

**Screening for Developmental Delay in At-Risk Children:
Ages and Stages Questionnaire in an Adolescent Primary
Care Clinic**

by

Jordan Zelinger, M.S.Ed.

**A Doctoral Project Submitted in Partial Fulfillment of
the Requirements for the Degree of Doctor of Psychology
in the Department of Psychology**

Pace University, New York, New York

2014

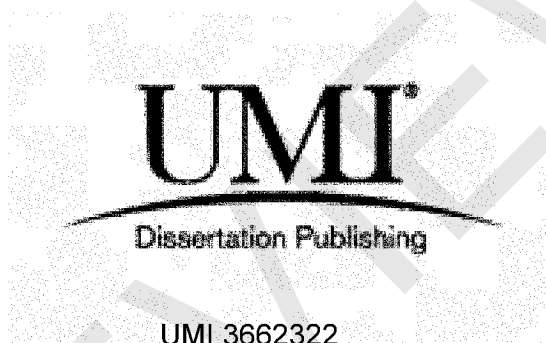
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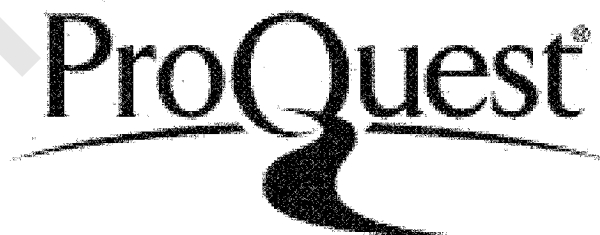
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APPROVAL PAGE
PSY.D PROJECT FINAL APPROVAL FORM

NAME: Jordan Zelinger, M.S.Ed.

TITLE OF PROJECT: Screening for Developmental Delay in At-Risk Children: Ages
and Stages Questionnaire in an Adolescent Primary Care Clinic

DOCTORAL PROJECT COMMITTEE:

PROJECT ADVISOR: Florence L. Denmark, Ph.D.
Name

Robert S. Pace, Distinguished
Research Professor Pace University
Title Affiliation

PROJECT CONSULTANT: Richard Velayo, Ph.D.
Name

Professor Pace University
Title Affiliation

FINAL APPROVAL OF COMPLETED PROJECT:

I have read the final version of the doctoral project and certify that it meets the relevant requirements for the Psy.D. degree in School-Clinical Child Psychology.

Florence L. Denmark
Project Advisor's Signature

12/5/14
Date

[Signature]
Project Consultant's Signature

12/5/14
Date

Acknowledgments

I would like to thank several people for their help that was instrumental in the completion of this project. I would like to thank Dr. Florence Denmark for her advice and feedback throughout the process of completing this project. Your advice and flexibility during difficult circumstances was very reassuring. I would like to thank Dr. Richard Velayo for his instrumental help with methodology, statistics, and practicality. You helped keep me focused on the task at hand, without your input I would likely still be working. I would also like to thank Mr. Stephen Salbod for his positive attitude and technical expertise, both of which were always welcome. I would also like to thank my family and friends for their continued support and feedback throughout.

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PREVIEW

ABSTRACT

The current study examined the rates of developmental delay and classifications made using the Ages and Stages: Third Edition (ASQ-3) at free primary care clinic geared toward the treatment of adolescents and their children in and around New York City. This sample may serve as a model for primary care clinics as they comply with the Individuals with Disabilities Education Act (IDEA) and see an influx of patients due to the Affordable Care, as many at-risk patient's and their children may now be seen by service providers. An archival data set containing scores and classifications from the ASQ-3 for 140 parent-child dyads was examined; average parental age was 20.9 years, and children ranged in age from one to 68 months. Raw scores were presented in five developmental areas (Communication, Gross Motor, Fine Motor, Problem Solving, and Personal Social) and children were classified as "below" the cutoff, in the "monitoring" area, or "above" the cutoff in each developmental area. Significant differences between all groups were found, suggesting that ASQ-3 can be used to make referrals and inform service provision. Significant differences were observed between the research and normative samples in the areas of communication, fine motor, and problem solving domains. Observed rates of children falling "below" the cutoff in this population were much greater than those observed in the general population. A total of approximately 23% of participants were "below" in at least one developmental area, rates within single developmental areas ranged from approximately 4% to 10%. These results highlight the importance of providing services to this population exhibiting high incidence of developmental delay and contribute to growing body of knowledge of at-risk populations

CHAPTER I

INTRODUCTION

The importance of early experiences and the impact on subsequent development has been a focus of research and social policy in recent years. Developments in neuroscience and biology are illustrating the impact early experiences can have upon the developing brain. The Individuals with Disabilities Education Act (IDEA) provides for children with known or suspected developmental delay to be entitled to Early Intervention (EI) services. EI is a practical and cost-effective way to ameliorate the consequence of developmental deficits and improve later outcomes. At the same time, changes to public policy providing for improved access to healthcare has highlighted the importance of intervening as early as possible in the development of children, especially within at-risk populations. The passage of the Affordable Care Act now means that there will be improved access to medical and mental health services for parents and children who might not otherwise of access to care. It has become incumbent upon professionals in many healthcare settings seeing an influx of patients to assess for developmental delay in children. In this regard, patients presenting to a free primary care clinic geared towards the treatment of adolescents and their children in New York City may serve as a prototype for patient populations that might now be treated in similar settings. Documented risk factors for developmental delay include low parental age, socioeconomic-status, parental education, race, and prematurity; the number and severity of these risk factors has been repeatedly linked to adverse outcomes. The Ages and

Stages Questionnaire: Third Edition (ASQ-3) is a cost-effective and viable ways to screen for atypical development for the children of parents who may now be presenting to primary care settings.

The research population in this study is comprised solely of adolescent parents and their children presenting to a free primary care clinic specifically designed for the treatment of adolescents in and around New York City. The population presenting to this city clinic generally faces multiple risk-factors including low maternal age, predominantly low socio-economic status, low levels of education, lack of support family and/or social support, and is predominantly composed of racial and ethnic minorities. It is important to assess the validity of classifications made by using a screening measure as these classifications are used to inform allocation and provision of services. In addition, observed rates of developmental delay using this self-report measure will be reported as it is important that specific populations be understood in greater detail as service provision is left to state and local municipalities.

CHAPTER II

LITERATURE REVIEW

Importance of Early Environment and Experiences

Environmental enrichment and neuroplasticity. In his 1949 book titled The Organization of Behavior: A Neuropsychological Theory, Donald Hebb summarized much of his research on the impact of early experiences and the environment on development. Principles he pioneered included the idea of neuroplasticity and the importance of early experiences on brain structure, as well the impact of early experiences on behavior later in life. The idea of “environmental enrichment” was described by Hebb following an informal experiment in which he brought some of his rodent subjects home. Those brought home were considered and treated as “pets”. They were eventually returned to the laboratory and their performance on mazes compared against a control group consisting of rats that were not allowed to explore an “enriched environment” and raised in cages within the laboratory. The “pet” rats outperformed those who were raised in the sterile laboratory environment initially as well as over time. Hebb believed “the richer experience of the “pet” group made them better able to profit by new experience at maturity- one of the characteristics of the ‘intelligent’ human being” (Hebb, 1947). These “pet” rats outperformed those in the control group with a noticeable gap that was observed to increase over time and be considered somewhat permanent. More recently it has been observed that environmental enrichment can lead to increase neuroplasticity within the developing brain (Baroncelli, Braschi, Spolidoro,

Begenesic, Sale, & Maffei, 2010). Environment enrichment has been seen to enhance cognitive function and reduce the impact of brain disease (Pang & Hannan, 2013).

Environmental enrichment has even been shown to ameliorate some autistic symptoms in animal models (Woo & Leon, 2013).

Another important contribution of Hebb is known as the “Hebbian synapse” which refers to the theory that synaptic connections between neurons strengthen as those neurons communicate more and more. This idea underlies the “use it or lose it” premise as connections that are used frequently become strengthened and increasingly automatic whereas connections that are not used will fizzle and fade in their automaticity as well as efficiency. As behaviors are repeated the brain structures allowing for the performance of these behaviors becomes strengthened increasing their efficacy and automaticity. This supports the idea that positive early experiences and exposure to educational activities will strengthen the capacity to learn while also increasing proficiency in the tasks learned. By early exposure and repetition it might therefore possible to improve later learning and performance on cognitive tasks, and address early deficits with remediation and special activities.

Critical periods. "Critical periods" refer to developmental period in which the presence of absence of a certain type of stimulation can result in irreversible changes in the brain (Daw, 1997). Hubel and Weisel (1962) were among the first to hypothesize the existence of critical periods and observe a direct correlation between early experiences and neural anatomy; they observed physiological changes in the brain area responsible for vision following experimental manipulation of visual input in cats. These researchers were able to alter the sensory input received by the eyes of their subjects through several

approaches and subsequently examined differences in brain structures known to be associated with visual input. They controlled visual input through surgical intervention that induced an “artificial squint” by placing of opaque barriers in front of eyes and varying the eye that was obscured, or suturing shut of the eyelids. These researchers varied their experimental manipulations in different ways, which allowed for the examination of the effects of visual deprivation at different times during the animal’s life span. Notable differences were observed in the cortical structures of the visual system between animals that were allowed unfettered access to sensory input naturally and those for which this type of information was restricted or absent. Support for the idea of critical periods comes from the observation that this sensory deprivation did not adversely impact neural structure if it occurred later in life. The major conclusions from this research lends support to earlier claims by Hebb and other researchers that early experiences do impact later development while making the contribution of “critical periods”. This ability for parts of the brain and nervous to change and adapt is referred to as “neuroplasticity” and it is early in life during these critical periods when the brain is most plastic. Experiences and stimulation during these times are crucial to take advantage of the temporary increase in neuroplasticity as the foundation for later brain structures are laid down (Amedi, Stern, Camprodon, Bermopohl, Merabet, Rotman et al., 2007; Fox, Levitt, & Nelson, 2010).

Additional support for existence of critical periods in developing children came in the form of children born with congenital cataracts. Wiesel (1982) wondered why children who had congenital cataracts present from birth surgically removed as children did not return to normal vision, whereas adults who developed cataracts later in life and had surgery often experiences full recoveries. Researchers concluded that a critical

period existed for human vision and that these children had missed crucial sensory stimulation during the critical period for development of normal vision.

Cynander and Frost (1999) concluded that in addition to vision, a similar use-dependent mechanism may be at play with regard to touch and sound. Critical periods likely exist for sound and that adequate stimulation during this period may pave the way for language development later in life. Researchers noted for example how children all over the world babble and make similar noises. All children are initially capable of making all of noises possible in human languages however through reinforcement from the environment in the form of parents and caregivers speaking their native language, children better learn how to produce commonly used sounds. The children do not practice and may even lose the ability to produce sounds not found in their language (Cynander & Frost, 1999). The loss of an ability through disuse is referred to as “pruning” as neural connections supporting these abilities are not strengthened and fizzle away.

Attachment and nurturance. In addition to adequate sensory stimulation, social involvement and comfort provided by caregivers is essential for healthy development. Harlow (1965) hoped to explore love and the primary attachment between mother and child and impact of this bond on later outcomes. In a famous experiment, monkeys were removed from their birth mothers a few hours after birth and raised by “surrogate” mothers. The “surrogate” mothers were found in two conditions; they were either made of soft terry cloth and provided no food or they were made of a wire mesh and provided food through an attached bottle. Observations showed that these infant monkeys spent significantly more time with the soft mothers even though they provided no sustenance.

In later experiments in which these monkeys were placed in a novel and stressful situation it was observed that soft mothers were sought out for comfort and security and that these mothers provided a “secure base” from which the monkeys were able to explore their environments and deal with stress. When these cloth mothers were removed the monkeys became visibly distressed and were observed to rock in place, cry, scream, and freeze up. The maternal relationship has been observed to directly impact structures of the brain that help deal emotions and reactions to danger, a positive relationship has also been linked to improved performance on cognitive tasks in animal models. Mothering types of behaviors in rats including grooming, licking of pups, nursing all had positive effects. A positive correlation was observed between these types of behaviors and development of the hippocampus and impacted presence of brain derived neural growth factors in rat pups (Liu, Diorio, Day, & Meaney, 2000).

Bradley and Colleagues (1989) assessed the impact on the home environment of developing children on their later cognitive scores. These researchers used the Home Observation for Measurement of the Environment Inventory (HOME), which is designed to assess the quality of stimulation and support available to the child within the home. Depending on the age of the child being assessed, different versions of the HOME was administered. Subscales assessed by the infant version include (a) parental responsiveness, (b) acceptance of child, which was previously referred to as avoidance of restriction and punishment, (c) organization of environment, (d) play materials, (e) parental involvement, and (f) variety of stimulation. Subscales assessed by the preschool version of the home measure were largely similar yet geared toward a slightly older child; examples include subscales related to developing language, academic skills, pride and

affection, and responsibility. High scores on the HOME were positively correlated with performance on later cognitive measures including measures of overall intelligence and developmental assessments. A quality home environment has been observed to be related to increases in later cognitive performance. This effect can be observed over and above the impact of finances, suggesting that it is more than just a plethora of toys that contributes to optimal development (Bradley, Caldwell, Rock, Ramey, Barnard, & Gray et al., 1989).

The quality of sensory information and the ability it may have to help regulate thinking and bodily functions relates largely to stress. Children raised in stressful environments may continually be in states of arousal which stimulate the sympathetic nervous system responsible for the “fight or flight” reflex. Short term activation may result in positive effects including heightened awareness and memory however chronic stress exposure has documented negative effects including reduced capacity to process new information, decreases in memory, changes in behavior, and reduction of immune system functioning (McEwen, 1998). A lack of soothing touch can make it difficult for a child to regulate their physical experiences and lead to deficits in later coping. Gunnar, Brodersen, Nachmias, Buss, and Rigatuso (1996) studied the relationship between stress and how securely attached children were with a primary caregiver. They administered the Ainsworth Strange Situation to 83 infants at 2, 4, 6, and 15 months of age during their well-baby visits and had mothers complete ratings about their children’s fearfulness. Also assessed were the infants’ cortisol levels and maternal responsiveness. Researchers found that having a secure attachment alleviated the sympathetic nervous system responses of infants classified as highly fearful, suggesting that a secure attachment can

help infants cope with stress. Maternal responsiveness was also related to attachment security suggesting that highly responsive mothers are more likely to have securely attached children. Infants and toddlers who have experienced consistent responsive and sensitive care from secure attachments with their parents appear to benefit in many ways later in life.

The consequences of failing to provide soothing and regulating experiences and adequate environmental stimulation can be seen in children who experienced neglect; Romania orphanages are notorious for the sterile and neglectful conditions in which children live and provide the basis for such comparisons. Le Mare, Audet and Kurtynik (2007) compared three groups of children adopted into Canadian families. Two groups of children who had either spent much of their previous lives in an orphanage or a brief period of time in an orphanage as an infant were compared with a third group of children who had been born in Canada and spent no time in an orphanage. Data was collected on these children after they had been living with their new family for 11 months, and again at 4.5 and 10.5 years of age. The data indicated that families raising children who had spent the most time in orphanages requested services more than any other group, with highest frequency requests for academic help, mental health care, parental support, and respite care. As the children reached school age however, those who had spent some time in the orphanages also experienced significant increases in request for services coinciding with higher rates of medical and behavioral problems observed and reported by professionals. Children who had spent several years in orphanages prior to adoption were observed to have significant differences in overall intelligence, atypical insecure attachments, and serious behavioral problems that are extremely difficult to ameliorate