely are you to use the learning activities at home? 78
12. How effective do you think the learning activities will be with your child? 78
13. How much did reviewing the ASQ help you to identify this child's specific needs? 79
14. How much did the ASQ help you develop learning activities for this child? 79
15. How difficult or easy are the learning activities to understand? 80
16. How difficult or easy do you think the learning activities will be to use? 80
17. How useful do you think the learning activities will be for focusing attention on this child's needed skills in the developmental areas? 80
18. How likely are you to use the learning activities in your program? 81
19. How effective do you think the learning activities will be? 81
20. Test-retest ICC for the personal-social domain on the 60-month ASQ..... 93

Figure Page

21. Inter-observer ICC for the communication domain on the 60-month ASQ 95
22. Inter-observer ICC for the gross motor domain on the 54-month ASQ 96

LIST OF TABLES

Table Page

1. Psychometric Standards for Effective Screening Tests 26
2. Selected Quality Developmental Preschool Screening Tests 28
3. Research Questions, Outcome Measures, and Data Analysis 60
4. Demographic Information of Study Participants 62
5. Percentage Estimates of Population Distribution for the United States, Oregon, Idaho, Ada County and the Current Study 64
6. Intraclass Correlations for Test-Retest for Domain and Age 72
7. Intraclass Correlations for Professional and Parent Administrations for Domain and Age 73
8. Internal Consistency for Domains and Age Intervals 75
9. Number of Participants in Targeted Areas 82
10. Number of Risk and Non-Risk Participants in Each Age Interval for Phase Two 87
11. Overall Performance on ASQ and BDI-2 by Age Interval: Sensitivity, Specificity, False Positive, True Positive, False Negative, Percent Agreement, Under-Identification, Over-Identification, and Positive Predictive Value 90
12. Distribution of Risk Participants Across Study Phases and Age Intervals 100
13. Participants with an Established or Suspected Delay/Disability and Their Measurement Classification 102

CHAPTER I

INTRODUCTION

Early identification of children at risk for developmental delays is critical in order to implement timely intervention. Early identification is predicated on the theory that a distinction can be made between those children who have typical development and those that face the possibility of developmental challenges or issues (Squires, Potter, & Bricker, 1999).

To prevent delays from becoming serious or leading to more problematic conditions, early identification before school entry is optimal (Ackerman & Barnett, 2005; Schor, Abrams, & Shea, 2007). Research has shown that life outcomes may be positively affected by early identification and the receiving of services in the preschool years (Barnett & Belfield, 2006). State and federal policy and legislation have recently begun to reflect this belief. There are a growing number of programs designed to find, identify, track, and serve children at risk for developmental problems (Halfon, DuPlessis, & Inkelas, 2007).

When compared to school-age children, the screening of children birth to five years old is limited due to lack of exposure to public programs, especially for those children who do not access medical care regularly (Schor, 2004; Schor et al., 2007). However, there has been a steady increase in the number of children receiving early intervention (EI) and early childhood special education (ECSE) services, due to improved

screening instruments and systems (Squires et al., 1999). Both Part B and Part C of Individuals with Disabilities Education Act (IDEA) contain explicit requirements for states to actively identify children and serve eligible children with high quality services.

According to recent reports, the number of infants and toddlers served by Part C of IDEA nationwide has increased by 83% from 1994 to 2005, showing increased capacity of states to identify and serve eligible young children age's birth to three years old (Danaher, Goode, & Lazara, 2007). However, infants (birth - 12 months) represented only 14% of the total number of young children (birth to 3 years) receiving Part C services in the 2004 Part C IDEA child count (Danaher et al., 2007). From 2001 to 2005 there has been a 14% increase in the number of children age three to five receiving Part B services (Lazara, Danaher, & Kraus, 2007).

Finding those children who are in need of Part B and Part C services is the first step in early intervention (McLean, 2004). Child Find programs and systems have been established in each state and territory, mandated by IDEA legislation. These programs and systems are usually managed by educational agencies and are responsible for "finding" eligible children and providing services needed for them to reach their developmental milestones or meet their educational needs. Agencies tend to "find," or identify, children through an assortment of personnel, such as social workers, teachers, therapists, public health nurses and medical doctors. When children are identified, they are referred to a specialist for a careful, more thorough evaluation of their development. The evaluation helps identify any areas of concern that may need more in depth intervention. In order to receive early intervention or special education services, a child

must be evaluated to confirm he/she has a delay or disability that meets state definitions. The rationale for using a system of child find, early identification, and referral is based on the importance of intervening as early as possible in order to prevent and minimize developmental delays (Lipkin, 2006; McLean, 2004).

The 24th Annual Report to Congress reports the average age at initial identification of a child with disabilities is 5.9 years old (U.S. Department of Education, 2001). By this age many opportunities are missed for improving outcomes. For example, a child with no exposure to books, print, or rich oral language shows vast skill differences at the time of school entry compared to a child with these experiences. Hart and Risley (1995) found in their study of 42 families, categorized as professional, working class, or welfare, that children's cumulative vocabulary at age three is 1,100, 750, or 500, respectively. The findings from this study indicate a need to identify children from risk environments and provide intervention, support, and services. Thus, much work remains to be done to assure that state child find and public awareness systems are effectively identifying all eligible young children and their families.

Early Identification

There are critical periods of development when it is essential that certain skills are acquired by young children (Committee for Economic Development [CED], 2006; Hart & Risley, 1995; Shonkoff & Phillips, 2000; Shore, 1997). Preschool programs provide one venue for children to receive vital experiences and education that positively impact development. Cognitively, experience is sequential. Schemas for classifying and thinking

about experiences are developed in infancy and throughout the school years (Piaget, 1952). The amount and diversity of early experiences influence which new opportunities for experience are noticed, incorporated, sought after, and chosen.

Some core concepts of development are interaction, relationships, early experiences, and individual differences (Sandall, McLean, & Smith, 2000; Shonkoff, 2003; Shonkoff & Phillips, 2000; Shore, 1997). These core concepts play a role in early identification. Children's development is an immensely complex process and is influenced individually by both nature and nurture (Bronfenbrenner, 1979; Meisels & Shonkoff, 2000; Sameroff & Chandler, 1975). Bronfenbrenner's (1979) ecological and Sameroff and Chandler's (1975) transactional models of development depict the significance of the environment, relationships and interactions with both the child and his or her development. These models of development help us understand developmental psychopathology and how environment, relationships, and interactions indicate current or future issues, delays, or problems. Understanding the effects of nature and nurture on development will aid in the early identification of delays and at-risk factors.

Early neurological development is shaped not only by environment, but also by an individual's attachments and relationships (Karoly et al., 1998; Shonkoff & Phillips, 2000; Shore, 1997). The best way for children to grow into competent, confident learners is to provide them with nurturing, caring environments. When caregivers respond to children's emotional cues with appropriate, timely responses, their interactions tend to be successful and the relationship is likely to support healthy development in many domains,

such as communication, cognition, and social-emotional competence (Shonkoff & Phillips, 2000).

Early identification of possible delays or disabilities is important for many reasons. First, the plasticity of the brain and the influence of the environment can make a difference in the early years of development (Shonkoff, 2003). Second, with early identification and quality preschool services, children will be more prepared for the school environment (Schor et al., 2007; Shonkoff, 2003). Finally, children will be more socially and emotionally competent and successful with peers in early academic settings with early identification (Brophy-Herb, Lee, Nievar, & Stollak, 2007).

Plasticity of the Brain and the Influence of the Environment

Neuroscientists have found that throughout the entire process of development, the brain is affected by environmental conditions (Shore, 1997). Before and after birth, growth of brain connections occur, and nourishment, stimulation, care, and experiences affect development. Environmental and biological risk factors (e.g., abuse, poverty, unsafe home/neighborhood, stressful life situations, prematurity, low birth weight) have the profound potential to affect development (Blumberg, Halfon, & Olson, 2004; Dawson, Ashman, & Carver, 2000; Fumagalli, Molteni, Racagni, & Riva, 2007; Greenspan & Meisels, 1996).

There are periods of development, called "plasticity," when the brain has the capacity to change or adapt in response to experience or damage (Shonkoff & Phillips, 2000; Shore, 1997). During the plastic periods, there are time-limited windows of opportunity during which critical stimuli from the environment are necessary for healthy

brain development. Interactions between caregiver and child, such as talking, singing, and playing with, are as important environmental stimulants as providing adequate nutrition; protecting children from drugs, environmental toxins, and stress; and obtaining developmental screenings (Halfon et al., 2007; Shonkoff, 2003; Thompson, 2001). Early identification of delays, disabilities, risk factors, and consequences will have lifelong implications.

Preparation for the School Environment

Early identification and quality preschool experiences can boost children's chances for later school success. Considerable evidence has shown that by the time children are eight years old, they are launched into trajectories that largely determine their academic futures (Dawson et al., 2000; Shonkoff & Phillips, 2000). The likelihood of a student dropping out of high school based on their academic performance and social adjustment in the third grade can be predicted with uncanny accuracy (Alexander & Entwisle, 1988; Entwisle & Alexander, 1993; Farran, 2005; Lloyd, 1978). Research has even suggested that the quality of care, experiences, and support received in the first years of life can predict drop-out patterns before children even enter school (Teo, Carlson, Mathier, Egeland, & Sroufe, 1996). With an emphasis on academics and the importance of school success, early identification can change a child's developmental trajectory.

Social and Emotional Competence

With early identification and intervention, children will be more successful with peers in early academic settings and more likely to be confident of skills (Lazar &

Darlington, 1982). One of the major developmental tasks of early childhood is establishing relationships with other children. In establishing relationships, children create a context in which they evaluate their competence, self-worth, and view of the world (Ladd & Price, 1987; Shonkoff & Phillips, 2000). The patterns of peer interaction and relationship building in the early childhood years also can predict children's social competence or deviance in later years (Ollendick, Weist, Borden, & Greene, 1992). Learning to play well together and make friends are not easy tasks and children who do them well tend to have quality, structured experiences as toddlers and in preschool settings. Relationships and attachments with caregivers, temperament and predispositions, peer interaction opportunities, performance in school, family environment and neighborhood environment all seem to play a role in social and emotional competence (Booth, Rose-Krasnor, & Rubin, 1991; Rothbart & Bates, 1998; Shonkoff & Phillips, 2000). Children with social-emotional problems tend to do poorly in school and poor academic performance, in turn, seems to intensify these problems (Arnold, 1997; Hinshaw, 1992). Due to the No Child Left Behind Act of 2002 (NCLB), there has been an emphasis on reading and math performance, however, the *whole* child or all developmental domains need to be evaluated. The early identification of any delays or deviances from typical social, emotional and academic development could affect later school success.

Statement of Problem

In the following section, three barriers to early identification are addressed. Early identification is complicated due to a variety of factors. First, there is a growing diversity of young children in the U.S. (Espinosa, 2005; Magnuson & Waldfogel, 2005). Diversity is a challenge to service providers because of the complex task of identifying groups that are underserved and eliminating cultural and language barriers that may interfere with identification, assessment, and service provision (Espinosa, 2005; Lynch & Hanson, 2004; Shonkoff & Phillips, 2000). Second, there is an access barrier to screening services for underserved populations. In the U.S., 17% of children have a developmental disability, yet less than 50% of these children are identified before starting school (Department of Health and Human Services, Centers for Disease Control, National Center on Birth Defects and Developmental Disabilities [CDC], 2005; Schor et al., 2007). Lastly, the cost of screening by professionals is high (Dobrez, Sasso, Holl, Shalowitz, Leon, & Budetti, 2001; Glascoe, Foster, & Wolraich, 1997). A low-cost, effective measurement tool that is readily available to help identify children early on in their development is one solution for effective early identification.

Diversity of Population

Since 2000, the proportion of the U.S. population that is Hispanic has increased tremendously, while Black, and White populations have remained relatively stable with little growth. The Hispanic population has increased by 6.9 million from 2000 to 2005, becoming the largest racial ethnic minority in 2003 (Lichter, Quain, & Crowley, 2006). Meanwhile, the Black and Asian populations have increased by 1.9 million and White by

2.5 million (United States Census Bureau, 2006a). For example, in Oregon, Hispanic and White populations increased tremendously from 2000 to 2005; the Hispanic population increased by 78,000 and the White population by 128,000. The Black population had the least amount of growth, with an increase of only 2,600 and the Asian population by 24,000 (United States Census Bureau, 2006a). These trends are projected to continue, if not accelerate, in the future (Lichter et al., 2006; Shonkoff & Phillips, 2000).

According to the *24th Annual Report to Congress on the Implementation of IDEA* (2001) and the *26th Annual Report to Congress on the Implementation of IDEA* (2005b), there have been increases in each ethnic/racial population categories of children with disabilities age's three to five served under IDEA. The White (not Hispanic) population increased by 5%, while the Black (not Hispanic) and the Hispanic populations served each increased by 10%. The Asian/Pacific Islander population has had the smallest increase in children served, increasing by less than 5%.

This increase in diverse populations requires culturally competent assessment when finding, designing and using measurement tools for early identification (Pavri, 2001; Pavri & Fowler, 2005). Tools that are not sensitive to different cultures can over- or under-identify young children of diverse backgrounds (McLean, 1999; 2004; Pavri & Fowler, 2005). One of the problems with over-identification is the unwarranted diagnosis of a disability. Under-identification results in failing to identify children with delays, and the risk of not providing needed services in time. Imperative to the correct identification of culturally diverse children is the recognition that development is largely adaptive in nature and consequently must be considered within the context in which it takes place

and within which it evolves over time (Shonkoff & Phillips, 2000). That is to say, skills and behaviors are best understood when culture, learning opportunities, experiences and interactions in the child's natural environment are taken into account (Espinosa, 2005).

Disproportionate representation by ethnicity and race is evident in the annual reports to Congress on the implementation of IDEA (U.S. Department of Education, 2001; 2005a; 2005b). Young Black children with disabilities are often over-represented and Asian/Pacific Islander children are often under-represented in eligibility categories (Delgado & Scott, 2006; Pavri, 2001; Pavri & Fowler, 2005; U.S. Department of Education, 2001; 2005a; 2005b). Ethnic/racial disparities in referral and identification of young children can be attributed to several factors, including the use of culturally biased materials/instruments, the use of translated materials and/or a translator, and practitioners and professionals not being sensitive to the culture of the child being screened (Barrera, 1996; Brown & Barrera, 1999; McLean, 1999; Pavri & Fowler, 2005).

An issue compounding the diversity factor in accurate early identification is increasing socio-economic disparity. Separating race/ethnicity from SES remains difficult, because they are highly correlated (Brahan & Bauchner, 2005). Many ethnically and racially diverse families are from low socio-economic status (SES) background and experience additional stressors such as limited parent education, poor neighborhoods, housing security, and job security (Brahan & Bauchner, 2005; Shields & Behrman, 2002). These stressors increase the probability that poor African American and Hispanic children will suffer additional educational barriers such as inadequate school

environments, poor teachers, and limited resources (Ackerman & Barnett, 2005; Brooks-Gunn, 2003; CED, 2006; Espinosa, 2002).

Access to Screening

According to the American Academy of Pediatrics (AAP) (2006), current rates of early identification and detection of developmental delay are much lower than their actual prevalence. Pediatricians are expected to give parents guidance on developmental issues (American Academy of Pediatrics [AAP], 2001; Pavri & Fowler, 2005). However, especially after age 3, children do not receive regular health care check ups (Halfon et al., 2007; Schor, 2004; Schor et al., 2007). Early recognition of developmental delays necessitates an in-depth knowledge of the precursors to developmental skills as well as clinical judgment (AAP, 2001; 2006). However, due to poor healthcare, economic status, and other environmental factors, many children do not see a physician regularly for check-ups. These regular visits could be a time for the parent to discuss development, receive screening results, and/or follow-up previous concerns.

Research has shown that children born in inner cities, impoverished, and disadvantaged often do not receive screening services, despite being the ones most in need of developmental monitoring and intervention (e.g., Brinker, Frazier, Lancelot, & Norman, 1989). Screening can be difficult with families from economically depressed communities due to frequent changing of address, lack of insurance, and deficient community resources (Wertheimer, Croan, Anderson Moore, & Hair, 2003).

A second barrier to receiving screening services is that many children do not attend a formal child care program that screens children. Moreover, not all families with

children participate in child-find or screening activities or attend early education programs (Pavri & Fowler, 2005). Upon entry into a program and at regular intervals, children at a quality programs are often screened and/or monitored. Children who do not attend a program (e.g., remain at home, family day care) do not always have the opportunity to receive screening assessments at regular intervals, if at all.

Need for Low-Cost Measurement Tool

The third barrier to early identification is cost. Professional assessments and large scale screening and monitoring procedures are expensive. In a study estimating the cost of screening preschool children, researchers found that parent-completed screening assessments were the least costly, averaging $0.32 to $1.30 for administration costs (Dobrez et al., 2001). The tools administered by a doctor or health care provider ranged from $11.11 to $66.68 (Dobrez et al., 2001). Unfortunately, physicians are not usually reimbursed for screening children; therefore, making screening difficult to complete (AAP, 2006; CDC, 2006). The cost of detecting the small amount of children at risk and in need of further evaluation or services can be high, given that most children develop typically and as expected (Squires et al., 1999). For example, if a group of 150 children are screened once a year for 5 years at the cost of $50 per assessment, the total cost for screening all of the children would be $37500, or $250 per child.

In order to track children's development systematically, screening and monitoring are needed. However, there are relatively few technically adequate, low-cost screening tools available. A major barrier to developmental screening has been the availability of a cost-effective, valid, and reliable instrument reflective of current diverse demographics.

To be effective, a screening instrument must to be accurate, economical, and have current norms for use with large numbers of children (AAP, 2001; 2006; Meisels & Atkins-Burnett, 2005; Squires, Potter, Bricker, & Lamorey, 1998). The cost of screening should be significantly less than the cost of intervention if the child goes undiagnosed until symptomatic (Dworkin, 1989). If the instrument is not valid or reliable, random or inaccurate screening scores may lead to under- or over-referral for diagnostic evaluation. Current normative data are necessary for screening tests in order to establish appropriate cutoff points; the normative sample needs to be current and reflective of the population being screened (Meisels & Atkins-Burnett, 2005; Salvia, Ysseldyke, & Bolt 2007).

A cost-effective approach to screen large groups of children is to use parent-completed questionnaires (Dobrez et al., 2001; Glascoe et al., 1997). Parent-completed questionnaires can be used in a variety of ways: with child find systems, in physicians' offices, or distributed or mailed to the home in conjunction with home visits. Parents can assist in screening their child at six-month intervals at a fraction of the cost of a professional assessment given once a year. In addition, parents from diverse cultures can perhaps provide a more sensitive evaluation of their child's current level of skills than a professional who does not understand the cultural ecology of the family.

Summary

Systematic early identification of young children is vitally important due to the complexity and dynamic nature of development and the influence of the environment on outcomes. In order for children to ultimately be successful in the school environment and

with peers, timely identification and the provisions of necessary services are needed. With a growing diverse population and limited access to screening for risk groups, the need for a flexible, economical measurement tool is critical to improve children's outcomes.

CHAPTER II

REVIEW OF THE LITERATURE

This study is designed to examine the psychometric properties and the utility of the 3rd edition of the Ages and Stages Questionnaires with preschool age children. As a background for the study, the literature review will address the need for 1) early identification, 2) quality early childhood experiences, and 3) valid, reliable, screening instruments. This chapter ends with the rationale and purpose for the current study.

Why Early Identification?

The period between birth and age 5 is critically important (Grunewald & Rolnick, 2005; Shonkoff & Meisels, 2000). During this time, experiences are provided that help children develop a broad foundation of knowledge, cognitive skills, and essential social-emotional skills. The brain is rapidly growing during these early years and will reach 90% of its adult size by age three (Shore, 1997). Without sufficient support and encouragement, from health care to early education to high-quality everyday life experiences, children can fall far behind in their academic and social skills before they reach kindergarten (Wertheimer et al., 2003). These gaps tend to only grow wider as the child ages. Because of the decreasing plasticity of the brain as it matures, it is easier to build a strong base early on than to try to adapt or remediate later (Shonkoff, 2003; Shonkoff & Phillips, 2000).

The developmental process involves a dynamic interaction between genetics and experiences (Galinsky, 2006). Children's individual genetic predispositions determine the timetable for development, while life experiences determine how development occurs, or the actual construction of the brain circuits (Galinsky, 2006; Shonkoff & Phillips, 2000). Development of the brain circuitry is hierarchical. The basic circuits are established first and lay the foundation for more complex circuits to develop.

Brain Development

Brain research has shown that contributing to, and investing in, children from birth to five years old has an impact on future years (Dawson et al., 2000; Nelson, 2000; Halfon et al., 2007; Shonkoff & Phillips, 2000; Shore, 1997). Children develop initial competencies on which subsequent development builds and lays the groundwork for later more complex skills; the learning process is cumulative (Heckman & Masterov, 2007; Shonkoff & Phillips, 2000). Early advantages cumulate as well as disadvantages over time (Hart & Risley, 1995; Heckman & Masterov, 2007).

Beginning before birth and throughout the entire process of development, environmental conditions – including stimulation, health and nourishment, care, affection, and surroundings – affect the brain (Halfon et al., 2007; Karoly et al., 1998; Shore, 1997). Young children's brain development proceeds at an astounding pace and a slow down or delay in this development can hinder a child's entire developmental repertoire.

A number of issues mediate whether development is positive or negative, with both biological and environmental factors possibly compromising healthy development

(Barnett, 1995; Karoly et al., 1998). These factors include genetic defects and the quality of the caregiving environment.

Quality Early Childhood Experiences

Child development theory has evolved from the previous belief that young children were incapable of learning pre-academic skills such as letters, early literacy, and numbers to the understanding that these early academic skills help them succeed later in school (Mead, 2004). The preschool years are an optimal time for development of fundamental skills. Key aspects of a child's development such as motor skills, language development, social skills, and the cognitive skills need to be well developed upon entry into school (Bredekamp & Copple, 1997; Grunewald & Rolnick, 2005; Shore, 1997).

Preschool Years

Preschool can be used as a building block for school readiness, preparing and laying the groundwork for kindergarten and later school experiences. There is a considerable amount of research that indicates quality preschool programs that are designed to build school readiness in children effectively improve their school performance and life outcomes (Currie, 2001; Mead, 2004). Preschool classrooms are places where play constitutes the medium of learning and interactions become vehicles for maturation (Maeroff, 2006). In this environment, children can get "ready to learn" and "ready for school."

Heckman and Masterov (2007) wrote "skill begets skill and learning begets more learning" (p. 5). Experiences in the earliest years of formal schooling are formative and

children's success or failure early on often predicts the course of later schooling (Barnett & Belfield, 2006; Bredekamp & Copple, 1997; Farran, 2005). Participation in a high-quality early childhood program that is developmentally appropriate will produce short- and long- term positive effects on children's development and school success (Barnett, 2002; Bredekamp & Copple, 1997; Farran, 2005; Schweinhart, 2001).

Developmental trajectories determined during the preschool years can be attributed to a child's early life experiences, either leading to positive or negative outcomes (Dawson et al., 2000; Shonkoff & Phillips, 2000). Both present and future cognitive and behavior development are influenced by early life experiences and relationships (Greenspan & Meisels, 1996; Karoly et al., 1998; Shonkoff & Phillips, 2000). Children exposed to environment and biological risk factors (e.g., poverty, abuse, low birth weight, low maternal education, single or teen parent) may be affected in cognitive, social-emotional, and physical developmental areas (Dawson et al., 2000; Greenspan & Meisels, 1996; Shields & Behrman, 2002).

Under current educational policies, many kindergarteners begin school under-prepared to learn and adapt to school environments (Wertheimer et al., 2003). However, children who attend preschool in the year before entering kindergarten often have a better chance to succeed as they are better prepared for the school environment (Ackerman & Barnett, 2005; Barnett & Hustedt, 2003).

Evidence supporting the long-term benefits of preschool is available from numerous studies on early childhood education programs. The early childhood field is indebted to three well-researched and notable programs that provide strong evidence of

economical and general benefits; early education is indeed a sound investment. These programs include: the High/Scope Perry Preschool (Schweinhart, Montie, Xiang, Barnett, Belfield, & Nores, 2005), the Carolina Abecedarian Program (Campbell, Ramey, Pungello, Spatling, & Miller-Johnson, 2002), and the Chicago Child-Parent Center (Reynolds, Temple, Roberston, & Mann, 2002). These programs began at least 40 years ago and have continued to present beneficial evidence. Each program enrolled disadvantaged preschool children and followed them into their adult years. Findings from these studies suggested that underprivileged children make considerable gains in cognition, social-emotional development, and educational performance when they participate in a high-quality early education programs when compared to children who do not participate in such programs. Studies were designed to address the impact of high quality early childhood programs on children at-risk (Galinsky, 2006). At-risk indicators included, but were not limited to, school failure, school dropout, and special education services.

The High/Scope Perry Preschool

The High/Scope Perry Preschool enrolled 3-4 year olds at a center for two and half hours per day with weekly home visits. Children were randomly assigned to either the treatment group or a control group and participants were tracked through age 40. Results from this study indicated participating children had higher reading and math scores, fewer enrollments in special education, and were more likely to graduate high school (Heckman, Grunewald, & Reynolds, 2006; Schweinhart et al., 2005). Other findings included fewer arrests and convictions among participants, and they were more

likely to be employed with higher earnings and less likely to be on welfare assistance than non-participants (Galinsky, 2006; Heckman et al., 2006).

The Carolina Abecedarian Project

The Carolina Abecedarian Project took place between 1972 and 1977, and enrolled children 3-months to 4-years old and followed them through 21 years old. The program was a full day, center-based preschool; random assignment was used for placement. Results showed that children who received a full day of preschool had higher reading and math achievement, and lower rates of grade retention and special education placement than children who did not. Participants were more likely to enroll in college after high school as well. Female participants were found to be more likely to delay having their first child and had higher earnings than female non-participants (Campbell et al., 2002; Galinsky, 2006; Heckman et al., 2006).

The Chicago Child-Parent Center

The Chicago Child-Parent Center (1983-1985) study included an intensive parenting program and was evaluated using a quasi-experimental design. The children enrolled were 3-4 years old, attended a half day preschool, and were assessed through age 21. Results from this study included lower rates of child maltreatment from participating parents in the parenting program (Reynolds et al., 2002). Child participant findings included higher math and reading assessment scores, lower rates of grade retention and special education referrals, and higher rates of high school completion and college enrollment. Lower rates of juvenile arrests, adult convictions, and incarcerations were reported for participants (Heckman et al., 2006; Reynolds et al., 2002).

There were three main differences in these three studies. First, the criteria for admission into the programs varied. While all focused on children from disadvantaged environments, the prerequisites for enrollment differed in age, ethnicity, socioeconomic status, and parent education. Second, the programs took place in separate decades and in diverse communities. Finally, different resources, interventions, and curriculums were offered. Even with these differences, all the studies showed consistent similar outcomes (Currie, 2001, Galinsky, 2006; Heckman et al., 2006; Heckman & Masterov, 2007). Participants tended to have higher test scores in reading and math, were less likely to be held back a grade (grade retention), had less special education placements and referrals, attained higher education achievements, and had less involvement in crime and delinquency.

Another issue to consider when looking at the outcomes of these studies is that these were considered *quality* programs. Teachers for the High/Scope Perry Preschool and the Chicago Child-Parent Center programs had at least a bachelor's degree with certification in early childhood education (Heckman et al., 2006; Reynolds et al., 2002; Schweinhart et al., 2005). The Carolina Abecedarian Project teachers did not all have bachelor degree's but did earn salaries that were competitive to those of public school teachers (Campbell et al., 2002; Heckman et al., 2006). The High/Scope Perry Preschool included a weekly home visiting component, the Chicago Child-Parent Center included an intensive parenting program, and the Carolina Abecedarian Project was a full day preschool. These aspects were costly, intensive, required a large amount of time/services and are not usually a part of a preschool program. Of course, the quality implications of

these studies beg the question of how developmental outcomes are affected when children attend high quality preschools with well trained teachers.

Many children from low SES backgrounds will benefit similarly from high quality preschool programs. Currently, less than half of children in poverty attend preschool (Barnett & Belfield, 2006). Therefore children already at a disadvantage may enter primary school with further disadvantages due to no preschool experience (Greene, 2006). Ironically, these are the very students that need the extra support in order to keep up with their peers. Entering school less prepared than peers may hinder chances for future academic success. However, if provided with a quality preschool experience, young children may have higher school achievement, less grade retention, less special education referral, and less crime rates (Campbell et al., 2002; Greene, 2006; Reynolds et al., 2002; Schweinhart et al., 2005; Temple & Reynolds, 2007).

Summary

All children benefit from quality early life experiences, as development is affected by quality of life, environment, interactions and human attachments. Poor quality experiences, education, and care may be detrimental to the development of any child at any age (Barnett, 1995). Early experiences lay the foundation for growth in capabilities in and understanding of concepts, causation, problem solving, language, and making attachments (Thompson, 2001).

Since not all children are fortunate enough to have quality early experiences, it is imperative to find children in need of more intensive, targeted early services. Routine and

repeated screening of at risk children is one solution. The positive impact of early intervention on children's development and subsequent school performance presents a compelling argument for professionals and pediatricians to search for and screen children with developmental delays (Glascoe, 2005).

Screening

Closing the preparation and learning gap to guarantee all children who enter school ready to learn will necessitate more than the discussion of the importance of quality early childhood experiences (Mead, 2004). Children need more or less intensive programs depending upon needs. Some children need domain specific interventions such as language and communication, while others may have more global delays and qualify for early childhood special education (ECSE) services under IDEA. For optimal outcomes, children need to be evaluated for specific needs, and follow-up services provided for those children who need them (Rydz, Shevell, Majnemer, & Oskoui, 2005).

Rationale for Using Screening Instruments for Early Identification

Assessing preschool-age children is challenging. Children's development is rapidly changing at this age, and their development is greatly impacted by environmental factors and learning experiences (Glascoe, 2005; Shonkoff, 2003). Furthermore, standardized paper-and-pencil tests typically given in later grades are not appropriate for children entering school. Testing is often not a natural experience for young children (Bailey, 2004a; 2004b; Gilliam, Meisels, & Mayes, 2005); many times, traditional assessments do not engage children and do not incorporate play activities. In addition,

traditional assessments are often given by unfamiliar people and require the young child to attend to adult-directed instructions and tasks (McLean & Crais, 2004).

Using a screening instrument that is dynamic and designed to follow children's development over time provides a quick method of assessing the current performance of children. Using parent-completed screening instruments with young children provides one solution for effective screening. Whenever possible, test data for young children should be combined with parental, teacher, and other professional information and first hand observations for optimal results (Gilliam et al., 2005). The use of caregivers assessing in their child's natural environment is ideal and may give more accurate assessment results (McLean & Crais, 2004).

Purpose of Screening

The preliminary process for identifying children who may be at risk of future difficulty (e.g., inability to meet academic expectations) and those who may have special needs in learning (e.g., disabilities, delays) is screening (Gilliam et al., 2005; McLean, 2004; Rydz et al., 2005). In both cases, if a child appears to be delayed or at risk, he or she must be assessed more thoroughly to evaluate whether more intensive interventions are needed.

A preschool screening tool is not designed to provide a detailed description of developmental functioning or to design intervention strategies, but to indicate which children need more comprehensive evaluation or support services as they get ready to enter school. Children that present risks for academic problems may benefit from

prevention plans or targeted learning activities that focus on skill areas in order to bring the child's skills up to expected levels.

Effective screening tests must meet psychometric standards as outlined in Table 1 (Salvia et al., 2007). The American Academy of Pediatrics (AAP) (2006) includes a listing of quality developmental preschool tests recommended for use by physicians and others involved in preschool screening. Selected instruments are compared in Table 2.

One quality instrument used for screening children's development and competence is the Ages and Stages Questionnaires (ASQ) (Squires et al., 1999), reported to have acceptable psychometric properties, economical, family-centered, and easy to administer (Boyce, 2005). The AAP (2006) lists the ASQ as an effective and reliable screening instrument that can monitor a child's development from three months to five years. The ASQ is written at a fourth to sixth grade reading level, and is available in several languages, such as Spanish, French and Korean. It can be completed in a short amount of time during a doctor's visit or in the home, and is affordable as it is completed by parents and caregivers. Other high-quality tests include the Parents' Evaluation of Developmental Status (PEDS) (Glascoe, 1998), the Child Development Inventories (CDIs) (Ireton, 1992), the Pediatric Symptom Checklist (PSC) (Jellinek & Murphy, 1988), and the Brigrance Screens (Brigance, 2002) (AAP, 2006; Glascoe 2003).

Table 1

Psychometric Standards for Effective Screening Tests

Standard	Description
Specificity	The proportion of children correctly excluded as developing typically and performs at the expected level of a standardized assessment (Squires et al., 1999). Specificity should be in the range of 70-80%, ideally closer to 80% (AAP, 2006; Hamilton, 2006; Rydz et al., 2005).
Sensitivity	The ability of the instrument to detect small differences across groups of children and within an individual child (Salvia et al., 2007). Sensitivity should be in the range of 70-80% or higher (AAP, 2006; Hamilton, 2006; Rydz et al., 2005).
Reliability	The consistency of assessment scores (Salvia et al., 2007). Instruments should be selected with reliability coefficients greater than .80 and preferably greater than .90 (Bailey, 2004a)
Validity	The instrument measures what it is supposed to measure (Salvia et al., 2007). Four types of validity: criterion (concurrent), content, instructional, and construct (Bailey, 2004a).

Table 1, continued

Psychometric Standards for Effective Screening Tests

Standard	Description
Representative normative sample	Group within a population who takes a test and represents the larger population. When choosing an instrument, the year that testing was done should be considered, characteristics of the normative sample (stratified, proportionally representative of culture, gender, income levels, and urban-rural distribution) (American Educational Research Association [AERA], 1999; Bailey, 2004a; Salvia et al., 2007).

Table 2

Selected Quality Developmental Preschool Screening Tests

Name	Description
Ages & Stages Questionnaires (ASQ) (Squires, Potter, & Bricker, 1999)	Parent report; for ages 4-60 months; screens for risk of delays in gross and fine motor, communication, problem-solving, and personal-social skills; takes 10-15 minutes to complete; available in multiple languages; 94% test-rest reliability, 44-83% internal consistency; 76-91% concurrent validity; sensitivity: 70-90%; specificity: 76-91%
Brigance Screens (Brigance, 2002)	Observational report; completed by professional; screens for children who are delayed as well as advanced in 6 domains; takes about 10-15 minutes to complete; available in multiple languages; 94-99% reliable; 66-94% valid; sensitivity: 70-80%; specificity: 70-80%
Child Development Inventory (CDI) (Ireton, 1992)	Parent report; contains 3 age range screening tests (0-18 month, 18-36 month, 36-72 month); screens for delays in 5 domains; takes about 10 minutes to complete; available in English and Spanish; written at a 9th grade reading level; sensitivity: 80-100%; specificity: 94-96%

Table 2, continued

Selected Quality Developmental Preschool Screening Tests

Name	Description
Developmental Indicators for Assessment of Learning – 3rd ed. (DIAL – 3) (Mardell-Csudnowski & Goldenberg, 1998)	Observational report; for ages 3 years to 6 years 11 months; available in English and Spanish; takes 20-30 minutes to administer; screens development in motor, concepts, language, self-help, and social skills; 87% internal reliability, 90% inter-rater reliability, 84-88% test-retest reliability; 79% concurrent validity; sensitivity: 83%; specificity: 86%
Early Screening Inventory – Revised (ESI – R) (Meisels, Marsden, Wiske, & Henderson, 1997)	Observational report; for ages 3-6 years old; screens children at risk for school failure; takes 10-15 minutes to complete; available in English and Spanish; also available online; 97-99% inter-rater reliability, 87-98% test-retest reliability; 73% valid; sensitivity: 92-93%; specificity: 80%
Parents' Evaluation of Developmental Status (PEDS) (Glascoe, 1998)	Parent report; for children birth to age 8; screens for risk of developmental or behavioral problems (9 domains); takes about 5 minutes to complete; available in English, Spanish, and Vietnamese; written at a 4th-5th grade reading level; 81-95% reliable; 60-86% valid; sensitivity: 74-79%; specificity: 70-80%

Table 2, continued

Selected Quality Developmental Preschool Screening Tests

Name	Description
Pediatric Symptom Checklist (PSC) (Jellinek & Murphy, 1988)	Parent report; for children age 4-16 years; screens for mental health and behavioral problems; takes about 7 minutes to complete; available in English, Spanish, and Chinese; 84-91% reliable; 79-92% valid; sensitivity: 88-92%; specificity: 68-99%

Using Screening to Monitor Development

A proposed purpose of screening is to monitor the development of children that do not score low enough for further evaluation (e.g., below cutoff), but close enough to the cutoff to be of concern. Children with scores that hover just above the cutoff score are in need of monitoring so as to ensure they receive support and needed services to increase their skills and continue on the path of typical development.

Cutoff scores are generally two standard deviations below the mean. On screening assessments, children have very low skill levels to be below the empirically-derived cutoff. There is a concern even for those children who score slightly above the cutoff, such as one standard deviation *above* the mean. One standard deviation above the mean reflects a limited skill repertoire. In order to catch and monitor children with low scores that are a concern, but not low enough to need further evaluation or referral, a "monitor" scoring category is needed.

Rationale for Using the ASQ

Special education services are substantially more expensive than regular schooling (Barnett & Hustedt, 2003; Heckman et al., 2006). Using a screening tool early on to identify children at risk or who are already presenting delays can potentially minimize referrals and placements in special education in later schooling (Gilliam et al., 2005; Poteat, 2005; Rydz et al., 2005; Squires et al., 1999). Since the ASQ is designed for children ages 6 months to 60 months, the questionnaires for 4 to 5 year olds (48- to 60-month) can be administered by parents or teachers as children prepare to enter school. Children are screened on the ASQ in developmental areas, including communication, gross motor, fine motor, problem solving, and personal-social.

Advantages of using the ASQ are that it is dynamic, easy to administer, completed by parents and caregivers, and flexible and adaptable to environments (Hamilton, 2006; Squires et al., 1999). The ASQ can be administered in 6 month intervals throughout the early childhood years to detect developmental delays when they surface. While most children develop at a predictable and consistent rate, some do not. For example, typically a child will learn to roll over then crawl then pull up to stand to walk; however, this sequence can vary by child. Variations in the sequence can sometimes be a cause for concern, and other variations pose no concern. Repeated screening helps to determine whether a child is experiencing variations that need further evaluation. Since the ASQ is designed to screen at frequent intervals, the potential to detect delays is increased because children missed at one interval will be more likely to be identified at the next age interval.

A second advantage is that the ASQ is easy to administer. Completing the questionnaires is simple and straightforward, and little specific training is required for parents, caregivers, and other personnel. Most parents and caregivers can complete the ASQ with minimal assistance and can complete it independently at home. All ASQ questionnaires are written at a reading level of fourth to sixth grade, with illustrations included as necessary to assist with understanding. The questionnaires can be completed in approximately 15 minutes. Program staff can score the questionnaire in less than 5 minutes.

A final advantage of the ASQ is its flexibility. The ASQ can be adapted to specific environments, meaning it can be used in a variety of settings such as the home, early education programs, preschools, health clinics and doctors' offices, and in teen parenting programs. Questionnaires can be completed by parents with the assistance of personnel during home visits, or completed independently. Nurses and doctors can follow up with low birth weight babies from the NICU by distributing or mailing the ASQ home for parents to complete at regular intervals.

ASQ Reliability and Validity

Knowledge of statistics and psychometric theory are fundamental in test development (AERA, 1999; Bailey, 2004a). The American Educational Research Association (AERA), American Psychological Association, National Council on Measurement in Education [Joint Committee] (1999) have recommended standards for screening tests. These standards include reliability, validity, and normative samples.

Past Studies on the ASQ

The psychometric properties of the ASQ have been previously studied (Bricker, Squires, & Mounts, 1995; Squires, Bricker, & Potter, 1997; Squires et al., 1999). These studies include concurrent validity, test-retest reliability, inter-observer reliability, sensitivity, and specificity. For the second edition of the ASQ, concurrent validity was examined by comparing children's classifications on the parent-completed questionnaires to classifications on standardized assessments that were professionally administered including the Revised Gesell and Amatruda Developmental and Neurological Examination (Knobloch, Stevens, & Malone, 1980), the Bayley Scales of Infant Development (Bayley, 1969), the Stanford-Binet Intelligence Scale (Thorndike, Hagen, & Sattler, 1985), the McCarthy Scales of Children's Abilities (McCarthy, 1972), and the Battelle Developmental Inventory (Newborg, Stock, Wnek, Guidubaldi, & Svinicki, 1984). The overall agreement on children's classifications with these standardized assessments was 83%, with a range of 76-91% (Squires et al., 1999).

Test-retest reliability or the comparison of scores for two administrations at two points in time was examined for the ASQ by giving parents a second questionnaire to complete two weeks after the first. Reliability between classifications was reported to be 94%. Inter-observer reliability was assessed by having a trained examiner complete a questionnaire for a child shortly after a parent had completed one. (The parent was unaware that a comparison of the two questionnaires would be made and the examiner was blind to the parent's responses.) Overall agreement for inter-observer reliability was more than 90% between screening classifications.

Sensitivity and specificity were also examined. The ASQ is reported to be sensitive and able to detect delayed development at a rate of 75%, with a range of 51-90% (Squires et al., 1998). Specificity ranged from 81-92%, with an overall rate of 86%.

The original sample for the second edition of the ASQ included 8,119 children from 4 to 36 months old collected between 1984 and 1999 (Squires et al., 1999). Several characteristics of the sample were considered and data were collected, such as ethnicity, gender, family income, and education level of parents. Infants considered at risk due to economic or social conditions and infants who remained at least 3 days in the NICU were also studied.

Renorming the ASQ

Assessments should have their normative sample updated and studied every 10-15 years (Brennan, 2006; Hambleton & Zaal, 1991; Salvia et al., 2007). Renorming may be required to maintain the validity of test score interpretations (AERA, 1999). Out of date normative samples tend to estimate a child's relative standing in the population erroneously because the population at large changes over time. As society advances, expectations for children change and consequently their expected performance changes (AERA, 1999; Bailey, 2004a). The older the test and set of norms, the less likely it is to be representative of children and society today. Updating the norms will help produce a test that is valid and reliable for the current population of young children and families.

The steady rising of IQ scores over the last century, known as the Flynn effect, causes IQ tests norms to become obsolete over time. To counter this effect, IQ tests are "renormed" every 15-20 years by resetting the mean score to 100 to account for the

previous gains in IQ scores. Explanations for the Flynn effect have included improved nutrition and health care, a trend towards smaller families, better education, and a greater familiarity with multiple-choice questions and test-taking (Neisser, 1997). Mean scores, standard deviations, and scoring need to be recalculated in order to adjust for the intellectual growth and demographic changes in society.

Updating norms can be completed in two ways. The first way is by systematically developing a completely different set of norms or recruiting an entirely new sample. The second is by using a small representative sample to recalibrate the old norms (Salvia et al., 2007). When updating the normative base, studies on concurrent validity and reliability also need to be re-examined using updated criterion measures.

The characteristics of the normative sample also need to be considered when developing new norms. Ideally, society should be proportionally represented in the sample. Income levels, gender, culture, geographic regions, and urban-rural distributions should be considered when recruiting a normative sample (Bailey, 2004a; Brennan, 2006). Descriptive statistics for all examinees should be given, including dates of testing and any weighting of sample (AERA, 1999).

Utility of the ASQ

In addition to developing an updated normative base, an important question associated with the ASQ is whether the results of the screening tests can be useful to guide early childhood teachers in providing rich and tailored experiences for children. A proposed modification of the third edition of the ASQ is the addition of a "monitor" category for children that score between 1 and 2 standard deviations from the mean. The

new "monitor" category will indicate children whose scores in a particular developmental area are close to the cutoff score (i.e., 2 standard deviations below the mean) and may need closer monitoring. Learning activity plans can be developed and put into place for these children by their preschool teachers. Utility and usefulness of the addition of the new category needs to be studied. It will be important to examine whether parents and teachers can use the ASQ results, including the "monitor" category, to direct targeted learning activities for children in areas of concern.

Purpose of Study

The purpose of this study is to examine the psychometric properties of a newly revised parent-completed questionnaire that holds promise to overcome barriers to effective screening including cultural issues, prohibitive cost, and lack of access to on-going screening services. The 4-5 year old (48, 54, and 60 month) intervals of the ASQ will be studied in order to investigate how accurately the revised questionnaires identify preschool children and how helpful a "monitor" category is for directing learning activities. This study will examine the addition of the "monitor" category and whether parents and early childhood teachers can use ASQ results to direct targeted activities in domains of concern. This 4-5 year old age group was chosen because of the potential of the ASQ for detecting children at risk for school failure or lacking the skills required for successful entrance into kindergarten.

Research Questions

To evaluate the validity and reliability and to contribute to the psychometric base of the revised ASQ, the study will address three research questions:

1. What is the validity of the 48, 54, and 60 month ASQ, 3rd ed., using the Battelle Developmental Inventory – 2nd ed. (BDI-2) as a criterion measure?
    a. What is the concurrent validity of the ASQ, 3rd ed.?
    b. What is the sensitivity of the ASQ, 3rd ed.?
    c. What is the specificity of the ASQ, 3rd ed.?
    d. What is the positive predictive value of the ASQ, 3rd ed.?
2. What is the reliability of the 48, 54, and 60 month ASQ, 3rd ed.?
    a. What is the test-retest reliability of the ASQ, 3rd ed.?
    b. What is the inter-observer reliability of the ASQ, 3rd ed.?
    c. What is the internal consistency of the ASQ, 3rd ed.?
3. Is adding a "monitor" category (i.e., 1 standard deviation from the mean score in each domain) useful for teachers and parents to implement targeted learning activities for preschool children?

CHAPTER III

METHOD OF STUDY

This study focused on a psychometric study of the Ages and Stages Questionnaires, 3rd edition, for children ages 4 to 5 years old (48, 54, and 60 month) in terms of: (a) validity, (b) reliability, (c) internal consistency, (d) contribution to the renorming sample, and (e) usefulness of adding a "monitor" category for directing targeted learning activities for preschool children. This chapter describes participants and settings, measures, recruitment procedures, experimental procedures and data analysis.

Participants

Three participant categories were included: 1) parents/caregivers, 2) their children age 48 to 60 months, and 3) teachers/program staff working with recruited children.

Children and Parents

The study sample consisted of 101 children and their parents/caregivers. (A parent/caregiver is defined as a mother, father, grandparent, foster parent, or legal guardian and referred to as "parent" from here on.) Participants resided in Oregon (n = 43), Washington (n = 4), California (n = 1), and Idaho (n = 53). At the time of the study, children ranged in age 45 to 65 months. In each age group (i.e., 48 month, 54 month, and 60 month) there were 41, 36, and 24 participants respectively. Approximately 39% of the children (n = 39) were identified as at risk (e.g., below the federal poverty level, maternal age of 19 or younger at child's birth, mother's level of education 12th grade or less,

and/or family involvement with Head Start). The remaining 61% of the children did not have any identifiable risk factors and were considered to be typically developing.

Typically developing children were defined as "not eligible" for early intervention services at the time of the screening and assessment, nor having a suspicion of delay or evaluation referral made. At risk children were defined as having one or more of the risk factors listed above, having a suspicion of delay or evaluation referral made. Participants were recruited through public and private childcare agencies and preschools, neighborhood centers, Head Start classrooms, and by advertisement on craigslist.com in both Oregon and Idaho.

Teachers/Program Staff

Teachers/program staff were defined as any staff member or teacher that worked with a child participating in the study. The study sample consisted of seven teachers/program staff from Oregon ($n = 2$) and Idaho ($n = 5$). Teachers/program staff were recruited through the public and private childcare agencies and preschools that served the participating children. Three participants were from Head Start, two reported to be special education teachers, and two were from public or private preschools, neighborhood centers, or childcare centers.

Protection of Human Subjects

A protocol pertaining to the research procedures in this study was submitted to the University of Oregon's Institutional Review Board and to Boise State University's Office of Research Compliance for review. Efforts were taken to protect the privacy, confidentiality, and anonymity of the families and staff who participated in the study.

Efforts included using numbers instead of names on paperwork (i.e., assessment questionnaires and protocols), keeping materials locked in a filing cabinet, training all data collectors to keep participant and study information confidential, and plans to dispose of all identifying materials five years after completion of the study. Consent forms describing purpose, procedures, benefits and risks were administered and signed before any data were collected. A copy of the consent form was given to participants for their records and contact information; consent forms are located in Appendix A. Parent participants were offered $10 and $15 gift certificates for completion of the two phases of the study. Teacher participants were offered a small gift for their classroom (e.g., supplies, book), or a personal gift (e.g., gift certificate for coffee, chocolates) for their participation. An example of the recruitment letter can be found in Appendix B.

Measures

Four measures were used: 1) demographic form, 2) Ages and Stages Questionnaire, 3rd Edition, 3) Battelle Developmental Inventory, 2nd Edition, and 4) Utility Survey. Each measure is described below.

Demographic Form

Each participating parent/caregiver was asked to complete a demographic form. This form included questions pertaining to the child, including gender, date of birth, as well as whether the child had an identified or suspected delay or disability and what type of, if any, services received. Family information on the form included: mother's age at

child's birth, family income, mother's level of education, number of adults and number of children in home, and ethnic group. The demographic form can be found in Appendix C.

Ages and Stages Questionnaires

The *Ages and Stages Questionnaire: A Parent-Completed, Child-Monitoring System, Third Edition* (ASQ) (Squires & Bricker, in press) is a screening system comprised of questionnaires to be completed by parents and/or caregivers. The ASQ second edition (Squires et al., 1999) is currently being revised and the new third edition will have updated norms and some new features, such as reordering and rewording of some questions.

The third edition will also include a new scoring category. Currently, children either score as 'typically developing' or as 'risk', with a cutoff score determining the category. The scores in the risk category are two standard deviations below the mean score for that domain. Children must score fairly low in a domain in order to be considered 'risk' and referred for further evaluation. The addition of a scoring category that is one standard deviation *above* the mean is one way to possibly catch children that have low scores, are not recommended for referral.

The questionnaires used in this study included a "monitor" category for scoring. The purpose of the "monitor" range is to identify children that may need some help to increase their skills in a particular developmental area. Children with scores that are close to the cutoff score (i.e., 2 standard deviations below mean for cutoff, and 1 standard deviation below the mean for "monitor") will fall in this "monitor" category and giving

these children enrichment activities in this area will be recommended. Figure 1 depicts the scoring portion of an ASQ scoring sheet, including all three scoring categories.

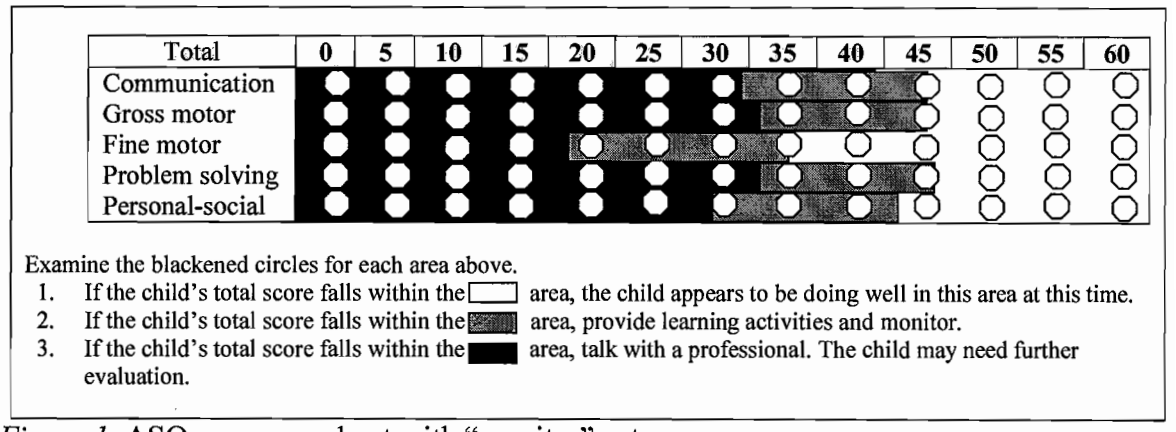


Figure 1. ASQ summary sheet with "monitor" category.

The ASQ is comprised of 19 age intervals from 4-months to 60-months (i.e., 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 27, 30, 33, 36, 42, 48, 54, and 60-months). There are 30 developmental items on each questionnaire that are categorized by five developmental areas: communication, gross motor, fine motor, problem solving, and personal-social. Parents check *yes* to indicate their child is able to perform specified task, *sometimes* to indicate emerging ability to perform specified task, and *not yet* to indicate child is not yet performing specified task. Scoring is as follows: *yes* is 10 points, *sometimes* is 5 points, and *not yet* is 0 points. The total score is compared to the established screening cutoff scores. Also included is an Overall section with eight open-ended questions for parents/caregivers to address any additional concerns, which are not given point values. Each interval includes an Information Summary Sheet which provides space for scoring

as well as recording family information. A copy of the 48 month ASQ can be found in Appendix C.

Battelle Developmental Inventory, 2nd Edition

The *Battelle Developmental Inventory, 2nd Edition* (BDI-2) (Newborg, 2005) was selected as the criterion measure for concurrent validity. The BDI-2 was chosen because it is widely used as an assessment tool (Athanasiou, 2007; Barton & Spiker, 2007; Paget, 1989) and was recently revised and renormed (Athanasiou, 2007; Barton & Spiker, 2007; Newborg, 2005). The BDI-2 is a standardized, norm-referenced assessment that is individually administered to children from birth to seven years old. There are five developmental domains with 450 test items in the full BDI-2 battery, with adaptive, personal-social, communication, motor, and cognitive domains. Test items are presented in a standardized format that specifies the behavior to be assessed, the materials to be used, the procedure(s) for administering the item, and the objective for scoring the response. The examiner completes each domain by collecting data by directly testing the child, interviewing the parents/caregivers, and/or observing the child in natural settings.

The administration time for the BDI-2 for children 3-5 years old is reported to take 60-90 minutes. Before administering the BDI-2, examiners must familiarize themselves with all aspects of the test and practice administering the test. For each subdomain, the administration begins at the child's chronological age.

To score the items, a three point rating scale is used (i.e., 0 = skill not mastered, 1 = partial mastery, and 2 = mastery). Basal and ceiling levels need to be established; the basal level is met when the child scores a 2 on three consecutive items and the ceiling

when the child scores a 0 on three consecutive items. The BDI-2 scores can be calculated using percentile ranks, age equivalents, and standard scores. For this study, standard scores were used.

For this study, the stop points (i.e., ceiling level) were modified. The rationale for this modification included the amount of time to administer the full test and the need to identify children with developmental problems. It takes approximately 60-90 minutes to administer the entire test to preschool age children. Data collectors found that most of the children stopped participating and were non-compliant after 45 minutes to one hour of test administration. After six assessments using BDI-2 scoring guidelines (i.e., basal and ceiling) were given, modifications were made so that testing time was reduced to a reasonable time period. The researcher determined that stopping after the 5-6 age interval would not affect results. For example, a 48-month old would begin testing at his chronological age (i.e., 4 years old) and testing would stop after the 5-6 year old items were given. A basal was determined, but not a true ceiling.

After scoring 16 assessments with this stop rule, it was discovered that assessments scored following this rule had artificially deflated scores. Typically developing children should score at least a 90 developmental quotient. Assessments scored with the stop point of the 5-6 age interval, had scores of 90 or below. In order to bring the deflated scores up, stop points were determined within the "typically developing" range (e.g., in the 75th percentile or higher) for each age interval. For example, when the stop point for the subdomain 'Personal Responsibility' was question 13 (PR 13) for a 48-50 month old child and the child received all twos on the assessment

from basal to stop point, her raw score would be 26 and in the 84th percentile. The remaining 37 assessments were given and scored according to these stop points. The rationale for using stop points is that an artificially deflated score of a 90 or below does not indicate if a child is developing typically or in need of monitoring. The "monitor" range on the BDI-2 is 80-89. Increasing the stop point above the 5-6 age interval gives children the opportunity to score above a 90. Appendix D includes the determined stop points for each age interval.

Psychometric data for the BDI-2 has been examined and reported (Athanasiou, 2007; Barton & Spiker, 2007; Newborg, 2005). The BDI-2 was standardized on a sample of 2,500 children, with the sample closely matching the 2001 US Census (Athanasiou, 2007). The Examiner's Manual provides detailed information showing the BDI-2 has good reliability, with overall test score reliability at .99 (Newborg, 2005). Internal consistency was assessed using the split-half method, with reliabilities averaged across ages. Reliabilities on domains ranged from .90-.96, and on subdomains varied from .85-.95. For diagnostic purposes, the median internal consistency estimates for each age interval and subdomain have accepted standards, although certain subdomains at certain ages were problematic (Athanasiou, 2007). Inter-observer reliability was reported to be high, ranging from 94-97% agreement across a sub-sampling of 17 items from the Fine Motor and Perceptual Motor subdomains that did not have objective scoring parameters and thus required the examiner's interpretation.

The manual provides information demonstrating the BDI-2 has good validity (Barton & Spiker, 2007). Three types of validity were reported: content, criterion, and

construct. Content validity was supported by previous BDI content and milestones, supplemented by additional items based on recent developmental literature, professional judgment, and item analysis procedures. Professional judgment and item analyses were utilized to determine item selection, classification, and deletion. Classical and item response theory methods were used for item analysis.

Evidence of criterion-related validity is described through convergent validity with many widely used instruments and measures of similar construct. Instruments used for criterion-related validity included the original BDI (Newborg et al., 1984), the Bayley Scales of Infant Development, 2nd Edition (BSID-II; Bayley, 1993), the Denver Developmental Screening Test-II (Frankenburg &Dobbs, 1990), the Preschool Language Scales, 4th Edition (Zimmerman, Steiner, & Pond, 2002), The Vineland Social-Emotional Early Childhood Scales (Sparrow, Balla, & Cichetti, 1998), the Comprehensive Test of Phonological Processing (Wagner, Torgesen, & Rashotte, 1999), the Wechsler Preschool and Primary Scale of Intelligence, 3rd Edition (Wechsler, 2002), and the Woodcock-Johnson III Tests of Achievement (Woodcock, McGrew, & Mather, 2001). Preliminary evidence of relationships between components of these tests commonly used in the field and the BDI-2 shows correlations in the .60-.75 range. Correlations between subscales or domains where correspondence would not be expected (e.g., the Motor Domain on the BDI-2 and BSID-II mental scale) tended to be in the .30-.50 range.

Utility Survey

The intention of the utility survey was to provide information relating to parent and teacher/program staff satisfaction with a new scoring criterion, the addition of the "monitor" category for identifying children close to cutoff scores. The utility survey also asked about ease of using selected learning activities for targeting domains of development for intervention. Each participating parent with a child scoring in the "monitor" category and each participating teacher/program staff with a participating child in their program in this category were asked to complete a utility survey. This form included questions pertaining to the child to whom the ASQ was administered, areas/domains in "monitor" category, ease of using the ASQ to direct targeted learning activities and satisfaction regarding using the ASQ for this purpose. Targeted learning activities were included with the survey and a copy of the ASQ. A parent sample learning activity (Twombly & Fink, 2004) for the Communication domain and a teacher sample learning activity for the Fine Motor domain can be found in Appendix D.

The utility surveys can be found in Appendix C. The consent letter for teachers/program staff to sign and the letter to the parents describing the survey can be found in Appendix A.

Procedures

The procedures section describes the participant recruitment process, research design, and the data collection process used.

Recruitment of Subjects

Children ages 4 to 5 years old and their parents were recruited in several locations, from Medford, Oregon to Vancouver, Washington along the I-5 corridor, and in the Boise, Idaho area. Recruitment took place in early childhood and child care programs, Head Start and on the website, craigslist.com. Directors of programs serving children (i.e., Head Start) were contacted by phone or email by the researcher. The study purpose and procedures were explained and the director was asked for permission to recruit from program classrooms. A flyer was posted in centers and on the website describing the study and giving contact information for the researcher. Recruitment included places with a more diverse, at risk population of families and children that normally may not receive regular screening, such as in neighborhood centers and free health clinics.

Parents were recruited in a variety of ways to ensure that participants were economically and ethnically diverse. Families attending neighborhood centers, low income health centers, WIC, Head Start, and home day cares were approached by the researcher or research assistant. Child care providers and preschools were given recruitment flyers and posters describing the study and giving contact information if interested in participating. Also, a recruitment flyer was posted on the internet site, craigslist.com, in cities in Oregon and Idaho with a brief description of the study and contact information.

For recruitment in diverse child care centers and early childhood programs, the investigator and research assistant posted flyers. If parents were interested in

participating, they contacted the researcher by calling the number listed or by email. A packet containing: a) a consent form, b) a demographic form, c) a research opportunity form for phase two, d) a permission to contact child's teacher form (optional), and e) an ASQ appropriate for the child's age was mailed to the interested families. Parents were instructed to fill out all the forms in the packet and return to the researcher using the self-addressed, stamped envelope. Parents interested in participating in phase two were contacted to schedule a time for the researcher or assistant to administer the BDI-2.

After four months of recruiting children in all age intervals (e.g., 48, 54, and 60 month), the researcher ceased recruiting children in the 60 month age interval. Parent interest in participating in this age interval was low and of the completed and returned initial packets, only 33% indicated interest in participating in phase two of the study. A total of 24 families participated in phase one in this age interval, with eight families also participating in phase two.

Teachers/program staff were recruited through participating parents. Included in the packets mailed to parents was a permission form to contact their child's teacher, which can be found in Appendix A; completion of this form was optional. Parents wanting their child's teacher to see the ASQ scores filled out the permission form. If the form was completed and the child scored within the "monitor" range, the teacher was mailed a packet with a consent letter, a copy of the parent permission form, copies of the child's ASQ, a utility survey, and sample learning activities for the targeted domain. A self-addressed, stamped envelope was included for returning materials.

Data Collection

Upon initial contact from interested families, the researcher gathered pertinent information (name, child's age, mailing address, and phone number). Once parents volunteered for the study, the study packet was mailed to the family with a stamped, self-addressed envelope for returning materials to the researcher. Parents were given two to three reminder calls or emails if the packet was not returned within two weeks from being mailed by the researcher. Percentages of unreturned packets were 32% (19/41), 22% 10/36), and 25% (8/24) for the 48, 54, and 60 month intervals respectively. When the questionnaire was returned, the researcher checked to see whether the consent form, demographic form, and ASQ were completed and included. If the research opportunity form for phase two was filled out and returned, the researcher or research assistant contacted the family to make an appointment to administer the BDI-2.

Teachers were informed about the study and invited to participate through a letter describing the study. If a teacher had a child in their program that was participating in the study and scored within the "monitor" range, a consent letter was sent to the teacher with a description of the study, a copy of the parent's permission to contact, copies of the child's ASQ, a utility survey, and sample learning activities. Interested teachers completed the documents in the packet and returned materials to the researcher in the self-addressed, stamped envelope.

Data were coded and identified with an identification number to protect confidentiality of participants and to keep the data collector blind to the results of the ASQ when giving the BDI-2.

Experimental Procedures

This study was conducted in two phases. Phase one data addressed the second research question related to the reliability of the ASQ. During phase two, the first research question was addressed examining the validity of the ASQ. The experimental procedures of the two phases are described below.

Phase One

In the first phase, the following were collected from participating parents: 1) consent form signatures, 2) demographic form, 3) ASQ, 4) research opportunity form for phase two, and 5) permission to contact child's teacher form (optional). A compensation form for the $10 gift certificate was given to participating parents to complete.

The consent letter briefly described the study and the forms. In addition to the ASQ, parents received a research opportunity form that provided information on the second phase of the study and a place to leave contact information if interested in participating. A copy of the research opportunity form for phase two can be found in Appendix B. Also included in the packet was a permission to contact child's teacher form. This form was optional and described the purpose for contacting the child's teacher (e.g., to share ASQ scores and complete a utility survey). After completing the forms, parents returned materials by mail in the included self-addressed, stamped envelope.

Teachers/programs staff of participating children whose parents gave consent to contact were asked to complete a consent form and review the ASQ and learning activities for participating children in their program and to complete the utility survey.

All forms were in a packet that could be returned by mail or collected by research staff in person.

Phase Two

Phase two included the assessment of the child's developmental skills using the standardized assessment (BDI-2) by the researcher or research assistant. The researcher or assistant contacted the parents who indicated on the research opportunity form for phase two (from phase one) that they would like to participate in phase two and have their child further assessed. Fifty-nine parent/child dyads from phase one participated in phase two.

The location for the developmental assessment was determined by the parent, either in their home or other convenient location, or on the university campus. The visit began with the researcher or research assistant explaining the study and describing the assessments to be given. An attempt was made to establish rapport and put the child at ease before beginning the assessment by playing with novel toys or reading a book to the child. The BDI-2 test items were administered through the standard structure-observation described, or interview procedures as outlined in the technical manuals. The administration of the BDI-2 occurred approximately three to four weeks after the parent returned the packet.

During the second phase, the parent completed the ASQ a second time. This took place either at the time the standardized assessment was given or two to three weeks after, depending on the parent's preference. The two phases of the study are described in Figure 2.

Phase One	Approximate Time	Location
1. Parent completes: a. Demographic Form b. ASQ c. Research Opportunity Form for Phase Two	5-10 minutes 10-15 minutes 5 minutes	Home
Phase Two		
2. A trained evaluator administers a developmental assessment to child with parent present 3. The trained evaluator administers the ASQ with parent present 4. Parent completes a 2nd ASQ	40-90 minutes	Home, convenient site, university campus

Figure 2. Description of phases of study.

If parents opted to participate only in phase one (i.e., completing only the initial ASQ), they received a $10 gift certificate. For the completion of both phases of the study, parents received an additional $15 gift certificate ($25 total). Compensation for phase two was more due to the increased amount of time involved in participating in this phase. Teachers/program staff also received incentives for participating in the utility survey. Incentives included a small gift for the teacher, such as chocolates, or something for their class, such as a book.

The research assistants ($N = 6$) administering the BDI-2 held Master's degrees and had previous experience and training with administration of standardized assessments, including the BDI and BDI-2. All research assistants had experience working with children and families. Before beginning data collection for the study, training on the administration of the BDI-2 was given and the research assistants practiced administering the assessment on at least 2 children.

Data Analysis

Data were analyzed using strategies relevant to each research question. The following section describes the measures used to answer the research questions, identification of the independent and dependent variables, and a description of the data analysis used to interpret findings.

Research Question 1: What is the validity of the ASQ, 3rd ed. (48-60 months) using the BDI-2 as a criterion measure?

a.) What is the concurrent validity?

b.) What is the sensitivity?

c.) What is the specificity?

d.) What is the positive predictive value?

Measures	**Independent Variables**	**Dependent Variables**
ASQ and BDI-2	Children's ASQ scores	Children's scores on the BDI-2

According to Bailey (2004a), concurrent validity is how well and to what extent a given assessment relates to a criterion measure when administered at approximately the same time. Concurrent validity in this study was examined by correlating the results from the ASQ to the criterion measure, the BDI-2. Developmental quotients from the BDI-2 and total domains scores for the ASQ were used for computing the correlations. Assessments were administered sequentially.

Classifications between the screening instrument and the criterion measure were made. Specifically, classifications on the ASQ (i.e., "OK" or "Risk") were compared to classifications on the BDI-2. Total domain scores on the ASQ were compared to total developmental quotient on the BDI-2 to determine status. A child's score of 75 or lower is designated as "identified" because this score meets many states entrance criteria for early intervention or special education. For this study, children scoring at or below 75 were considered "identified". A percentage of agreement between classifications was computed. A set of contingency tables were used to compare the specificity, sensitivity, and positive predictive value. An illustration of the classification criteria in the contingency table is provided in Figure 3.

		BDI-2	
		Identified	*Typically Developing*
ASQ, 3rd ed.	*Identified*	Condition Present + Positive result = True Positive	Condition absent + Positive result = False Positive
	Typically Developing	Condition present + Negative result = False Negative (invalid)	Condition absent + Negative result = True Negative (accurate)

Figure 3. Classification criteria for ASQ and BDI-2.

Research Question 2: What is reliability of the ASQ, 3rd ed. (48-60 months)?

a.) What is the test-retest reliability?

b.) What is the inter-observer reliability between two independent raters?

c.) What is the internal consistency?

Measures		Independent Variables	Dependent Variables
a.)	ASQ	Scores on ASQ at time 1	Scores on ASQ at time 2
b.)	ASQ	Parents' scores	Professional examiner's scores
c.)	ASQ	Item scores	Domain scores

Test-retest reliability is the measure of test results stability over time across two or more administrations of the same test (Salvia et al., 2007). The amount of time between test administrations should be short enough to measure the same developmental period and long enough that test items are not remembered or memorized. Test-retest reliability of the ASQ was measured in this study. Parents were given the second ASQ to complete on their child within three to four weeks of their first completed ASQ. Intraclass correlations and percent agreement between the child's classifications (i.e., "OK" or "Risk") were calculated between the first and second administrations of the ASQ ($n = 48$).

Inter-observer reliability is the degree to which an assessment yields similar results for the same individual at the same time with more than one rater/observer. This type of reliability is important because high agreement between two raters may indicate that the assessment is written and can be administered in a manner that two people can

independently reach the same consensus. In this study, inter-observer agreement was measured by having the parent administer the questionnaire and having the researcher administer the questionnaire. In order to examine the consistency between parent and professional administration of the ASQ, scores from the parent and professional administration were compared.

For consistency, the second ASQ completed by the parent was compared to the professionally administered ASQ ($n = 40$). Intraclass correlations and percent agreements were calculated in order to examine the level of agreement between the two types of administration. A total of 48 second ASQs were completed by parents and returned. The number of professional administered ASQs was 48; however eight questionnaires had to be eliminated because the test had more than two uncompleted items within a domain. This most likely occurred because the examiner had little opportunity to observe some activities like eating and did not score the item.

Internal consistency measures the consistency of results across items within a single test. Internal consistency of the ASQ was addressed by investigating the extent to which individual items in a domain measure the same concept. To estimate the internal consistency of items within a domain, Cronbach's alpha was used. Cronbach's alpha indicates the extent to which all items of a domain can be treated as measuring a single latent variable and have the same true score. Alpha coefficients provide an estimate for the consistency of the child's performance across items.

Research Question 3: Is adding a "monitor" category (i.e., -1 standard deviation from cutoff score) useful in directing learning activities for preschool children?		
Measures	**Independent Variables**	**Dependent Variables**
Utility survey	None	Scores on the utility survey

To measure the utility of adding a "monitor" category to the ASQ, a survey was given to parents of a child scoring within this range and teachers/program staff that had a child in their program participating in the study. Parents and teachers/program staff were given the opportunity to review the completed ASQ on the child. Based on the child's scores, specific learning activities for the areas the child scored in the "monitor" category were given. Parents and teachers/program staff reviewed these activities and then completed the utility survey. The utility survey contains questions that address whether the parent and teacher/program staff feels the category will be useful in directing and using targeted learning activities for the child. A copy of the utility survey can be found in Appendix C and copies of sample learning activities can be found in Appendix D. Satisfaction was evaluated by calculating the percentages of answer (frequency counts). Comments and suggestions from parents and teachers are reported.

Summary

The ASQ is currently being revised for a third edition. This study examined the psychometric properties of the new edition for children ages 4-5 years old. Moreover, a new approach to scoring was investigated, with the addition of the "monitor" category.

Previous studies of the ASQ suggest that it is a reliable and valid tool when administered to target age intervals (AAP, 2001; 2006; Boyce, 2005; Poteat, 2005; Squires et al., 1999).

Typically developing and at-risk children were recruited in Oregon, Washington, and Idaho. Demographics and family information for participants were gathered. The ASQ was administered by parents and concurrent validity was investigated. In addition, the utility of adding a "monitor" category in directing learning activities was studied.

Table 3 presents the research questions, outcome measures, and data analysis used to address the research questions.

Table 3

Research Questions, Outcome Measures, and Data Analysis

Research Question	Outcome Measure	Data Analysis
1. What is the validity of the ASQ, 3rd ed. (48-60 months) using the BDI-2 as a criterion measure? a.) What is the concurrent validity? b.) What is the sensitivity? c.) What is the specificity? d.) What is the positive predictive value?	ASQ and BDI-2	Contingency table
2. What is the reliability of the ASQ, 3rd ed. (48-60 months)?		
a.) What is the test-retest reliability?	ASQ (time 1 & time 2)	ICC; percent agreement
b.) What is the inter-observer reliability between two independent raters?	ASQ	ICC; percent agreement
c.) What is the internal consistency?	ASQ	Cronbach's Alpha
3. Is adding a "monitor" category (i.e., -1 standard deviation from cutoff score) useful in directing learning activities for preschool children?	Utility Survey	Percentages of answers (frequency)

CHAPTER IV

RESULTS

This chapter reports the results from the research study in three sections. The first section addresses demographic information relating to study participants. The following section addresses the technical adequacy, including the validity and reliability of the ASQ. In the final section, results from the utility survey are presented.

Participants

Children and Parents

A total of 101 parent/child dyads participated in the first phase, and 59 dyads participated in the second phase of the study. Participants were recruited through flyers and posters posted in public and private childcare agencies and preschools, neighborhood centers, Head Start classrooms, and by online advertisement on craigslist.com in Oregon and Idaho. For the first phase of the study, parents were offered compensation of a $10 gift certificate for their time. Parents participating in phase two were offered an additional $15 gift certificate. All parents were asked to complete a demographic form in order to ascertain child and family demographics. Demographic information for participants in both phases is presented in Table 4.

Table 4

Demographic Information of Study Participants

	Phase One ($N = 101$)		Phase Two ($N = 59$)	
	n	%	*n*	%
Age	41	41	25	42
45-50 months	36	36	26	44
51-56 months	24	24	8	14
57-65 months				
Gender				
Male	48	48	30	51
Female	53	52	29	49
Status				
Suspected delay or disability	9	9	6	10
Identified delay or disability	9	9	6	10
Ethnicity/Race				
Hispanic/Latino	5	5	3	5
Caucasian/White	81	80	47	80
African American	1	1	1	2
Asian	4	4	3	5
Native American	1	1	0	0
Hawaiian	0	0	0	0
Pacific Islander	0	0	0	0
Multi-racial/or more than one race checked	8	8	5	8
Other	1	1	0	0
Mother's Education				
Some high school	3	3	2	3
High school graduate	9	9	3	5
Technical school	8	8	6	10
Some college	37	37	23	39
College graduate	35	35	19	32
Post graduate	9	9	6	10
Income				
0-$15,800	8	8	3	5
$15,801-20,800	6	6	2	3
$20,801-25,000	6	6	4	7
$25,001-28,800	6	6	4	7
$28,801-33,000	8	8	4	7
$33,001-44,800	13	13	6	12
Over $44,801	45	45	30	51
Don't Know	1	1	1	2
Missing	9	9	5	8

Table 4, continued

Demographic Information of Study Participants

	Phase One (n = 101)		Phase Two (n = 59)	
	n	%	*n*	%
Who Completed				
Mother	99	98	49	83
Father	5	5	4	7
Number of Risk Factors				
No know risk factors	62	61	39	66
One risk factor	23	23	14	24
Two risk factors or agency affiliation	4	4	2	3
Three or more risk factors, Head Start	12	12	4	7

Children ranged in age from 45 to 65 months for both phases. Due to low interest and small numbers of participants in phase one for the 57-65 month age interval, recruiting concluded after four months with 24 participants in this range, only eight participating in phase two. In both phases, the majority of child participants were Caucasian/White, with about the same number of males and females. This study attempted to closely match the 2006 U.S. Census data. A comparison of ethnicity and race demographics for total participants in this study and the population of the United States, Oregon, Idaho, and Ada County (Boise) is presented in Table 5. Population comparisons for the states of Oregon and Idaho, and particularly Ada County were chosen because participants were recruited from all over Oregon, but only recruited from Ada County in Idaho.

Table 5

Percentage Estimates of Population Distribution for the United States, Oregon, Idaho, Ada County and the Current Study

	United States	**Oregon**	**Idaho**	**Ada County (Boise, ID)**	**Current Study**
Hispanic/Latino	14.8	10.2	9.5	6.0	5.0
Caucasian/White	73.9	86.0	92.5	92.5	80.1
African American	12.3	1.7	0.5	0.9	1.0
Asian	4.3	3.7	1.0	1.9	4.0
Native American	0.8	1.8	1.1	0.6	1.0
Hawaiian/Pacific Islander	0.1	0.2	0.1	0.2	0.0
Multi-racial	2.0	3.0	2.1	2.3	7.9

Note. United States, Oregon, Idaho, and Ada County values were derived from the 2006 U.S. Census Bureau.

In phase one, 9% of child participants had a suspected developmental delay or disability ($n = 9$) and 9 % had an identified developmental delay or disability ($n = 9$). Nine children (9 %) were receiving services (e.g., speech, physical or occupational therapy). In phase two, 10% of the child participants had a suspected developmental delay or disability ($n = 6$) and 10 % had an identified developmental delay or disability ($n = 6$).

A total of 39 participants (39%) had one or more risk factors (e.g., below the federal poverty level, maternal age of 19 or younger at child's birth, mother's level of education 12th grade or less, and family involvement with Head Start) in phase one. In phase two, twenty (34%) of the participants had one or more risk factors.

The majority of parents who completed the ASQ were mothers (98%). Parents were asked to report on the mother's highest level of educational attainment. The majority of the mothers had at least received a high school diploma (97%, $n = 98$). The mother's age at the child's birth was also reported. The average age of mothers was 26 years old, with nine in the risk category of 19 or younger. Forty-five percent of parents reported the highest income level (i.e., over $44,801). The majority of families reported to be a two-parent household. These questions were asked to better understand the socioeconomic status of the families participating in the study.

Teachers/Program Staff

Seven teachers participated in the utility survey. Three participants were from Head Start, two reported to be special education teachers, and two were from public or private preschools, neighborhood centers, or childcare centers.

Technical Adequacy

Developmental assessment tools and measurement systems are created to evaluate constructs and development. When creating a new or revising an existing tool, it is important to determine if the tool is measuring what it purports to measure and is a valid and reliable measurement of the constructs it is designed to evaluate. The ASQ was designed to measure children's development, according to parent report, in five domain areas: communication, gross motor, fine motor, problem solving, and personal-social. The general purpose of this study was to validate the validity and reliability of the new edition of the ASQ. This section addresses the technical adequacy of this questionnaire.

Validity

Validity indicates the instrument measures what it is supposed to measure (Salvia et al., 2007). Evidence of validity can be collected in a variety of ways. Administering two assessments that measure related constructs to the same participants and then comparing the scores from the test in question to the criterion measure is one way to measure test validity. The criterion measure needs to be generally accepted as a tool that is reliable and valid. Concurrent validity, or the degree to which the two scores are positively correlated, is demonstrated when a test correlates well to the measure that has previously been validated (criterion).

Concurrent validity includes sensitivity, specificity, and positive predictive value. Sensitivity refers to the ability of the instrument to detect small differences across groups of children and within an individual child (Salvia et al., 2007). Specificity is the proportion of children correctly excluded as developing typically and performing at the expected level of a standardized assessment (Squires et al., 1999). The proportion of children not identified by the instrument when in fact they are identified/eligible is the positive predictive value. To examine the agreement between measures, the child's classifications on both tools are compared.

Research Question # 1

The current study examined the extent ASQ scores and the BDI-2 scores were in agreement in classification. To be considered "identified", a child's score falls 2 standard deviations below the mean. A child is considered identified when their BDI-2 total developmental quotient (DQ) score is at or below 75 and has a score below the cutoff in

one or more domains on the ASQ. One of the following four outcomes is possible when determining classification by comparing the questionnaire and standardized tool:

1. Both assessments classify the child as not "identified" (e.g., typically developing)
2. Both assessments classify the child as "identified"
3. The questionnaire classifies the child as "identified" and the standardized tool classifies the child as typically developing
4. The questionnaire classifies the child as typically developing and the standardized tool classifies the child as "identified"

The analytical procedure used to examine the research question was to develop contingency tables, and then check cross tabulations to determine sensitivity, specificity, and positive predictive value. Concurrent validity for the ASQ, including sensitivity, specificity and predictive validity, was evaluated by examining the correspondence of participants' scores on the ASQ with their scores on the BDI-2 (n = 59). Total domain scores on the ASQ were matched with corresponding total DQ scores on the BDI-2 for 44 participants. For the remaining 15 participants, the domain DQ was matched with the ASQ domain score (e.g., BDI communication DQ to ASQ communication score). These 15 participants did not have a total DQ because one or more subdomains were not given, therefore a total score was not calculated.

Concurrent validity. Contingency tables are used to record and analyze the relationship between two or more variables, usually categorical variables. The contingency tables displayed in this chapter were created by classifying participants as either identified or typically developing. The contingency table for the ASQ system and the BDI-2 shows the agreement on classification status between the two measures. BDI-2 cut off score was 75 or below. Agreement between the BDI-2 and the ASQ system for the 44 participants with a total DQ is contained in Figure 4. The agreement between domain DQs on the BDI-2 and domain scores on the ASQ for participants missing a total DQ is shown in Figure 5.

Ages & Stages Questionnaires (48, 54, & 60 months)

	BDI-2		
	Identified	*Typically Developing*	*Total*
Identified	**1**	**4**	**5**
Typically Developing	**0**	**39**	**39**
Total	**1**	**43**	**44**

Sensitivity	Specificity	False positive	True positive	False negative	Positive predictive value
1.00%	91.00%	0.80%	1.00%	0.00%	0.20%

Figure 4. Cross tabulation of agreement between total DQ on BDI-2 and the ASQ for 48, 54, and 60 month age intervals.

Ages & Stages Questionnaires (48, 54, & 60 months)

	BDI-2		
	Identified	*Typically Developing*	*Total*
Identified	**0**	**1**	**1**
Typically Developing	**1**	**13**	**14**
Total	**1**	**14**	**15**

Sensitivity	Specificity	False positive	True positive	False negative	Positive predictive value
0.00%	93.00%	1.00%	1.00%	0.07%	0.00%

Figure 5. Cross tabulation of agreement between domain DQ on BDI-2 and domain ASQ scores for 48, 54, and 60 month age intervals.

Sensitivity, specificity, and positive predictive value for participants with total DQ scores. The overall percent agreement or proportion of participants correctly identified by the ASQ was 91%. The overall results from the cross tabulations show the ASQ was able to correctly identify children in need of further evaluation with 100% sensitivity. The specificity of the ASQ to correctly identify children that do not need further evaluation was 91%. The proportion of children determined by the ASQ to be typically developing when in fact they were identified (positive predictive value) was 20%.

Sensitivity, specificity, and positive predictive value for participants without total DQ scores (domain DQs only). The overall percent agreement of participants' ASQ domain scores correctly identified was 87%. The overall results from the cross tabulations show the ASQ was able to correctly identify children in need of further evaluation within a domain with 0% sensitivity (i.e., no identified children in sample).

The specificity of the ASQ to correctly identify domains in which children do not need further evaluation was 93%. The positive predictive value was 0%.

Contingency tables containing agreement between all BDI-2 assessments, using total DQ, and the ASQ by age interval (i.e., 48, 54, and 60 month) can be found in Figure 6.

Reliability

Reliability is the consistency of the measurement, or the degree to which an instrument measures the same way each time it is used under the same condition with the same subjects. In short, it is the repeatability of a measurement. A measure is considered reliable if a person's score on the same test given twice is similar (Salvia et al., 2007). It is important to remember that reliability is not measured, it is estimated. Estimating test-retest reliability requires giving the same measurement to the same person more than once. Another important reliability estimate is internal consistency. Internal consistency estimates reliability by grouping questions in a questionnaire that measure the same construct. If the measurements are evaluating different constructs, then a measure may not give consistent results.

Ages & Stages Questionnaires (48 months)

	BDI-2		
	Identified	*Typically Developing*	*Total*
Identified	**1**	**3**	**4**
Typically Developing	**0**	**13**	**13**
Total	**1**	**16**	**17**

Sensitivity	Specificity	False positive	True positive	False negative	Positive predictive value
1.00%	0.81%	0.75%	1.00%	0.00%	0.25%

Ages & Stages Questionnaires (54 months)

	BDI-2		
	Identified	*Typically Developing*	*Total*
Identified	**0**	**1**	**1**
Typically Developing	**0**	**18**	**18**
Total	**0**	**19**	**19**

Sensitivity	Specificity	False positive	True positive	False negative	Positive predictive value
0.00%	0.95%	1.00%	0.00%	0.00%	0.00%

Ages & Stages Questionnaires (60 months)

	BDI-2		
	Identified	*Typically Developing*	*Total*
Identified	**0**	**0**	**0**
Typically Developing	**0**	**8**	**8**
Total	**0**	**8**	**8**

Sensitivity	Specificity	False positive	True positive	False negative	Positive predictive value
0.00%	1.00%	0.00%	0.00%	0.00%	0.00%

Figure 6. Cross tabulation of agreement between BDI-2 and ASQ by age interval.

Research Question #2

Test-retest reliability. Test-retest reliability was determined by comparing the results of two questionnaires completed by parents in a three to four week period. Parents participating in both phases were given the opportunity to complete two ASQs. Scores from time one and time two were compared for test-retest reliability ($n = 48$). A second ASQ was completed and returned for twenty-five 48-month old, seventeen 54-month old, and six 60-month old children. The second ASQ was given to the parent at the time of the BDI-2 administration. Parents could complete at the time of the assessment and return to the examiner or complete at their convenience and return by mail in the self-addressed, stamped envelope. The scores from time one and time two were compared by intraclass correlations (ICC) and percent agreement. ICC was chosen because it assesses rating reliability by comparing the variability of different ratings of the same subject to the total variation across all ratings and all subjects (Shrout & Fleiss, 1979). ICC coefficients for each age range and domain are reported in Table 6.

Table 6

Intraclass Correlations for Test-Retest for Domain and Age

	48 Month	54 Month	60 Month
Communication	.47	.72	.36
Gross Motor	.72	.38	.51
Fine Motor	.79	.61	.88
Problem Solving	.81	.67	.67
Personal Social	.52	.57	.29

Test-retest percent agreement between classifications was 88% for the 48 month ($n = 25$), and 100% for both the 54 ($n = 17$) and 60 ($n = 6$) month intervals.

Inter-observer reliability. Inter-observer reliability was evaluated by examining the relationship between the administration of the ASQ by the parent and the professional examiner (Total $n = 40$; 48-month $n = 19$, 54-month $n = 15$, 60-month $n = 6$). The research assistant completed an ASQ for the child's age after completing the BDI-2. At the home visit for the administration of the BDI-2, parents were given a second ASQ to complete. Inter-observer reliability was measured by intraclass correlations within domain scores and percent agreement between classifications based on the questionnaires completed by parents and examiners. Inter-observer ICC coefficients for each age range and domain are reported in Table 7. Inter-observer percent agreement between classifications was 100% for all age intervals

Table 7

Intraclass Correlations for Professional and Parent Administrations for Domain and Age

	48 Month	54 Month	60 Month
Communication	.83	.88	1.00
Gross Motor	.58	.22	1.00
Fine Motor	.93	.79	.98
Problem Solving	.94	.83	1.00
Personal-Social	.50	.82	.62

Inter-observer reliability was also calculated for professional examiners using percent agreement. The researcher conducted inter-observer reliability for eleven of the developmental assessments (19%) given by the professional examiner. Percent agreement between classifications was 100%. The researcher conducted reliability with each of the professional examiners at least two points in time.

Internal consistency. Internal consistency estimates reliability by grouping questions in a questionnaire that measure the same concept. Internal consistency within domains on the ASQ was analyzed using Cronbach's alpha (Cronbach, 1951). Cronbach's coefficient alpha was calculated for area scores on individual questionnaires. The internal consistency within domains was evaluated using phase one item level data (n = 101). Results for internal consistency for each domain for each age interval are presented in Table 8.

Table 8

Internal Consistency for Domains and Age Intervals

	Cronbach's Alpha
Communication	.79 (48)
	.39 (54)
	.80 (60)
Gross Motor	.70 (48)
	.62 (54)
	.79 (60)
Fine Motor	.68 (48)
	.24 (54)
	.63 (60)
Problem Solving	.37 (48)
	.44 (54)
	.23 (60)
Personal-Social	.55 (48)
	.45 (54)
	.83 (60)

Note. Age interval in parentheses.

Utility

The utility survey for parents and teachers included questions pertaining to the usefulness of using the "monitor" scoring category for directing targeted learning activities. In order to ascertain parent and teacher opinions of this new category and of the learning activities, they were asked to complete a survey after reviewing the scored ASQ and learning activities targeting the domain in which the child scored in the "monitor" range. Opinions were examined by evaluating ease of understanding and use,

specificity of the learning activities for skill areas, and effectiveness. The utility surveys can be found in Appendix C.

Research Question #3

Parents (n = 13) of children scoring in the "monitor" range and teachers (n = 7) of participating children scoring in this range completed a utility survey.

Parents. Twenty-nine parents of children scoring in the "monitor" range were mailed a letter explaining the scoring of the ASQ with their child's scores. A copy of the ASQ, learning activities for the domain(s) in which the child scored within the "monitor" range, and a utility survey was included with the letter. Thirteen parents returned the utility survey (45%).

The survey included questions about the learning activities' ease of understanding and use of the learning activities, specificity in targeting skills, likelihood of using the activities at home, usefulness, and effectiveness. Results from the parent surveys are shown graphically in the next six figures (Figures 7-12).

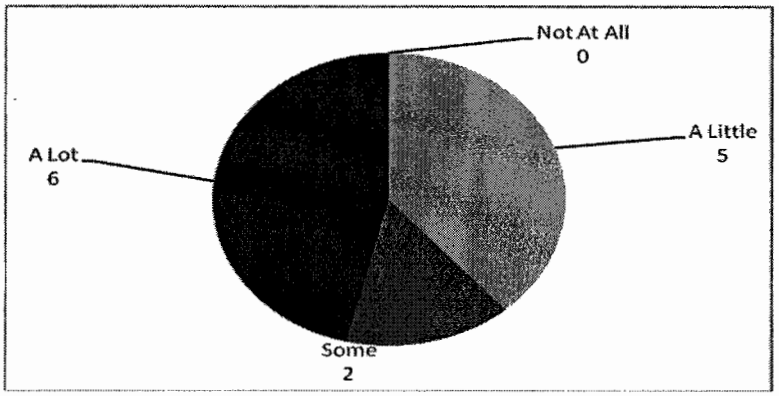


Figure 7. How much did reviewing the ASQ help you to identify your child's specific needs? (n = 13)

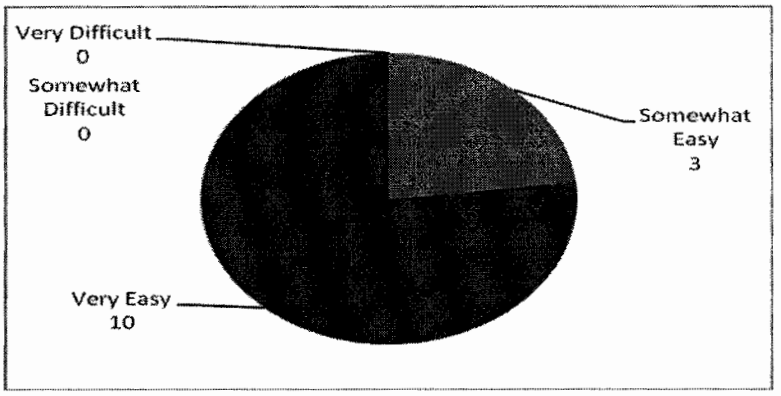


Figure 8. How difficult or easy are the learning activities to understand? (n = 13)

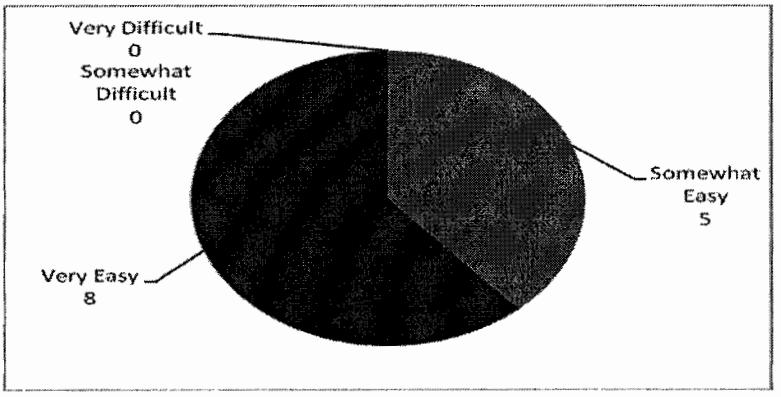


Figure 9. How difficult or easy are the learning activities to use? (n = 13)

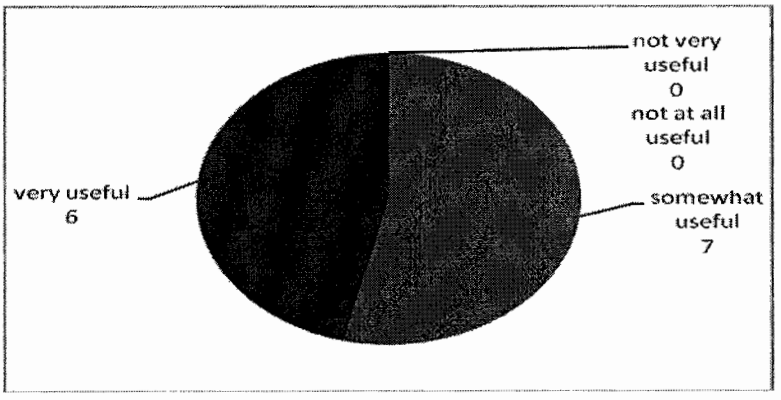


Figure 10. How useful do you think the learning activities will be for focusing attention on your child's needed skills in the developmental areas? (n = 13)

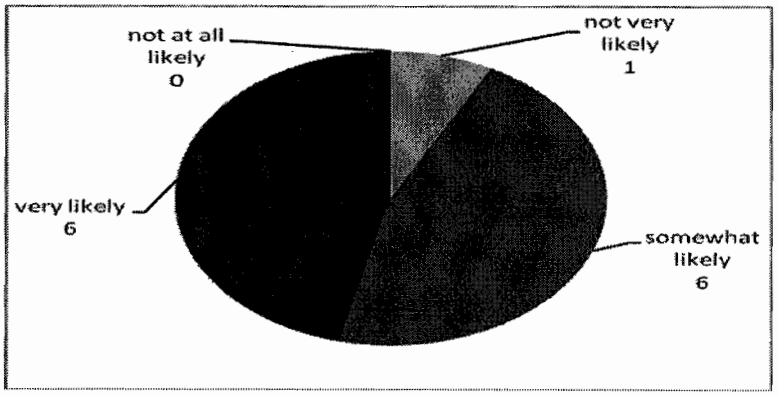


Figure 11. How likely are you to use the learning activities at home? (n = 13)

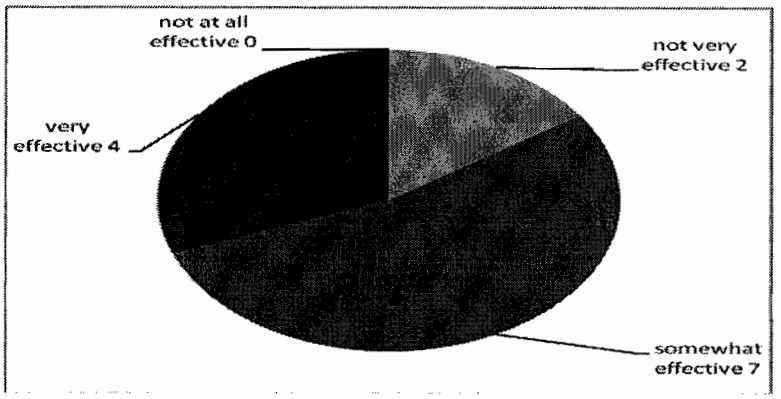


Figure 12. How effective do you think the learning activities will be with your child? (n = 13)

Teachers. Eleven teachers/program staff were contacted (with permission) if a child participating in the study was in their program and scored within the "monitor" range. Teachers were mailed a consent letter explaining the scoring of the ASQ with the child's scores and a copy of the parent's permission to contact. Also included was a copy of the ASQ, learning activities for the domain(s) in which the child scored within the "monitor" range, and a utility survey. Seven teachers returned the survey (64%).

The survey included questions about the learning activities' ease of understanding and use, specificity in targeting skills, likelihood of using the activities in the program,

usefulness, and effectiveness. Results from the teacher surveys are shown graphically in the following seven figures (Figures 13-19).

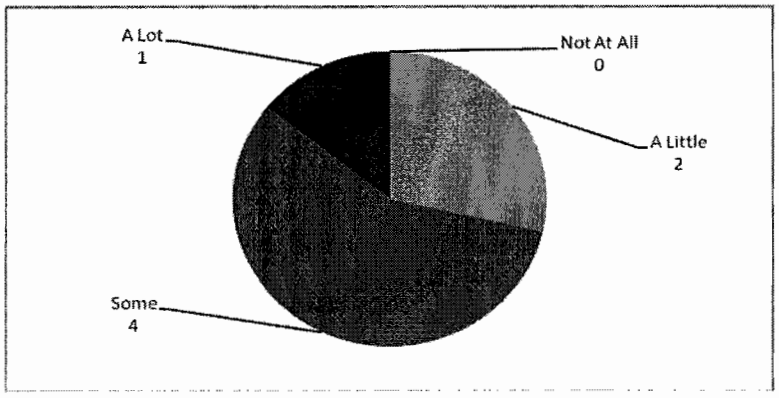


Figure 13. How much did reviewing the ASQ help you identify this child's specific needs? (n = 7)

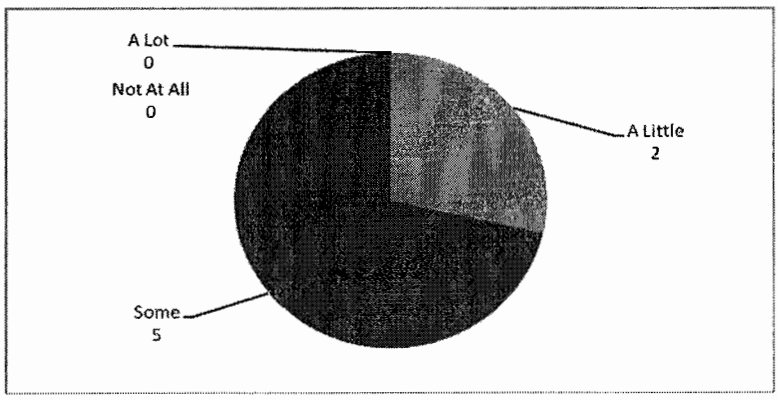


Figure 14. How much did the ASQ help you develop learning activities for this child? (n = 7)

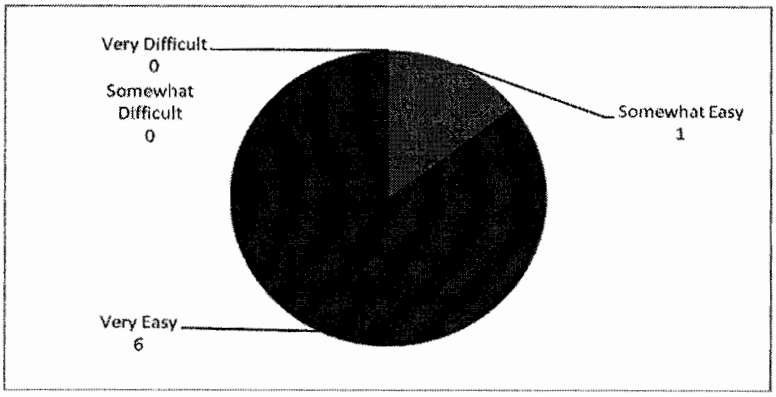


Figure 15. How difficult or easy are the learning activities to understand? ($n = 7$)

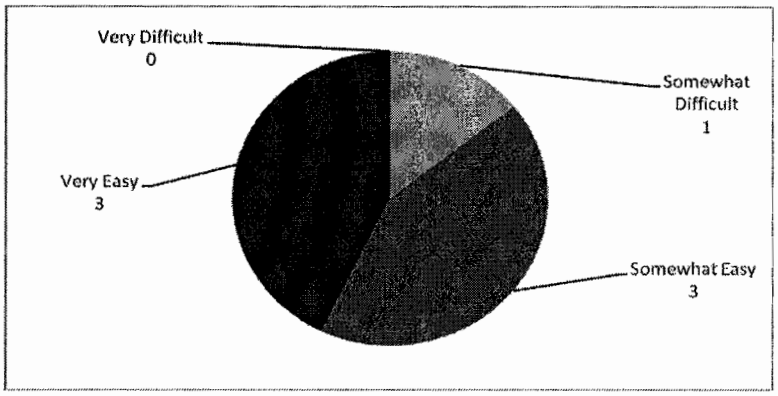


Figure 16. How difficult or easy do you think the learning activities will be to use? ($n = 7$)

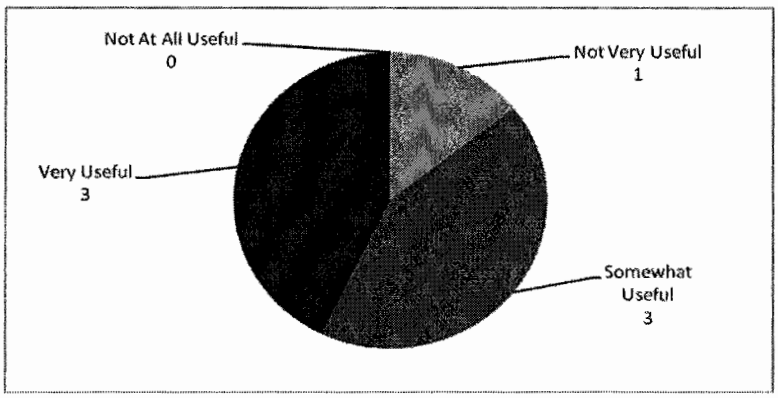


Figure 17. How useful do you think the learning activities will be for focusing attention on this child's needed skills in the developmental areas? ($n = 7$)

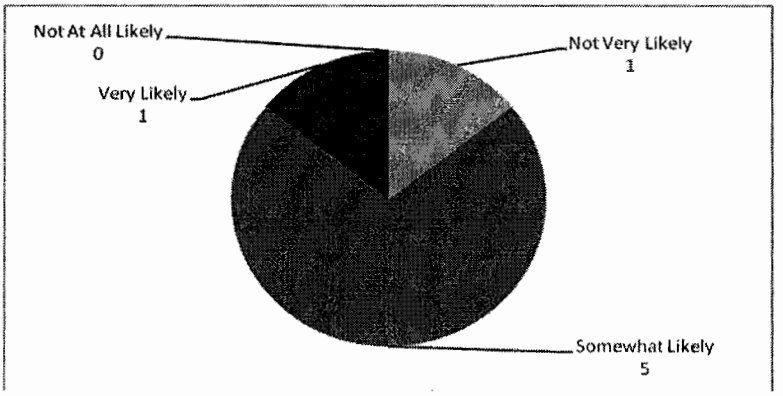


Figure 18. How likely are you to use the learning activities in your program? ($n = 7$)

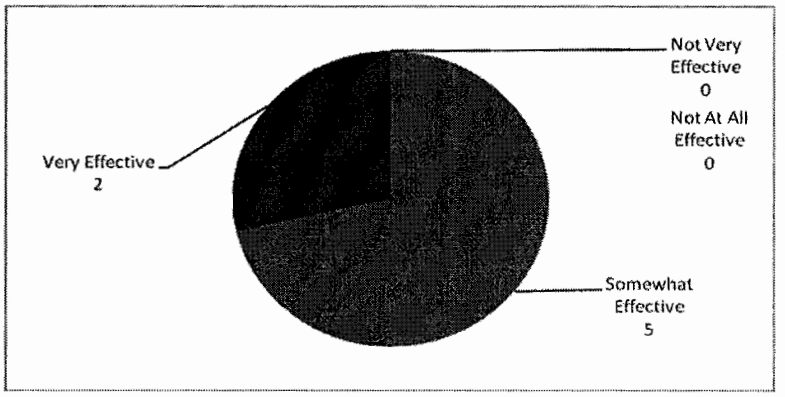


Figure 19. How effective do you think the learning activities will be? ($n = 7$)

Overall, parents and teachers indicated they found the learning activities easy to understand and use. All the parents and teachers indicated they felt the learning activities were specific enough to target the skill areas. The majority also said they think the activities would be effective with the child. Teachers and parents were also asked to specify what area was being targeted. Some children scored in the "monitor" range in more than one area. Results for domain areas targeted are shown in Table 9.

Table 9

Number of Partcipants in Targeted Areas

Area Targeted	Parent Surveys	Teacher Surveys
Communication	5	3
Gross Motor	4	2
Fine Motor	4	3
Problem Solving	1	1
Personal-Social	5	3

Parents and teachers were also asked if they had any suggestions or comments to make the ASQ more helpful. Suggestions/comments from teachers included: 1) "I feel this would probably be used. It does seem to be a long monitoring system that would take a good amount of time per child," 2) "The activities will be more useful in the home setting," and 3) "This is a good tool to focus parents on child's strengths and needs." The general feeling from the teacher suggestions and comments is that teachers feel the activities are more useful for parents and home setting than for doing in the classroom. Only two parents left comments. Their comments included: 1) "Activities will be easy to use if I can remember or make a daily point to do them," and 2) "Thanks, this has been helpful."

CHAPTER V

DISCUSSION

Growing concern to identify children at risk for developmental delays or disabilities as early as possible has increased attention for early intervention and screening instruments. A variety of factors complicate the early identification of children at risk for developmental delays or disabilities, including the growing diversity of the population and access barriers to screening services. The Ages and Stages Questionnaires have been widely used with a variety of approaches in order to overcome these barriers. The new edition will have revisions to the cutoff points, as well as reordering of some questions in order to better identify children at risk. The current study examined the reliability and validity of the new edition and contributed to the normative sample, as well as evaluated the addition of a "monitor" range above the cutoff points.

Interpretation of Results

Participants

Phase One

A total of 101 families participated in phase one of the study. Participants were assigned to one of three age ranges: 1) 45-50 months, 2) 51-56 months, and 3) 57-65 months. These age intervals were chosen to match the ASQ age administration chart. Children in the 45-50 month interval were given the 48-month questionnaire ($n = 41$).

The 54-month questionnaire was given to children in the 51-56 month interval ($n = 36$), and children in the 57-65 month interval were given the 60-month questionnaire ($n = 24$).

The distribution of children across the three age intervals was uneven, with the distribution of the two younger intervals (48- and 54-month) more evenly distributed. The lower number of participants in the older interval (60-month) was due to lack of participant interest. The investigator stopped recruiting from this age interval after several months of low numbers. Only twenty-four families volunteered for the study between the months of June and October. Of these twenty-four, only eight volunteered for the second phase. Because interest was much higher in the other two phases, the investigator decided to cease recruiting from the 57-65 age range and focus on the two younger ranges.

The children in this study represent six ethnic backgrounds: Caucasian/White, Hispanic/Latino, African American, Asian, Native American, and Multi-racial (two or more races). One participant checked "other" on the demographic form. Eighty percent of parents indicated their child was Caucasian/White, which is higher than the national percentage, but lower than percentages for Oregon, Idaho, and Ada County. More children in the study were multi-racial than in the U.S., Oregon, Idaho, and Ada County general populations. The Asian population in the study was about the same as the U.S. population, slightly higher than the Oregon population, but considerably higher than the Idaho and Ada County population. The African American population in the study was about the same as the Oregon population, considerably less than the U.S. population, and higher than the Idaho and Ada County population. The Native American and Hawaiian/Pacific Islander population in the study closely matched the state and national

populations. A smaller percentage of children were Hispanic/Latino as compared to the state and national populations.

This study attempted to recruit children from diverse backgrounds and ethnicities. Discrepancies between the study sample and the national population may be contributed to the lack of diversity in Oregon and Idaho. Both states have higher percentages of Caucasian/Whites, but much lower percentages of Hispanic/Latinos, African Americans, and Asians. In contrast, the states have higher populations of Native Americans and people of two or more ethnic groups.

In phase one, there were slightly more girls than boys (53/48). The majority of parents completing the questionnaire were mothers (98%), with the average age of 26 at the time of the child's birth. Most of the mother's indicated they had finished some college (37%) or had a college degree (35%), which is greater than the national averages of 19% and 24%, respectively. Ninety-seven percent of the mothers had received at least a high school diploma. The majority of participants also reported to be two-parent households with an income of over $44,801. (Income levels were derived from the 2006 Poverty Thresholds by Size of Family and Number of Related Children Under 18 Years Worksheet from the U.S. Census Bureau.) Attempts were made to recruit families that were diverse, less likely to be educated or lower income by posting flyers in agencies and buildings frequented by this population such as Head Start classrooms, Adult and Family Services, WIC, and agencies serving homeless populations. However, response rates from these families were low. It is possible that the response rate was low because these families did not have the resources, interest, or time to volunteer. Another possibility

could be the mode for contacting the investigator. The families had to either call or email the investigator if interested. Some families may not have had means to call or email. In the future, a mail-back post card may be more useful as an alternative way to contact the investigator.

Nine percent of the children had a suspected delay or disability and 9% had an identified delay or disability. Thirty-nine percent had one or more risk factors, such as poverty, affiliation with an agency serving at risk families such as Head Start, suspected delay or disability, and maternal age of 19 or younger.

Phase one was used to recruit families for phase two. Fifty-eight percent of phase one participants participated in phase two. The remaining 42% contribute to the normative sample, but not to the concurrent validity study of the ASQ.

Phase Two

A total of 59 families participated in the second phase. The same age intervals from phase one were used. There were slightly more males than females in the second phase (51/49). Phase two subjects participated in phase one, therefore ethnicity and race percentages remained relatively the same. Percentages in educational attainment and income also remained fairly constant across both phases.

As mentioned previously, there was an under-representation of participants in terms of income, educational attainment, and to some extent, ethnic diversity when compared to the general population of the U.S. Both phases of the study tended to have mothers with higher levels of education and family income. For generalizing study results, samples should be representative of the general population (Salvia et al., 2007).

In order to ensure a more representative sample, recruiting in more locations serving at risk populations with lower income levels and less educational attainment would be beneficial. Providing additional assistance or resources to these families, as well as a more varied type of compensation (e.g., higher amount of gift certificate, cash instead of gift certificate, gift certificate choice) may increase participation. Another way to increase participation would be to recruit and administer assessments on-site and in person at the agency (e.g., WIC). This was a goal for this study, but gaining permission from the agencies to recruit on-site was denied.

Twenty of the 59 participating families were considered "at risk" based on the presence of one or more risk factors in their family, such as poverty, maternal age of 19 or younger, affiliation with an agency serving at risk populations (e.g., WIC, Head Start), or child having a suspected or identified delay or disability. Table 10 shows the number of children in each age interval based risk status.

Table 10

Number of Risk and Non-Risk Participants in Each Age Interval for Phase Two

	45-50 months	51-56 months	57-65 months	Total
At Risk	9	8	3	20
Non-risk	16	18	5	39
Total	25	26	8	59

The initial recruiting goal was to have equal numbers of risk and non-risk participants in each age interval. However, non-risk parents were more responsive to participating in phase two. It is important to note that in the 45-50 and 51-56 month intervals, the risk and non-risk categories are fairly distributed. However, in future studies, a more balanced representation of risk and non-risk participants would be preferable for analysis.

Validity

Assessments *must* be valid and are considered valid when it measures what we want it to measure (Hand, 2004). One characteristic this study examined was concurrent validity of the third edition of the ASQ. Concurrent validity compares scores on an instrument with current performance on a criterion measure. The criterion measure which the ASQ is compared to is the standardized BDI-2. The first research question directly relates to concurrent validity, including the sensitivity, specificity, and predictive validity of the ASQ.

Research Question #1

Concurrent validity. The total domain scores of the ASQ and the total developmental quotients on the BDI-2 were compared in order to investigate concurrent validity. The current study examined the extent to which the ASQ scores classify children as typically developing or in need of referral for further testing (identified). Findings indicated, with this sample, the ASQ accurately identified and classified children as being

eligible or in need of further evaluation for eligibility status when the classification criterion was the BDI-2. The ASQ accurately identified 91% (39/44) of the children.

The percent agreement across the three age intervals ranged from 82% to 100%, with a mean of 92%. The sensitivity of the ASQ to correctly identify children as "identified" or risk was 100%. The specificity of the ASQ to correctly identify children as typically developing was 91%, ranging across age intervals from 81% to 100% with a mean of 92%.

Four children were identified by the ASQ when the BDI determined them to be typically developing. Children determined identified/eligible when they are typically developing is the false positive percentage. The false positive percentage for the overall ASQ was 80%, with a range of 0% to 100% with a mean of 58%. One reason this percentage was high could be due to the small sample size. Another reason could be some parents were extremely concrete when answering the ASQ and under-reported their child's skill level. The ASQ has six questions in each domain, whereas the BDI-2 has many more questions within a domain. A child scoring a 0 or a 5 on the ASQ on several questions could fall below the cutoff, whereas a child can miss multiple questions on the BDI-2 and still score in the typically developing range.

The ASQ did identify all children deemed identified/eligible by the BDI-2, with a 0% false negative percentage. The false negative percentage refers to children determined typically developing by the ASQ when they are in fact identified/eligible.

Under-identification refers to the proportion of children incorrectly identified by the ASQ as typically developing when they are identified/eligible. The percentage of

under-identification was 0%. Over-identification is the proportion of children incorrectly deemed by the ASQ to be identified/eligible when they are typically developing. The over-identification percentage was 10%, with a range of 0% to 18% and a mean of 8% across intervals. The ASQ over-identified 4 children (of 44) and did not under-identify any children. Three of the over-identified children were in the 45-50 month age interval, and one in the 51-56 month interval. Overall performance on the ASQ and BDI-2 by age interval is shown in Table 11.

Table 11

Overall Performance on ASQ and BDI-2 by Age Interval: Sensitivity, Specificity, False Positive, True Positive, False Negative, Percent Agreement, Under-Identification, Over-Identification, and Positive Predictive Value

	Overall ($N = 44$)	48 Month ($n = 17$)	54 Month ($n = 19$)	60 Month ($n = 8$)
Sensitivity	100%	100%	*	*
Specificity	91%	81%	95%	100%
False Positive	80%	75%	100%	0%
True Positive	100%	100%	*	*
False Negative	0%	0%	0%	0%
Percent Agreement	91%	82%	95%	100%
Under-Identification	0%	0%	0%	0%
Over-Identification	10%	18%	5%	0%
Positive Predictive Value	20%	25%	*	*

Note. * indicates no identified/eligible children in the age interval sample.

Fifteen of the participants did not have a total developmental quotient (DQ) on the BDI-2 due to incomplete or absent subdomain and domain scores. Concurrent validity for these participants was calculated by comparing their domain score on the ASQ to the corresponding domain DQ on the BDI-2. For example, the personal-social score on the ASQ was compared to the personal-social domain DQ on the BDI-2. Domain DQs of 75 or below were matched with corresponding domain cutoff scores on the ASQ.

For these 15 participants, the overall agreement in classifications within domains was 87%, with 93% specificity. One participant (Child A) scored below the cutoff in one domain on the ASQ, but scored in the typically developing range in the same domain on the BDI-2. Another child (Child B) scored in the typically developing range in one domain on the ASQ, but scored a 70 in the same domain on the BDI-2.

Child A scored below the gross motor cutoff score on the ASQ, but in the typically developing range on the BDI-2. On the second ASQ given for test-retest reliability, she scored above the cutoff in all domains. Child B scored in the typically developing range in the personal-social domain on the ASQ, but scored a 70 in the personal-social domain on the BDI-2. Child B is affiliated with an early intervention agency and his scores on the BDI-2 are from the assessment given by the agency. He is receiving early intervention services based on his BDI-2 scores, as well as scores from two other standardized measures (i.e., Bayley Scales of Infant Development and the Preschool Language Scale, 4th ed.). His ASQ was completed by his mother, who is a graduate student in the field of early childhood and works for the early intervention agency. His scores may be higher on the ASQ because his mother is familiar with the

questionnaire, aware of child development, and trained to be an observer of early development. She may also be working on his developing skills targeted on the ASQ.

Reliability

A measure that yields reliable information should produce comparable results when administered to the same person within a short period of time. Another feature this study evaluated was reliability of the third edition of the ASQ. Test-retest and inter-observer reliability were examined, as well as the internal consistency of the items in each domain. The second research question directly relates to these aspects of the ASQ.

Research Question #2

Test-retest reliability. Test-retest reliability of the ASQ was examined in the current study by calculating intraclass correlations and percent agreement. Most of the correlations were below .70, and ranged across domains and age intervals from .29 to a .88. Results indicate there was not much variance in the means which contributed to low residuals. An example of the score means from the personal-social domain of the 60 month ASQ can be found in Figure 20.

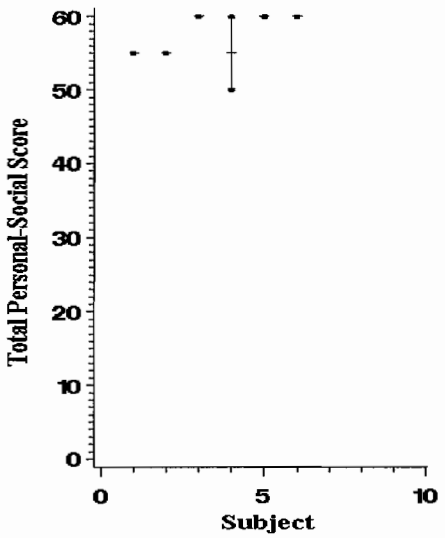


Figure 20. Test-retest ICC for the personal-social domain on the 60-month ASQ.

With only six participants in the 60-month range, and with only one different score on the second ASQ (subject 4), there is not much variance in means resulting in a low ICC of .29. The ICC could be misleading. The figure indicates that correlation is actually strong; all but one subject had the same score in this domain for time one and time two. This is the case for each of the intraclass correlations below a .70. ICCs were evaluated by comparing each participant's domain score in time one to their domain score in time two. Differences in scores, for example a 50 in communication in time one and a 60 in time two, will lower the ICC since it is not an exact match.

Percent agreement in classifications was also calculated for time one and time two to provide another indication of test-retest reliability. Test-retest reliability was strong, with a mean agreement of 96%. Percent agreement was calculated by comparing classification (i.e., identified or typically developing) in time one to classification in time

two. Differences in scores within a domain did not lower the percentage unless the subject went from an identified classification to a typically developing classification, or vice versa.

A potential limitation to test-retest reliability is that it is possible that the parents' completion of the first ASQ may have had an effect on their completion of the second ASQ. In addition, observing the administration of the BDI-2 could influence parental reporting on the second ASQ. Parents may have been alerted to emergent or non-existing skills while completing the first ASQ and worked on these skills in the interval between first and second reports. It is possible that completion of the first ASQ made parents more aware of items and skills to look for and therefore, report differently on the second ASQ. Also, parents witnessed the administration of the BDI-2 and completed the second ASQ either during the developmental assessment or soon afterward. In future studies, giving the parents the second ASQ one to two weeks after the first (instead of 3-4 weeks) and before administration of the BDI-2 would be preferable. The second ASQ could be mailed to the parents immediately after the first is received with the instructions to complete before the appointment for the developmental assessment.

Inter-observer reliability. Inter-observer reliability was evaluated by ICC and percent agreement calculations. ICC findings indicated a strong agreement between parent and professional administrations. Most of the correlations were well above .70, with a range of .22 to 1.00. Only four correlations were below .70. The intraclass correlations suggested that parent report and professional examiner were highly linked. An example of the 60 month communication ICC is presented in Figure 21.

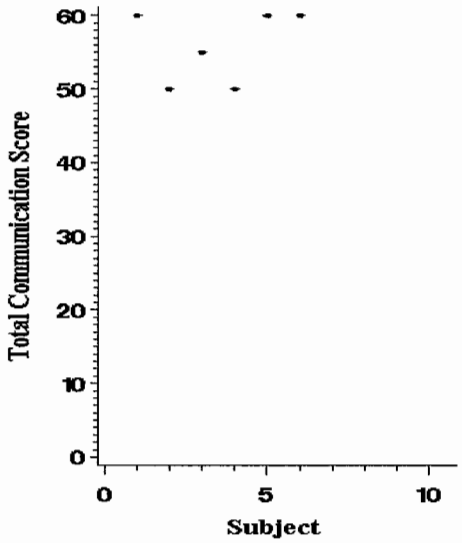


Figure 21. Inter-observer ICC for the communication domain on the 60-month ASQ.

The figure indicates the parent and professional administrations yielded the same scores for each subject, with an ICC of 1.00. There was also some variance in the mean scores. The lowest inter-observer ICC was .22 for the gross motor domain for the 54-month. Figure 22 presents the ICC for this age and domain.

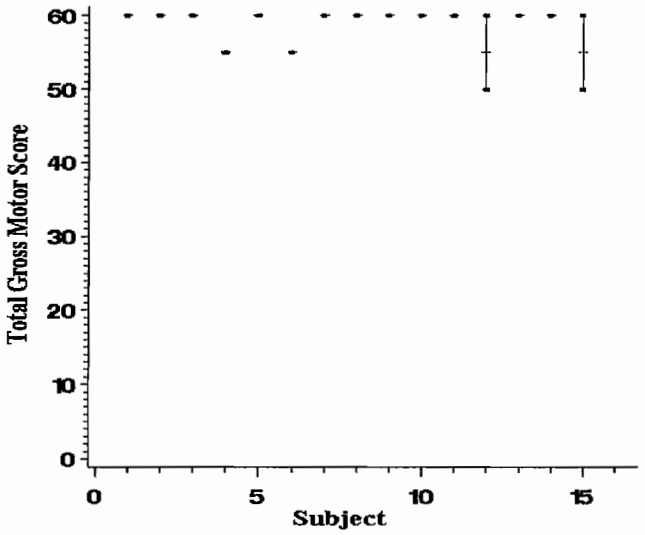


Figure 22. Inter-observer ICC for the gross motor domain on the 54-month ASQ.

This figure demonstrates how a low ICC (.22) was possible. There were 15 parent reports matched to the professional examiner report. Scores were the same for all questionnaires except two (subjects 12 and 15). The scores for both administrations for these two subjects were similar; therefore there was not much variance in the means.

Percent agreement was also calculated for inter-observer reliability. Reliability between raters on classification was very strong at 100% for all three age ranges.

Internal consistency. Internal consistency was calculated in order to evaluate how well the scores within a domain were associated. Cronbach's alpha was used to assess the connection between individual items and the test as a whole, by estimating the amount of variance constant across a set of scores. Cronbach's alpha coefficients scale is 0.0 to 1.0, with 1.0 being perfect agreement. For the communication domain, alphas ranged from .39 at 54 months to .80 at 60 months. Gross motor alphas ranged from .62 at

54 months to .79 at 60 months. The alphas ranged from .24 at 54 months to .68 at 48 months in the fine motor domain. The problem solving area had a coefficient alpha range of .23 at 60 months to .44 at 54 months. Finally, the personal-social domain alphas ranged from .45 at 54 months to .83 at 60 months.

There were some factors that influenced these ranges of alpha values. First, a high alpha is unlikely due to the varying developmental quotients of the items that make up each domain area. A child performing below the cutoff in a particular area may not have a static score across the items in that domain. Another factor is that error variance is increased when a statistic uses individual items rather than a collective total for the calculation. In this instance, the reported alphas use the individual items from each area, thus the possible error variance was increased.

On the whole, the 60 month ASQ had higher alphas and the 54 month had the weakest alphas. Sample sizes were small in all three age intervals, with 60 months having the smallest sample. Scores across domains and for individual items were fairly consistent across the 60-month interval. The most significant variances in scores for individual items occurred in the 54-month interval.

Utility

Research Question #3

This study examined the addition of a "monitor" category to the scoring. The purpose of this category is to identify children that score 1 standard deviation from the cutoff score in a domain and provide them with learning activities directed towards this

area. Parents and teachers of children that scored within the "monitor" range were given learning activities for the area, a copy of the completed and scored ASQ, and a utility survey. The utility survey was an attempt to gage the usefulness of the "monitor" category for help with identifying areas in which a child has emerging skills or is in need of extra practice. The goal of this category is to get additional help and resources to children who are not scoring below the cutoff score indicating further evaluation, but are at risk for possible delays or scoring below cutoff in the future. Ideally, a child scoring in the "monitor" range will receive learning activities, resources, and/or help in this area and when screened again will score in the typically developing range.

Originally, this research question targeted teachers and program staff. Unfortunately, the majority of the participants were not attending a program or the parents did not sign the consent to contact the teacher. In order to get more feedback on the "monitor" category and learning activities, parents were added to the sample. Since the ASQ is a parent-completed questionnaire, it seemed only natural to survey parents on the scoring category and the use of activities to provide extra resources for the child.

Parents. Feedback from parents on the addition of the "monitor" category and the learning activities was positive. Parents denoted they felt the learning activities would be successful and effective for helping their child and focused on the needed skill(s), therefore raising scores. Parents also indicated they felt reviewing the ASQ for the purpose of identifying specific needs was helpful.

The survey was not given to the parent until after they had returned the second ASQ. The rationale for waiting until the second ASQ was received before sending the

survey and learning activities was to ensure parents did not do the learning activities in the time in between the two questionnaires, therefore possibly jeopardizing the test-retest reliability.

Teachers. Teachers were contacted to participate in the survey if there was a child in the study that attended their program and also scored within the "monitor" range. Teachers indicated they felt reviewing the ASQ was fairly helpful for identify specific needs. The learning activities were considered helpful, easy to understand, and implement. However, the majority of the teachers indicated they would only be somewhat likely to use the activities in their program. The comments from the teachers suggested they feel the activities would be more useful in the home.

Limitations

Limitations of the current study include: 1) small sample size, 2) distribution of risk and non-risk participants, 3) diversity in sample population, and 4) lack of children suspected or identified with a disability.

Sample

The sample size across the three age intervals varied. The 48-month and 54-month interval had fairly equal population size, but the 60-month interval was small. In order to get a better understanding of concurrent validity, especially when using contingency tables, a large *N* is needed. Overall sample size and individual age interval samples need to be large as well. Future studies could include at least one hundred

children in each age interval to increase not only the sample size but also the probability of having a more diverse sample.

Distribution of Participants

As mentioned before, attempts were made to recruit risk families. The ASQ targets children at risk and has been studied with risk populations. In this study, distribution of the risk population across phase one, phase two and age intervals was uneven. The distribution of risk participants across the three age intervals and for phase one and two is presented in Table 12.

Table 12

Distribution of Risk Participants Across Study Phases and Age Intervals

	Phase One	Phase Two
48 Month	17 (41)	11 (25)
54 Month	10 (36)	6 (26)
60 Month	11 (24)	3 (8)

Note. Total *N* in parentheses.

Future studies could include more risk families, ideally half risk and half non-risk families for comparison. Offering a variety of compensations to choose as well as obtaining permission from agencies, such as WIC, to recruit and test on-site would be beneficial and might increase participation overall and decrease the likelihood of losing participant interest between phase one and two.

Diversity

Unfortunately, the Northwest does not have a very diverse population on a whole. Recruiting a diverse population that mirrors the U.S. demographics is a challenge. In the future, widening the recruitment area would be beneficial. Also, targeting recruitment to neighborhoods and areas that are more diverse (e.g., the Albina district in Portland, which is predominantly African American) could increase diversity of the sample. Recruiting from lower socio-economic areas and cities that do not include major universities will also increase diversity in income and educational attainment.

Disability

Another confounding aspect of the small sample size is the lack of children suspected of or identified with a disability. Findings for concurrent validity are compromised due to a lack of children participating that were identified by the ASQ and the BDI as having a disability. A larger sample of children with identified needs is necessary to calculate sensitivity, specificity, and predictive validity with accuracy.

Demographic information obtained in the phase two sample included: (a) six children with established disabilities and receiving services, and (b) six with a suspected delay or disability. Only one of these participants was identified as "eligible" by both the ASQ and the BDI-2. The demographic form completed for all participants included inquiries as to whether the child had an established or suspected delay or disability. Parents were also asked to indicate what type of services their child was receiving if he/she did in fact have a disability. The response to this question contained an open-ended blank space instead of a check list of various types of services possible. The

majority of the parents answered "developmental services" or something similar. Only one parent specified speech therapy. "Developmental services" is vague and does not indicate what type of disability or actual services received. It is impossible to compare the scores of the assessments to see if the types of services or disability indicated a match. For example, if a parent said their child received physical therapy, the assumption would be that the child would score below the cutoff on the ASQ and a 75 or below on the BDI-2 in the gross motor domain. In the future, the demographic form should specify a list of types of services or have a blank for parents to indicate a specific disability. The number of participants identified or suspected of delay or disability and what their scores reflected on both measurements is shown in Table 13.

Table 13

Participants with an Established or Suspected Delay/Disability and Their Measurement Classification

Identification by Measurements (ASQ & BDI-2)	Established Delay or Disability	Suspected Delay or Disability
Both identified	1	0
Neither identified	2	4
Identified by ASQ, not identified by BDI	2	1
Identified by BDI, not by ASQ	1	0

Note. Identified or suspected according to demographic information.

Implications

This section will address implications for research and practice for parent-completed questionnaires for preschoolers and the utility of scoring categories. Further, this section will address future directions for research.

Research

Results from the current study add to the existing literature base on screening instruments and the validity of parent-completed questionnaires. This study contributes to early intervention literature in two ways. First, this study is an extension of a larger study for the third edition of the ASQ. Second, this study begins to look at the addition of the "monitor" scoring category.

The third edition of the ASQ will include new cutoff scores, normative sample, scoring categories, and revisions such as the reordering of some questions. The current study used newly developed cutoff scores as well as a new scoring category (i.e., monitor) and contributed to a new, larger normative sample. Results from the third research question addressing the "monitor" category indicated it is useful for focusing on needed skills. More research should be done on the effectiveness of this scoring category.

The reliability and validity data obtained from the current study were comparable and consistent with the data gathered on previous studies on the ASQ (Squires et al., 1999), as well as the current larger study. The present study results indicated few differences between previous and current research.

First, this study had a much smaller sample size. The original sample for the second edition of the ASQ included 8,119 children from 4 to 36 months old (Squires et

al., 1999). The present study had a total of 101 children from 45-65 months for renorming with 59 from this sample participating in the concurrent validity study. Not only was the sample size much smaller, but also included older children than the previous study.

Second, the "monitor" category in scoring was used. The present study is the first research on the inclusion of this scoring category and its utility. Previous studies only included the categories of "risk" and "OK."

Third, research questions and analysis differed. An additional research question about the utility of the "monitor" category was included with research questions about validity and reliability in the present study. This study used analysis such as intraclass correlations and percent agreement to examine test-retest and inter-observer reliability, which is different from the previous study that used percent agreement only. Internal consistency was evaluated in the previous study using Pearson product moment correlations and Cronbach's Alpha and the present study used only Cronbach's Alpha.

Practice

This study documents the validity and reliability of a parent-completed questionnaire for 48-, 54-, and 60-month old children. As the field continues to move toward using screening instruments for identifying children at risk for delays or disabilities, we will continue to need valid and reliable screening tools. The ASQ system has been thoroughly researched. To ensure the questionnaires maintain their sensitivity to children's abilities and keep current with the population demographics and needs, regular research is required, especially when new revisions are made.

The ASQ is useful for indentifying children quickly and can be used for universal screening. Completing and scoring the ASQ takes less than 30 minutes. With a screening tool that is easy to administer and score, many children can be identified at low cost. The ASQ can be used in universal screening situations, such as kindergarten round-ups and enrollments.

Identifying children in need of focused support (i.e., "monitor" category) or scoring below cutoff allows parents and teachers to design, select or adapt interventions that align with the child's specific needs. Results from the current study may be used to provide preliminary evidence in support of future development of scoring categories and targeted learning activities. Both parents and teachers indicated in the utility survey that they feel the learning activities would be helpful for targeting skills and successful with the child scoring in the "monitor" category. Response to the category and the learning activities was positive, which suggests further research on the effectiveness of the scoring category is warranted.

Findings from this study indicated the ASQ does an adequate job of accurately classifying children as at-risk or in need of further evaluation for eligibility status. There was a strong correlation between parent reporting across time and between parent report and professional report. These findings indicate the questionnaires are specific and reliable and assess children's performance in a straightforward manner.

The ASQ is a tool that parents and professionals can use to design and implement activities that target children's skills. Based on the utility survey, the ASQ results indicated gaps in abilities and helps pinpoint areas of needed effort. Parents and

professionals can use the ASQ to learn about skills the child has mastered, skills that are emerging, and skills the child is not yet doing.

The "monitor" scoring category can be used to emphasize areas of need for the child. When a child scores below cutoff points, further evaluation is indicated. A score in the typically developing range reflects on target development. The addition of a "monitor" category highlights those areas in which a child is not at a typically developing level, but also is not scoring below cutoff points. This scoring category can be useful for both parents and professionals in generating interventions and activities that target skills emerging or not mastered.

Future Directions

There is an increased need for screening instruments for preschool age children (McLean & Crais, 2004). This preliminary study has contributed to that need by documenting the reliability, validity, and utility of the ASQ system. To further this move in providing effective screening, future research should focus on two primary goals: 1) replicating and extending findings with large samples, and 2) examining the effectiveness of scoring categories.

Replication of this study will allow for robust results regarding reliability and validity. Larger participant samples should be used to encourage more diverse backgrounds and varying needs of the children. Replicating the study with a more even distribution of population, backgrounds, and needs would allow for greater generalization of results.

In order to address validity, more children identified or suspected of having a disability should be included. If the ASQ and the criterion measure identify a child that is "identified" prior to the study, results are strengthened. Future studies could use a subsample of children with disabilities for concurrent validity study.

Further research is needed on the effectiveness of the "monitor" scoring category. Future studies should examine the trajectory of scores for a child who scores in the "monitor" category for an area and then receives additional support and learning activities in this area. Studies using both parents and professionals would be beneficial. Future research should focus on children in the older age intervals (e.g., 48-60 months) attending a preschool program. Studies could examine the effectiveness of implementing targeted learning activities and repeated screening. Giving children a pre- and post- ASQ and monitoring their scores over time while implementing learning activities would provide valuable information for both the ASQ and help with designing and creating effective learning activities. Also, a concurrent validity and reliability study of the "monitor" scoring category would be beneficial. Similar to the current study, matching scores in the "monitor" range on the ASQ to scores on a standardized assessment that are one standard deviation above the cutoff (e.g., developmental quotient of 75).

This study examined the psychometric properties of the third edition of the Ages and Stages Questionnaires for preschool age children. Results are promising and suggest further research in the "monitor" category will be worthwhile.

APPENDIX A

CONSENT LETTERS

Letter of Consent for Parents

Dear Parents,

You are invited to participate in a research study to study a screening tool, the "Ages and Stages Questionnaires: A Parent-Completed, Child-Monitoring System (ASQ)." The purpose of this study is to find out about the reliability and validity of the screening tool. Your child was selected as a possible participant in this study because he/she is between the ages of 48 and 60 months old. In the packet there is: 1) an ASQ appropriate for your child's age, 2) a demographic form, 3) a research opportunity form to participate in phase two (green paper), 3) a consent letter (with a copy for you to keep), 5) consent to contact child's teacher (*optional* – pink paper) and 6) a self-addressed, stamped envelope for returning materials to the researcher. Please fill out all forms and consents and mail back in the self-addressed, stamped envelope. If you do not wish to participate in phase two, do not fill out or return the research opportunity form (yellow paper).

Participation in phase one involves the completion of two questionnaires and will take approximately 20 to 30 minutes. Phase two will take approximately 40 to 90 minutes and includes an additional developmental assessment. Research procedures are outlined in the table below.

Phase One	**Approximate Time**	**Location**
5. You complete: a. Demographic Form b. ASQ c. Research Opportunity Form for Phase Two	 5-10 minutes 10-15 minutes 5 minutes	Your home, on site
Phase Two		
6. A trained evaluator (research assistant from BSUs Early Childhood Studies program) administers a developmental assessment to your child with you present 7. The trained evaluator administers the ASQ with you present 8. You complete a 2nd ASQ	40-90 minutes	Your home, on site, or the Education Building on the BSU campus (your preference)

Teachers from day cares and early childhood programs will also be recruited to complete a utility and satisfaction survey for using ASQ scores to develop and implement learning activities for children. If your child attends a program, with your consent, your child's ASQ scores would be shared with the teacher. The teacher will look over the ASQ and examples of learning activities, and complete the survey. Attached is a consent form to

contact teacher. This is optional. If you do not consent to sharing scores with your child's teacher, do not fill out or return the pink paper.

Benefits: In recognition and appreciation for you and your child's participation in the two phases, you will be offered a total of $25. For participating in Phase One, you will be offered a $10 gift certificate. If you participate in Phase Two as well, you receive another $15 gift certificate. The benefits of participating in the study may include: opportunity for parent and child to participate in activities, receive information about your child's development, and contribute to a research study.
Potential risks: The potential risk or discomfort of participating in the study may include the presence of a researcher in the home and parent may feel inconvenienced.

Any information that can be identified with you or your child that is obtained in connection with this study will remain confidential and will be disclosed only with your permission. Participant identities will be kept confidential using initials and ID numbers on documents, rather than your child's real name. Confidentiality will only be broken if there is evidence of child abuse. Data collectors are required to notify the appropriate agency if child abuse is suspected.

Your participation is voluntary. Your decision whether or not to participate will not affect your relationship with the University of Oregon, Boise State University, or your child's current educational placement. If you decide to participate, you are free to withdraw your consent and discontinue participation at any time without penalty. If you have any questions, please feel free to call me at (208) 426-2807, or my faculty advisor, Dr. Jane Squires at (541) 346-2634. Your signature indicates that you have read and understand the information provided above, that you willingly agree to permit your child to participate, that you may withdraw your consent at any time and discontinue participation without penalty, and that you have received a copy of this form. If you have questions about you or your child's rights as a research participant, call the Office for Protection of Human Subjects, University of Oregon, Eugene, OR 97403, (541) 346-2510 or the Office of Research Compliance, Boise State University, Boise, ID 83725, (208) 426-1574.

Sincerely,
Juli Pool, M.S.
Jane Squires, Ph.D., Advisor

_____ I have read this consent form and agree to participate in the study.

Parent/Legal Guardian Signature _____Date _____
Parent/Legal Guardian Name (please print) _____
Child's name (please print) _____
How did you hear about the study?

- ☐ **Craigslist.com**
- ☐ **child care center**
- ☐ **Head Start**
- ☐ **Other:** _____

Letter of Consent for Teachers/Program Staff

Dear Staff,

You are invited to participate in a research study that will investigate the properties of the screening tool, the "Ages and Stages Questionnaires: A Parent-Completed, Child-Monitoring System (ASQ)." The purpose of this study is to find out about the reliability and validity of the screening tool, as well as contribute to the normative sample of a larger study. In addition, the study will examine the usefulness and utility of a "monitor" category for developing learning activities for needed skills for the child. You were selected as a possible participant in this study because you have a child in your program that is participating in the study. If you decide to participate, an ASQ completed by the child's parent will be given to you to review. You will also be given learning activities that target the areas of concern for the child. You are asked to review the ASQ and the learning activities and then fill out the utility survey. A self-addressed, stamped envelope for returning materials to the researcher will be provided.

Participation in this study involves reviewing the ASQ and learning activities and the completion of utility survey. Completion will take approximately 15-30 minutes of your time.

Benefits: In recognition and appreciation for your participation, you will be given the option of choosing some materials for your classroom (e.g., book, small toys, art supplies) or something personal for you (e.g., chocolates, gift certificate for coffee). The benefits of participating in the study may include: opportunity to participate in learning activities with a child in your program, receive information about a child's development, and contribute to a research study.

Potential risks: The potential risk or discomfort of participating in the study may include the time inconvenience of filling out a survey.

Any information that can be identified with you or the child participating that is obtained in connection with this study will remain confidential and will be disclosed only with the parent's permission. Participant identities will be kept confidential using initials and ID numbers on documents, rather than the child's real name.

Your participation is voluntary. Your decision whether or not to participate will not affect your relationship with the University of Oregon or Boise State University or the child's current educational placement. If you decide to participate, you are free to withdraw your consent and discontinue participation at any time without penalty. If you have any questions, please feel free to call me at (208) 426-2807, or my faculty advisor, Dr. Jane Squires at (541) 346-2634. Your signature indicates that you have read and understand the information provided above, that you willingly to participate, that you may withdraw

your consent at any time and discontinue participation without penalty, and that you have received a copy of this form. If you have questions about you or your child's rights as a research participant, call the Office for Protection of Human Subjects, University of Oregon, Eugene, OR 97403, (541) 346-2510 or the Office of Research Compliance, Boise State University, Boise, ID 83725, (208) 426-1574.

Sincerely,

Juli Pool, M.S.
Jane Squires, Ph.D., Advisor

_____ I have read this consent form and agree to participate in the study.

Practitioner/Program Staff Signature _____

Date _____

Consent to Contact Teacher/Program Staff

If you have a child in a day care or early childhood program, I, Juli Pool, from Boise State University's Early Childhood Studies Program, would like to show the teacher your child's ASQ scores in order for the teacher to complete a satisfaction and utility survey. The teacher would look over the child's scores and the examples of learning activities provided and then complete the survey. The survey has questions pertaining to the ease of using ASQ scores to develop and use learning activities with children in their program. This is OPTIONAL.

If you give consent for us to share your child's ASQ scores with his or her teacher, please fill out the contact information and sign.

_____ I have read this consent form and consent for my child's scores to be shared with his or her teacher

Parent Signature _____

Print Name _____

Date _____

Program name: _____

Program phone number: _____

Child's Teacher's Name: _____

APPENDIX B

RECRUITMENT

Recruitment Letter to Parents about Utility Survey

Dear ____,

____'s assessments have been scored. On the Ages and Stages Questionnaire (ASQ), __ scored in the "monitor" range in the _____ area. The purpose of the "monitor" range is to identify children that may need some help to increase their skills in developmental areas. Provided are examples of some learning activities that you can do with your child using materials in your home. The purpose of the learning activities is to support children's development and enhance their growth in the developmental area.

Enclosed I have included copies of ____'s ASQ with scores, examples of learning activities for the developmental area in the monitor range, and a utility/satisfaction survey. The survey asks questions pertaining to the ease of using the ASQ to use learning activities for the child based on their needed skills. All you need to do is look at the questionnaire scores and examples of learning activities, then complete the survey and return it to the researcher. Completion will take approximately 15-30 minutes of your time. A self-addressed, stamped envelope for returning materials to the researcher is provided.

On the developmental assessment given by Melissa on ____, ___ overall score was ___, which is within the ____ developmental range. In the individual developmental domains, or areas, ___ scored as follows:

Area/Domain	**Score**	**Range**
Adaptive *(self-care, responsibility)*		
Personal-Social *(interactions, self-concept)*		
Communication *(receptive & expressive)*		
Motor *(fine, gross, & perceptual)*		
Cognitive *(attention & memory, reasoning)*		

Your participation in completing the survey is voluntary. Your decision whether or not to participate will not affect your relationship with the University of Oregon or your child's participation in the study. If you have any questions, please feel free to call me at (208) 426-2807, or my faculty advisor, Dr. Jane Squires at (541) 346-2634. If you have questions about you or your child's rights as a research participant, call the Office for Protection of Human Subjects, University of Oregon, Eugene, OR 97403, (541) 346-2510 or the Office of Research Compliance, Boise State University, Boise, ID 83725, (208) 426-1574.

Recruitment Letter to Teachers about Utility Survey

Dear _____,

My name is Juli Pool and I am a doctoral student at the University of Oregon. I am conducting a research study for my dissertation here in Boise to learn more about the ease of using scores from the "Ages and Stages Questionnaires: A Parent-Completed, Child-Monitoring System (ASQ)" for developing and implementing learning activities for children who score in the "monitor" category. There is a child in your program, _____, who is participating in my study and scores within this range in _____.

The purpose of this study is to find out about the reliability and validity of the screening tool, as well as contribute to the normative sample of a larger study. In addition, the study will examine the usefulness and utility of the "monitor" category for developing learning activities for needed skills for the child.

Enclosed I have included copies of the consent form to contact you, _____'s ASQ with scores, _____ learning activities, and a utility/satisfaction survey. The survey asks questions pertaining to the ease of using the scores to develop and implement learning activities for the child based on their needed skills. All you need to do is look at the questionnaire scores and examples of learning activities, **then complete the survey and return it to the researcher along with this consent form**. Completion will take approximately 15-30 minutes of your time. A self-addressed, stamped envelope for returning materials to the researcher is provided. For your participation, you will be given the option of choosing some materials for your classroom (e.g., book, small toys, art supplies) or something personal for you (e.g., chocolates, gift certificate for coffee).

Benefits: In recognition and appreciation for your participation, you will be given the option of choosing some materials for your classroom (e.g., book, small toys, art supplies) or something personal for you (e.g., chocolates, gift certificate for coffee). The benefits of participating in the study may include: opportunity to participate in learning activities with a child in your program, receive information about a child's development, and contribute to a research study.

Potential risks: The potential risk or discomfort of participating in the study may include the time inconvenience of filling out a survey.

Any information that can be identified with you or the child participating that is obtained in connection with this study will remain confidential and will be disclosed only with the parent's permission. Participant identities will be kept confidential using initials and ID numbers on documents, rather than the child's real name.

Your participation is voluntary. Your decision whether or not to participate will not affect your relationship with the University of Oregon, Boise State University, or the child's

current educational placement. If you decide to participate, you are free to withdraw your consent and discontinue participation at any time without penalty. If you have any questions, please feel free to call me at (208) 426-2807, or my faculty advisor, Dr. Jane Squires at (541) 346-2634. Your signature indicates that you have read and understand the information provided above, that you willingly to participate, that you may withdraw your consent at any time and discontinue participation without penalty, and that you have received a copy of this form. If you have questions about you or your child's rights as a research participant, call the Office for Protection of Human Subjects, University of Oregon, Eugene, OR 97403, (541) 346-2510 or the Office of Research Compliance, Boise State University, Boise, ID 83725, (208) 426-1574.

Sincerely,

Juli Pool, M.S.
Jane Squires, Ph.D., Advisor

_____ I have read this consent form and agree to participate in the study.

Practitioner/Program Staff Signature _____

Date _____

For your participation, you may choose an incentive to be mailed to you:

_____ Materials for your classroom (e.g., book, small toys, art supplies)

_____ Personal item (e.g., chocolates, gift certificate for coffee)

RESEARCH OPPORTUNITY FORM FOR PHASE TWO

Do you have a child 45 to 65 months old?

Would you like to learn more about their development?

Would you like to earn an extra $15 gift certificate?

Contact Juli Pool at (208)426-2807 or by email: julipool@boisestate.edu. Fill out the form below and return it with the packet.

If you choose to participate, you will be asked to schedule a time convenient for a research assistant to come to your home (or meet on the BSU campus, your preference) and administer a developmental assessment to your child with you present. This second phase should take approximately 40 to 90 minutes. At this time, you will be asked to complete an additional ASQ or take one to fill out and return at a later date.

Parents' Name _____

Child's Name _____

My child is _____ months old.

Your contact info:

Phone: _____

Address: _____

Email address: _____

Juli Pool
Early Childhood Studies
Boise State University

Child Development Study

For children ages 4 to 5 ½ years old (or 45-65 months)

Early Intervention Program
University of Oregon
Early Childhood Studies
Boise State University

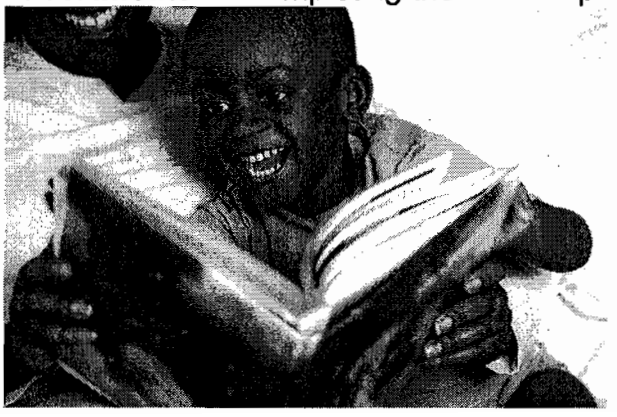
How can you help?

First, you will be asked to complete a questionnaire about your child. This questionnaire should take approximately 10-15 minutes to complete. Second, if you agree, a trained evaluator will complete a developmental assessment with your child (at your home, on site at your child's school program, or on the BSU campus). The developmental assessment may take approximately 60 minutes and will be scheduled at your convenience. At the conclusion of the study, you will be asked to complete the questionnaire again. The researcher or assistant will offer you a brief summary of your child's development at the end of the study.

What do you need to do?

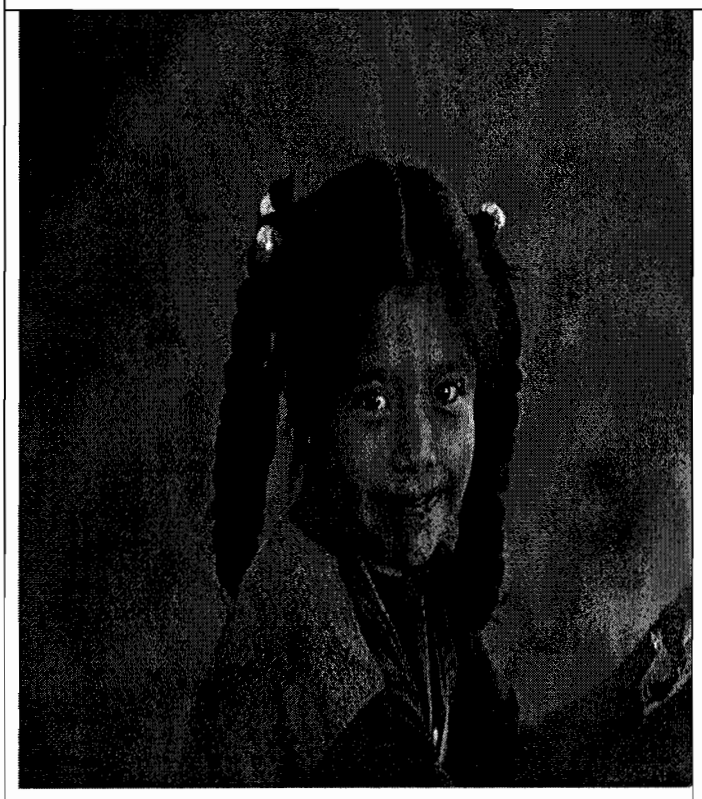
If you are interested in having your child participate, please contact Juli Pool at (208) 426-2807 or by email: julipool@boisestate.edu.

Families who participate in the first phase will receive a **$10 gift certificate** and an additional **$15 gift certificate** for completing the second phase. Thank you!



Child Development Study

Check your child's development & EARN up to $25 in gift certificates!



Parents of children 45 – 65 months old:

You are invited to participate in a research study examining a parent-completed developmental questionnaire.

Participating families will receive a $10 gift certificate for completing the first phase of the study and an additional $15 gift certificate for completing phase two.

Early Intervention Program at the University of Oregon & Boise State University

For more information or to participate, please contact Juli Pool at (208) 426-2807 or email: julipool@boisestate.edu. Thank you!

APPENDIX C

MEASURES

ASQ Family Demographic Form

Date: _____

Child's Sex (check one): 1

- ☐ Male
- ☐ Female

Child's Date of Birth: _____2
Child's Weight at Birth: _____3

Child's Developmental Status (check one): 4

- ☐ No history or indication of developmental delay or problem
- ☐ Suspected developmental delay or disability
- ☐ Identified delay or disability

Does the child receive special services? 5

- ☐ Yes
- ☐ No

If yes, what type of services does he/she receive? _____6

Child's Ethnicity (check all that apply): 7

- ☐ Hispanic/Latino
- ☐ Caucasian/White
- ☐ African American
- ☐ Asian
- ☐ Native American
- ☐ Hawaiian
- ☐ Pacific Islander
- ☐ Multi-racial
- ☐ Other:

_____

Mother's Level of Education: 8

- ☐ Middle school
- ☐ Some high school
- ☐ High school graduate
- ☐ Technical school
- ☐ Some college
- ☐ College graduate
- ☐ Post graduate

Mother's Age at Child's Birth: _____9
Family income (optional): 10
Yearly

- ☐ 0-$15,800
- ☐ $15,801-20,800
- ☐ $20,801-25,000
- ☐ $25,001-28,800
- ☐ $28,801-33,000
- ☐ $33,001-44,800
- ☐ Over $44,801
- ☐ Don't know

Number of children in household: ____11
Number of adults in household: _____12
Person answering questions: 13

- ☐ Mother
- ☐ Father
- ☐ Guardian
- ☐ Grandparent
- ☐ Other: _____

Is someone assisting with the completion of these questions? Yes ____ No ____1

Ages & Stages Questionnaires: A Parent-Completed, Child-Monitoring System
Second Edition
By Diane Bricker and Jane Squires
With assistance from Linda Mounts, LaWanda Potter, Robert Nickel, Elizabeth Twombly, and Jane Farrell

48 Month • 4 Year Questionnaire

On the following pages are questions about activities children do. Your child may have already done some of the activities described here, and there may be some your child has not begun doing yet. For each item, please check the box that tells whether your child is doing the activity regularly, sometimes, or not yet.

Important Points to Remember:

- ☑ Be sure to try each activity with your child before checking a box.
- ☑ Try to make completing this questionnaire a game that is fun for you and your child.
- ☑ Make sure your child is rested, fed, and ready to play.
- ☑ Please return this questionnaire by _____.
- ☑ If you have any questions or concerns about your child or about this questionnaire, please call: _____.
- ☑ Look forward to filling out another questionnaire in _____ months.

ASQ

Ages & Stages Questionnaires: A Parent-Completed, Child-Monitoring System
Second Edition
By Diane Bricker and Jane Squires
with assistance from Linda Mounts, LaWanda Potter, Robert Nickel, Elizabeth Twombly, and Jane Farrell

48 Month • 4 Year Questionnaire

Please provide the following information.

Child's name: _____

Child's date of birth: _____

Today's date: _____

Please complete this questionnaire on or before: _____

Person filling out this questionnaire: _____

What is your relationship to the child? _____

Your telephone: _____

Your mailing address: _____

_____

City: _____

State: _____ ZIP code: _____

List people assisting in questionnaire completion: _____

_____

Administering program or provider: _____

ASQ

	YES	SOMETIMES	NOT YET	
COMMUNICATION *Be sure to try each activity with your child.*				
1. Does your child name at least three items from a common category? For example, if you say to your child, "Tell me some things that you can eat," does your child answer with something like, "Cookies, eggs, and cereal"? Or if you say, "Tell me the names of some animals," does your child answer with something like, "Cow, dog, and elephant"?	❑	❑	❑	___
2. Does your child answer the following questions: "What do you do when you are hungry?" (Acceptable answers include: "Get food," "Eat," "Ask for something to eat," and "Have a snack.") Please write your child's response: _____ "What do you do when you are tired?" (Acceptable answers include: "Take a nap," "Rest," "Go to sleep," "Go to bed," "Lie down," and "Sit down.") Please write your child's response: _____ Mark "sometimes" if your child answers only one question.	❑	❑	❑	___
3. Does your child tell you at least two things about common objects? For example, if you say to your child, "Tell me about your ball," does he say something like, "It's round. I throw it. It's big"?	❑	❑	❑	___
4. Does your child use endings of words, such as "s," "ed," and "ing"? For example, does your child say things like, "I see two cat*s*," "I am play*ing*," or "I kick*ed* the ball"?	❑	❑	❑	___
5. Without giving help by pointing or repeating, does your child follow three directions that are unrelated to one another? For example, you may ask your child to "Clap your hands, walk to the door, and sit down."	❑	❑	❑	___
6. Does your child use all of the words in a sentence (for example, "a," "the," "am," "is," and "are") to make complete sentences, such as "I *am* going to *the* park," or "*Is* there *a* toy to play with?" or "*Are* you coming, too?"	❑	❑	❑	___
		COMMUNICATION TOTAL		___
GROSS MOTOR *Be sure to try each activity with your child.*				
1. Does your child catch a large ball with both hands? You should stand about 5 feet away and give your child two or three tries. 	❑	❑	❑	___
2. Does your child climb the rungs of a ladder of a playground slide and slide down without help?	❑	❑	❑	___
3. While standing, does your child throw a ball *overhand* in the direction of a person standing at least 6 feet away? To throw overhand, your child must raise her arm to shoulder height and throw the ball forward. (Dropping the ball, letting the ball go, or throwing the ball underhand should be scored as "not yet.") 	❑	❑	❑	___

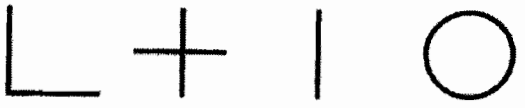
	YES	SOMETIMES	NOT YET	
GROSS MOTOR *(continued)*				
4. Does your child hop up and down on either the right or left foot at least one time without losing his balance or falling?	❑	❑	❑	___
5. Does your child jump forward a distance of 20 inches from a standing position, starting with her feet together?	❑	❑	❑	___
6. Without holding onto anything, does your child stand on one foot for at least 5 seconds without losing his balance and putting his foot down? You may give your child two or three tries before you mark the question. 	❑	❑	❑	___
		GROSS MOTOR TOTAL		___

FINE MOTOR *Be sure to try each activity with your child.*

1. Does your child put together a six-piece interlocking puzzle? (If one is not available, take a full-page picture from a magazine or catalog and cut it into six pieces. Does your child put it back together correctly?) ❑ ❑ ❑ ___

2. Using child-safe scissors, does your child cut a paper in half on a more or less straight line, making the blades go up and down? (Carefully watch your child's use of scissors for safety reasons.)  ❑ ❑ ❑ ___

3. Using the shapes below to look at, does your child copy at least three shapes onto a large piece of paper using a pencil or crayon, without tracing? Your child's drawings should look similar to the design of the shapes below, but they may be different in size. ❑ ❑ ❑ ___



4. Does your child unbutton one or more buttons? Your child may use his own clothing or a doll's clothing. ❑ ❑ ❑ ___

5. Does your child draw pictures of people that have at least three of the following features: head, eyes, nose, mouth, neck, hair, trunk, arms, hands, legs, or feet? ❑ ❑ ❑ ___

6. Does your child color mostly within the lines in a coloring book? Your child should not go more than ¼ inch outside the lines on most of the picture. ❑ ❑ ❑ ___

FINE MOTOR TOTAL ___

	YES	SOMETIMES	NOT YET	
PROBLEM SOLVING *Be sure to try each activity with your child.*				
1. When you say, "Say five eight three," does your child repeat *just* these three numbers in the correct order? *Do not repeat these numbers.* If necessary, try another series of numbers and say, "Say six nine two." Your child must repeat just one series of three numbers to answer "yes" to this question.	❑	❑	❑	___
2. When asked, "Which circle is the smallest?" does your child point to the smallest circle? Ask this question *without* providing help by pointing, gesturing, or looking at the smallest circle. 	❑	❑	❑	___
3. Without giving help by pointing, does your child follow three different directions using the words "under," "between," and "middle"? For example, ask your child to put a book "*under* the couch." Then ask her to put the ball "*between* the chairs" and the shoe "in the *middle* of the table."	❑	❑	❑	___
4. When shown an object and asked, "What color is this?" does your child name five different colors like red, blue, yellow, orange, black, white, or pink? Answer "yes" only if your child answers the question correctly using five colors.	❑	❑	❑	___
5. Does your child dress up and "play-act," pretending to be someone or something else? For example, your child may dress up in different clothes and pretend to be a mommy, daddy, brother or sister, or an imaginary animal or figure.	❑	❑	❑	___
6. If you place five objects in front of your child, can he count them saying, "One, two, three, four, five," in order? Ask this question *without* providing help by pointing, gesturing, or naming.	❑	❑	❑	___
		PROBLEM SOLVING TOTAL		___
PERSONAL-SOCIAL *Be sure to try each activity with your child.*				
1. Does your child serve herself, taking food from one container to another using utensils? For example, can your child use a large spoon to scoop applesauce from a jar into a bowl?	❑	❑	❑	___
2. Does your child tell you at least four of the following: a. First name b. Age c. City she lives in d. Last name e. Boy or girl f. Telephone number Please circle the items your child knows.	❑	❑	❑	___
3. Does your child wash his hands and face using soap and dry off with a towel without help?	❑	❑	❑	___
4. Does your child tell you the names of two or more playmates, not including brothers and sisters? Ask this question without providing help by suggesting names of playmates or friends.	❑	❑	❑	___

	YES	SOMETIMES	NOT YET	
PERSONAL-SOCIAL *(continued)*				
5. Does your child brush her teeth by putting toothpaste on the toothbrush and brushing all her teeth without help? You may still need to check and rebrush your child's teeth.	❑	❑	❑	___
6. Does your child dress or undress himself without help (except for snaps, buttons, and zippers)?	❑	❑	❑	___
			PERSONAL-SOCIAL TOTAL	___

OVERALL *Parents and providers may use the space below or the back of this sheet for additional comments.*

1. Do you think your child hears well? YES ❑ NO ❑
   If no, explain: _____
2. Do you think your child talks like other children her age? YES ❑ NO ❑
   If no, explain: _____
3. Can you understand most of what your child says? YES ❑ NO ❑
   If no, explain: _____
4. Do you think your child walks, runs, and climbs like other children his age? YES ❑ NO ❑
   If no, explain: _____
5. Does either parent have a family history of childhood deafness or hearing impairment? YES ❑ NO ❑
   If yes, explain: _____
6. Do you have any concerns about your child's vision? YES ❑ NO ❑
   If yes, explain: _____
7. Has your child had any medical problems in the last several months? YES ❑ NO ❑
   If yes, explain: _____
8. Does anything about your child worry you? YES ❑ NO ❑
   If yes, explain: _____

48 Month/4 Year ASQ Information Summary

Child's name: _____ Date of birth: _____

Person filling out the ASQ: _____ Relationship to child: _____

Mailing address: _____ City: _____ State: _____ Zip: _____

Telephone: _____ Assisting in ASQ Completion: _____

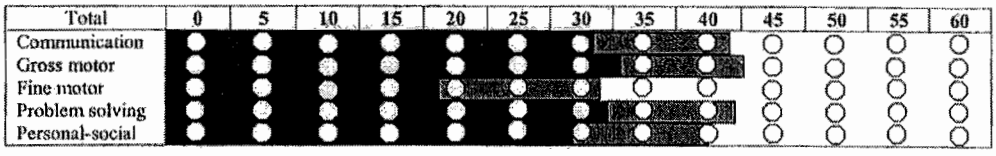
Today's date: _____

OVERALL: Please transfer the answers in the Overall section of the questionnaire by circling "yes" or "no" and reporting any comments.

1. Hears well? Comments:	YES	NO	5. Family history of hearing impairment? Comments:	YES	NO
2. Talks like other children? Comments:	YES	NO	6. Vision concerns? Comments:	YES	NO
3. Understand child? Comments:	YES	NO	7. Recent medical problems? Comments:	YES	NO
4. Walks, runs, and climbs like others? Comments:	YES	NO	8. Other concerns? Comments:	YES	NO

SCORING THE QUESTIONNAIRE

1. Be sure each item has been answered. If an item cannot be answered, refer to the ratio scoring procedure in *The ASQ User's Guide.*
2. Score each item on the questionnaire by writing the appropriate number on the line by each item answer.
   YES = 10 SOMETIMES = 5 NOT YET = 0
3. Add up the item scores for each area, and record these totals in the space provided for area totals.
4. Indicate the child's total score for each area by filling in the appropriate circle on the chart below. For example, if the total score for the Communication area was 50, fill in the circle below 50 in the first row.



Examine the blackened circles for each area above.

5. If the child's total score falls within the ☐ area, the child appears to be doing well in this area at this time.
6. If the child's total score falls within the ▒ area, provide learning activities and monitor.
7. If the child's total score falls within the ■ area, talk with a professional. The child may need further evaluation.

OPTIONAL: The specific answers to each item on the questionnaire can be recorded below on the summary chart.

	Score	Cutoff
Communication		31.9
Gross motor		33.8
Fine motor		17.4
Problem solving		32.2
Personal-social		29.3

48 months/4 years

Communication				Gross motor				Fine motor				Problem solving				Personal-social			
	Y	S	N		Y	S	N		Y	S	N		Y	S	N		Y	S	N
1	○	○	○	1	○	○	○	1	○	○	○	1	○	○	○	1	○	○	○
2	○	○	○	2	○	○	○	2	○	○	○	2	○	○	○	2	○	○	○
3	○	○	○	3	○	○	○	3	○	○	○	3	○	○	○	3	○	○	○
4	○	○	○	4	○	○	○	4	○	○	○	4	○	○	○	4	○	○	○
5	○	○	○	5	○	○	○	5	○	○	○	5	○	○	○	5	○	○	○
6	○	○	○	6	○	○	○	6	○	○	○	6	○	○	○	6	○	○	○

Administering program or provider: _____

Teacher/Program Staff ASQ Utility & Satisfaction Questionnaire

The purpose of this brief questionnaire is to get your opinions on the ease of using ASQ scores for implementing learning activities. Feel free to qualify your answers by making comments in the margins or on the back.

A. What areas were targeted for this child's learning activities? *Please check all that apply.*

Areas	✓ Learning Activity
Communication	____
Gross Motor	____
Fine Motor	____
Problem Solving	____
Personal-social	____

B. How much did reviewing the ASQ help you to identify this child's specific needs? *(Circle the number that best fits your opinion. If an item does not apply to you or if you don't know, please make a note.)*
0. Not at all
1. A little
2. Some
3. A lot

C. How much did the ASQ help you develop learning activities for this child?
0. Not at all
1. A little
2. Some
3. A lot

D. How difficult or easy are the learning activities to understand?
0. Very difficult
1. Somewhat difficult
2. Somewhat easy
3. Very easy

E. How difficult or easy do you think the learning activities will be to use?
0. Very difficult
1. Somewhat difficult
2. Somewhat easy
3. Very easy

F. Do you think the learning activities are specific enough to target skill areas?
1. Yes
2. No

G. How useful do you think the learning activities will be for focusing attention on this child's needed skills in the developmental areas?
0. Not at all useful
1. Not very useful
2. Somewhat useful
3. Very useful

H. How likely are you to use the learning activities in your program?
0. Not at all likely
1. Not very likely
2. Somewhat likely
3. Very likely

I. How effective do you think the learning activities will be?
0. Not at all effective
1. Not very effective
2. Somewhat effective
3. Very effective

J. How old is the child? _____

K. Today's date: _____

L. What is your position or title? _____

_____

M. Do you have any suggestions to make the ASQ more helpful?

Parent ASQ Utility & Satisfaction Questionnaire

The purpose of this questionnaire is to get your opinions on using the learning activities that accompany the ASQ. Feel free to make comments in the margins or on the back of the questionnaire.

N. What areas were targeted for your child's learning activities? *Please check all that apply.*

Areas	✓ Learning Activity
Communication	____
Gross Motor	____
Fine Motor	____
Problem Solving	____
Personal-social	____

O. How much did reviewing the ASQ help you to identify your child's specific needs? *(Circle the number that best fits your opinion. If an item does not apply to you or if you don't know, please make a note.)*
0. Not at all
1. A little
2. Some
3. A lot

P. How difficult or easy are the learning activities to understand?
0. Very difficult
1. Somewhat difficult
2. Somewhat easy
3. Very easy

Q. How difficult or easy are the learning activities to use?
0. Very difficult
1. Somewhat difficult
2. Somewhat easy
3. Very easy

R. Do you think the learning activities are specific enough to target skill areas?
1. Yes
2. No

S. How useful do you think the learning activities will be for focusing attention on your child's needed skills in the developmental areas?
0. Not at all useful
1. Not very useful
2. Somewhat useful
3. Very useful

T. How likely are you to use the learning activities at home?
0. Not at all likely
1. Not very likely
2. Somewhat likely
3. Very likely

U. How effective do you think the learning activities will be with your child?
0. Not at all effective
1. Not very effective
2. Somewhat effective
3. Very effective

V. How old is your child? _____

W. Today's date: _____

X. Do you have any suggestions to make the ASQ more helpful?
1. Yes →Please take a moment to list
2. No your suggestions.

APPENDIX D

MISCELLANEOUS

Communication

Activities to Help Your Child Grow and Learn

Your child's communication skills are growing and blossoming. She is learning how to have conversations with people she knows and is starting conversations as well as responding to people's questions. She is learning different parts of speech and using more complicated sentences: for example, when describing something she might say, "It was a very big brown dog." She may use very silly language and laugh at her own jokes.

Animal Guessing This is a game the whole family can play. Cut out some pictures of animals from a magazine. Turn the pictures upside down and have one person at a time choose a picture. The other people playing ask yes/no questions to guess what the animal is (e.g., "Does the animal swim?" "Is it bigger than a cat?"). When someone guesses the animal correctly, it's another person's turn to choose an animal card and let the others guess.

Bedtime Memories When it's time to go to sleep each night, have a soft talk with your child. Whisper to him, "What was your favorite thing that happened today?" Ask what else happened. Share your favorite event, too.

Reading Adventures Read to your child every day. Read slowly and with interest. Use a finger to follow the words. Stop reading at times, and encourage your child to talk about the pictures and the story. Make this a special and fun time for you and your child.

Moonbeams On a night when the moon is visible, find a place to lie down or sit outside with your child and look at the moon and stars. What do you see? Can you connect the stars to make a picture? Can you make out a face on the moon? Ponder what it would be like to be an astronaut flying into space in a rocket. What do you think it is like on the moon? What would you do there? How would you feel about being so far away from earth?

Rhymes and Rhythm While chanting or singing a nursery rhyme, have your child tap it out on a drum, the bottom of a pot, or an oatmeal box. This musical activity can be made more challenging and interesting by adding new instruments such as bells, spoons, or shakers (small plastic containers filled with beans). Have some noisy fun with friends!

At the Office Set up a little office for your child with notebooks, a toy phone, a computer keyboard, pencils and pens, a ruler, a calculator, and a calendar. Add some envelopes, paper, and stickers. Encourage her to pretend to go to work, write letters, type messages, and make notes for friends. Pretend with her; call her on the phone and ask her questions.

Ages&Stages

54–60 months

Fine Motor

Activities to Help Children

The following are activities to support children's development in the area of fine motor. These simple activities are designed to provide teachers and others with easy and quick ideas for learning games and interactions that enhance the growth and development of children. The activities can be used with a group or with the target child.

Lacing Cards	Using scissors, the child can cut out simple pictures of familiar things from magazines and glue the pictures onto cardboard. With a paper punch, punch several holes around the outside of the picture. Tie a shoestring or yarn through one of the holes. Make sure the other end of the string has tape wrapped around it to make a firm tip. The child can sew in and out around the edge of the card. For variation, have the child sew two cards together.
Portraits	Encourage the child to draw a picture of their family or friends. When he is done, ask him to tell you about his picture. You can write down what he says about his siblings, parents, pets, friends, grandparents, etc. and save his responses with the picture to share with his caregivers.
It's a Wrap	Give the child a small sturdy box, some newspaper or wrapping paper, tape, and ribbon. Let her practice wrapping the box.
Writing Area	Incorporate a writing area in your classroom. At a table, include pencils, crayons, tape, glue, envelopes, paper, magazines and scissors. Encourage children to write letters and "mail" them. Also include tracing paper. Have children trace over their names or letters. They can also cut out pictures and glue them to their letters.
Sidewalk Fun	Have children decorate the sidewalks and patios of your building with chalk drawings. Don't forge to remind them to sign their name to their picture!

Stop points on Battelle

Personal Responsibility (PR)

Months	Stop point
45-47	PR 13
48-50	PR 13
51-53	PR 14
54-56	PR 15
57-59	PR 17
60-62	PR 17
63-65	PR 18

Self-Concept/Social Role (SR)

Months	Stop point
45-47	SR 33
48-50	SR 34
51-53	SR 35
54-56	SR 35
57-59	SR 36
60-62	SR 37
63-65	SR 38

Receptive Communication (RC)

Months	Stop point
45-47	RC 27
48-50	RC 28
51-53	RC 29
54-56	RC 29
57-59	RC 30
60-62	RC 32
63-65	RC 32

Expressive Communication (EC)

Months	Stop point
45-47	EC 30
48-50	EC 32
51-53	EC 33
54-56	EC 35
57-59	EC 35
60-62	EC 36
63-65	EC 37

Perceptual Motor (PM)

Months	Stop point
45-47	PM 13
48-50	PM 13
51-53	PM 14
54-56	PM 15
57-59	PM 16
60-62	PM 17
63-65	PM 18

Reasoning & Academic Skills (RA)

Months	Stop point
45-47	RA 17
48-50	RA 18
51-53	RA 19
54-56	RA 20
57-59	RA 21
60-62	RA 23
63-65	RA 24

Perception & Concepts (PC)

Months	Stop point
45-47	PC 22
48-50	PC 25
51-53	PC 26
54-56	PC 27
57-59	PC 30
60-62	PC 32
63-65	PC 33

Start Points
36-47 months: 3 years
48-59 months: 4 years
60-71 months: 5 years

Child's age	**Use this ASQ**
45 months to 50 months	48
51 months to 56 months	54
57 months to 65 months	60

BIBLIOGRAPHY

Ackerman, D. J., & Barnett, W. S. (2005). Prepared for kindergarten: What does "readiness" mean? Retrieved January 23, 2007 from http://nieer.org/resources/policyreports/report5.pdf

Alexander, K. L., & Entwisle, D. R. (1988). Achievement in the first 2 years of school: Patterns and processes. *Monographs of the Society for Research in Child Development, 53*(2, Serial No. 218).

American Academy of Pediatrics [AAP]. (2001). Developmental surveillance and screening of infants and young children. *Pediatrics, 108*(1), 192-196.

American Academy of Pediatrics [AAP]. (2006). Identifying infants and young children with developmental disorders in the medical home: An algorithm for developmental surveillance and screening. *Pediatrics, 118*(1), 405-420.

American Educational Research Association (AERA), American Psychological Association, National Council on Measurement in Education [Joint Committee]. (1999). *Standards for educational and psychological testing.* Washington, DC: American Educational Research Association.

Arnold, D. (1997). Co-occurrence of externalizing behavior problems and emergent academic difficulties in young high-risk boys: A preliminary evaluation of patterns and mechanisms. *Journal of Applied Developmental Psychology, 18,* 317-330.

Athanasiou, M. (2007). [Review of the Battelle Developmental Inventory, 2nd Edition]. In R. A. Spies & B. S. Plake (Eds.), *The seventeenth mental measurements yearbook.* Lincoln, NE: Buros Institute of Mental Measurements.

Bailey, D. B., Jr. (2004a). Test and test development. In M. McLean, M. Wolery, & D. B. Bailey, Jr. (Eds.), *Assessing infants and preschoolers with special needs* (pp. 22-44). Upper Saddle River, NJ: Pearson Education, Inc.

Bailey, D. B., Jr. (2004b). Assessing family resources, priorities, and concerns. In M. McLean, D. B. Bailey, Jr., & M. Wolery (Eds.), *Assessing infants and preschoolers with special needs* (pp. 172-203). Upper Saddle River, NJ: Pearson Education, Inc.

Barnett, W. S. (1995). Long-term effects of early childhood programs on cognitive and school outcomes. *The Future of Children, 5*(3), 25-50.

Barnett, W. S. (2002). Early childhood education. In A. Molnar (Ed.), *School reform proposals: The research evidence* (pp. 1-26). Greenwich, CT: Information Age Publishing, Inc.

Barnett, W. S., & Belfield, C. R. (2006). Early childhood development and social mobility. *The Future of Children, 16*(2), 73-98.

Barnett, W. S., & Hustedt, J. T. (2003). Preschool: The most important grade. *Educational Leadership, 60*(7), 54-57.

Barrera, I. (1996). Thoughts on the assessment of young children whose sociocultural background is unfamiliar to the assessor. In S. J. Meisels & E. Fenichels (Eds.), *New visions for the developmental assessment of infants and young children* (pp. 69-83). Washington, DC: Zero to Three.

Barton, L R., & Spiker, D. (2007). [Review of the Battelle Developmental Inventory, 2nd Edition]. In R. A. Spies & B. S. Plake (Eds.), *The seventeenth mental measurements yearbook.* Lincoln, NE: Buros Institute of Mental Measurements.

Bayley, N. (1969). *Bayley Scales of Infant Development.* San Antonio, TX: The Psychological Corporation.

Bayley, N. (1993). *Bayley Scales of Infant Development* (2nd ed.). San Antonio, TX: The Psychological Corporation.

Blumberg, S. J., Halfon, N., & Olson, L. M. (2004). The national survey of early childhood health. *Pediatrics, 113*(6), 1899-1906.

Booth, C. L., Rose-Krasnor, L., & Rubin, K. H. (1991). Relating preschoolers' social competence and their mothers' parenting behaviors to early attachment security and high-risk status. *Journal of Social and Personal Relationships, 8*(3), 363-382.

Boyce, B. A. (2005). [Review of the Ages & Stages Questionnaires]. In R. A. Spies & B. S. Plake (Eds.), *The sixteenth mental measurements yearbook* (pp. 32-34). Lincoln, NE: Buros Institute of Mental Measurements.

Brahan, D., & Bauchner, H. (2005). Changes in reporting of race/ethnicity, socioeconomic status, gender, and age over 10 years. *Pediatrics, 115*(2), 163-166. Retrieved March 30, 2007 from http://pediatrics.aappublications.org/cgi/content/full/115/2/e163

Bredekamp, S., & Copple, C. (Eds.). (1997). *Developmentally appropriate practice in early childhood programs* (2nd ed.). Washington, DC: National Association for the Education of Young Children.

Brennan, R. L. (Ed.). (2006). *Educational measurement* (4th ed.). Westport, CT: Praeger Publishers.

Bricker, D., Squires, J., & Mounts, L. (1995). *Ages and Stages Questionnaires: A parent-completed child-monitoring system.* Baltimore: Paul Brookes.

Brigance, A. (2002). *Brigance Screens.* North Billerica, MA: Curriculum Associates, Inc.

Brinker, R. P., Frazier, W., Lancelot, B., & Norman, J. (1989). Identifying young infants from the inner city for early intervention. *Infants and Young Children, 2,* 49-58.

Bronfenbrenner, U. (1979). *Ecological systems theory.* London: Jessica Kinglsey.

Brooks-Gunn, J. (2003). Do you believe in magic? What we can expect from early childhood intervention programs. *SRC Social Policy Report, 39*(4), 3-14.

Brophy-Herb, H. E., Lee, R. E., Nievar, M. A., & Stollak, G. (2007). Preschoolers' social competence: Relations to family characteristics, teacher behaviors and classroom climate. *Journal of Applied Developmental Psychology, 28,* 134-148.

Brown, T., & Barrera, I. (1999). Enduring problems in assessment: The persistent challenges of cultural dynamics and family issues. *Infants and Young Children, 12*(1), 34-42.

Campbell, F. A., Ramey, C. T., Pungello, E., Spatling, J., & Miller-Johnson, S. (2002). Early childhood education: Young adult outcomes from the Abecedarian project. *Applied Developmental Science, 1*(6), 42-57.

Committee for Economic Development [CED]. (2006). *The economic promise of investing in high-quality preschool: Using early education to improve economic growth and the fiscal sustainability of states and the nation.* Retrieved January 25, 2007, from http://www.ced.org/docs/report/report_prek_econpromise.pdf

Cronbach, L. (1951). Coefficient alpha and the internal structure of tests. *Psychometrika, 16*(3), 297-334.

Currie, J. (2001). Early childhood education programs. *The Journal of Economic Perspectives, 15*(2), 213-238.

Danaher, J., Goode, S., & Lazara, A. (Eds.). (2007). *Part C updates* (9th ed.). Chapel Hill: The University of North Carolina, FPG Child Development Institute, National Early Childhood Technical Assistance Center.

Dawson, G., Ashman, S. B., & Carver, L. J. (2000). The role of early experience in shaping behavioral and brain development and its implications for social policy. *Development and Psychopathology, 12,* 695-712.

Delgado, C. E. F., & Scott, K. G. (2006). Comparison of referral rates for preschool children at risk for disabilities using information obtained from birth certificate records. *The Journal of Special Education, 40*(1), 28-35.

Department of Health and Human Services, Centers for Disease Control, National Center on Birth Defects and Developmental Disabilities [CDC]. (2005). Using developmental screening to improve children's health. Retrieved March 31, 2007 from http://www.cdc.gov/ncbddd/child/improve.htm

Department of Health and Human Services, Centers for Disease Control, National Center on Birth Defects and Developmental Disabilities [CDC]. (2006). Barriers to developmental screening according to Pediatricians. Retrieved March 15, 2007 from http://www.cdc.gov/ncbddd/child/documents/DSbarriersrpt.pdf

Dobrez, D., Sasso, A. L., Holl, J., Shalowitz, M., Leon, S., & Budetti, P. (2001). Estimating the cost of developmental and behavioral screening of preschool children in general pediatric practice. *Pediatrics, 108*(4), 913-922.

Dworkin, P. (1989). British and American recommendations for developmental monitoring: The role of surveillance. *Pediatrics, 84,* 1000-1010.

Entwisle, D. R., & Alexander, K. L. (1993). Entry into school: The beginning school transition and educational stratification in the United States. *Annual Review of Sociology, 19,* 401-423.

Espinosa, L. M. (2002). High-quality preschool: Why we need it and what it looks like. *Preschool Policy Matters, 1,* 1-12. Retrieved March 5, 2007 from http://nieer.org/resources/policybriefs/1.pdf

Espinosa, L. M. (2005). Curriculum and assessment considerations for young children from culturally, linguistically, and economically diverse backgrounds. *Psychology in the Schools, 42*(8), 837-853.

Farran, D. C. (2005). Developing and implementing preventive intervention programs for children at risk: Poverty as a case in point. In M. J. Guralnick (Ed.), *The developmental systems approach to early intervention* (pp. 267-304). Baltimore: Paul Brookes.

Frankenburg, W. K., & Dobbs, J.B. (1990). *Denver Developmental Screening Test II-Screening Manual.* Denver: Denver Developmental Materials.

Fumagalli, F., Molteni, R., Racagni, G., & Riva, M. A. (2007). Stress during development: Impact on neuroplasticity and relevance to psychopathology. *Progress in Neurobiology, 81,* 197-217.

Galinsky, E. (2006). *The economic benefits of high-quality early childhood programs: What makes the difference?* Washington, DC: Committee for Economic Development.

Gilliam, W. S., Meisels, S. J., & Mayes, L. C. (2005). Screening and surveillance in early intervention systems. In M. J. Guralnick (Ed.), *The developmental systems approach to early intervention* (pp. 73-98). Baltimore: Paul Brookes.

Glascoe, F. P., Foster, E. M., & Wolraich, M. L. (1997). An economic analysis of developmental detection methods. *Pediatrics, 99*(6), 830-837.

Glascoe, F. P. (1998). *Collaborating with parents: Using Parents' Evaluation of Developmental Status to detect and address developmental and behavioral problems.* Nashville, TN: Ellsworth & Vandermeer Press.

Glascoe, F. P. (2003, May). Developmental/behavioral screening: How to do it efficiently and cost effectively and why. Presentation at Institute for Leaders in CSHCN Programs Workshop. Retrieved March 8, 2007 from http://www.medicalhomeinfo.org/screening/Screen%20Materials/STEPPs-Glascoe-ILSCP-03.ppt#355,1,Developmental/Behavioral%20Screening:

Glascoe, F. P. (2005). Screening for developmental and behavioral problems. *Mental Retardation and Developmental Disabilities Research Reviews, 11,* 173-179.

Greene, W. (2006). Universal preschool: A costly but worthy goal. *Journal of Law and Education, 351* 555-563.

Greenspan, S., & Meisels, S. (1996). Toward a new vision for the developmental assessment of infants and young children. In S. Meisels & E. Fenichel (Eds.), *New visions for the developmental assessment of infants and young children* (pp.11-26). Washington, DC: Zero to Three.

Grunewald, R., & Rolnick, A. (2005, June). Early childhood development on a large scale. *The Region: Banking and Policy Issues Magazine*, Federal Reserve Bank of Minneapolis. Retrieved January 23, 2007 from http://www.minneapolisfed.org/pubs/region/05-06/ecd.cfm

Halfon, N., DuPlessis, H., & Inkelas, M. (2007). Transforming the U.S. child health system. *Health Affairs, 26I* 315- 330.

Hambleton, R. K., & Zaal, Z. N. (Eds.). (1991). *Advances in educational and psychological testing: Theory and applications. Evaluations in education and human services series.* Norwell, MA: Kluwer Academic Publishers.

Hamilton, S. (2006). Screening for developmental delay: Reliable, easy-to-use tools. Win-win solutions for children at risk and busy practitioners. *The Journal of Family Practice, 55I* 415-422.

Hart, B., & Risley, T. R. (1995). *Meaningful differences in the everyday experience of young American children.* Baltimore: Paul Brookes.

Heckman, J., Grunewald, R., & Reynolds, A. (2006). The dollars and cents of investing early: Cost-benefit analysis in early care and education. *Zero to Three, 26*(6), 10-17.

Heckman, J., & Masterov, D. V. (2007, April). *The productivity argument for investing in young children.* IZA Discussion Paper No. 2725. Retrieved on Retrieved January 15, 2007 from http://ftp.iza.org/dp2725.pdf

Hinshaw, S. P. (1992). Externalizing behavior problems and academic underachievement in childhood and adolescence: Causal relationships and underlying mechanisms. *Psychological Bulletin, 111,* 127-154.

Ireton, H. (1992). *Child Development Inventory.* Minneapolis, MN: Behavior Science Systems.

Jellinek, M. S., & Murphy, J. M. (1988). Screening for psychosocial disorders in pediatric practice. *American Journal of Diseases in Children, 142*, 1153-1157.

Karoly, L. P., Greenwood, P. W., Everingham, S. S., Houbé, J., Kilburn, M. R., Ryell, C. P., et al. (1998). *Investing in our children.* Washington, DC: RAND.

Knobloch, H., Stevens, F., & Malone, A. F. (1980). *Manual of developmental diagnosis: The administration and interpretation of the Revised Gesell and Amatruda Developmental and Neurological Examination.* New York: Harper & Row.

Ladd, G. W., & Price, J. M. (1987). Predicting childrens' social and school adjustment following the transition from preschool to kindergarten. *Child Development, 58*(5), 1168-1189.

Lazara, A., Danaher, J., & Kraus, R. (Eds.). (2007). *Section 619 profile* (15th ed.). Chapel Hill: The University of North Carolina, FPG Child Development Institute, National Early Childhood Technical Assistance Center.

Lazar, I., & Darlington, R. (1982). Lasting effects of early education: A report from the Consortium for Longitudinal Studies. *Monographs of the Society for Research in Child Development*, *47*(2-3, Serial No. 195).

Lichter, D. T., Quian, Z., & Crowley, M. L. (2006). Race and poverty: Divergent fortunes of America's children? *Focus, 24*(3), 8-16. Retrieved March 30, 2007 from http://www.irp.wisc.edu/publications/focus/pdfs/foc243b.pdf

Lipkin, P. (2006, September). Moving forward in developmental screening: Special needs: Realizing potential. *Pediatric News, 40*(9), 34.

Lloyd, D. N. (1978). Prediction of school failure from third-grade data. *Educational and Psychological Measurement, 38*(4), 1193-1200.

Lynch, E. W., & Hanson, M. J. (2004). Family diversity, assessment, and cultural competence. In M. McLean, M. Wolery, & D. B. Bailey, Jr. (Eds.), *Assessing infants and preschoolers with special needs* (3rd ed.) (pp. 71-99). Upper Saddle River, NJ: Pearson Education, Inc.

Maeroff, G. I. (2006). *Building blocks: Making children successful in the early years of school.* New York: Palgrave Macmillan.

Magnuson, K. A., & Waldfogel, J. (2005). Early childhood care and education: Effects on ethnic and racial gaps in school readiness. *The Future of Children, 15*(1), 168-196.

Mardell-Czudnowski, C., & Goldenberg, D. S. (1998). *Developmental Indicators for Assessment of Learning – 3rd Edition (DIAL – 3).* Bloomington, MN: Pearson Assessments.

McCarthy, D. (1972). *McCarthy scales of children's abilities.* San Antonio, TX: The Psychological Corporation.

McLean, M. (1999). Assessing young children for whom English is a second language. *Young Exceptional Children, 1*(3), 20-26.

McLean, M. (2004). Identification and referral. In M. McLean, M. Worley, & D. B. Bailey, Jr. (Eds.), *Assessing infants and preschoolers with special needs* (3rd ed.) (pp. 100-122). Upper Saddle River, NJ: Pearson Education, Inc.

McLean, M., & Crais, E. R. (2004). Procedural considerations in assessing infants and preschoolers with disabilities. In M. McLean, M. Worley, & D. B. Bailey, Jr. (Eds.), *Assessing infants and preschoolers with special needs* (3rd ed.) (pp. 100-122). Upper Saddle River, NJ: Pearson Education, Inc.

Mead, S. (2004, September). Open the preschool door, close the preparation gap. *Progressive Policy Institute Policy Report.* Retrieved on January 10, 2007 from http://www.ppionline.org/documents/PreK_0904.pdf

Meisels, S. J., & Atkins-Burnett, S. (2005). *Developmental screening in early childhood: A guide* (5th ed.). Washington, DC: National Association for the Education of Young Children.

Meisels, S. J., Marsden, D. B., Wiske, M. S., & Henderson, L. W. (1997). *Early Screening Inventory – Revised (ESI – R).* Lebanon, IN: Pearson Early Learning.

Meisels, S. J., & Shonkoff, J. P. (2000). Early childhood intervention: A continuing evolution. In J. P. Shonkoff & S. J. Meisels (Eds.), *Handbook of early childhood intervention* (2nd ed.) (pp. 3-31). Cambridge: Cambridge University Press.

Neisser, U. (1997). Rising scores on intelligence test. *American Scientist, 85,* 440-447.

Nelson, A. C. (2000). The neurobiological bases of early intervention. In J. P. Shonkoff & S. J. Meisels (Eds.), *Handbook of early childhood intervention* (2nd ed.) (pp. 204-229). Cambridge, UK: Cambridge University Press.

Newborg, J. (2005). *Battelle Developmental Inventory – Second edition.* Chicago: Riverside.

Newborg, J., Stock, J. R., Wnek, L., Guidubaldi, J., & Svinicki, J. (1984). *Battelle Developmental Inventory.* Chicago: Riverside.

No Child Left Behind Act (NCLB). (2002). P. L. 107-110.

Ollendick, T. H., Weist, M. D., Borden, M. G., & Greene, R. W. (1992). Sociometric status and academic, behavioral, an psychological adjustment: A five-year longitudinal study. *Journal of Consulting and Clinical Psychology, 60,* 80-87.

Paget, K. D. (1989). [Review of the Battelle Developmental Inventory]. In J. C. Conoley & J. J. Kramer (Eds.), *The tenth mental measurements yearbook* (pp. 70-72). Lincoln, NE: Buros Institute of Mental Measurements.

Pavri, S. (2001). Developmental delay or cultural difference? Developing effective Child Find practices for young children from culturally and linguistically diverse families. *Young Exceptional Children, 4*(4), 2-9.

Pavri, S., & Fowler, S. (2005). Child find, screening, and tracking: Serving culturally and linguistically diverse children and families. In S. Fowler, R. Santos, & R. Corso (Eds.), *Appropriate screening, assessment, and family information gathering* (pp. 3-22). Longmont, CO: Sopris West.

Piaget, J. (1952). *The origins of intelligence in children.* New York: International Universities Press.

Poteat, G. M. (2005). [Review of the Ages & Stages Questionnaires]. In R. A. Spies & B. S. Plake (Eds.), *The sixteenth mental measurements yearbook* (pp. 34-36). Lincoln, NE: Buros Institute of Mental Measurements.

Reynolds, A. J., Temple, J. A., Roberston, D. L., & Mann, E. A. (2002, Winter). Age 21 cost-benefit analysis of the Title I Chicago Child-Parent Centers. *Educational Evaluation and Policy Analysis, 4*(24), 267-303.

Rothbart, M. K., & Bates, J. E. (1998). Temperament. In W. Damon & N. Eisenberg (Eds.)., *Handbook of Child Psychology – Fifth Edition: Vol. 3. Social, Emotional, and Personality Development* (pp. 105-176). New York: John Wiley & Sons, Inc.

Rydz, D., Shevell, M. I., Majnemer, A., Oskoui, M. (2005). Developmental screening. *Journal of Child Neurology, 20*(1), 4-21.

Salvia, J., Ysseldyke, J. E., & Bolt, S. (2007). *Assessment in special and inclusive education.* (10th ed.) Boston: Houghton-Mifflin.

Sameroff, A. J., & Chandler, M. (1975). Reproductive risk and the continuum of caretaking casualty. In F.D. Horowitz (Ed.), *Child development research* (Vol. 4). Chicago: University of Chicago Press.

Sandall, S., McLean, M. E., & Smith, B. J. (Eds.). (2000). *DEC recommended practices in early intervention/early childhood special education.* Longmont, CO: Sopris West.

Schor, E. L. (2004). Rethinking well-child care. *Pediatrics, 114*(1), 210-216.

Schor, E. L., Abrams, M., & Shea, K. (2007). Medicaid: Health promotion and disease prevention for school readiness. *Health Affairs, 26*(2), 420-429.

Schweinhart, L. J. (2001). Getting ready for school in preschool. In B. Sornson (Ed.), *Preventing early learning failure* (pp. 110-120). Alexandria, VA: Association for Supervision and Curriculum Development.

Schweinhart, L. J., Montie, J., Xiang, Z., Barnett, W. S., Belfield, C. R., & Nores, M. (2005). *Lifetime effects: The High/Scope Perry Preschool Study through age 40.* Ypsilanti, MI: High-Scope Press.

Shields, M. K., & Behrman, R. E. (2002). Children and welfare reform: Analysis and recommendations. *The Future of Children, 12*(1), 5-26.

Shonkoff, J. P. (2003). From neurons to neighborhoods: Old and new challenges for developmental and behavioral pediatrics. *Journal of Developmental and Behavioral Pediatrics, 24*(1), 70-76.

Shonkoff, J., & Phillips, D. (2000). *From neurons to neighborhoods: The science of early childhood development.* Washington, DC: National Academy Press.

Shore, R. (1997). *Rethinking the brain: New insights into early development.* New York: Families and Work Institute.

Shrout, E. & Fleiss, J. L. (1979). Intraclass correlations: Uses in assessing rater reliability. *Psychological Bulletin, 86*(2), 420-428.

Sparrow, S. S., Balla, D., & Cicchetti, D. (1998). *The Vineland Social-Emotional Early Childhood Scales.* Circle Pines, MN: American guidance Service.

Squires, J., Bricker, D., & Potter, L. (1997). Revision of a parent-completed developmental screening tool: Ages and Stages Questionnaires. *Journal of Pediatric Psychology, 22(3),* 313-328.

Squires, J., Potter, L. & Bricker, D. (1999). *The Ages and Stages Questionnaires: A parent-completed, child-monitoring system* (2nd ed.). Baltimore: Paul Brookes.

Squires, J., & Bricker, D. (in press). *The Ages and Stages Questionnaires: A parent-completed, child-monitoring system* (3rd ed.).

Squires, J., Potter, L., Bricker, D., & Lamorey, S. (1998). Parent-completed developmental questionnaires: Effectiveness with low and middle income parents. *Early Childhood Research Quarterly, 13*(2), 345-354.

Temple, J. A., & Reynolds, A. J. (2007). Benefits and costs of investments in preschool education: Evidence from the Child-Parent Centers and related programs. *Economics of Education Review, 26,* 126-144.

Teo, A., Carlson, E., Mathieu, P. J., Egeland, B., & Sroufe, L. A. (1996). A prospective longitudinal study of psychosocial predictors of achievement. *Journal of School Psychology, 34*(3), 285-306.

Thompson, R. A. (2001). Development in the first years of life. *The Future of Children, 11*(1), 21-34.

Thorndike, R., Hagen, E., & Sattler, J. (1985). *Stanford-Binet Intelligence Scale* (4th ed.). Chicago: Riverside.

Twombly, E., & Fink, G. (2004). *Ages & Stages Learning Activities.* Baltimore: Paul Brookes.

United States Census Bureau. (2006a). Annual estimates of the population by sex, race and Hispanic or Latino origin for the United States: April 1, 2000 to July 1, 2005 (NC-EST2005-03). Retrieved March 21, 2007 from http://www.census.gov/popest/national/asrh/NC-EST2005/NC-EST2005-03.xls

United States Census Bureau. (2006). http://factfinder.census.gov/ Retrieved January 22, 2008.

U.S. Department of Education. (2001). *Twenty-fourth annual report to congress on the implementation of the Individuals with Disabilities Education Act.* Jessup, MD: ED Pubs.

U.S. Department of Education, Office of Special Education and Rehabilitative Services, Office of Special Education Programs. (2005a). *25th annual (2003) report to congress on the implementation of the Individuals with Disabilities Education Act. Volume 1.* Jessup, MD: ED Pubs.

U.S. Department of Education, Office of Special Education and Rehabilitative Services, Office of Special Education Programs. (2005b). *26th annual (2004) report to congress on the implementation of the Individuals with Disabilities Education Act. Volume 1.* Jessup, MD: ED Pubs.

Wagner, R., Torgesen, J., & Rashotte, C. (1999). *Comprehensive Test of Phonological Processing.* Austin, TX: Pro-Ed.

Wertheimer, R., Croan, T., Anderson Moore, K., & Hair, E. C. (2003). Attending kindergarten and already behind: A statistical portrait of vulnerable young children. *Child Trends Research Brief Publication # 2003-20.* Retrieved April 13, 2007 from www.childtrends.org

Wechsler, D. (2002). *The Wechsler Preschool and Primary Scale of Intelligence – 3rd Edition (WPPSI-III).* San Antonio, TX: The Psychological Corporation.

Woodcock, R. W., McGrew, K. S., & Mather, N. (2001). *The Woodcock-Johnson III Tests of Achievement.* Itasca, IL: Riverside Publishing Company.

Zimmerman, I. L., Steiner, V. G., & Pond, R. E. (2002). *The Preschool Language Scales – 4th Edition (PLS-4).* San Antonio, TX: The Psychological Corporation.