# APPLICATION OF THE CUMULATIVE RISK MODEL IN PREDICTING SCHOOL READINESS IN HEAD START CHILDREN

A Dissertation

by

OLGA LYDIA RODRIGUEZ-ESCOBAR

Submitted to the Office of Graduate Studies of
Texas A&M University
in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

August 2007

Major Subject: School Psychology

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Approved by:

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ABSTRACT

Application of the Cumulative Risk Model in Predicting School Readiness in Head Start Children. (August 2007)

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Chair of Advisory Committee: Dr. Cynthia A. Riccio

This study investigates the degree to which the cumulative risk index predicted school readiness in a Head Start population. In general, the reviewed studies indicated the cumulative risk model was efficacious in predicting adverse developmental outcomes. This study built on this literature by investigating how child, parent, and family risk factors predicted school readiness in Head Start children using two statistical models. Specific aims of this study included identifying 1) to what degree multiple predictors contributed to school readiness and 2) to what degree the cumulative risk index contributed to school readiness. Participants included 176 Head Start children ages 3 to 5 years. Data were analyzed using multivariate regression to determine if the cumulative risk model was a stronger predictor of school readiness than any risk factor in isolation. Hierarchical regression was also utilized to determine if individual risk factors contributed anything above and beyond the sum, the cumulative risk index.

Multiple regression analysis revealed that older age and previous enrollment in Head Start predicted higher scores, while low income predicted lower scores, as did taking the test in Spanish. Analysis also revealed that higher scores on the cumulative risk index predicted lower test scores. The analysis revealed that the individual risk

factors did not contribute to the model above and beyond the cumulative risk index. Adding the individual risk factors did not account for more variance than using gender, age, and the cumulative risk index as the only predictors. Similarly, the cumulative risk index did not account for more variance than using age and gender as the only predictors. The current study adds empirical support to the continued use of the cumulative risk model in predicting adverse developmental outcomes.

# DEDICATION

This dissertation is dedicated to my husband Bob and my daughters, Syanne and Sidney. Their encouragement and patience throughout my entire graduate career has provided me the motivation to continue throughout this seemingly never ending endeavor. Bob, thank you for always believing in me and for assuming so many additional responsibilities to make my doctorate degree a reality—my gratitude is immeasurable. Only you and I truly know the degree to which our family sacrificed. Syanne and Sidney, on days when I felt I didn't have an ounce to continue, your boundless love and affection for "momma" was all I needed to recharge. As you recall your childhood, I hope that my love of reading and learning will be firmly shaped in your memories and encourage you to pursue your wildest dreams.

Next, this dissertation is dedicated to my parents, Jose and Olga; you have been the catalysts for my educational pursuits. Dad, my interest in psychology and my strong "child advocate gene" is mostly attributable to you. There is no greater role model of patience and absolute complete devotion to children than you. *Mami, usted a sido un ejemplo de fuerza inimaginable. Gracias por todo lo que a hecho para que nuestra familia siempre saliera adelante. Usted y papi siempre pusieron sus hijos sobre todo lo demas. Nunca lo olvidare.*

This dissertation is also dedicated to the rest of my family who have in one way or another, provided support all these years: my in-laws, my sisters and their families, my brothers and their significant others, my sister-in-law and her family, and the rest of the gang that are too many to list.

# ACKNOWLEDGMENTS

I would like to express to gratitude to my committee members, Dr. Cynthia Riccio, Dr. Michael Ash, Dr. Amanda Jensen Doss, and Dr. Christine Stanley, whose guidance and support have assisted me in finalizing this project. Also, I would like to express a special thank you to my committee chair, Dr. Riccio, for her endless support throughout the completion of this dissertation and throughout my entire doctorate program.

A special appreciation is due to the children and staff of the Brazos Valley Community Action Agency/Head Start program. Without you, this project certainly would not have been formulated and I appreciate all your efforts in serving our Head Start children with the highest standards.

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# CHAPTER I

## INTRODUCTION

On January 8, 1964, President Lyndon B. Johnson declared "War on Poverty" and called for national cooperative efforts to improve the general welfare of the poor across the nation (Guskey, 2005). A critical component of this declaration was the Economic Opportunity Act of 1964, which included several intervention programs such as Job Corps and Head Start (Malveaux, 2004). Co-founded in 1965 by pioneering child psychologist, Urie Bronfenbrenner, Head Start is a school readiness program that provides comprehensive services to low income children and their families such as education, health, nutrition, and parent involvement (Addison, 1992). These services are designed to foster the social and cognitive development of economically disadvantaged children. Significant emphasis is placed on the involvement of parents in the education of their children as well as parental educational and employment goals (Addison, 1992). Therefore, not only does Head Start aim to prepare young children for school by providing early education, but also by providing support at multiple levels in a child's environment that impact development. This integrated, multimodal intervention approach is not accidental and strongly reflects the premises of Bronfenbrenner's (1979) ecological systems theory.

The ecological systems theory (Bronfenbrenner, 1979), places the child at the center of five unique systems: microsystem, mesosystem, exosystem, macrosystem, and

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This dissertation follows the style of *American Psychologist*.

chronosystem. According to Bronfenbrenner, these systems all have the ability to directly or indirectly impact a child's development and a change in one system, positive or negative, will cause changes throughout other systems. The greatest impact to the child's development, however, is hypothesized to come from the microsystem, or an individual's immediate settings such as home and school. This view is represented in one of the key features of the Head Start program with significant emphasis placed on the engagement of parents in their children's learning as well as in the administration of the program (Addison, 1992).

If the microsystem is posited to have the most significant impact to a child, then investigations of early developmental outcomes would benefit from examining risk factors within the microsystem that comprise learning or academic achievement. This is especially true for children living in poverty, as these children tend to experience a higher number of risk factors and more unfavorable outcomes (Pungello, Kupersmidt, Burchinal & Patterson, 1996). Beginning with their first year of school, poor children are less likely to evidence school readiness, or those basic or emergent skills needed to succeed academically (Whitehurst & Lonigan, 1998). Even as they progress in grade, the number of family risk factors continues to be negatively associated with their achievement gains (U.S. Department of Education, 2004). These family risk factors include non-English primary home language, household below poverty level, mother's highest education less than a high school diploma/Graduate Equivalency Diploma (GED), and single-parent household. In general, poor children enter our educational system lacking school readiness skills that are linked with later academic performance

(Baydar, Brooks-Gunn & Furstenberg, 1993 as cited in Whitehurst & Lonigan, 1998). From an ecological perspective, practice would benefit from research efforts that investigate the relationship between multiple risk factors within the microsystem, and adverse outcomes such as inadequate school readiness skills. These investigations would be helpful in guiding intervention and prevention efforts, such as Head Start. Although research and ecological systems theory suggest multiple risk factors are likely responsible for adverse outcomes, research, in general, has not explored how the accumulation of risk factors contribute to adverse developmental outcomes (Evans, 2004). In an effort to address this need, this study will employ the cumulative risk model to examine risk factors within the microsystem, specifically, child, parent, and family risk factors, and their impact on school readiness of Head Start children.

*Cumulative Risk Model*

The basic premise of the cumulative risk model is that negative developmental outcomes are not the result of one distinct factor, but the number, or quantity, of factors taken together (Evans, 2004). Using the cumulative risk model, researchers combine the absence or presence of risks to calculate a cumulative risk index (hereafter referred to as the CRI). Each risk factor is categorized and assigned a 0 (absence of risk) or a 1 (presence of risk); the sum of the risk factors present for each individual is labeled the CRI and then used as a single predictor for the outcome of interest.

Although the cumulative risk model emphasizes quantity of risk factors, the quality of each risk factor, or the degree to which it impacts the outcome of interest, is not evaluated (Evans, 2004; Hooper, Burchinal, Roberts, Zeisel & Neebe, 1998). The

premise is that the combined effect of multiple risk factors, rather than individual risk factors, is most responsible for adverse developmental outcomes (Stanton-Chapman, Chapman, Kaiser & Hancock, 2004). While this model has not been widely tested (Hooper et al., 1998), researchers have begun to build empirical support for its use in the last quarter century. Interestingly, the cumulative risk model began to surface around the time that Bronfenbrenner (1979) proposed the ecological systems theory.

A review of the literature shows that the cumulative risk model has been used to predict a variety of early developmental outcomes such as cognitive performance, mental health, physical health, language development, social development, and academic achievement. Taken together, these studies provide empirical support for the continued use of the cumulative risk model in predicting developmental outcomes—that is, the total number of risk factors, rather than any single risk factor in isolation, can better predict negative developmental outcomes.

*Statement of the Problem and Purpose of the Study*

While results have yielded positive results for the continued use of this simplistic model, additional research is necessary to validate its utility and generalizability. Compared to the current literature base utilizing the cumulative risk model, this study is important in three ways. First, this study will add to the small body of knowledge that investigates the efficacy of the cumulative risk model. Second, this model has mostly been used to investigate the impact of multiple risk factors in populations with inherent risks (i.e., low SES); however, very few of these studies have included Head Start populations. As previously stated, children living in poverty often experience more risk

with adverse outcomes (Pungello et al., 1996) such as initial and continued unfavorable academic performance (Whitehurst & Lonigan, 1998). This study will address the ongoing necessity to study the achievement progress of poor children, specifically the school readiness of Head Start participants. Lastly, investigations of school readiness or academic achievement of Head Start children using a cumulative risk approach are almost non-existent. This study addressed this gap in the literature by testing the efficacy of the cumulative risk model in predicting school readiness in a Head Start population. In so doing, the study proposes to test the following hypotheses:

Hypothesis 1

Consistent with the cumulative risk model, it was expected that as the total number of child, parent, and family risk factors increased, performance on the school readiness measure would decrease.

Hypothesis 2

Consistent with the cumulative risk model and previous research, the cumulative risk index was expected to be a stronger predictor of school readiness than any risk factor in isolation.

Hypothesis 3

It was expected that individual risk factors would not contribute significant variance above and beyond their sum, the cumulative risk index.

*Definition of Terms*

*Ecological Systems Theory.* Introduced by Urie Bronfenbrenner (1979), the ecological systems theory places the child at the center of five unique systems:

microsystem, mesosystem, exosystem, macrosystem, and chronosystem. These systems all have the ability to directly or indirectly impact a child's development and a change in one system, positive or negative, will cause changes throughout other systems. The greatest impact, however, is hypothesized to come from the microsystem, or an individual's immediate settings such as home and school.

*Cumulative Risk Model.* The cumulative risk model posits that negative developmental outcomes are not the result of one distinct factor, but multiple risk factors. The greater the number of risk factors, the more likely an individual will experience negative developmental outcomes. With this model each factor is assigned a 0 (absence of risk) or a 1 (presence of risk); the sum is then used to predict the outcome measure of interest. The contribution or weight of any particular risk factor is not evaluated.

*Cumulative Risk Index.* Each risk factor is assigned a 0 (absence of risk) or a 1 (presence of risk); the sum of the risk factors present for each individual is known as the cumulative risk index. The cumulative risk index is then used as a single predictor for the outcome of interest.

# CHAPTER II

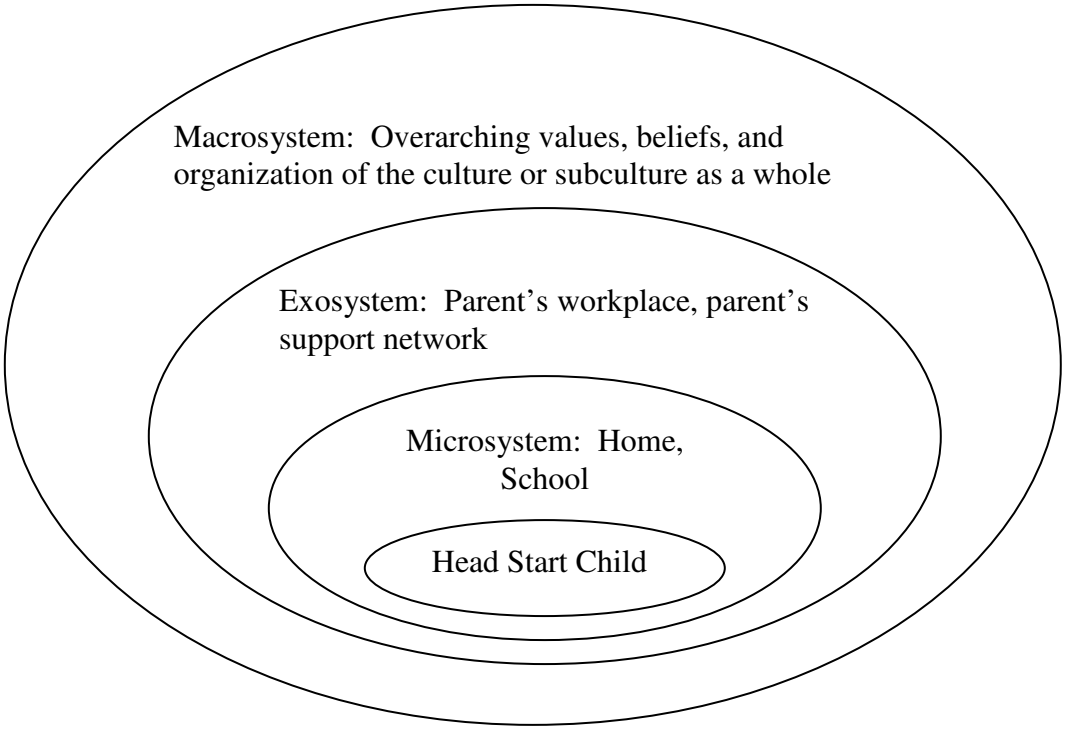
# REVIEW OF THE RELATED LITERATURE

This chapter provides a rationale for investigating the efficacy of the cumulative risk model in predicting school readiness for a Head Start population. First, a theoretical framework for this study is provided. Second, the areas of risk that are being considered to impact school readiness or academic achievement in the current population are examined. Specifically, these risks include: minority status, family income, family size, father absence, previous enrollment in Head Start, and child language. Third, an overview of the cumulative risk model along with a review of the literature highlighting the efficacy of the cumulative risk in predicting developmental outcomes of Head Start children is presented. Lastly, the statement of the problem and the research questions for this study are provided.

## *Ecological Systems Theory*

Utilizing the ecological systems theory as a framework for this study, the preschool child is at the center of five unique systems: microsystem, mesosystem, exosystem, macrosystem, and chronosystem (see Figure 1). These systems all have the ability to directly or indirectly impact a child's development and a change in one system, positive or negative, will cause changes throughout other systems. Bronfenbrenner believed that the greatest impact to a child's development comes from the microsystem, or an individual's immediate settings such as home and school (Bronfenbrenner, 1979).

Figure 1
An ecological model of child and family risk factors for the Head Start child




The macrosystem refers to the interrelations between two microsystems.
The chronosystem refers to the dimension of time.

The first system, the microsystem, refers to the immediate setting in which a child is developing such as the home or school. Of particular interest within these settings are the activities the child engages in, the roles that the child is expected to fulfill, and the interpersonal relations that the child experiences. Aspects of these immediate settings that have meaning to the child are proposed to have the greatest impact on the development of the child (Bronfenbrenner, 1979). For example, the

relationships a child has with his parents or his Head Start teachers would be expected to have the most powerful impact on his development.

The mesosystem refers to the interrelations between two or more microsystems in which the child actively participates such as relations between home and school. The connections between these microsystems are just as important as the events taking place within each microsystem (Bronfenbrenner, 1979). For instance, a child may benefit not only from having a positive relationship with his teacher, but also from his school having accurate knowledge and positive attitudes about his home setting.

The exosystem includes one or more settings in which the child does not actively participate, but which contains events that have direct and powerful impacts on the development of the child (e.g., parent's workplace, parent's support network; Bronfenbrenner, 1979). For example, loss of parent employment will impact how basic needs are met for the family and the child. Similarly, changes in federal funding that reduce the number of Head Start support staff will impact how academic services are delivered in the classroom and thus impact the child.

The macrosystem includes the overarching values, beliefs, and organization of the culture or subculture as a whole. The macrosystem includes the micro-, meso-, and exosystems characteristic of a given society or group (Bronfenbrenner, 1979). For example, the United States educational system is predominantly organized so that children spend much of their day at school and receive most of their academic instruction from their school teachers. Another example is the valued traditional family with two heterogeneous parents over the single parent household.

The last system, the chronosystem, accounts for the dimension of time. With this system, Bronfenbrenner (2005) proposed that the child's development must always be considered in relation to time. Time not only matures the child physically, but also provides experiences that influence overall development. More specifically, these experiences can originate within the child (e.g., illness, growth), in the external environment (e.g., divorce), are normative (e.g., school entry/Head Start entry), or are non-normative (e.g., death of a parent). Regardless of their origin, these events are believed to impact the relation between the child, the environment, and prompt developmental change (Bronfenbrenner, 2005).

In sum, the ecological systems theory places an individual at the center of five distinct, but interacting systems, which continuously impact development across time with the most significant impact stemming from an individual's immediate settings. Based on this theory, investigations of child developmental outcomes would benefit from examining multiple factors within the microsystem. In regard to school readiness, a better understanding of risk factors within the microsystem is necessary to inform prevention and intervention efforts such as Head Start. Since risk factors typically do not occur in isolation, this ecological systems theory provides a suitable framework to assess multiple risk factors within multiple settings.

*Risk Factors Related to Academic Achievement*

In 2006, the National Center for Children in Poverty reported that the number of children living in families with incomes below the poverty level was 13 million, which is $20,000 for a family of four (Fass & Cauthen, 2006). Official poverty rates were highest

for young children. Forty-two percent of children under age 6 years live in low-income families and experience negative impacts across multiple domains including health, housing, and education. Economic deprivation affects overall childhood development (Duncan, Brooks-Gunn & Klebanov, 1994; Korenman, Miller & Sjaastad, 1995). In regard to education, socioeconomic status (SES) is viewed as one of the most widely used variables in education research (Sirin, 2005). Children living in poverty exhibit significant achievement gaps that are evident upon school entry and continue to persist throughout their schooling (Whitehurst & Lonigan, 1998). When poor children enter the school system, they are less likely to have attended a preschool development program that provides them with school readiness skills. Also, throughout their schooling, they are more likely to attend under-funded schools (Sirin, 2005) and thus continually lack knowledge, resources, and skills needed to succeed academically.

Not only is SES related to academic achievement, but it is also indirectly linked through race as minority children are more likely to live in a low-income household or single-parent families, have less educated parents, and attend under-funded schools (Sirin, 2005). Additionally, the stress of chronic economic hardship is likely to diminish positive parent responsiveness and thus the overall quality and opportunity for learning at home (Jackson, 2003). In the most recent long-term trend assessment (Perie, Moran, & Lutkus, 2005), children of color across the nation were consistently outperformed by their White peers in both reading and math across a thirty-three year time span. Though achievement gaps have shortened from 1971 to 2004, Black and Hispanic students remain considerably behind.

Another risk factor hypothesized to impact school readiness in this study's population is family size. Family size has consistently been negatively associated with academic outcomes; as the number of siblings increases, academic outcomes are jeopardized (Downey, 1995). A theory used to explain this association is the resource dilution model (Blake, 1981 as cited in Downey, 1995). The resource dilution model simply proposes that academic outcomes are vulnerable to family size because parental resources are diluted. The more children in a family, the less parental resources they each receive, such as parental attention and teaching. Thus, opportunities for learning are reduced which in turn compromise academic achievement.

Father absence is also expected to impact school readiness. Consistent with the resource dilution model, the academic achievement of children raised by single-mothers is also negatively impacted due to a limited availability of resources (Horowitz & Souza, 2004). In regard to the risk factors being considered for this study, father absence is considered a risk primarily because of the expected decrease in parental warmth and quality of parent-child relationships by both the mother and the father. However, monetary resources are almost always expected to decrease with the absence of the father.

Further, children who enter school speaking a language other than English are faced with the overwhelming task of simultaneously learning English and basic skills needed for academic success. Hispanic students, in particular, face additional challenges. Not only do Hispanic students often enter the school with the "strikes" of economic, race, and language disadvantage, but also they are less likely to have

participated in preschool programs (U.S. Department of Education, 2006), which further increases their risk for poor academic achievement. Nichols, Rupley, & Rickelman (2004) found that students with little or no preschool experience, from low SES families, and of Hispanic origin were at greatest risk for not developing beginning reading skills. In terms of school readiness, it appears that Spanish speaking Hispanic students are the most disadvantaged when we consider additional "strikes", their often uneducated parents with a tendency to desire large numbers of children (Unger, 1997).

Last, given that the academic performance of poor minority children is consistently unfavorable and that these children often carry multiple risks, enrollment in preschool programs prior to kindergarten entry is critical. Early intervention has been found to have positive, long-term effects on cognitive and academic development (Campbell, Pungello, Miller-Johnson, Burchinal, & Ramey, 2001; Ramey, Campbell, Burchinal, Skinner, Gardner, & Ramey, 2000). Also, academic gains have been found to be larger and longer lasting among high-risk populations (Magnuson, Ruhm, & Waldfogel, 2007). Additional benefits include reduced special education placement and grade retention (Ramey & Ramey, 2004).

Thus, the risk factors explored in this study include SES, minority status, family size, father absence, child language, and previous enrollment in Head Start. These risk factors are considered to impact school readiness and generally do not occur in isolation. However, research typically examines the relationships between singular risk factors and negative developmental outcomes (Stanton-Chapman et al., 2004). Only limited studies have examined the effects of the quantity of risk factors on academic outcomes. In an

effort to address this need, this study will employ the cumulative risk model to examine risk factors within the microsystem, specifically, child, parent, and family risk factors, and their impact on the school readiness of a Head Start population.

*Overview of the Cumulative Risk Model*

When a dependent variable is predicted from two or more independent variables, the most commonly used statistical method is multiple regression (Glass & Hopkins, 1996). A relatively new, but related approach is the cumulative risk model and is gaining popularity in predictions of negative developmental outcomes. The basic premise of the cumulative risk model is that negative developmental outcomes are not the result of one distinct factor, but the accumulation or number of factors. Using the cumulative risk model, researchers combine the absence or presence of multiple risk factors to calculate a cumulative risk index, which is then used as a single predictor for the outcome of interest. The cumulative risk index differs from univariate regression in that the cumulative risk index is an artificial union of the multiple predictors. The cumulative risk approach does not refer to a multiple regression analysis where some dependent measure is predicted from two or more independent variables. With multiple regression analyses, each predictor is weighed and combined in a way that most accurately predicts the independent variable (Glass & Hopkins, 1996). In contrast, the cumulative risk model does not weigh the independent variable. In fact, once independent variables are categorized, they contribute to their sum (i.e., the cumulative risk index) with equal weight.

A major advantage of the cumulative risk model is its simplicity (Burchinal, Roberts, Hooper & Zeisel, 2000). Collapsing multiple variables into a single predictor is especially useful when statistical power is limited due to a large number of predictor variables with a small sample size (Gutman, Sameroff & Cole, 2003). Another benefit is the relative ease of transferring results into graphic representation (Sameroff, Seifer, Baldwin & Baldwin, 1993).

On the other hand, the cumulative risk model also has its disadvantages. One drawback is that aggregation of the risk factors leads to loss of predictive power (Sameroff et al., 1993); when formulating the cumulative risk index, all variables are dichotomized and their contribution, if any, to their sum, is equalized (Corapci, 2005). Moreover, studies utilizing the cumulative risk model are more susceptible to the influence of the regression effect as this phenomenon frequently occurs in investigations of atypical populations (Glass & Hopkins, 1996). Most importantly, the cumulative risk model lacks specificity (Kendall-Grove, 1997; Krishnakumar & Black, 2002). While the model indicates that an increase in risk factors will likely result in an increase of adverse outcomes, the model fails to specify which factor accounts for the most variance; thus, prevention and intervention efforts as less informed. This may be a reason why relatively few studies have utilized this model in developmental prediction. Nonetheless, although the cumulative risk model has not been widely tested (Hooper et al., 1998), researchers have begun to build empirical evidence for its use for the last quarter century.

*Empirical Support for the Cumulative Risk Model*

The premise that negative developmental outcomes are more closely associated to the number of risk factors and not any particular risk factor is often credited to Sameroff, Seifer, Barocas, Zax, and Greenspan (1987); however, Sameroff et al. (1993) credited the pioneering efforts to Parmelee and Haber (1973) in their predictions of early cognition from health and physical risk factors. Nonetheless, studies utilizing the cumulative risk model have continued to gain popularity and often include investigations of mental health as well as cognitive outcomes of children (Sameroff et al., 1993).

Early studies utilizing the cumulative risk model explored the relation between biological risk factors and intelligence (Broman, Nichols & Kennedy, 1975; Field, Hallock, Ting, Dempsey, Dabiri & Shuman, 1978; Parmelee & Haber, 1973) as well as family risk factors and psychiatric disorders (Rutter, 1979). Sameroff and colleagues conducted a longitudinal study relating social and family risk factors with cognitive performance (Sameroff et al., 1993). Investigations of behavioral disorders have also been of interest (Buikhuisen, 1982; Jones, Forehand, Brody & Armistead, 2002; Mathijssen, Koot, Verhulst, De Bruyn, & Oud, 1998; Montanez, 2002; Williams, Anderson, McGee & Silva, 1990). More recent studies have continued to express interest in predicting cognition as well as language development (Burchinal et al., 2000; Hooper et al., 1998; Kerr, Black & Krishnakumar, 2000; Nair, Shuler, Black, Kettinger, & Harrington, 2003; Stanton-Chapman et al., 2004) and to investigate mental health outcomes (Corapci, Smith & Lozoff, 2006; Kaslow, Thompson, Brooks & Twomey, 2000; Kendall-Grove, 1997; Mackner, Starr & Black, 1997). Less common, but

valuable investigations have also examined the sexual behavior of adolescents (Miller, Forehand, & Kotchick, 2000), the social competence of preschool children (Corapci, 2005; Loutzenhiser, 2002), and the quality of parent-child interactions (Motz, 2003).

As a whole, the current literature has yielded positive results for the continued use of the cumulative risk model; that is, as risk factors increase, outcomes are compromised. Nonetheless, investigations utilizing this single predictor model are limited and additional research is necessary to validate its utility and generalizability. Moreover, this model has mostly been used to investigate the impact of multiple risk factors in populations with inherent risks (i.e., low SES); however, very few of these studies have included Head Start populations. Specifically, investigations of school readiness or academic achievement of Head Start children using a cumulative risk approach are almost non-existent. The remainder of this chapter focuses on research studies that have used the cumulative risk model to predict school readiness or school achievement in Head Start populations.

The 1993 National Household Education Survey (U. S. Department of Education, 1995) investigated the school readiness of 4,423 children from ages 3 to 5 who had not yet attended kindergarten; specifically, the study focused on 2,000 four year olds who were 6 months away from beginning kindergarten. Phone interviews were conducted and gathered information from parents about their children and five family risk factors. Risk factors included 1) mother has less than a high school education, 2) the family is below the official poverty line, 3) the mother speaks a language other than English as her main language, 4) the mother was unmarried at the time of the child's birth, and 5) child

lives in single-parent household. These five risk factors were correlated with children's emerging literacy and numeracy, fine and gross motor skills, general health, social emotional development, and speech development. Results indicated that four year old children who had attended a center-based program, such as Head Start, outperformed children who had not attended any center-based program on all outcome measures. The cumulative risk index was related to four of the five outcome measures with the strongest negative relation to emerging literacy and numeracy; however, the cumulative risk model was not as effective in accounting for variations as the multiple regression model. Results indicated that low maternal education and language status were the most detrimental to emerging literacy and general health (U. S. Department of Education, 1995).

The Early Childhood Study (Henry, Henderson, Ponder, Gordon, Mashburn & Richman, 2003) compared the school readiness of 514 Georgia preschool children participating in Head Start (age 4 years; n=102), pre-kindergarten, and private preschool across the state. Parent and teacher ratings, observations, and direct assessments were used to measure language and communication skills, cognitive development, health/physical well being, and social and emotional development. The cumulative risk index was generated to compare the degree of risk across programs. Four family characteristics were considered to measure risk: 1) mother's level of education, 2) parent participation in school, 3) family receives benefits such as food stamps, Medicaid, welfare, or Peachcare, and 4) child lived with both parents since birth. Results indicated that Head Start children typically experienced the highest number of risks (1.7)

compared to those in Georgia's Pre-K (0.76) and those in private school (0.48). Head Start children were also consistently outperformed in all four outcome areas by children attending pre-kindergarten and private preschool. Analyses estimating the predictive power of risk factors or number of risks were not computed; however, the study was more descriptive in nature and focused on the effectiveness and outcomes of Georgia's Pre-K programs as opposed to the impact of risk factors on school readiness.

Ackerman, Brown, and Izard (2004) conducted a longitudinal study examining the relations between contextual risks, academic competence, and externalizing behavior. About 150 children were followed from Head Start to fifth grade. Risk factors included: 1) income-to-means ratio, 2) number of family moves, 3) parent-child relationship, 4) number of parent police contacts, 5) substance abuse, and 6) psychiatric morbidity. Academic competence was not assessed directly, but measured as reported by teachers on an academic competence rating scale. Results indicated that instability in family income was most predictive of academic ratings especially in the early grades. As a whole, the contextual risk index consistently predicted externalizing behavior across grade levels. Although school readiness was not specifically assessed, this study highlights the negative impact and persistence of risk factors in Head Start children.

Burchinal, Roberts, Zeisel and Hooper (2006) followed 75 African American children who previously attended Head Start from kindergarten through third grade. In this study, social risk factors and protective factors were used to investigate academic and social skills. Family and social risk factors included: 1) poverty, 2) father absent in household, 3) large household size, 4) low maternal education, 5) high maternal

depression, and 6) high life stress. Protective factors included quality of home, maternal teaching style, child care/classroom quality, and child language skills. Results indicated that the number of risk factors was related to adverse academic performance and social skills upon entry to school and throughout the early elementary years; however, responsive and stimulating parenting, higher quality classrooms, and better language skills were found to mediate the negative impacts of risk factors on both academic and social skills (Burchinal et al., 2006).

Thus far, the reviewed studies show that the cumulative risk model has been promising in predicting negative academic outcomes in Head Start children. This population was more likely to experience a higher number of risks (Henry et al., 2003; U. S. Department of Education, 1995). These risks were predictive of initial and persistent negative academic outcomes and were also predictive of externalizing behaviors (Ackerman et al., 2004; Burchinal et al., 2006). Similar results have been found in children from low-income families, but not necessarily Head Start participants. Gutman et al. (2003) investigated the effects of early risk and protective factors on later academic outcomes of a low-income group. Results indicated that the number of risks was predictive of poor academic outcomes during first and twelfth grade. The grade point average (GPA) and number of absences during first and twelfth grades were examined in a sample of 145 children from the Rochester Longitudinal Study (Sameroff et al., 1987). Protective factors were child intelligence and mental health at age 4. Risk factors were measured at age 4 and included: 1) disadvantage minority group status, 2) occupation of head of household, 3) maternal education, 4) family size, 5) father

absence, 6) stressful life events, 7) parental perspectives, 8) maternal anxiety, 9) maternal mental health, and 10) negative mother-child interaction. Results indicated that an increase in risk factors negatively impacted GPA and absences at both time points. Even high intelligence and better mental health did not offer sufficient protective effects for students experiencing a high number of risk factors. The Gutman et al. study supports findings from other studies that children from low income families continually experience higher number of risk factors that compromise initial and subsequent academic performance (Ackerman et al., 2004; Burchinal et al., 2006; Pungello et al., 1996).

Lastly, other cumulative risk model studies that included Head Start children were found, but the studies investigated the impact of risk factors on social emotional competence (Corapci, 2005; Loutzenhiser, 2002). Corapci (2005) found that the cumulative risk index was significantly and negatively correlated with social competence. Risk and protective factors were investigated to determine their relation to the social competence of 113 preschoolers while they were enrolled in Head Start. Risk factors for this study included: 1) ethnic status, 2) living situation/single parent household, 3) caregiver's educational level, 4) employment status of caregivers, 5) family crowding, 6) residential mobility, 7) was home chaos, 8) maternal efficacy feelings, 9) inhibited child temperament, and 10) impulsive child temperament. Also, maternal efficacy and child temperament were tested as protective factors. Results showed that as the number of risk factors increased, ratings of social competence decreased. This was also found even for children with less inhibited and less impulsive

child temperament as well as for children whose mothers reported higher level of parenting efficacy. Correlations between social competence and independent risk variables indicated that children with bigger families and those living with only one caregiver were rated as more aggressive.

Loutzenhiser (2002) indicated contrary results and found that the cumulative risk index was not predictive of social competence in a sample of 25 Head Start children. Risk was assessed in the following ten family factors: 1) parent educational level, 2) parent occupation, 3) family income, 4) minority status, 5) family size, 6) availability of family resources, 7) availability of family social support, 8) maternal depression, 9) the occurrence of stressful life events, and 10) minority status. Contrary to the investigator's expectations, the cumulative risk index was not found to be predictive of social competence. Also, only maternal depression and family social support were correlated with social competence. One explanation offered by the investigator is the possibility that parents may have underreported risks, as almost half of the families reported no risk at all. Based on previous research, Loutzenhiser (2002) expected for this high-risk population to experience more risk.

*Statement of the Problem*

Thus, based on the review of the literature, there is a small body of knowledge that investigates the efficacy of the cumulative risk model with low-income preschool children in relation to academic readiness. This model has mostly been used to investigate the impact of multiple risk factors in populations with inherent risks (i.e., low SES); however, very few of these studies have included Head Start populations. Also,

investigations of school readiness or academic achievement of Head Start children using a cumulative risk approach are almost non-existent. This study addresses this gap in the literature by testing the efficacy of the cumulative risk model in predicting school readiness in a Head Start population.

*Purpose of the Study*

The purpose of this study was to examine the utility of the cumulative risk model in predicting school readiness in a Head Start population. Given that children from low-income families are more likely to experience multiple risk factors and subsequent unfavorable academic performance, an important component of this study was to investigate the value of the cumulative risk model in predicting school readiness. Also, in an effort to inform early interventions, this study investigated the degree to which child, parent, and family risk factors predicted school readiness.

*Research Questions*

The present study was designed to a) investigate the efficacy of the cumulative risk model in predicting school readiness in Head Start children, b) compare the predictive power of the cumulative risk index with the individual risk factors, and c) to explore if individual risk factors contribute anything above and beyond their sum, as represented by the cumulative risk index. Thus, the following research questions were developed:

Research Question 1

Using a multiple regression analysis, to what degree do child, parent, and family risk factors predict school readiness as measured by the Total Score on the Fall Speed

DIAL? It was hypothesized that family income and language status would be most predictive of school readiness.

Research Question 2

When compared to a multiple regression analysis, is the cumulative risk index as good as or a stronger predictor of school readiness as measured by the Total Score on the Fall Speed DIAL? Consistent with the cumulative risk model and previous research, the cumulative risk index was expected to be a stronger predictor of school readiness than any risk factor in isolation.

Research Question 3

Using hierarchical regression, do individual risk factors contribute significant variance above and beyond their sum, the cumulative risk index? It was expected that individual risk factors would not contribute significant variance above and beyond their sum, the cumulative risk index.

# CHAPTER III

# METHODOLOGY

This chapter provides details of the research study. First, a description of the participants in this study is provided. Second, an overview of instruments used, analysis procedures and variables of interest are presented.

## *Participants*

Participants included 176 children previously enrolled in one of six center-based Brazos Valley Community Action Agency (BVCAA) Head Start programs during the fall of 2005. Per federal mandates (PL 107-110, 2001), all BVCAA Head Start children are administered a developmental screener, the Speed Developmental Indicators for the Assessment of Learning (Speed DIAL; Mardell-Czudnowski & Goldberg, 1998), within the first 45 days of their enrollment. Only those children who entered one of six center-based BVCAA Head Start programs, enrolled no later than September 1, 2005, and were administered the Speed DIAL within 45 days of their enrollment were included in the present study. Of the 495 students who were enrolled during the 2005-2006 school year, 309 (62%) were screened out because they did not meet the inclusion criteria. Thus, 186 children met inclusion criteria; however, of these 186 children, ten were not included in the analyses because there was no demographic or risk information collected for these children. Independent samples t tests showed that removed children and included children were not statistically different in age or test score ($p > .05$). Therefore, analyses were conducted on 176 children.

Of the 176 children who participated in this study, 65 (36.9%) were 3 years of age, 108 (61.4%), were 4 years, and 3 (1.7%) were 5; the mean age of the sample was 4. For the sample, 48.3% of the children were female and 51.7% were males. Ethnic distribution was 42.6% African American, 46.6% Hispanic, and 10.2% Caucasian. Of the participants, 144 (81.8%) of the children were administered the Speed Dial in English and 32 were administered in Spanish. All the families reported English or Spanish as the first language. No children were reported to have a language other than Spanish as their first language. Finally, 40 (22.7%) were previously enrolled in Head Start or another childhood development program (see Table 1).

*Instruments*

The Speed DIAL (Mardell-Czudnowski & Goldberg, 1998), used to measure school readiness, is a shortened version of the Developmental Indicators for the Assessment of Learning, Third Edition (DIAL-3; Mardell-Czudnowski & Goldberg, 1998). Both the DIAL-3 and the Speed DIAL can be administered in English and Spanish. The DIAL-3 screens children ages 3-0 through 6-11 in five areas: motor, language, concepts, self-help, and social development. The Speed DIAL content includes ten items taken from the motor, concepts, and language areas of the DIAL-3. The motor area assesses gross and fine motor development, the concepts area assesses knowledge of basic concepts such as naming colors, and the language area assesses the child's use of expressive and receptive language. With each of the ten items on the Speed DIAL, the child earns an item raw score, which is then converted into an item scaled score. These scaled scores are a functional 5-point scale, with 0 as the lowest and

4 as the highest. The scaled score for the three areas are summed to obtain the Speed DIAL Total Score. Speed DIAL Total Scores can be converted to percentile ranks or standard scores (mean = 100, *SD* = 15). Results of the Speed DIAL can be used to determine if the child requires further assessment ("Potential Delay") or appears to be developing satisfactorily ("OK").

Psychometric data on the Speed DIAL is not available; a separate technical manual specific to the Speed DIAL is nonexistent. The Technical Manual for the DIAL-3 (Mardell-Czudnowski & Goldberg, 1998) does not include psychometric data for the Speed DIAL; however, it does include technical information on the DIAL-3. For example, convergent validity for the DIAL-3 Total range from .53 correlation with the Brigance Preschool Screen (Brigance, 1985) to .79 correlation with the General Conceptual Ability composite score on the Different Ability Scales (Elliot, 1990). Also, Gonzales, Pizzitola, Team, and Ash (2002) obtained statistically significant test-reliability coefficients with the BVCAA Head Start population ($r = 0.82$, $p < .01$). The Speed DIAL Total Score is also strongly correlated with the DIAL-3 Total Score ($r = 0.94$, $p < .01$) (Mardell-Czudnowski & Goldberg, 1998).

Table 1

*Demographic Characteristics of the Child (N = 176)*

| | Frequency | % |
|---|---|---|
| Gender | | |
| Male | 91 | 51.7 |
| Female | 85 | 48.3 |
| Age | | |
| 3 years | 65 | 36.9 |
| 4 years | 108 | 61.4 |
| 5 years | 3 | 1.7 |
| Race | | |
| African American | 75 | 42.6 |
| Hispanic | 82 | 46.6 |
| Caucasian | 18 | 10.2 |
| Language | | |
| English | 144 | 81.8 |
| Spanish | 32 | 18.2 |
| Previously enrolled in Head Start | | |
| Yes | 40 | 22.7 |
| No | 135 | 76.7 |
| Disability | | |
| Yes | 24 | 13.6 |
| No | 151 | 85.8 |

Note: Variables where levels of frequencies do not add to 176 and percentages not totaling 100% reflect missing data.

*Family Information Form.* The Brazos Valley Community Action Agency (BVCAA) Child Development/Head Start program application is designed to collect child, parent(s), and family information in order to determine eligibility for acceptance into the BVCAA Head Start program. The data are intended to provide the U.S. Department of Health and Human Services information about the population currently being served by the BVCAA Head Start program. The application domains of the BVCAA/Head Start program application include child, parent(s), and family. The child domain, documents information about the child's age, sex, ethnic origin, child's primary language, English speaking ability, whether the child was previously enrolled in Head Start or other child development program (if so, specific programs attended), disability status, and specific disability. The parent(s) domain, documents the parent's date of birth, whether the person is a supporting adult in the child's life, whether the parent resides in the same household with the applicant, whether the person is employed or in school, whether the parent was previously enrolled in Head Start or other child development program (if so, specific programs attended), and the person's primary occupational status. The mother is also asked to provide as to whether she is currently pregnant, the length of the pregnancy, and if prenatal care is being received. The third domain, family, documents information relating to the family type (foster, single parent, two parent, other relative, or other family type), number of adults in the family, number of children in the family, gross income, the time period that the income is based on (previous 12 months or last calendar year), the number of adults contributing to the family gross income, and the types of services or financial assistance received.

*Procedures*

The current study is an archival study; thus, existing data were utilized. The BVCAA Head Start program collects the parent responses to the BVCAA program application and the Speed DIAL Total Scores for each child yearly. The data have been collected every year beginning in the fall of 2002 and are available for approximately 350 children each year; however, only the data collected during the fall 2005 was utilized for the current study as it included testing results for new as well as previously enrolled children. Prior to that, between the academic years 2002-2003 and 2004-2005, returning children were excluded from testing.

All assessment staff received mandatory half-day training on the administration of the Speed DIAL by mental health interns employed by Head Start. The mental health interns are doctoral level students with specialized training in the assessment of the Speed DIAL. Also, the students' classroom teacher initially made determination of language of administration. However, when necessary, assessment staff made subjective decisions to readminister the Speed DIAL if the student appeared to have difficulty understanding the tasks due to lack of proficiency.

Before permission to access the data was granted, confidentiality was maintained by assigning numbers to student names; all identifying child information was removed. Thus, data were de-identified, and therefore, individual consent forms were not necessary. The Speed DIAL and the BVCAA application data were then recorded in Statistical Package for the Social Sciences (SPSS) 14.0.

*Computation of the Cumulative Risk Index*

The cumulative risk index is a score that is utilized to determine the composite number of risk factors that are present for each participant. Consistent with the cumulative risk model approach, the current study calculated the cumulative risk index by assigning a score of 1 to designate the presence of risk or a score of 0 to designate the absence of risk; the scores were then summed to obtain the cumulative risk index. All the risk factors were selected from the BVCAA Child Development/Head Start program application.

*Risk Factors/Independent Variables*. A total of six variables were evaluated for risk and their sum was used to compute the cumulative risk index. The six variables were minority status, gross family income, family size, father absence, previous enrollment in Head Start, and child speaks a language other than English. These variables were selected based on previous research that has found them to be predictive of adverse developmental outcomes (Ackerman, Izard, Schoff, Youngstrom & Kogos, 1999; Ackerman et al., 2004; Burchinal et al., 2006; Gutman et al., 2003; Henry et al, 2003; Ou, 2005; Pungello et al, 1996; Sameroff et al., 1993; U. S. Department of Education, 1995). The following were the risk factors for this study with frequencies provided in Table 2.

Risk factor 1 was minority status. This was based on parent report on the Family Information Form. Children whose ethnicity was anything other than Caucasian were included in the risk category (assigned 1 point); children who were Caucasian were

assigned 0 points. Ninety percent of the sample was classified in the risk category for this variable.

Risk factor 2 was gross family income; this information was obtained from the Family Information Form. Children whose gross family income was at, or below, the median income of $9,200 were included in the risk category (assigned 1 point); if gross family income was above the median, then 0 was assigned. Forty – nine percent of the sample was classified in the risk category for this variable.

Risk factor 3 was family size; again, this was based on information from the Family Information Form. Children with more than four children living in the home, were included at-risk and assigned 1 point; four or less children in the home resulted in being assigned 0 points for this category. Twelve percent of the sample was classified in the risk category for this variable.

Risk factor 4 was father absence or presence in the home. If the father was reported to reside in the same household as the child only some of the time or not at all, the child was assigned 1 point for this risk category; if the father was reported to reside in the same household, the child was assigned 0 points. Sixty – six percent of the sample was classified in the risk category for this variable.

Table 2

*Frequencies and Percentages of Risk Factors (N = 176)*

| | Frequency | % |
|---|---|---|
| Minority | | |
| Minority | 158 | 89.8 |
| Caucasian | 18 | 10.2 |
| Income (Low) | | |
| Lower | 87 | 49.4 |
| Upper | 89 | 50.6 |
| Children (More than 4) | | |
| Yes | 21 | 11.9 |
| No | 155 | 88.1 |
| Father in Home | | |
| Absent | 116 | 65.9 |
| Present | 60 | 34.1 |
| Previously Preschool Enrollment | | |
| No Previous Enrollment | 135 | 76.7 |
| Previous Enrollment | 40 | 22.7 |
| Language (Spanish) | | |
| Spanish | 32 | 18.2 |
| English | 144 | 81.8 |

Risk factor 5 was previous enrollment in Head Start. Children who had not previously attended Head Start or other childhood developmental program, were considered at-risk and received 1 point; those children who had previously attended Head Start or other childhood developmental program received 0 points. Length of time

of previous enrollment is not assessed in the Family Information Form. Seventy – seven percent of the sample was classified in the risk category for this variable. Only one child had been enrolled in Head Start more than twice.

Risk factor 6 was child language. Children who were administered the Speed Dial in Spanish were considered at-risk and received 1 point; those administered the test in English received 0 points. There were no children who spoke a language other than Spanish as their first language and administered the test in English. Eighteen percent of the sample was classified in the risk category for this variable.

# CHAPTER IV

# RESULTS

This chapter provides the results of the efficacy of the cumulative risk model in predicting school readiness for a Head Start population. First, demographic characteristics of the participants, parents of the participants, and the continuous variables are provided. Second, the results of the multiple regression analyses are provided by research question. Lastly, the results of the supplementary analysis and a brief summary of the overall results are reported.

## *Demographics*

As mentioned in Chapter III, a total of 176 children participated in the current study. Roughly half of the children were male (51.7%) and a little under half were female (48.3%) (see Table 1). Of the 176 children, 36.9% were 3 years old, 61.4% were 4 years old, and 1.7% were 5 years old. Hispanic children made up a majority of the sample (46.6%), African American children comprised 42.6% of the sample, and Caucasian children represented the smallest proportion (10.2%). A majority of the children took the test in English (81.8%), were not previously enrolled in Head Start (76.7%), and did not have any disabilities (85.8%).

A majority of the children were from single parent (mother only) families (55.1%) and roughly one-third were from two parent families (33.5%) (see Table 3). A majority of the respondents did not include employment status for the father (74.4%). Of those who listed a job for the father, 21.6% reported that the father was currently employed. In terms of the mother's employment status, 57.4% were currently employed

at the time of the survey. As shown in Table 4, there was an average of three children per household ($M$ = 2.82, $SD$ = 1.28), and an average of two adults per household ($M$ = 1.50, $SD$ = .61). The average household income was $9,646.50 ($SD$ = 5,768.98).

Table 3

*Demographic Characteristics of the Parents (N = 176)*

| | Frequency | % |
|---|---|---|
| Father's employment | | |
| Employed | 38 | 21.6 |
| School | 1 | 0.6 |
| Neither | 6 | 3.4 |
| Not listed | 131 | 74.4 |
| Mother's employment | | |
| Employed | 101 | 57.4 |
| Neither | 28 | 15.9 |
| Employed and School | 2 | 1.1 |
| Not listed | 45 | 25.6 |
| Family type | | |
| Foster family | 5 | 2.8 |
| Other family/relatives | 14 | 8.0 |
| Single parent - mother figure only | 97 | 55.1 |
| Two parent family | 59 | 33.5 |
| Single parent - father figure only | 1 | 0.6 |

Note: Variables where levels of frequencies do not add to 176 and percentages not totaling 100% reflect missing data.

Table 4

*Demographic Characteristics of Continuous Variables (N = 176)*

| | N | Mean | SD | Range |
|---|---|---|---|---|
| Age | 176 | 3.65 | 0.51 | 3 – 5 |
| Number of Adults in Household | 176 | 1.50 | 0.61 | 1 – 4 |
| Number of Children in Household | 176 | 2.82 | 1.28 | 1 – 6 |
| Gross Annual Income | 176 | $9,646.50 | $5,768.98 | 0 – 33544 |

*Multiple Regression Analysis*

Prior to addressing the hypotheses, data were examined for completeness and Speed DIAL scores were examined for skewness, kurtosis, and normality (all *p*s>.05). Similarly, tests for normality were conducted with the cumulative risk index. Multiple regression analysis was performed to examine the relationship between child, parent, and family risk factors and school readiness. School readiness served as the dependent variable and was measured by the total score on the Fall Speed DIAL. The risk factors served as predictors and included the following: 1) Minority Status, 2) Absence of Father Figure, 3) Spanish Speaking, 4) Number of Children in Household, 5) Low Income, and 6) No Head Start. Demographics of the child, specifically gender and age of the child, were also included in the analyses as control variables. An increase in scores with age was expected as part of children's natural development. In regard to

gender, during the preschool years, girls are expected to develop verbal and social skills more rapidly than boys.

All six of the risk factors were dummy coded so that the presence of risk factor was set to 1 and the absence of the risk factor was set to 0. Specifically, race was dummy coded so that Caucasian was set to 0 and all other levels of race were set to 1. The absence of a father figure was assessed by responses to the family type item. The family type was recoded so that "two parent family" and "single parent – father figure only" were set to 0 and all other levels of family type were set to 1. Spanish speaking was set according to whether the child took the test in English or Spanish. The item was dummy coded so that the Spanish test was set to 1 and the English test set to 0.

Although the number of children in the household was left as a continuous variable in the analysis, it was also dummy coded in order to calculate the cumulative risk index. The number of children was recoded so that more than four children was set to 1 and four children or less was set to 0. Low income was included as a median-split variable. Frequencies for income were examined to determine the median, or 50%, cut-off point. Because roughly 50% of the records had incomes at or below 9,200, participants with incomes less than or equal to 9,200 were classified as having low income and set to 1, whereas participants with incomes greater than 9,200 were classified as having higher incomes and set to 0. Whether or not a child had experience in Head Start was assessed in the survey and recoded so that no previous enrollment in Head Start was set to 1 and other responses were set to 0.

The cumulative risk index (CRI) was calculated by summing the dummy coded risk factors. Higher scores on the CRI represent the presence of more risk factors, whereas lower scores represent fewer risk factors. The CRI has a potential range of 0 to 6. The 176 children had an average cumulative risk score of 3.12 (*SD* = .96) with a range of 0 – 5.

Research Question 1: Using multiple regression analysis, to what degree do child, parent, and family risk factors predict school readiness as measured by the Total Score on the Fall Speed DIAL?

A multiple regression analysis was conducted on test scores using gender, age, and the six risk factors as predictors. The model, $F$ (8, 173) = 9.31, $p < .001$, accounted for 31% of the variance in test scores ($R^2 = .305$). As shown in Table 5, controlling for the other variables, test scores were predicted by age (*Beta* = .469, $p < .001$), low income (*Beta* = -0.143, $p < .05$), no previous experience in Head Start (*Beta* = -0.140, $p < .05$), and taking the Spanish version of the test (*Beta* = -0.145, $p < .05$). Multiple regression analysis revealed that age, income, previous enrollment in Head Start, and language were significant predictors of test scores on the Fall Speed DIAL. Specifically, older age and previous enrollment in head start predicted higher scores, while low income predicted lower scores, as did taking the test in Spanish.

Table 5

*Multiple Regression of Gender, Age, and Risk Factors on Test Scores*

| | *B* | SE | Beta | *t* | *P* |
|---|---|---|---|---|---|
| Gender | 1.146 | 0.935 | 0.081 | 1.225 | 0.222 |
| Age | 6.508 | 0.943 | 0.469 | 6.904 | 0.001 |
| Minority | -0.878 | 1.544 | -0.038 | -0.568 | 0.571 |
| Low Income | -2.035 | 1.017 | -0.143 | -2.000 | 0.047 |
| Number of Children | -0.496 | 0.379 | -0.089 | -1.310 | 0.192 |
| No Father | 0.318 | 1.113 | 0.021 | 0.285 | 0.776 |
| No Previous Preschool Enrollment | -2.371 | 1.142 | -0.140 | -2.076 | 0.039 |
| Spanish Test | -2.698 | 1.333 | -0.145 | -2.025 | 0.045 |

Note: $R^2$ = .305.

Research Question 2: When compared to a multiple regression analysis, is the cumulative risk index as good as or a stronger predictor of school readiness as measured by the Total Score on the Fall Speed DIAL?

A multiple regression analysis was conducted to evaluate the predictive value of the CRI on school readiness. The predictors included gender, age, and the CRI. The model, $F$ (3, 175) = 22.64, $p < .001$, accounted for 28% of the variance in test scores ($R^2$ = .283). As shown in Table 6, controlling for the other variables, test scores were predicted by age (*Beta* = .477, $p < .001$) and the CRI (*Beta* = -0.178, $p < .01$). Older age predicted higher test scores, or increased school readiness, whereas higher scores on the CRI predicted lower test scores, or lower levels of school readiness.

Table 6

*Multiple Regression of Gender, Age, and the Cumulative Risk Index on Test Scores*

| | *B* | SE | Beta | *t* | *p* |
|---|---|---|---|---|---|
| Gender | 1.428 | 0.922 | 0.101 | 1.550 | 0.123 |
| Age | 6.600 | 0.908 | 0.477 | 7.269 | 0.001 |
| Cumulative Risk Index | -1.330 | 0.488 | -0.178 | -2.723 | 0.007 |

Note: $R^2 = .283$.

The cumulative risk index was *as good* a predictor of test scores as the six individual predictors. The model including age, gender and the six risk factors accounted for 31% of the variance (see Table 5), while the model including age, gender, and the cumulative risk index accounted for 28% of the variance (see Table 6). Only a 3% difference in variance was found between the two models predicting test scores.

Research Question 3: Using hierarchical regression, do individual risk factors add anything above and beyond their sum, the CRI?

A hierarchical multiple regression analysis was conducted in order to determine whether the individual risk factors add anything above and beyond the CRI. The predictors were entered in three separate blocks. The first block included gender and age. The second block was comprised of gender, age, and the CRI. The third block added the six risk factors.

As shown in Table 7, Block 1, $F$ (2, 173) = 29.088, $p < .001$, contained gender and age as predictors. The block was significant and accounted for 25% of the variance.

Block 2, $F$ (3, 170) = 22.392, $p < .001$, included age, gender, and the CRI and accounted for 28% of the variance. The change in $R^2$ from Block 1 to Block 2 was significant, $R^2$ change = .029, $p < .01$; however, the change was too small to be considered a meaningful change. Block 3, $F$ (8, 165) = 9.042, $p < .001$, included gender, age, the CRI, and the individual risk factors and accounted for about 30% of the variance. Although the full model accounted for the most variance, the change in $R^2$ from Block 2 and Block 3 was not significant, $R^2$ change = .022, $p = .406$. Furthermore, Block 3 does not add any significant predictors. Therefore, the results suggest that the individual risk factors do not add to the model.

*Supplementary Analyses*

Additional analyses were conducted to examine potential interaction effects between age, language, and gender and their effects on school readiness. Specifically, a three-way (age X language X gender) ANOVA was conducted on the total score on the Fall Speed DIAL. Means and standard deviations are displayed in Table 8. The results revealed a main effect for age, with older children (aged 4 and 5) having higher mean scores ($M$ = 15.52, $SD$ = 6.92) than younger children ($M$ = 7.87, $SD$ = 4.28). The results failed to reveal any significant interaction effects, all *ns*.

Table 7

*Multiple Regression of Gender, Age, the CRI, and Individual Risk Factors on School Readiness*

| | *B* | SE | Beta | *t* | *p* |
|---|---|---|---|---|---|
| Block 1, ($F = 29.088$, $p < .001$, $R^2 = .254$) | | | | | |
| Gender | 1.452 | 0.945 | 0.102 | 1.537 | 0.126 |
| Age | 6.997 | 0.922 | 0.504 | 7.589 | 0.001 |
| Block 2, ($F = 22.392$, $p < .001$, $R^2 = .283$) | | | | | |
| Gender | 1.380 | 0.929 | 0.097 | 1.485 | 0.139 |
| Age | 6.639 | 0.916 | 0.478 | 7.244 | 0.001 |
| Cumulative Risk Index | -1.298 | 0.492 | -0.173 | -2.640 | 0.009 |
| Block 3, ($F = 9.042$, $p < .001$, $R^2 = .305$) | | | | | |
| Gender | 1.195 | 0.940 | 0.084 | 1.272 | 0.205 |
| Age | 6.474 | 0.956 | 0.466 | 6.771 | 0.001 |
| Total Risk | -1.868 | 1.014 | -0.250 | -1.842 | 0.067 |
| Minority | 0.872 | 1.799 | 0.037 | 0.485 | 0.629 |
| No Father | 2.116 | 1.719 | 0.141 | 1.231 | 0.220 |
| No Head Start | -0.345 | 1.534 | -0.020 | -0.225 | 0.822 |
| Spanish Test | -0.952 | 1.594 | -0.051 | -0.597 | 0.551 |
| Number of Children | 1.165 | 1.725 | 0.052 | 0.675 | 0.501 |

Table 8

*Average Scores on the Fall Speed DIAL by Language and Age*

| | Male | | | Female | | | Total | | |
|---|---|---|---|---|---|---|---|---|---|
| | N | Mean | SD | N | Mean | SD | N | Mean | SD |
| English | | | | | | | | | |
| 3 years | 22 | 7.32 | 4.26 | 31 | 8.87 | 3.83 | 53 | 8.23 | 4.05 |
| 4-5 years | 48 | 15.65 | 7.37 | 43 | 16.44 | 6.58 | 91 | 16.02 | 6.98 |
| Total | 70 | 13.03 | 7.60 | 74 | 13.27 | 6.72 | 144 | 13.15 | 7.13 |
| Spanish | | | | | | | | | |
| 3 years | 7 | 6.00 | 3.92 | 5 | 6.80 | 6.94 | 12 | 6.33 | 5.11 |
| 4-5 years | 14 | 12.14 | 6.36 | 6 | 15.83 | 5.74 | 20 | 13.25 | 6.27 |
| Total | 21 | 10.10 | 6.30 | 11 | 11.73 | 7.62 | 32 | 10.66 | 6.70 |
| Total | | | | | | | | | |
| 3 years | 29 | 7.00 | 4.15 | 36 | 8.58 | 4.31 | 65 | 7.87 | 4.28 |
| 4-5 years | 62 | 14.86 | 7.26 | 49 | 16.37 | 6.44 | 111 | 15.52 | 6.92 |
| Total | 91 | 12.35 | 7.39 | 85 | 13.07 | 6.81 | 176 | 12.70 | 7.10 |

Note: Means are from a Gender X Age. Gender main effect, $F(1, 172) = 97.01$, $p = 0.106$. Age main effect, $F(1, 172) = 67.25$, $p < 0.001$. Gender X Age Interaction, $F(1, 172) = .001$, $p = .970$.

*Summary*

The study examined the contribution of the cumulative risk index to the prediction of school readiness in 176 preschool children attending center-based Head Start programs. Regression analyses and supplementary analysis indicate the cumulative risk index was a significant predictor of Speed Dial scores. Individual risk factors did not account for more variance than using gender, age, and the cumulative risk index as

the only predictors. Also, the cumulative risk index did not account for more meaningful variance than using gender and age as the only predictors. No interaction effects were found. These results will be discussed and implications identified in Chapter V.

# CHAPTER V

# DISCUSSION AND CONCLUSIONS

## *Summary and Implication of Findings*

The purpose of this study was to provide information regarding the influence of child, parent, and family factors on the school readiness of a Head Start population using the cumulative risk model. According to ecological systems theory (Bronfenbrenner, 1979), the microsystem or the child's immediate settings, such as home and school, are posited to have the greatest impact on the development of the child. Considering that Head Start children are a population with inherent risks, this investigation sought to explore risk factors within the microsystem that are associated with unfavorable school readiness. Specifically, this exploration was conducted by using multiple analytic approaches, including a single predictor approach known as the cumulative risk model. Review of the related literature revealed few studies utilizing the cumulative risk model have rarely included Head Start populations and have yet to thoroughly investigate school readiness. This study addressed this gap in the literature by testing the efficacy of the cumulative risk model in predicting school readiness in a Head Start population. The investigation was divided into three research questions.

With six major factors accounted for either in multiple regression or with the use of the cumulative risk index, results indicated that age, income, previous enrollment in head start, and language were significant predictors of test scores on the Fall Speed DIAL. Specifically, older age predicted higher scores, low income predicted lower scores, previous enrollment in head start predicted higher scores, and taking the test in

Spanish predicted lower scores. Analysis revealed that the CRI was a significant predictor of test scores on the Fall Speed DIAL. Higher scores on the CRI predicted lower test scores and the individual risk factors did not contribute to the model above and beyond the CRI. Adding the individual risk factors did not account for more variance than using gender, age, and the CRI as the only predictors. Similarly, the CRI did not account for more variance than using gender and age as the only predictors. Further, supplementary analyses indicated a main effect for age, but no interaction effects. Future studies need to continue to investigate interaction effects between gender, age, and language.

*Limitations*

There are various limitations to the present study including validity of parent information, risk factors measured, convergence of outcome measure, and limitations inherent in the cumulative risk model. The results of this study must be considered within the context of its limitations. All risk factor information is based solely on parent self-report. Parents may provide inaccurate information perhaps with the intention of increasing their probability of acceptance in the program (e.g., father not being present, amount of income); thus, measurement of risk factors may be overestimated. Alternatively, the parents may strive for social desirability in responding, thus resulting in underestimation of risk. Further, there is potential for risk factors to change over time and risk information in this study was gathered at a single point in time, when the parent completed Family Information Form. Any changes in risk factors that may exacerbate or ameliorate outcomes were not known.

Furthermore, the risk factors selected from the application are not exhaustive. There are other risk factors that may also have the potential to contribute to negative outcomes, such as child physiology, physical conditions at home, and teacher ability. Moreover, protective factors (e.g., positive parent-child relationships) were not considered in the current study. Their potential to offset risk remains unknown for this sample.

A final limitation relates to the measures used in this study. The Speed Dial provides a Total Score converging performances for the content areas of motor, concept, and language. Since subtest area scores are not available on the Speed DIAL, this study was not able to measure the degree to which the cumulative risk index or individual risk factors impact different areas of development as may have been possible had the Dial-3 been administered. In addition, the cumulative risk model lacks specificity (Kendall-Grove, 1997; Krishnakumar & Black, 2002). While empirical support for the continued use of this model is primarily consistent, the model does not measure which risk factor is the strongest predictor of school readiness or the process by which the risk factor impacts outcomes.

*Conclusions and Recommendations for Future Research*

In sum, the current study adds empirical support to the continued use of the cumulative risk model in predicting adverse developmental outcomes. This study extends the cumulative risk model pioneered by Rutter (1979) to the school readiness of a Head Start population; that is, as the number of risk factors increased school readiness was compromised. Yet, the body of research exploring the efficacy of the cumulative

risk model in predicting school readiness of Head Start children is scarce. Given that children from low-income families enter school with risks that exceed the general preschool population (Pungello et al., 1996) and are at an increased risk for initial and continued adverse academic performance (Whitehurst & Lonigan, 1998), a better understanding of these risks is critical to inform prevention and intervention efforts.

As posited by Bronfenbrenner's ecological systems theory, the microsystem, such as the home and school, has the greatest potential of impacting the development of children. While the current study provided support for this premise, the design of this study did not investigate the process by which these risks impact the child. Thus, not only should future studies explore the impact of the quantity of risk factors, but also explore the quality of the relationships between the child and the primary caregivers (e.g., parents and teachers), who are theorized to have the greatest impact on the developing child (Bronfenbrenner, 1979).

Another area of interest would be to investigate how cumulative risks impact development at different points in time. For example, as supported in the current study, an increase in risk factors predicted school readiness during the preschool years. Of interest would be to investigate if the total number of risks during the first year of Head Start continued to impact school performance to the same degree during subsequent years (e.g., end of kindergarten, third grade, end of elementary grades). Findings from longitudinal studies investigating the impact of high risk in other low income populations indicate the adverse effects of high risks during early childhood are likely to persist (Ackerman et al., 2004; Burchinal et al., 2006; Gutman et al., 2003; Pungello et

al., 1996). Similar studies utilizing Head Start populations are needed to continue to validate this hypothesis and add to the limited research base.

Most importantly, future research should consider assessing both risk and protective factors in Head Start populations and their impact on school readiness. Bryant, Burchinal, Lau and Sparling (1994) found that the quality of Head Start classrooms predicted both achievement and cognitive scores. Burchinal et al. (2006) found that the quality of classrooms as well as the quality of the parent-child interaction mediated the negative impacts of social risk factors on academic and social skills. Other protective factors, including ability level, teacher-child ratio, and so on need to be identified in conjunction with "quality". The degree to which these protective factors reduce the negative impacts of risk factors on school readiness is worth investigating.

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